Form 01077 (R7-92)

FORM 101.1 | REVISION 14

CERTIFICATION OF ENGINEERING CALCULATION

STATION AND UNIT NUMBER: Oconee Nuclear Station Units 1,2 and 3

TITLE OF CALCULATION: Oconee-Keowee Overhead Path Analysis

CALCULATION NUMBER: OSC-5701

ORIGINALLY CONSISTING OF:

PAGES i,ii,1 THROUGH 93

TOTAL ATTACHMENTS 7* TOTAL MICROFICHE ATTACHMENTS N/A

TOTAL VOLUMES 1 TYPE I CALCULATION/ANALYSIS? YES [X] NO [ ]

TYPE I REVIEW FREQUENCY 3 yrs

THESE ENGINEERING CALCULATIONS COVER QA CONDITION 1 ITEMS. IN ACCORDANCE WITH ESTABLISHED PROCEDURES, THE QUALITY HAS BEEN ASSURED AND CERTIFY THAT THE ABOVE CALCULATION HAS BEEN ORIGINATED, CHECKED OR APPROVED AS NOTED BELOW:

ORIGINATED BY Sokha Chhak *Sokha Chhak* DATE 5/12/94

CHECKED BY Aldean Benge *Aldean Benge* DATE 5/12/94

APRROVED BY *[signature]* DATE 5/12/94

ISSUED TO TECHNICAL SERVICES DIVISION *Sokha Chhak* DATE 6/8/94

RECEIVED BY TECHNICAL SERVICES DIVISION *CE Blakeney* DATE 6/17/94

MICROFICHE ATTACHMENT LIST: [ ] Yes [X] No See Form 101.4

REV. NO.	CALCULATION PAGES (VOL) REVISED	DELETED	ADDED	ATTACHMENTS (VOL) REVISED	DELETED	ADDED	VOLUMES DELETED	ADDED	ORIG DATE	CHKD DATE	APPR DATE	ISSUE DATE REC'D DATE
01	ii,5,10,12		Rev. Sheet, 94 to 125			8*			S. Chhak 3/2/95	AB 3/2/95	[signature] 3/8/95	S. Chhak 4/11/95 JMH 4-26-95

INFORMATION ONLY

* Attachment 7 is Disk 1 of 1

* Attachment 8 is Disk 1 of 1

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Form 101.2 Revision 1
26164 (R9-89)

File/Calculation No. OSC 5701

REVISION DOCUMENTATION SHEET

Revision Number	Review Frequency Changed Yes/No	Revision Description
1	No	Add Appendix K to analyze the impact of NSM-ON-52966 P. Clark 3/2/95 Correct typographical errors AB 3/2/95

CALCULATION/ANALYSIS INFORMATION SHEET

A. PROBLEM:

Determine the adequacy of a Keowee Hydro unit to supply power to Oconee auxiliaries via the overhead path during a three-unit LOOP with a simultaneous LOCA on one unit.

B. RELATION TO QA:

QA Condition 1

C. DESIGN METHODS:

Use the Cyme program and the Keowee model as certified in OSC 5336 Rev. 00 to simulate the Keowee unit supplying power to the Oconee auxiliaries.

D. APPLICABLE CODES AND STANDARDS (NAME, NUMBER, DATE, REVISION):

None

E. OTHER DESIGN CRITERIA:

None

F. RELATED FSAR CRITERIA:

FSAR Sections 8.3.1.1.1 and 8.3.1.1.3

G. CALCULATION PAGE NO: See Table of Contents

H. ASSUMPTIONS PAGE NO: See Table of Contents

I. REFERENCES PAGE NO: See Table of Contents

J. CONCLUSION PAGE NO: See Table of Contents

Table Of Contents

OCONEE NUCLEAR STATION
UNITS 1,2 and 3
OCONEE-KEOWEE OVERHEAD PATH ANALYSIS

1.0 SCOPE AND PURPOSE

The purpose of this calculation is to determine the adequacy of the Keowee units when used to provide emergency power to the Oconee auxiliaries via the overhead path during a three-unit LOOP with a simultaneous LOCA on one unit.

2.0 REFERENCES

1. KM-301-3, Keowee Main Step Up Transformer Name Plate
2. OSC-4441 Rev.01, OSC-4442 Rev.01, and OSC-4443 Rev.01 - Oconee Units 1, 2 and 3 ASDOP Input
3. OSC-5336 Rev.00, Cyme-Keowee Program Verification
4. OEE-118-11 through 24,
5. Industrial Power Systems Handbook, Donald Beeman
6. OSC 2444 Rev.04, Voltage Study for Oconee Auxiliary Power Systems when Fed from Keowee Via Underground Circuit and CT4 XFMR.
7. OSC 5284 Rev.00, Design Input for PIP 0-092-0581, Transformer Tap Setting
8. OSC 4984 Rev.00, OSC 4839 Rev.00 and OSC 5078, Design Input for NSM's 12870, 22870 and 32870

3.0 ASSUMPTIONS

1. For low voltage cables (4 KV and below), impedances assumed are of those given for 5 KV cables in Reference 5, page 99, Table 1.21 for armored cable.
2. Load center and motor control center transformers of the same voltage and KVA class are identical. The worst impedance will be used for each transformer class.
3. Transformer inrush currents are assumed to be constant ($10.0 / 2\sqrt{2} = 3.54$ pu) and to last 5 cycles for startup transformers (CT1, CT2 and CT3), and 15 cycles for load-center transformers. Inrush for motor control center transformers is negligible. This assumption is based on some typical data given in Attachment 1.

4.0 CONCLUSION

Based on the results of various cases being analyzed, the Keowee units with existing control logic can be considered as viable emergency sources for an Oconee three-unit LOOP concurrent with a single unit LOCA scenario only if the conditions given in either 4.1 or 4.2 are satisfied. In addition, it was observed that the setting of the overcurrent relays in some cases could be increased and still be below the motor thermal damage curve. Thus , the setting of the 4 KV motor overcurrent relays should be reviewed to determine if the settings can be increased allowing longer motor starting times.

4.1 The Keowee Underground Unit (KUG) must not generate to the grid, and the Keowee Overhead Unit (KOH) must generate no more than 75 MW[1] to the grid. If the KOH separates from the grid, it must not be reconnected to the grid before all of the reactor coolant pump motors at Oconee have been tripped off.

4.2 Both KUG and KOH can generate up to 75 MW[1] to the grid if the KUG control system is modified such that the KUG will only be reconnected the underground circuit following a load rejection when the unit has decreased in speed to 1.10 pu or less.

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[1] 90 MW if the difference between the headwater and the tailrace levels is 125' or greater

5.0 METHOD OF ANALYSIS

The analysis of the Keowee unit to provide adequate power to the Oconee auxiliaries via the overhead path during a 3 unit LOOP concurrent with a single unit LOCA is performed transiently using a computer program from Cyme International and the Keowee model as shown in Reference 3.

The following Cyme program modules were used. For subsequent revisions of this calculation, if a new version of the program module is used, simply add the new version number on the same line, i.e. Cymbase V 2.36, V 3.1, etc.

1. CYMBASE V 2.36
2. MOTORP V 2.06
3. CYMFLOW 4.70
4. CYMEDIT V 5.40
5. CYMSTAB / UDM V 5.70

6.0 KEOWEE OVERHEAD PATH SIMULATION

This calculation examines the capability of the Keowee unit to supply power to Oconee via the overhead path. The plant condition for this study is LOCA/ LOOP at Unit 1 and LOOP at Units 2 & 3. Several cases were examined with detailed descriptions given followed by a table summarizing all the cases being examined. For each of the cases, the Keowee unit is separated from the grid (load rejection) at t= 1 second.

A. Cases 1L, 1H, 2L and 2H:

These cases simulate a Keowee overhead unit load rejection (90 MW for 1L & 1H, 75 MW for 2L & 2H) at a minimum and maximum expected net head. The amount of loads and the net head values are as shown in the summary table below. The purpose of these cases is to calculate the Keowee unit speed and voltage responses so that the reset time for the 27E Relays can be estimated.

B. Case 3L: 1 Unit LOCA on underground following load reject

This case simulates the loading of Oconee Unit 1 LOCA loads plus one Condensate Booster Pump motor onto Keowee via the overhead path at 11 seconds following a 75 MW load rejection with a net head of 113'. Following a LOOP, if the startup bus is not energized within 11 seconds, the LOCA unit will be transferred to the Keowee Underground Unit (KUG). If the Underground Unit was not generating prior to the LOOP, the KUG should not have any problems accepting the LOCA loads (Reference 6). If the KUG was generating, its capability to accept load must be analyzed. Since a Cyme model for the KUG has not yet been set up, the overhead path model (Case 3L) was used to approximate the KUG response.

C: Case 4L: 3 Unit LOOP & 4 RCP start following load reject on overhead

This case simulates the reclosure of the Keowee overhead unit ACB, re-energizing the startup transformers and restarting four reactor coolant pump motors at six seconds following a 75 MW load rejection with a net head of 113'. The purpose of this case is to determine if the 27E Relays will reset following a LOOP and the failure of the four RCPs to trip.

D. Case 5H: 3 Unit LOOP (Coincidentally w/ 1 LOCA + 2 LOOP) from standby on overhead

This case simulates the Keowee overhead unit with 0 MW of initial load and 140' of net head, accepting ON 1 LOCA loads plus 1 CBP, and ON 2&3 LOOP loads. Since the initial Keowee load is zero, the Keowee response is independent of the simulated starting time of Oconee loads. In this case, the simulated starting time could be anything, but t=180 cy was selected so that the steady state of the Keowee unit can be verified when examining the associated Cyme output. In addition, the 140' net head was selected because a higher net head would produce a more conservative result. A lower net head would

cause the frequency to remain low longer resulting in higher motor torques, allowing the motors to starter faster.

E. Case 6L: 2 Unit LOOP followed by 1 Unit LOCA, load reject on overhead (underground failure)

This case simulates the Keowee overhead unit, with a net head of 113', rejecting 75 MW of load at t=60 cy, and then accepting Oconee loads in two steps. At t=1320 cy, 21 seconds following the load rejection, the startup bus is energized (see Section 7.0, results of Case 2L). At this time, the LOCA unit has already connected to the Underground Unit, and only the LOOP units would be reconnected to the overhead path. Ten seconds later, t=1920 cy, if the underground circuit failed for any reasons, the LOCA unit would transfer back to the startup bus. This transfer constitutes the second step for Case 6L. | Rev. 01

F. Case 7L: 3 Unit LOOP (concurrently and 1LOCA + 2LOOP) following load reject

This case simulates the Keowee overhead unit, with a net head of 113', rejecting 75 MW of loads at t=60 cy, and then accepting Oconee loads at t=1320 cy when the startup bus is energized 21 seconds following the load rejection (see result of Case 2L, Section 7.0). Oconee loads consist of ON 1 LOCA loads plus 1 CBP, and ON 2&3 LOOP loads. This case and this loading envelop the 3 unit LOOP case; therefore, there is no need to analyze the 3 unit LOOP case. | Rev. 01

<u>Summary of Cases Being Examined (LR: Load Rejection, nh: Net Head)</u>

Cases	Description	PL Files	SF Files	SO files
1. Case 1L	90 MW LR, nh=113', 27E reset time?	KL90	KLMW	ONOHP90
2. Case 1H	90 MW LR, nh=140', 27E reset time?	KH90	KHMW	ONOHP90
3. Case 2L	75 MW LR, nh=113', 27E reset time?	KL75	KLMW	ONOHP75
4. Case 2H	75 MW LR, nh=140', 27E reset time?	KH75	KHMW	ONOHP75
5. Case 3L	U1 LOCA connected at t=12 seconds t=60 cy, 75 MW load rejection, nh=113' t=720 cy, ON1 LOCA connected	KL75L1	KLMWL1	ONOHP75
6. Case 4L	75MW LR, 4 RCPs remained connected t=60 cy, 75 MW load rejection, nh=113' t=420 cy, ACB reclosed, 4 RCPs restart	KL75R4	KL75R4	ONOHP75
7. Case 5H	Accepting (1LOCA+1CBP)+2LOOP t=0, Keowee unit steady state, nh=140' t=180 cy, accepting the above loads	KH00L123	KH00L123	ONOHP00
8. Case 6L	Accepting 2LOOP, 1 LOCA+1CBP later t=60 cy, 75 MW load rejection, nh=113' t=1320 cy, Units 2&3 LOOP on t=1920 cy, Unit 1 LOCA+1CBP on	KL75L231	KL75L231	ONOHP75
9. Case 7L	Accepting (1LOCA+1CBP)+2LOOP t=60 cy, 75 MW load rejection, nh=113' t=1320 cy, accepting all the above loads	KL75L123	KL75L123	ONOHP75

6.1 SINGLE LINE AND LOADS

Simplified single line diagrams representing a Keowee unit supplying Oconee auxiliaries via the overhead path are shown in Figures 6.1.A through 6.1.K (Appendix A).

6.2 CYME MODEL

6.2.1 Components

In addition to the components already listed in Section 6.2.1 of OSC 5336, the following components are needed to build a network file for this calculation. The components include a Cyme default zero sequence impedance which is not used in this calculation and has not been verified.

1. Cables, 1-500MCM (500MCM),
2. Cables, 1-350MCM (350MCM),
3. Cables, 1-250MCM (250MCM),
4. Cables, 2-250MCM(2/250MCM),
5. Cables, 1-2 (NO2),
6. Cables, 1-6 (NO6),
7. Cables, 1-10 (NO10),
8. Cable, Reactor Building Cooling Fan 1A feeder (RBF1A),
9. Cable, Reactor Building Cooling Fan 1C feeder (RBF1C),
10. Cable, Reactor Building Cooling Fan 2A feeder (RBF2A),
11. Cable, Reactor Building Cooling Fan 2C feeder (RBF2C),
12. Cable, Reactor Building Cooling Fan 3A feeder (RBF3A),
13. Cable, Reactor Building Cooling Fan 3C feeder (RBF3C),
14. Three-winding transformer (CT1),
15. Three-winding transformer (CT3),
16. Load center transformer 1500KVA (XMR1500),
17. Load center transformer 1000KVA (XMR1000),
18. Load center transformer 300KVA (XMR300),
19. MCC transformer 30KVA (XMR30),
20. MCC transformer 15KVA (XMR15),
21. XSF transformer 30KVA (XSF30),

Data for cable components are summarized in Appendices D and E. The summary includes ID Tag, Type, Size, R1 set 1 per 1000', and X1 per 1000'. For the "LENGTH" field, 1 is entered to indicate that R1 and X1 are per 1000'. Other data are tabulated as follows:

FIXED TAP XMR DATA

ID Tag	XMR1500	Nominal MVA	1.5
Prim. KV	4.16	Sec KV	0.60
Pos. seq. Z	0.0818*	Pos Seq X/R	
Zero Seq. Z		Zero Seq X/R	
Prim Conn	D	Sec Conn	Yg
Max Loading		Tap %	
Rg 1		Rg 2	

* XMR 3X8

ID Tag	XMR1000	Nominal MVA	1.0
Prim. KV	4.16	Sec KV	0.60
Pos. seq. Z	0.0825	Pos Seq X/R	
Zero Seq. Z		Zero Seq X/R	
Prim Conn	D	Sec Conn	Yg
Max Loading		Tap %	100
Rg 1		Rg 2	

ID Tag	XMR300	Nominal MVA	0.30
Prim. KV	4.16	Sec KV	0.60
Pos. seq. Z	0.0484*	Pos Seq X/R	
Zero Seq. Z		Zero Seq X/R	
Prim Conn	D	Sec Conn	Yg
Max Loading		Tap %	100
Rg 1		Rg 2	

* XMR 3X10

ID Tag	XMR30	Nominal MVA	0.030
Prim. KV	0.60	Sec KV	0.208
Pos. seq. Z	0.021	Pos Seq X/R	
Zero Seq. Z		Zero Seq X/R	
Prim Conn	D	Sec Conn	Yg
Max Loading		Tap %	100
Rg 1		Rg 2	

ID Tag	XMR15	Nominal MVA	0.015
Prim. KV	0.60	Sec KV	0.208
Pos. seq. Z	0.0183	Pos Seq X/R	
Zero Seq. Z		Zero Seq X/R	
Prim Conn	D	Sec Conn	Yg
Max Loading	115	Tap %	97.50*
Rg 1		Rg 2	

* per Reference 7, page 2 of 5

ID Tag	XSF30	Nominal MVA	0.030
Prim. KV	0.60	Sec KV	0.208
Pos. seq. Z	0.0332	Pos Seq X/R	
Zero Seq. Z		Zero Seq X/R	
Prim Conn	D	Sec Conn	Y
Max Loading		Tap %	100.00
Rg 1		Rg 2	

THREE WINDING XMR DATA

ID Tag	CT1/CT2/CT3		
Prim. KV	230	Prim MVA	60
Sec KV	6.9	Sec MVA	60
Tert KV	4.16	Tert MVA	60
Z1 hm	.1690/.1750/.1700	X/R hm	
Z1 hl	.2424/.2458/.2494	X/R hl	
Z1 ml	.3192/.3032/.3176	X/R ml	
Min Range %	95	Max range	95
Number Taps		KV Desired	
Prim Conn	Yg		
Sec Conn	Yg		
Tert Conn	Yg		
Max Loading		Control Tol	
Rg 1		Xg 1	
Rg 2		Xg 2	
Rg 3		Xg 3	
Z0 hm		X/R hm	
Z0 hl		X/R hl	
Z0 ml		X/R ml	

6.2.2 Network File : ONOHP00.NET

Use Cymbase and connect all the components except for loads as shown in the single line diagrams in Appendix A. The following notes are some precautions that need to be observed:

a. Keowee main stepup transformer KXMR is connected from Bus 2 to Bus 1
b. Assign Bus 3 as a SWINGBUS controlled at 230.00 KV
c. Assign 0 MW active generation to the Keowee generator
d. Initial loads are : Buses 16,17,106,107,26,27,206,207,36,37,306, and 307 are each 6.51 MVA @ 0.93 pf to represent a running RCP motor.
e. All other static loads shown in the single-line diagrams are modeled as negative load shed in the stability control files.

6.2.3 Network File - Load Flow Format : ONOHP00.NND: See manual

6.2.4 Load Flow Result File : ONOHP00.SO: See manual

To obtain a load flow file where the Keowee generator is generating to the grid, simply use Cymflow and modify ONOHP00.SO to include the MW generated by the Keowee unit and saved the new load flow data into a different file. For this study the following load flow files were created this way: ONOHP75.SO and ONOHP90.SO, for use in simulating a 75 MW load rejection and 90 MW load rejection respectively.

6.2.5 Motor Files :

The following motors are used in this simulation (see Appendix F for detail)

1. RCP motor with load: RCPN_O.TXT, OMRCP.SF
2. RBS motor SO 68F17398: OMRBS68F.TXT, OMRBS68F.SF
3. LPS motor SO 68F19685/86: OMLPS68F.TXT, OMLPS68F.SF
4. HPI motor SO 68F20801: OMHPI68F.TXT, OMHPI68F.SF
5. LPI motor SO 68F19739/40/41: OMLPI68F.TXT, OMLPI68F.SF
6. EFW motor SO 75F32561/62: OMEFW75F.TXT, OMEFW75F.SF, (2A,2B,3A,3B)
7. EFW motor SO 72F44015/16: OMEFW72F.TXT, OMEFW72F.SF, (1A,1B)
8. RBF motor (low speed): OMRBFLSP.TXT, OMRBFLSP.SF
9. CBP motor SO 77P495/96/97 OMCBP77P.TXT, OMCBP77P.SF
10. Miscellaneous equivalent motors

6.2.6 User Defined Models:

There are two basic user defined models: exciter model (KWEX.TXT), turbine-governor model (KWGV.TXT). The two models were explained in detail in OSC 5336. To simulate the minimum and maximum net head at Keowee, the basic governor model was modified slightly by changing the HREF parameter. For a net head of 113', HREF is 1.141414 and the new user defined model was saved as K113.TXT. For 140', HREF is 1.414141 and the file is K140.TXT.

6.2.7 Stability Control Files:

This file is created in Stab_Seq format using Cymedit module. For this study, multiple control files (SF files) were created. A list of this file is include in Section 6.0. A complete listing of each of the control files is included in Appendix H.

6.3 CYME PC FILES | Rev. 01

The following is a list of all the PC files used in the Cyme simulation of this calculation which are included in attached disks (Attachment 7) :

ONOH00.NET
ONOH00.NND
ONOH00.TAB
ONOH00.SO
ONOH75.SO
ONOH90.SO
KW_ONOP.ZIP, kw_onop.doc compressed (text of this calculation)
User defined files: KWEX.TXT, K113.TXT, and K140.TXT
All *.SF and *.TXT for motors
All *.SF for control files
Miscellaneous file for Cymbase components

7.0 RESULTS OF THE SIMULATION

7.1 CASE RESULTS

Cases 1H, 1L, 2H and 2L: (KH90.PL, KL90.PL, KH75.PL, and KL75.PL)

These cases were simulated to determine the time when the frequency would come down to 1.17 pu, thus allowing the 27E relays to start the reset process. The reset time can be obtained by adding an additional 4 seconds. Based on Figure J1 in Appendix J, the reset times for these cases are:

Case 1L, 90 MW LR @ 113' - 24.2 seconds following a LOOP
Case 1H, 90 MW LR @ 140' - 19.7 seconds following a LOOP
Case 2L, 75 MW LR @ 113' - 21.0 seconds following a LOOP
Case 2H, 75 MW LR @ 140' - 17.2 seconds following a LOOP

Case 3L: (KL75L1.PL)

This case was simulated to provide a basis for the scenario where the LOCA unit would be transferred to the Underground Unit 11 seconds following the event. The overpath circuit was used to simulate this case because the underground circuit was not yet created and the results from using the overhead should be a good indicator as how the Underground Unit would perform. At 11 second, following a 75 MW load rejection, the frequency of the Underground Unit would be the same as the overhead path unit's. As a result, some of the safety motors are expected to trip on overcurrent. Figure J2 in Appendix J shows the starting current and time for Reactor Building Spray Pump Motor, 5.08 pu for 370 cy. Based on the overcurrent relay setting shown in Attachment 5, this motor is expected to trip, hence Case 3L is not acceptable.

Case 4L: (KL75R4.PL)

The result of this case shows that the startup bus does not recover high enough for the 27E relays to reset. Figure J3 in Appendix J shows the startup bus voltages.

Cases 5H, 6L and 7L: (KH00L123.PL, KL75L231.PL, and KL75L123.PL)

For these cases the voltage and frequency recoveries are acceptable. However, detailed analyses of the motor performances are needed. The following table provides such details. The Table includes, for the most parts, loads and buses for Unit 1 which should be the worst case because of higher LOCA loads. For Cases 5H and 7L, loads are energized at t=180 cy and t=1320 cy, respectively. For Case 6L, Units 2&3 are connected at t=1320 cy and Unit 1 at ten seconds later, t=1920 cy. In Case 6L, only the effect of the second load application, Unit 1 LOCA, is examined; Case 7L should envelop the first load application (2-Unit LOOP).

Tabulated Results for Cases 5H, 6L and 7L

Variables	5H/ KH00L123	7L/ KL75L123	6L/ KL75L231
V102 min, Tcy V102=0.9, Tcy Relay Tripped?	0.502 @ 181 0.900 @ 338 Not Tripped (NT)	0.495 @ 1320 0.902 @ 1480 NT	0.652 @ 1920 0.901 @ 2070 NT
V202 min, Tcy V202=0.9, Tcy Relay Tripped?	0.559 @ 181 0.900 @ 310 NT	0.554 @ 1320 0.901 @ 1420 NT	0.834 @ 1920 0.903 @ 1940 NT
N max, Tcy /Frequency PU N=1.17, Tcy N=0.95, Tcy N min, Tcy N=0.95, Tcy	NA NA 0.950 @ 355 0.941 @ 466 0.950 @ 572	1.360 @ 587 1.170 @ 1080 0.950 @ 1620 0.950 @ 1620 0.950 @ 1620	1.360 @ 587 1.170 @ 1080 N/A 0.983 @ 1580 N/A
Irbs 117, Ts=Tcy-Trcl I rl, Trip Time Tt I b=30.77, Irlp=60	5.07 for 143 cy 2.60 - 180+cy NT	5.140 for 150cy 2.640 - 180+cy NT	5.350 for 130cy 2.750 - 180+cy NT
Ilps 118, Ts Irl, Tt Ib=72.59, Irlp=120	4.67 for 99cy 2.82 - 120+cy NT	4.730 for 100cy 2.860 - 120+cy NT	5.040 for 90cy 3.049 - 120+cy NT
Ihpi 119, Ts Irelay, Tt Ib=72.31, Irlp=120	6.69 for 169cy 4.03 - 300+cy NT	6.740 for 180cy 4.060 - 300+cy NT	7.28 for 170cy 4.39 - 300+cy NT
Ilpi 120, Ts Irl, Tt Ib=50.24, Irlp=90	3.79 for 101cy 2.12 -120+cy NT	3.840 for 110cy 2.14 - 120+cy NT	4.14 for 90cy 2.31 - 120+cy NT
Irbf 121, Ts Irl, Tt Ib=118.84, Irlp=220	3.74 for 253cy 2.02 - 600+cy NT	3.770 for 260cy 2.04 - 600+cy NT	3.800 for 250 2.05 - 600+cy NT
Iefw 155, Ts Irl, Tt Ib[2]=72.17, Irlp=100	5.01 for 203cy 3.60 - 300+cy NT	5.090 for 210cy 3.670 - 300+cy NT	5.14 for 220 3.17 - 300+cy NT
V158-6/1XS3 min[3] V158=0.85, Tcy	0.421 @ 181cy 0.850 @ 351cy	0.414 @ 1320cy 0.850 @ 1490cy	0.545 @ 1920cy 0.850 @ 2090cy
V162-2/1XS3 min V162=0.85, Tcy	0.421 @ 181cy 0.850 @ 344cy	0.414 @ 1320cy 0.851 @ 1490cy	0.548 @ 1920cy 0.851 @ 2080cy

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[2] There are two different EFWP motors. The higher rated current is used to determine relay trip time. |Rev. 01
[3] Worst voltage among XS1, XS2 and XS3 and XSF, applicable to 208V MCCs as well

Variables	5H/ KH00L123	7L/ KL75L123	6L/ KL75L231
Ilps 218, Tcy Irl, Trip Tcy Ib=72.59, Irlp=120	Better than Unit 1 LOCA is on Unit 1	Better than Unit 1	Better than 7L
Irbf 221, Tcy Irl, Trip Tcy Ib=119.32, Irlp=220	Better than Unit 1	Better than Unit 1	Better than 7L
Iefw 255, Tcy Irl, Trip Tcy Ib=119.32, Irlp=	Better than Unit 1	Better than Unit 1	Better than 7L
V258-6/2XS3 min V258=0.85, Tcy	Better than Unit 1	Better than Unit 1	Better than 7L
V262-2/2XS3 min V262=0.85, Tcy	Better than Unit 1	Better than Unit 1	Better than 7L
V358-6/3XS3 min V358=0.85, Tcy	Better than Unit 1	Better than Unit 1	Better than 7L
V362-2/3XS3 min V362=0.85, Tcy	Better than Unit 1	Better than Unit 1	Better than 7L

Notes: 1. Times given in "@xxx cy" are real time, not the elapsed time.
2. Times given in "for xxx cy" are durations or elapsed times.
3. Irbs 117 : Starting current for RBS motor, on bus 117
4. Ib : Cyme motor base current
5. Irl : Current in pu on relay base

7.2 EVALUATION OF CASE RESULTS

The following summaries are based on an assumed Oconee three unit LOOP concurrent with a single unit LOCA scenario.

7.2.1 KOH and KUH Generating to the Grid:

With both units generating to the grid at up to 75MW or greater at any headwater level (net head between 113' to 140'), after a load rejection followed by a reconnection to the grid, the KOH unit frequency does not decrease fast enough to allow the 27E Relays on the 4 KV system at Oconee to reset within 11 seconds (Cases 1H, 1L, 2H, and 2L). As a result , the LOCA unit will transfer to the underground circuit 11 seconds after the event. At this time, the frequency of the KUG unit has not decreased sufficiently to avoid the tripping of some of the Oconee safety motors due to overcurrent (Case 3L). As a solution, Keowee control systems should be modified such that the KUG will only be reconnected to the underground circuit following a load rejection when the unit has decreased in speed to 1.10 pu or less. In addition, the settings of 4 KV motor overcurrent relays should also be raised if possible to allow longer motor starting times.

7.2.2 KOH Only Generating to the Grid at 90 MW

With the KOH unit generating to the grid at 90 MW while the KUG unit is on standby, after a load rejection followed by a reconnection to the grid, the KOH unit frequency does not decrease fast enough for the 27E Relays on the 4 KV system at Oconee to reset within 11 seconds (Cases 1H and 1L). The LOCA unit will transfer to the KUG which will adequately provide power to the LOCA unit (Case 5H). However, if there is also a failure of the Keowee Underground Unit , the LOCA unit will return to the startup bus 10 seconds after the 27E Relays have reset. Dependent upon net head, the 27E Relay reset time may be sufficiently long such that the LOCA unit may not be energized within the required 33 second time limit. As shown in Case 1L (90 MW LR at 113' of net head), the 27E relays do not start the reset process until the frequency drops to 1.17 pu[4], 20.2 seconds after the event. With a 4-second reset time, the startup buses will be energized at 24.2 seconds. Once the buses are energized, the LOCA unit will wait another 10 seconds (to ensure that the power source is stable) before re-transferring to the startup source, for a total 34.2 seconds, exceeding the 33 second time limit. To ensure that this 33 second time limit is satisfied the net head must be 125' or greater[5] for this scenario.

[4] Freq=1.17 pu was derived in Appendix I of this calculation

[5] Interpolated between 113' (20.2 sec.) and 140' (15.7 sec.) with approximately 5' added margin

7.2.3 KOH Only Generating to the Grid at 75 MW:

With the KOH unit generating to the grid at 75 MW while the KUG unit is on standby, after a load rejection followed by a reconnection to the grid, the KOH unit frequency does not decrease fast enough for the 27E Relays on the 4 KV system at Oconee to reset within 11 seconds (Cases 1H and 1L). The LOCA unit will transfer to the KUG which will adequately provide power to the LOCA unit (Case 5H). However, if there is also a failure of the Keowee Underground Unit , the LOCA unit will return to the startup bus 10 seconds after the 27E Relays have reset. For the worst case condition, 113' of net head, the 27E Relays will reset within 17 seconds following the event such that the KOH unit would satisfactorily supply power to the LOCA unit within 27 seconds (Case 6L).

For the case of a three unit LOOP with the KUG not available, the KOH will satisfactorily supply power to the three unit LOOP.

7.2.4 KOH Only Generating to the Grid at 75 MW and Failure of Four Reactor Coolant Pumps to Trip During a LOOP:

With the KOH unit generating to the grid at 75 MW, the KUG unit on standby, and four reactor coolant pump motors fail to trip off during a LOOP, the scenario is the same as described in 7.2.3 above except the voltage on the startup bus which does not recover sufficiently to allow the 27E relays on the 4 KV system at Oconee to reset within 33 seconds (Case 4L).

APPENDIX A: SINGLE LINE DIAGRAMS

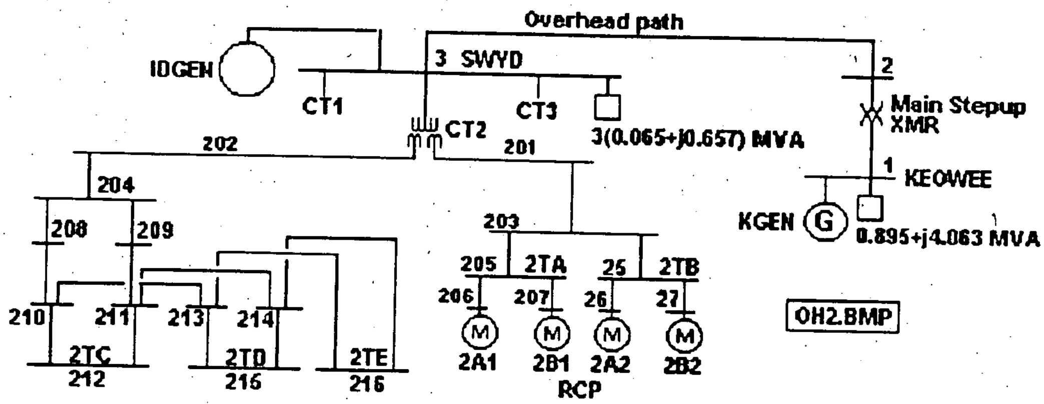


Figure 6.1.A

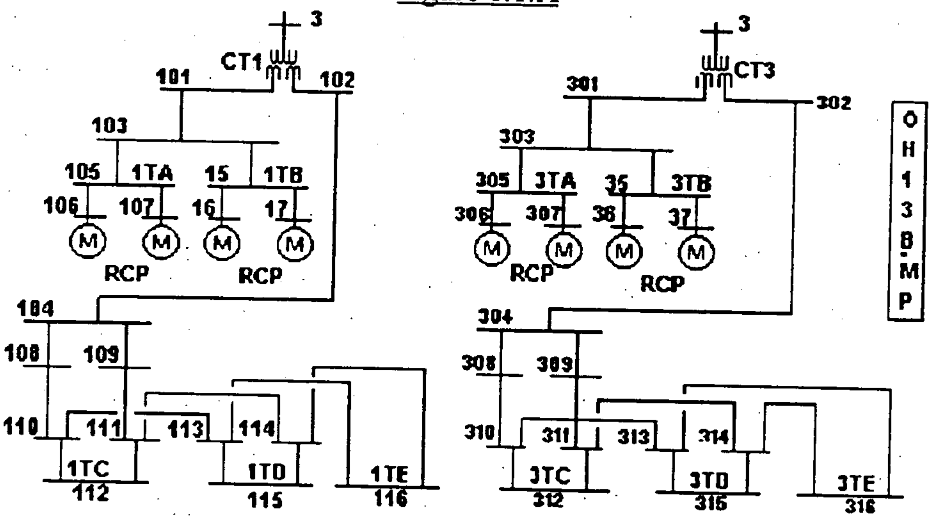
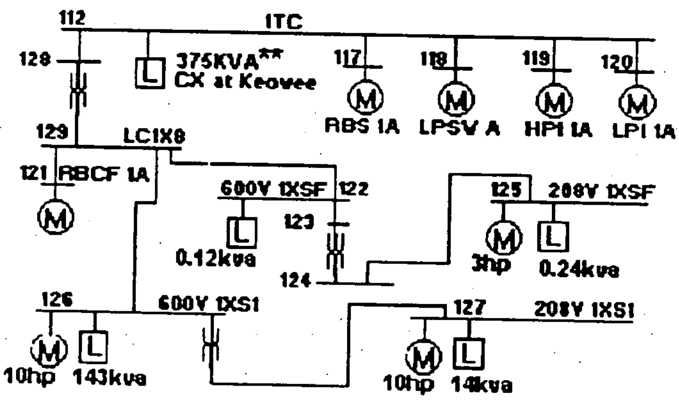


Figure 6.1.B



** per reference 6

Figure 6.1.C

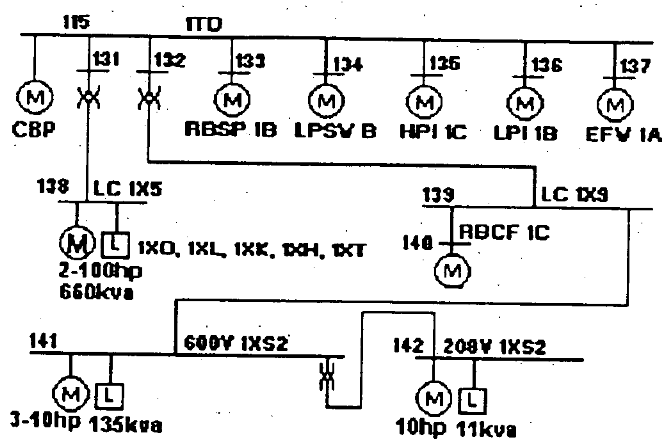


Figure 6.1.D

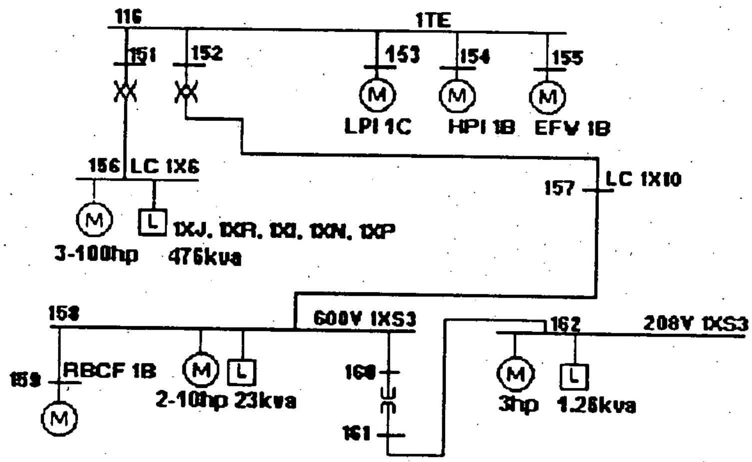


Figure 6.1.E

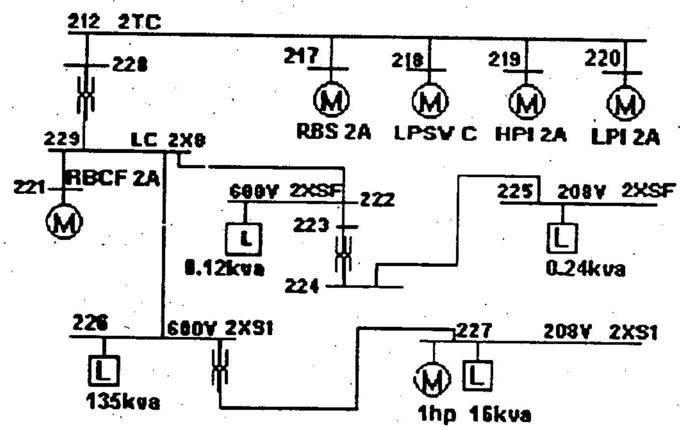


Figure 6.1.F

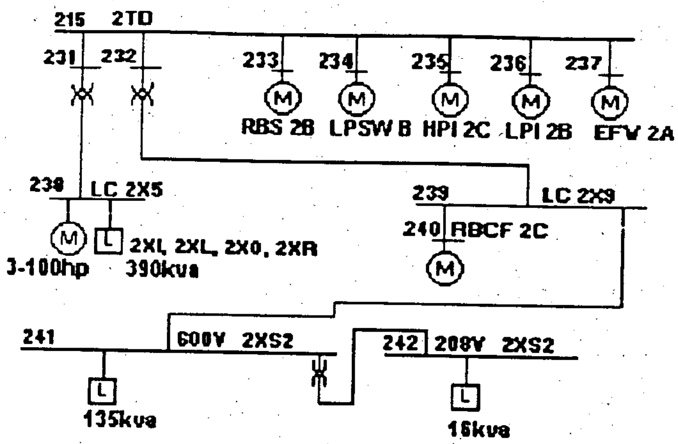


Figure 6.1.G

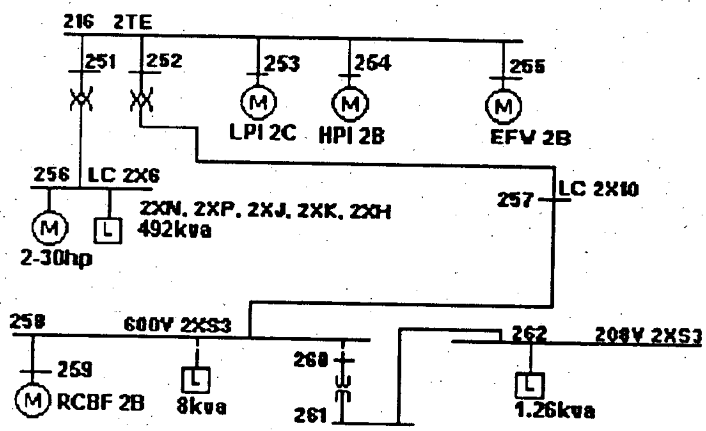


Figure 6.1.H

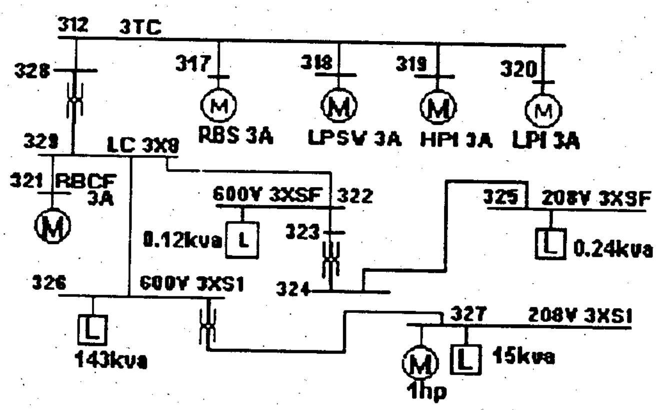


Figure 6.1.I

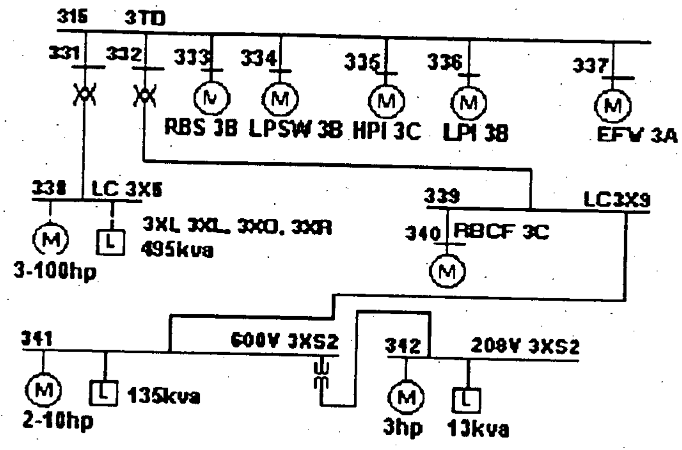


Figure 6.1.J

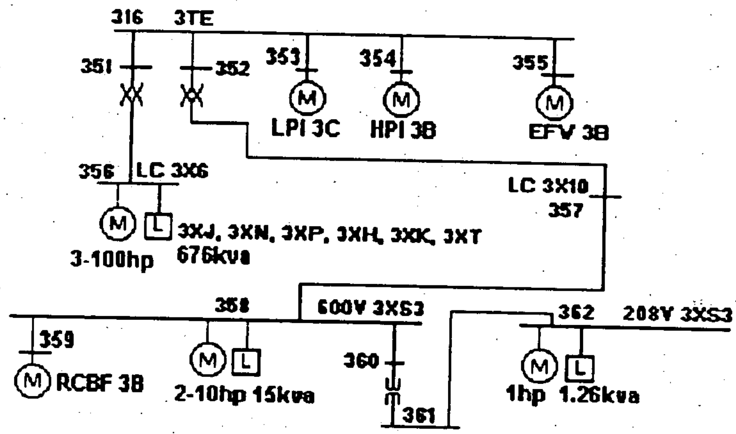


Figure 6.1.K

APPENDIX B: LOAD STATUS

B.1 Load List on 1TC

N= Normal, L= LOOP, LL= LOOP/LOCA, S= Load Shed

Bus/Load	N	L	LL	S	model	comment
117-RBSP 1A	off	off	on		*on*	Unit 1 LOOP/LOCA
118-LPSW A	on	on	on		*on*	
119-HPI 1A	on	on	on		*on*	
120-LPI 1A	off	off	on		*on*	
CCW 1A	on	off	off	y	off	
CCW 1D	on	off	off	y	off	
CB 1A	on	off	off	y	off	
HW 1A	on	off	off	y	off	
112-Keowee XMR	on	on	on		*on*	
1X1	on	off	off	y	off	
1X7	on	off*	off*	y	off	*On 60 sec. later, Ref. 8
121-1X8/ RBCF 1A	on	on	on		*on*	Start from low speed
126-1X8/ 6-1XS1	on	on	on		*on*	See detail in B.10
127-1X8/6-1XS1/2-1XS1	on	on	on		*on*	See detail
122-1X8/6-1XSF	on	on	on		*on*	See detail
125-1X8/6-1XSF/2-1XSF	on	on	on		*on*	See detail

B.2 Load List on 1TD

Bus/Load	N	L	LL	S	model	comment
133-RBSP 1B	off	off	on		*on*	Unit 1 LOOP/LOCA
134-LPSW B	off	off	on		*on*	
135-HPI 1C	off	off	on		*on*	
136-LPI 1B	off	off	on		*on*	
137-EFW 1A	off	on	on		*on*	
HD 1E2	on	off	off	y	off	
CCW 1B	on	off	off	y	off	
115-CB 1B	on	off	off	y	*on*	Failed to trip
HW 1B	on	off	off	y	off	
HD 1D2	on	off	off	y	off	
Cast Decon	off	off	off	y	off	
1X2	on	off	off	y	off	
138-1X5	on	on	on		*on*	See detail
140-1X9/ RBCF 1C	on	on	on		*on*	Start from low speed
141-1X9/ 6-1XS2	on	on	on		*on*	See detail
142-1X9/6-1XS2/2-1XS2	on	on	on		*on*	See detail

B.3 Load List on 1TE

Bus/Load	**N**	**L**	**LL**	**S**	**model**	**comment**
153-**LPI 1C**	off	off	off		off	Unit 1 LOOP/LOCA
154-**HPI 1B**	off	off	on		***on***	
155-**EFW 1B**	off	on	on		***on***	
CCW 1C	on	off	off	y	off	
CB 1C	off	off	off	y	off	
HW 1C	on	off	off	y	off	
HD 1D1	on	off	off	y	off	
HD 1E1	on	off	off	y	off	
CHLR A	on	off	off	y	off	
SWYD FDR	on	off	off	y	off	
1X3	on	off	off	y	off	
1X4	on	off	off	y	off	
156-**1X6**	on	on	on		***on***	See detail
159-1X10/6-1XS3/ **RBCF 1B**	off	off	on		***on***	Start from low speed
158-1X10/ **6-1XS3**	on	on	on		***on***	See detail
162-1X10/6-1XS3/**2-1XS3**	on	on	on		***on***	See detail

B.4 Load List on 2TC

Bus/Load	**N**	**L**	**LL**	**S**	**model**	**comment**
217-**RBSP 2A**	off	off	on		off	Unit 2 LOOP
218-**LPSW C**	on	on	on		***on***	
219-**HPI 2A**	on	on	on		***on***	
220-**LPI 2A**	off	off	on		off	
CCW 2A	on	off	off	y	off	
CCW 2D	on	off	off	y	off	
CB 2A	on	off	off	y	off	
HW 2A	on	off	off	y	off	
2X1	on	off	off	y	off	
2X11	on	off	off	y	off	
2X4	on	off	off	y	off*	*On 60 sec. later, Ref. 8
221-2X8/ **RBCF 2A**	on	on	on		***on***	Start from low speed
226-2X8/ **6-2XS1**	on	on	on		***on***	See detail
227-2X8/6-2XS1/**2-2XS1**	on	on	on		***on***	See detail
222-2X8/6-**2XSF**	on	on	on		***on***	See detail
225-2X8/6-2XSF/**2-2XSF**	on	on	on		***on***	See detail

B.5 Load List on 2TD

Bus/Load	N	L	LL	S	model	comment
233-RBSP 2B	off	off	on		off	Unit 2 LOOP
234-LPSW B	off	off	on		off	
235-HPI 2C	off	off	on		off	
236-LPI 2B	off	off	on		off	
237-EFW 2A	off	on	on		*on*	
HD 2E2	on	off	off	y	off	
CCW 2B	on	off	off	y	off	
CB 2B	on	off	off	y	off	
HW 2B	on	off	off	y	off	
HD 2D2	on	off	off	y	off	
2X2	on	off	off	y	off	
238-2X5	on	on	on		*on*	See detail
240-2X9/ RBCF 2C	on	on	on		*on*	Start from low speed
241-2X9/ 6-2XS2	on	on	on		*on*	See detail
242-2X9/6-2XS2/2-2XS2	on	on	on		*on*	See detail

B.6 Load List on 2TE

Bus/Load	N	L	LL	S	model	comment
253-LPI 2C	off	off	off		off	Unit 2 LOOP
254-HPI 2B	off	off	on		off	
255-EFW 2B	off	on	on		*on*	
CCW 2C	on	off	off	y	off	
CB 2C	off	off	off	y	off	
HW 2C	on	off	off	y	off	
HD 2D1	on	off	off	y	off	
HD 2E1	on	off	off	y	off	
CHLR A	on	off	off	y	off	
SWYD FDR	on	off	off	y	off	
2X3	on	off	off	y	off	
256-2X6	on	on	on		*on*	See detail
259-2X10/6-2XS3/ RBCF 2B	off	off	on		off	
258-2X10/ 6-2XS3	on	on	on		*on*	See detail
262-2X10/6-2XS3/2-2XS3	on	on	on		*on*	See detail

B.7 Load List on 3TC

Bus/Load	N	L	LL	S	model	comment
317-RBSP 3A	off	off	on		off	Unit 3 LOOP
318-LPSW 3A	on	on	on		*on*	
319-HPI 3A	on	on	on		*on*	
320-LPI 3A	off	off	on		off	
CCW 3A	on	off	off	y	off	
CCW 3D	on	off	off	y	off	
CB 3A	on	off	off	y	off	
HW 3A	on	off	off	y	off	
3X1	on	off	off	y	off	
3X4	on	off*	off*	y	off	*On 60 sec. later, Ref. 8
321-3X8/ RBCF 3A	on	on	on		*on*	Start from low speed
326-3X8/ 6-3XS1	on	on	on		*on*	See detail
327-3X8/6-3XS1/2-3XS1	on	on	on		*on*	See detail
322-3X8/6-3XSF	on	on	on		*on*	See detail
325-3X8/6-3XSF/2-3XSF	on	on	on		*on*	See detail

B.8 Load List on 3TD

Bus/Load	N	L	LL	S	model	comment
333-RBSP 3B	off	off	on		off	Unit 3 LOOP
334-LPSW B	off	off	on		off	
335-HPI 3C	off	off	on		off	
336-LPI 3B	off	off	on		off	
337-EFW 3A	off	on	on		*on*	
HD 3E2	on	off	off	y	off	
CCW 3B	on	off	off	y	off	
CB 3B	on	off	off	y	off	
HW 3B	on	off	off	y	off	
CHILLER	on	off	off	y	off	
HD 3D2	on	off	off	y	off	
3X2	on	off	off	y	off	
338-3X5	on	on	on		*on*	See detail
340-3X9/ RBCF 3C	on	on	on		*on*	Start at low speed
341-3X9/ 6-3XS2	on	on	on		*on*	See detail
342-3X9/6-3XS2/2-3XS2	on	on	on		*on*	See detail

B.9 Load List on 3TE

Bus/Load	N	L	LL	S	model	comment
353-LPI 3C	off	off	off		off	Unit 3 LOOP
354-HPI 3B	off	off	on		off	
355-EFW 3B	off	on	on		*on*	
CCW 3C	on	off	off	y	off	
CB 3C	on	off	off	y	off	
HW 3C	off	off	off	y	off	
HD 3D1	on	off	off	y	off	
HD 3E1	on	off	off	y	off	
CHLR A	on	off	off	y	off	
SWYD FDR	on	off	off	y	off	
3X3	on	off	off	y	off	
356-3X6	on	on	on		*on*	See detail
359-3X10/6-3XS3/ RBCF 3B	off	off	on		off	
358-3X10/ 6-3XS3	on	on	on		*on*	See detail
362-3X10/6-3XS3/2-3XS3	on	on	on		*on*	See detail

B.10 Low Voltage Loads Modeled

The following tabulation is the summary of low voltage loads calculated in Appendix C. Motors of less than 5HP are combined with KVA loads using 1HP=1KVA.

BUS/ EQU. MOTOR LOADS	LL-HP	LL-KVA	HP-Model	KVA-Model
126-600V 1XS1 / 1261	8.30	142.23	10	143
127-208V 1XS1 / 1271	11.82	13.71	10	14
122-600V 1XSF		0.12		0.12
125-208V 1XSF / 1251	3.00	0.24	3	0.24
141-600V 1XS2 /1411,1412,1413	30.80	134.50	3-10	135
142-208V 1XS2 / 1421	9.83	11.00	10	11
158-600V 1XS3 / 1581,1582	19.70	22.50	2-10	23
162-208V 1XS3 / 1621	2.09	1.26	3	1.26
138-LC 1X5 / 1381,1382	194.00	660.00	2-100	660
156-LC 1X6 / 1561,1562,1563	271.5	475.00	3-100	476

BUS/ EQU. MOTOR LOADS	L-HP	L-KVA	HP-Model	KVA-Model
226-600V 2XS1		134.50		135
227-208V 2XS1 / 2271	0.50	15.72	1	16
222-600V 2XSF		0.12		0.12
225-208V 2XSF		0.24		0.24
241-600V 2XS2		134.50		135
242-208V 2XS2		15.10		16
258-600V 2XS3		7.50		8
262-208V 2XS3		1.26		1.26
238-LC 2X5 / 2381,1382,2383	277.00	390.00	3-100	390
256-LC 2X6 / 2561,2562	62.00	492.00	2-30	492
326-600V 3XS1		142.00		143
327-208V 3XS1 / 3271	1.00	14.65	1	15
322-600V 3XSF		0.12		0.12
325/208V 3XSF		0.24		0.24
341-600V 3XS2 / 3411,3412	17.50	134.50	2-10	135
342-208V 3XS2 / 3421	3.00	12.55	3	13
358-600V 3XS3 / 3581,3582	17.50	15.00	2-10	15
362-208V 3XS3 / 3621	1.00	1.26	1	1.26
338-LC 3X5 / 3381,3382,3383	286.00	495.00	3-100	495
356-LC 3X6 / 3561,3562,3563	279.00	676.00	3-100	676

APPENDIX C: CONNECTED LOW-VOLTAGE LOADS

Loads tabulated below are derived from Rev.01 of OSC 4441, OSC 4442 and OSC 4443. Reactor Building Cooling Fans are modeled separately and are not included in the following table.

1. 0 LC 1X8	L-HP	L-KVA	LL-HP	LL-KVA
1.1 600V & 208V MCC 1XSF				
600V 1XSF non ES		0.12		0.12
208V 1XSF non ES		0.12		0.12
208V 1XSF ES			3.00	
1XSF-1		0.12		0.12
total		*0.36*	*3.00*	*0.36*
1.2 600V MCC 1XS1				
Non-ES loads		142.23*		142.23*
ES loads			8.30	
total	*0.00*	*142.23*	*8.30*	*142.23*
1.3 208V MCC 1XS1				
Non-ES loads	1.00	1.68	1.00	1.68
ES loads			10.32	
1SKJ	0.50	12.03	0.50	12.03
total	*1.50*	*13.71*	*11.82*	*13.71*
TOTAL ON 1X8	**1.50**	**79.30**	**23.12**	**79.30**

2.0 LC 1X5	L-HP	L-KVA	LL-HP	LL-KVA
MCC 1XH		38.00		38.00
MCC 1XK		168.00		168.00
MCC 1XL	106.00***	127.00	106.00***	127.00
MCC 1XO	3.00	270.00**	3.00	270.00**
MCC 1XT	245.00	57.00	85.00	57.00
MCC 1XI	0	0	0	0
TOTAL ON 1X5	**354.00**	**660.00**	**194.00**	**660.00**

3.0 LC 1X9

	L-HP	L-KVA	LL-HP	LL-KVA
Static loads		121.00		121.00
Control rod drive not in operation (LOOP)				
total	*0.00*	*0.00*	*0.00*	*0.00*
3.1 600V MCC 1XS2				
Non-ES	17.50	134.50*	22.50	134.50*
ES loads			8.30	
total	*17.50*	*134.50*	*30.80*	*134.50*
3.2 208V MCC 1XS2				
Non-ES	3.50	1.26	3.50	1.26
ES loads			6.33	
1SKK		9.74		9.74
total	*3.50*	*11.00*	*9.83*	*11.00*
TOTAL ON 1X9	**21.00**	**68.73**	**40.63**	**68.73**

4.0 LC 1X6

	L-HP	L-KVA	LL-HP	LL-KVA
MCC 1XI				
MCC 1XJ				
MCC 1XN	96.00***	60.00	96.00***	60.00
MCC 1XP		280.00**		280.00**
MCC 1XR	175.75	135.00	175.75	135.00
Total	**271.75**	**475.00**	**271.75**	**475.00**

5.0 MCCs 1XS3

	L-HP	L-KVA	LL-HP	LL-KVA
5.1 600V MCC 1XS3				
Non-ES	17.50	22.50	17.50	22.50
ES loads			2.20	
total	*17.50*	*22.50*	*19.70*	*22.50*
5.2 208V MCC 1XS3				
Non-ES	1.00	1.26	1.00	1.26
ES loads			1.09	
1SKL				
total	*1.00*	*1.26*	*2.09*	*1.26*
TOTAL ON 1XS3	**18.50**	**23.76**	**21.79**	**23.76**

6.0 LC 2X8

	L-HP	L-KVA	LL-HP	LL-KVA
6.1 600V & 208V MCCs 2XSF				
600V 2XSF non-ES		0.12		0.12
208V 2XSF non ES		0.12		0.12
208V 2XSF ES			3.00	
2XSF-1		0.12		0.12
total	*0.00*	*0.36*	*3.00*	*0.36*
6.2 600V MCC 2XS1				
Non-ES loads		134.50*		134.50*
ES loads			8.30	
total	*0.00*	*134.50*	*8.30*	*134.00*
6.3 208V MCC 2XS1				
Non-ES loads	0.50	1.26	0.50	1.26
ES loads			9.82	
2SKJ		14.46		14.46
total	*0.50*	*15.72*	*10.32*	*15.72*
TOTAL ON 2X8	**0.50**	**73.81**	**21.62**	**73.81**

7.0 LC 2X5

	L-HP	L-KVA	LL-HP	LL-KVA
MCC 2XI				
MCC 2XL	83.00***	30.00	83.00***	30.00
MCC 2XO	3.00	270.00**	3.00	270.00**
MCC 2XR	191.00	90.00	194.00	90.00
TOTAL ON 2X5	**277.00**	**390.00**	**280.00**	**390.00**

8.0 LC 2X9	L-HP	L-KVA	LL-HP	LL-KVA
Static loads		121.00		121.00
Control rod drive not in operation in LOOP				
total	*0.00*	*0.00*	*0.00*	*0.00*
8.1 600V MCC 2XS2				
Non-ES		134.50*		134.50*
ES loads			8.30	
total	*0.00*	*134.50*	*8.30*	*134.50*
8.2 208V MCC 2XS2				
Non-ES		1.26		1.26
ES loads			7.73	
2SKK		13.84		13.84
total	*0.00*	*15.10*	*7.73*	*15.10*
TOTAL ON 2X9	**0.00**	**72.83**	**16.03**	**72.83**

9.0 LC 2X6	L-HP	L-KVA	LL-HP	LL-KVA
MCC 2XH		38.00		38.00
MCC 2XJ				
MCC 2XK		168.00		168.00
MCC 2XN	62.00***	45.00	62.00***	45.00
MCC 2XP		241.00**		241.00**
TOTAL ON 2X6	**62.00**	**492.00**	**62.00**	**492.00**

10. 0 MCCs 2XS3	L-HP	L-KVA	LL-HP	LL-KVA
10.1 600V MCC 2XS3				
Non-ES		7.50		7.50
ES loads			0.48	
total	*0.00*	*7.50*	*0.48*	*7.50*
10.2 208V MCC 2XS3				
Non-ES		1.26		1.26
ES loads			1.58	
2SKL				
total	*0.00*	*1.26*	*1.58*	*1.26*
TOTAL ON 2XS3	**0.00**	**8.76**	**2.06**	**8.76**

11.0 LC 3X8	L-HP	L-KVA	LL-HP	LL-KVA
11.1 MCCs 3XSF				
600V 3XSF non ES		0.12		0.12
208V 3XSF non ES		0.12		0.12
208V 3XSF ES			3.10	
3XSF-1		0.12		0.12
total	*0.00*	*0.36*	*3.10*	*0.36*
11.2 600V MCC 3XS1				
Non-ES loads		142.00*		142.00*
ES loads			7.60	
total	*0.00*	*142.00*	*7.60*	*142.00*
11.3 208V MCC 3XS1				
Non-ES loads	1.00	1.68	1.00	1.68
ES loads			11.52	
3SKJ		12.97		12.97
total	*1.00*	*14.65*	*12.52*	*14.65*
TOTAL ON 3X8	**1.00**	**80.24**	**23.22**	**80.24**

12.0 LC 3X5	L-HP	L-KVA	LL-HP	LL-KVA
MCC 3XI				
MCC 3XL	106.00***	70.00	106.00***	70.00
MCC 3XO	27.00	318.00**	27.00	318.00**
MCC 3XR	153.00	107.00	158.00	107.00
TOTAL ON 3X5	**286.00**	**495.00**	**291.00**	**495.00**

13.0 LC 3X9	L-HP	L-KVA	LL-HP	LL-KVA
Static loads		121.00		121.00
Control rod drive not in operation in LOOP				
total	*0.00*	*0.00*	*0.00*	*0.00*
13.1 600V MCC 3XS2				
Non-ES	17.50	134.50*	17.50	134.50*
ES loads			7.60	
total	*17.50*	*134.50*	*25.10*	*134.50*
13.2 208V MCC 3XS2				
Non-ES	3.00	1.26	3.00	1.26
ES loads			7.73	
3SKK		11.29		11.29
total	*3.00*	*12.55*	*10.73*	*12.55*
TOTAL ON 3X9	**20.50**	**70.28**	**35.83**	**70.28**

14.0 LC 3X6	L-HP	L-KVA	LL-HP	LL-KVA
MCC 3XH		14.00		14.00
MCC 3XJ	0	0	0	0
MCC 3XK		168.00		168.00
MCC 3XN	96.00***	45.00	96.00***	45.00
MCC 3XP	19.00	270.00**	19.00	270.00**
MCC 3XT	164.00	179.00	169.00	179.00
Total	**279.00**	**676.00**	**284.00**	**676.00**

15.0 MCCs 3XS3		L-HP	L-KVA	LL-HP	LL-KVA
15.1 600V MCC 3XS3					
Non-ES		17.50	15.00	17.50	15.00
ES loads				2.20	
	total	*17.50*	*15.00*	*19.70*	*15.00*
15.2 208V MCC 3XS3					
Non-ES		1.00	1.26	1.00	1.26
ES loads				1.22	
1SKL					
	total	*1.00*	*1.26*	*2.22*	*1.26*
TOTAL ON 3XS3		**18.50**	**16.26**	**21.92**	**16.26**

* Control battery chargers in current limiting mode (77KVA increased), per Att. 6
** Power battery charger in current limiting mode (86KVA increased), per Att.6
*** One component cooling pump motor at 100% instead of two at 50% each, 30HP increased

APPENDIX D: FEEDER CABLE DATA

The following information is obtained from OSC-4441, 4442, and 4443, Oconee ASDOP input calculation.

From	To	Ref in ASDOP	ID Tag	Size	R ohm/1000'	X ohm/1000'	ft/1000
1TC							
112	128	B 403-406-1A	250MCM	1-250	0.05470	0.03562	0.105
112	117	B 403-407-1A	NO2	1-2	0.19700	0.04366	0.270
112	118	B 403-408-1A	NO2	1-2			0.100
112	119	B 403-409-1A	NO2	1-2			0.200
112	120	B 403-410-1A	NO2	1-2			0.250
129	121	B 58-59-1A/1B	RBF1A		8.06E-3*	5.25E-03*	1*
129	126	B 58-62-1A	500MCM	1-500	0.02920	0.03344	0.025
129	122	B 58-60-1A	350MCM	1-350	0.04000	0.03477	1.215
122	123	B 60-61-1A	NO6	1-6	0.49300	0.04941	0.025
124	125	B 27-28-1A	NO2	1-2			0.015
1TD							
115	131	B 420-422-1A	250MCM	1-250			0.105
115	132	B 420-423-1A	250MCM	1-250			0.100
115	133	B 420-424-1A	NO2	1-2			0.300
115	134	B 420-425-1A	NO2	1-2			0.165
115	135	B 420-426-1A	NO2	1-2			0.195
115	136	B 420-427-1A	NO2	1-2			0.285
115	137	B 420-428-1A	NO2	1-2			0.050
139	140	B 74-77-1A/1B	RBF1C		11.21E-03*	7.30E-03*	1*
139	141	B 74-76-1A	500MCM	1-500			0.085
1TE							
116	151	B 440-447-1A	250MCM	1-250			0.120
116	152	B 440-443-1A	NO2	1-2			0.050
116	153	B 440-444-1A	NO2	1-2			0.115
116	154	B 440-445-1A	NO2	1-2			0.115
116	155	B 440-446-1A	NO2	1-2			0.100
157	158	B 93-96-1A	500MCM	1-500			0.160
158	159	B 96-94-1A	2/250MCM	2-250	0.02735	0.01781	0.210
158	160	B 96-97-1A	NO10	1-10	1.24000	0.05745	0.025
161	162	B 24-25-1A	NO2	1-2			0.025

From	To	Ref in ASDOP	ID Tag	Size	R ohm/1000'	X ohm/1000'	ft/1000
2TC							
212	228	B 403-406-1A	250MCM	1-250			0.090
212	217	B 403-408-1A	NO2	1-2			0.250
212	218	B 403-409-1A	NO2	1-2			0.100
212	219	B 403-410-1A	NO2	1-2			0.200
212	220	B 403-411-1A	NO2	1-2			0.200
229	221	B 58-59-1A/1B	RBF2A		8.07E-03*	5.25E-03*	1*
229	226	B 58-62-1A	500MCM	1-500			0.045
229	222	B 58-60-1A	350MCM	1-350			1.165
222	223	B 60-61-1A	NO6	1-6			0.030
224	225	B 27-28-1A	NO2	1-2			0.015
2TD							
215	231	B 420-422-1A	250MCM	1-250			0.100
215	232	B 420-423-1A	250MCM	1-250			0.075
215	233	B 420-425-1A	NO2	1-2			0.200
215	234	B 420-426-1A	NO2	1-2			0.150
215	235	B 420-424-1A	NO2	1-2			0.200
215	236	B 420-427-1A	NO2	1-2			0.200
215	237	B 420-428-1A	NO2	1-2			0.100
239	240	B 74-77-1A/1B	RBF2C		12.55E-03*	8.18E-03*	1*
239	241	B 74-76-1A	500MCM	1-500			0.092
2TE							
216	251	B 440-442-1A	250MCM	1-250			0.100
216	252	B 440-443-1A	NO2	1-2			0.035
216	253	B 440-444-1A	NO2	1-2			0.200
216	254	B 440-445-1A	NO2	1-2			0.280
216	255	B 440-446-1A	NO2	1-2			0.100
257	258	B 88-89-1A	500MCM	1-500			0.200
258	259	B 89-95- 1A	2/250MCM	2-250			0.200
258	260	B 89-94-1A	NO10	1-10			0.035
261	262	B 24-25-1A	NO2	1-2			0.035
3TC							
312	328	B 403-406-1A	250MCM	1-250			0.085
312	317	B 403-407-1A	NO2	1-2			0.272
312	318	B 403-408-1A	NO2	1-2			0.175
312	319	B 403-409-1A	NO2	1-2			0.199
312	320	B 403-410-1A	NO2	1-2			0.252
329	321	B 58-59-1A/1B	RBF3A		7.22E-03*	4.71E-03*	1*
329	326	B 58-62-1A	500MCM	1-500			0.027
329	322	B 58-60-1A	350MCM	1-350			0.915
322	323	B 60-61-1A	NO6	1-6			0.030
324	325	B 27-28-1A	NO2	1-2			0.015

From	To	Ref in ASDOP	ID Tag	Size	R ohm/1000'	X ohm/1000'	ft/1000
3TD							
315	331	B 420-422-1A	250MCM	1-250			0.156
315	332	B 420-423-1A	250MCM	1-250			0.067
315	333	B 420-424-1A	NO2	1-2			0.236
315	334	B 420-425-1A	NO2	1-2			0.077
315	335	B 420-426-1A	NO2	1-2			0.199
315	336	B 420-427-1A	NO2	1-2			0.222
315	337	B 420-428-1A	NO2	1-2			0.110
339	340	B 74-75-1A/1B	RBF3C		7.87E-03*	5.126E-03*	1*
339	341	B 74-76-1A	500MCM	1-500			0.037
3TE							
316	351	B 440-442-1A	250MCM	1-250			0.197
316	352	B 440-443-1A	NO2	1-2			0.079
316	353	B 440-444-1A	NO2	1-2			0.230
316	354	B 440-445-1A	NO2	1-2			0.199
316	355	B 440-446-1A	NO2	1-2			0.110
357	358	B 88-89-1A	500MCM	1-500			0.149
358	359	B 89-90-1A	2/250MCM	2-250			0.134
358	360	B 89-92-1A	NO10	1-10			0.030
361	362	B 24-25-1A	NO2	1-2			0.003

* This feeder cable was modeled in ASDOP as a two-section cable (1A/1B). The value shown in the above table is the total impedance of the cable, sum of 1A and 1B. This cable will be modeled as a cable of one unit length (1000').

APPENDIX E: NON-SEG BUS DATA
(oohnsbus.xls)

The following information is obtained from Reference 3, pages 20 and 21.

From	To	Ref in ASDOP	Type	R Ohm/1000'	X Ohm/1000'	ft
Unit 1						
101	103	B 602-603-1A	13.8KV, 3KA	3.04E-03	3.98E-02	167
103	105	B 603-604-1A	13.8KV, 2KA	4.87E-03	3.72E-02	11
103	15	B 603-607-1A	13.8KV, 2KA	4.87E-03	3.72E-02	43
102	104	B 490-400-1A	4.16KV, 3KA	3.04E-03	2.76E-02	161
104	108	B 400-401-1A	4.16KV, 3KA	3.04E-03	2.76E-02	16
104	109	B 400-402-1A	4.16KV, 3KA	3.04E-03	2.76E-02	15
108	110	B 401-801-1A	4.16KV, 3KA	3.04E-03	2.76E-02	227
109	111	B 402-802-1A	4.16KV, 3KA	3.04E-03	2.76E-02	222
110	113	B 801-901-1A	4.16KV, 3KA	3.04E-03	2.76E-02	20
111	114	B 802-902-1A	4.16KV, 3KA	3.04E-03	2.76E-02	20
110	112	B 801-403-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
111	112	B 802-403-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
113	115	B 901-420-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
114	115	B 902-420-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
113	116	B 901-440-1A	4.16KV, 2KA	4.87E-03	3.36E-02	32
114	116	B 902-440-1A	4.16KV, 2KA	4.87E-03	3.36E-02	32
105	106	B 604-605-1A	2-600MCM	1.32E-02	1.86E-02	504
105	107	B 604-606-1A	2-600MCM	1.32E-02	1.86E-02	724
15	16	B 607-608-1A	2-600MCM	1.32E-02	1.86E-02	428
15	17	B 607-609-1A	2-600MCM	1.32E-02	1.86E-02	671
Unit 2						
201	203	B 602-603-1A	13.8KV, 3KA	3.04E-03	3.98E-02	171
203	205	B 603-604-1A	13.8KV, 2KA	4.87E-03	3.72E-02	11
203	25	B 603-607-1A	13.8KV, 2KA	4.87E-03	3.72E-02	25
202	204	B 490-400-1A	4.16KV, 3KA	3.04E-03	2.76E-02	157
204	208	B 400-401-1A	4.16KV, 3KA	3.04E-03	2.76E-02	16
204	209	B 400-402-1A	4.16KV, 3KA	3.04E-03	2.76E-02	18
208	210	B 401-801-1A	4.16KV, 3KA	3.04E-03	2.76E-02	260
209	211	B 402-802-1A	4.16KV, 3KA	3.04E-03	2.76E-02	220
210	213	B 801-901-1A	4.16KV, 3KA	3.04E-03	2.76E-02	20
211	214	B 802-902-1A	4.16KV, 3KA	3.04E-03	2.76E-02	20
210	212	B 801-403-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
211	212	B 802-403-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
213	215	B 901-420-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
214	215	B 902-420-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
213	216	B 901-440-1A	4.16KV, 2KA	4.87E-03	3.36E-02	32
214	216	B 902-440-1A	4.16KV, 2KA	4.87E-03	3.36E-02	32

205	206	B 604-605-1A	2-600MCM	1.32E-02	1.86E-02	810
205	207	B 604-606-1A	2-600MCM	1.32E-02	1.86E-02	650
25	26	B 607-608-1A	2-600MCM	1.32E-02	1.86E-02	850
25	27	B 607-609-1A	2-600MCM	1.32E-02	1.86E-02	595
Unit 3						
301	303	B 602-603-1A	13.8KV, 3KA	3.04E-03	3.98E-02	173
303	305	B 603-604-1A	13.8KV, 2KA	4.87E-03	3.72E-02	23
303	35	B 603-607-1A	13.8KV, 2KA	4.87E-03	3.72E-02	6
302	304	B 490-400-1A	4.16KV, 3KA	3.04E-03	2.76E-02	141
304	308	B 400-401-1A	4.16KV, 3KA	3.04E-03	2.76E-02	8
304	309	B 400-402-1A	4.16KV, 3KA	3.04E-03	2.76E-02	7
308	310	B 401-801-1A	4.16KV, 3KA	3.04E-03	2.76E-02	209
309	311	B 402-802-1A	4.16KV, 3KA	3.04E-03	2.76E-02	236
310	313	B 801-901-1A	4.16KV, 3KA	3.04E-03	2.76E-02	23
311	314	B 802-902-1A	4.16KV, 3KA	3.04E-03	2.76E-02	23
310	312	B 801-403-1A	4.16KV, 2KA	4.87E-03	3.36E-02	9
311	312	B 802-403-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
313	315	B 901-420-1A	4.16KV, 2KA	4.87E-03	3.36E-02	9
314	315	B 902-420-1A	4.16KV, 2KA	4.87E-03	3.36E-02	11
313	316	B 901-440-1A	4.16KV, 2KA	4.87E-03	3.36E-02	36
314	316	B 902-440-1A	4.16KV, 2KA	4.87E-03	3.36E-02	36
305	306	B 604-605-1A	2-600MCM	1.32E-02	1.86E-02	663
305	307	B 604-606-1A	2-600MCM	1.32E-02	1.86E-02	918
35	36	B 607-608-1A	2-600MCM	1.32E-02	1.86E-02	657
35	37	B 607-609-1A	2-600MCM	1.32E-02	1.86E-02	881

APPENDIX F: MOTORP INPUT DATA

RCPN_O.TXT

c File : RCP_O.TXT

```
C RCP Tm approximately 1.05*0.5(Tm_old + Tm_new)
C MOTOR INERTIA= 70000 LB-FT2,  LOAD INERTIA= 2000 LB FT2
C KVA, KV, RPM
7625.0 6.6 1200.0
C RPM,   CURRENT(A), PF,   MOTOR TORQUE(FT-LB)
   0.0  4352.0     0.226  38351.0
 200.0  4285.0     -1     38350.0
 400.0  4235.0     -1     38350.0
 650.0  4169.0     -1     40851.0
 800.0  4035.0     -1     45854.0
 900.0  3902.0     -1     54190.0
1000.0  3669.0     -1     66696.0
1050.0  3501.0     -1     79201.0
1100.0  3202.0     -1     91707.0
1120.0  3002.0     -1    100044.0
1150.0  2551.0     -1    108381.0
1180.0  1500.0     -1     83370.0
1190.0   667.0     0.935  39700.0
```

c * Decoupled, load torque Tl=0
c Motor Torque Attachment 3, Curve 627767
c KVA= 667*6.6*1.732= 7625 KVA
c IBase= 667*6.6/6.9= 638 A, used as base for Cyme current output
c Load torque from Attachment 3, Curve Mo22367-1-A

c	LRPM	LT, ft-lb
c	0	11910
c	600	11099
c	960	27790
c	1140	19700
c	1190	43670

c Additional MOTORP input: Bus KV=6.9, WK*K=70000, Class B, WTm=1, WIm=1
c WPf=1, W Xs/Xr= 0.66667 (default)

OMRBS68F.TXT

c File : OMRBS68F.TXT

```
C RBS SO 68f17398-399
C MOTOR INERTIA= 45 LB-FT2,  LOAD INERTIA= 2.75 LB FT2
C KVA, KV, RPM
221.7 4.00 3600.00
C RPM, CURRENT(A), PF, MOTOR TORQUE(FT-LB)
   0.0  215.0 0.198  378.0
 200.0     -1 0.201  380.0
 400.0     -1 0.203  390.0
 600.0     -1 0.206  400.0
 800.0     -1 0.210  410.0
1000.0     -1 0.210  420.0
1400.0     -1 0.220  440.0
2000.0     -1 0.246  490.0
2450.0     -1 0.270  580.0
2800.0     -1 0.340  690.0
3000.0     -1 0.394  800.0
3200.0     -1 0.490  950.0
3380.0     -1 0.630 1020.0
3440.0     -1 0.692 1000.0
3570.0   32.0 0.893  368.0
```

– OK per Motor torque curve @ full voltage (4000V)

c See Attachment 3
c Load torques are:

c	LRPM	LT,ft-lb
c	0	39.00
c	400	5.00
c	1400	31.00
c	3000	226.00
c	3570	379.00

cAdditional MOTORP input: Bus KV=4.16, Class B, WTm=1, WIm=1, WPf=1
c WXs/Xr= 0.66667 (default)

OMLPS68F.TXT

```
c File : OMLPS68F.TXT
C LPSW SO 68F19685-86
C MOTOR INERTIA= 960 LB-FT2,  LOAD INERTIA= 214 LB FT2
C KVA, KV, RPM
523.00 4.00 900.00
C RPM, CURRENT(A), PF, MOTOR TORQUE(FT-LB)
  0.0  480.8 0.290  3584.0
375.0     -1 0.335  4630.0
400.0     -1 0.338  4760.0
550.0     -1 0.377  5650.0
625.0     -1 0.420  6343.0
675.0     -1 0.449  7000.0
800.0     -1 0.680 10020.0
815.0     -1 0.694 10185.0
830.0     -1 0.751 10000.0
850.0     -1 0.813  9300.0
888.0   75.5 0.914  3549.0
```

c See Attachment 3
c Load torques are:

c	LRPM	LT, ft-lb
c	0	0
c	375	500
c	550	1000
c	800	2125
c	888	2550

c Additional MOTORP input: Bus KV=4.16, Class B, WTm=1, WIm=1, WPf=1
c WXs/Xr= 0.66667 (default)

OMHPI68F.TXT

```
C HPI S.O. 68F20801
C MOTOR INERTIA= 216 LB-FT2,  LOAD INERTIA= 32 LB FT2
C KVA, KV, RPM
521.0 4.0 3600.0
C RPM, CURRENT(A), PF, MOTOR TORQUE(FT-LB)
   0.0  686.0 0.236 1888.0
 180.0  686.0    -1 2065.0
 360.0  682.0 0.243 1976.0
 720.0  677.0    -1 1786.0
1080.0  667.0 0.252 1845.0
1800.0  634.0 0.275 1888.0
2520.0  598.0    -1 1926.0
2880.0  563.0 0.350 2103.0
3060.0  486.0 0.400 2382.0
3378.0  335.0    -1 3168.0
3420.0  292.0 0.644 3497.0
3494.0  180.0 0.830 2965.0
3587.0   75.2 0.926  878.0
```

c See Attachment 3
c Load torques are:

c	LRPM	LT,ft-lb
c	0	0
c	360	13
c	1800	228
c	2880	634
c	3587	963

c Additional MOTORP input: Bus KV=4.16, Class B, WTm=1, WIm=1, WPf=1
c WXs/Xr= 0.66667 (default)

OMLPI68F.TXT

```
c File: OMLPI68F.TXT
C ON 400HP-LPI, S.O. 68F19739-40-41
C MOTOR INERTIA= 130 LB-FT2, LOAD INERTIA= 35 LB FT2, Total=165
C KVA, KV, RPM
362.0 4.0 1800
C RPM, CURRENT(A), PF, MOTOR TORQUE(FT-LB)
   0.0  285.7 0.303 1416.0
 1000.0      -1 0.342 1647.0
1400.0      -1 0.423 1980.0
1700.0      -1 0.715 2679.0
1780.00  52.2 0.879 1180.0

c LT: Load Torque
c       RPM           LT des
c       0             108
c       600           86
c       1200          495
c       1500          774
c       1800          1065
```

c Additional MOTORP input: Bus KV=4.16, Class B, WTm=1, WIm=1, WPf=1
c WXs/Xr= 0.66667 (default)

OMEFW75F.TXT

```
c File: OMEFW75F.TXT
C ON EFW-600HP, S.O. 75f32561/562
C MOTOR INERTIA=128 LB-FT2,LOAD INERTIA=10.5 LB-FT2, Total=138.5
C KVA, KV, RPM
520.00 4.00 3600.00
C RPM, CURRENT(A), PF, MOTOR TORQUE(FT-LB)
   0.0  455.0 0.19   890.0
1400.0  421.0 0.195  835.0
2900.0  384.0 0.320 1300.0
3400.0  274.0 0.660 2370.0
3520.0  143.0 0.810 1750.0
3563.0   75.0 0.917  884.0

c LT: Load Torque
c        LRPM            LT,ft-lb
c        0               122
c        360             13.6
c        1400            102
c        2900            442
c        3600            687
```

c Additional MOTORP input: Bus KV=4.16, Class B, WTm=1, WIm=1, WPf=1
c WXs/Xr= 0.66667 (default)

OMEFW72F.TXT

```
c File: OMEFW72F.TXT
C EFW-500HP S.O. 72F44015 &  16 From McGuire
C MOTOR INERTIA= 113 LB-FT2, LOAD INERTIA= 9.2 LB FT2, Total=122.2
C KVA, KV, RPM
435.0 4.00 3600.00
C RPM, CURRENT(A), PF, MOTOR TORQUE(FT-LB)
   0.0  429.0 0.202  883.0
1400.0     -1 0.225  740.0
2900.0     -1 0.323  880.0
3400.0     -1 0.582 1460.0
3500.0     -1 0.760 2124.0
3580.0   62.8 0.909  733.0

c LT: Load torque
c        LRPM              LT,ft-lb
c        0                 120
c        360               10
c        1400              101
c        2900              470
c        3600              718
```

c Additional MOTORP input: Bus KV=4.16, Class B, WTm=1, WIm=1, WPf=1
c WXs/Xr= 0.66667 (default)

OMRBFLSP.TXT

```
c File: OMRBFLSP.TXT
C RBCF LOW SPEED Order No. 322174
C MOTOR INERTIA= 80 LB-FT2,  LOAD INERTIA= 1200 LB FT2
C KVA, KV, RPM
123.5 0.575 600.00
C RPM, I(A), PF,   Tm(FT-LB)
  0.0  623.0 0.300  835.0
100.0     -1 0.320  880.0
300.0     -1 0.350 1000.0
400.0     -1 0.365 1130.0
450.0     -1 0.390 1230.0
500.0     -1 0.440 1400.0
550.0     -1 0.540 1760.0
560.0     -1 0.600 1880.0
570.0     -1 0.630 1900.0
590.0  124.0 0.52   662.0

c LT: Load Torque
c        LRPM              LT,ft-lb
c        0                 100
c        60                8.1
c        300               105.3
C        480               263.25
C        600               405
```

C Additional MOTORP input: Bus KV=0.60, Class B, WTm=1, WIm=1, WPf=1
C WXs/Xr= 0.66667 (default)

OMCBP77P.TXT

```
c File: OMCBP77P.TXT
C ON CBP-2000HP, S.O. 77P495,-496, and -497
C MOTOR INERTIA= 460 LB-FT2,LOAD INERTIA=160 LB-FT2, Total= 620
C KVA, KV, RPM
1704.00 4.00 3600.00
C RPM     CURRENT(A)        PF        MOTOR TORQUE(FT-LB)
   0.0   1480.00            0.21      2348.00
1440.0     -1               0.23      2494.75
2880.0   -1                 0.30      3081.75
3420.0   -1                 0.475     4696.00
3510.0   -1                 0.600     6603.75
3580.0    246.00            0.910     2935.00

c LT: Load Torque
c          LRPM             LT,ft-lb
c          0                176.10
c          540              29.35
c          1440             470.00
c          2880             1878.00
c          3580             2935.00
```

c Additional MOTORP input: Bus KV=4.16, Class B, WTm=1, WIm=1, WPf=1
c WXs/Xr= 0.66667 (default)

APPENDIX G: TYPICAL MOTOR

For low voltage motors, detailed data such as motor torque, motor pf, motor current, and load torque versus RPM are not always available. Typical motor data are obtained by scaling correspondent known values of a 100hp, 575V motor from Catawba. This referenced motor is the Recirculating Cooling Water Pump Motor (CNM-1320-04.1). In this calculation, the *.SF files for typical motors are created using MOTORP, locked rotor (M4) option.

G.1 Data For The Referenced Motor

HP= 100, KVA= 94.12, KV= 0.575, Rated RPM= 1775, Total Inertia= 28.1

	RPM	Im	Pf	Tm		L-RPM		LT
LR:	0	520	0.383	462.00		0		30
BD:	1710	-1	-1	687.00		180		3
FL:	1775	94.5	0.874	296.00		720		49
						1440		195
					FL_RPM:	1775	FL_LT:	296

The breakdown speed is assumed to be 95% of the synch speed.
Load torque at rated RPM is assumed to be equal to rated motor torque.
Load torque at 0 RPM is assumed to be 10% of rated torque/
Load torque at other L_RPM is: $FL\_LT*(L\_RPM/FL\_RPM)^2$

G.2 Method To Calculate Motor Data for an X hp-Y volt Motor

K= X/100, VK= 575/Y
KVA= KVAo * K, *KVAo is the KVA of the referenced 100 hp motor*
Inertia= Inertia_o *K, *Inertia_o is the inertia of the referenced 100 hp motor*
Im= Imo * K*VK, *Imo is the current value for the referenced 100 hp motor*
No change in Pf
Tm= Tmo *K, *Tmo is motor torque value for the referenced 100 hp motor*
LT= LTo * K, *LTo is the load torque value for the referenced 100 hp motor*

G.3 Calculated Data

DATA FOR TYPICAL MOTOR: TP100.SF

HP	VOLT	K	VK	Inertia	KVA	KV
100	575	1	1	28.10	94.12	0.575

RPM	Im	Pf	Tm	L-RPM	LT
0	520.00	0.38	462.00	0	30.00
1710	-1.00	-1.00	687.00	180	3.00
1775	94.50	0.87	296.00	720	49.00
				1440	195.00
				1775	296.00

DATA FOR TYPICAL MOTOR: TP60.SF

HP	VOLT	K	VK	Inertia	KVA	KV
60	575	0.6	1	16.86	56.47	0.575

RPM	Im	Pf	Tm	L-RPM	LT
0	312.00	0.38	277.20	0	18.00
1710	-1.00	-1.00	412.20	180	1.80
1775	56.70	0.87	177.60	720	29.40
				1440	117.00
				1775	177.60

DATA FOR TYPICAL MOTOR: TP30.SF

HP	VOLT	K	VK	Inertia	KVA	KV
30	575	0.3	1	8.43	28.24	0.575

RPM	Im	Pf	Tm	L-RPM	LT
0	156.00	0.38	138.60	0	9.00
1710	-1.00	-1.00	206.10	180	0.90
1775	28.35	0.87	88.80	720	14.70
				1440	58.50
				1775	88.80

DATA FOR TYPICAL MOTOR: TP10.SF

HP	VOLT	K	VK	Inertia	KVA	KV
10	*575*	0.1	1	2.81	9.41	0.575

RPM	Im	Pf	Tm	L-RPM	LT
0	52.00	0.38	46.20	0	3.00
1710	-1.00	-1.00	68.70	180	0.30
1775	9.45	0.87	29.60	720	4.90
				1440	19.50
				1775	29.60

DATA FOR TYPICAL MOTOR: TP10_2.SF

HP	VOLT	K	VK	Inertia	KVA	KV
10	*208*	0.1	2.764423	2.81	9.41	0.208

RPM	Im	Pf	Tm	L-RPM	LT
0	143.75	0.38	46.20	0	3.00
1710	-1.00	-1.00	68.70	180	0.30
1775	26.12	0.87	29.60	720	4.90
				1440	19.50
				1775	29.60

DATA FOR TYPICAL MOTOR: TP3_2.SF

HP	VOLT	K	VK	Inertia	KVA	KV
3	*208*	0.03	2.764423	0.84	2.82	0.208

RPM	Im	Pf	Tm	L-RPM	LT
0	43.13	0.38	13.86	0	0.90
1710	-1.00	-1.00	20.61	180	0.09
1775	7.84	0.87	8.88	720	1.47
				1440	5.85
				1775	8.88

DATA FOR TYPICAL MOTOR: TP1_2.SF

HP	VOLT	K	VK	Inertia	KVA	KV
1	*208*	0.01	2.764423	0.28	0.94	0.208

RPM	Im	Pf	Tm	L-RPM	LT
0	14.38	0.38	4.62	0	0.30
1710	-1.00	-1.00	6.87	180	0.03
1775	2.61	0.87	2.96	720	0.49
				1440	1.95
				1775	2.96

APPENDIX H - LISTING OF CONTROL FILES
from KWSFILE.DOC

KLMW.SF

```
81KLMW.SF: Keowee overhead rejecting MW of load at 60 cy, nh=113'
90          1  1  1  1  1  1  1  1  1  1
92     1     3
95   1
95   2
95   3
95 101
95 102
95 106
95 107
95  16
95  17
95 112
95 115
95 116
95 201
95 202
95 212
95 215
95 216
95 301
95 302
95 312
95 315
95 316
01   .01   0.2    1.              500    2.    2. 1800.
03   1             1    3  13.8  87.5 4.578    1.    1.    1.   0.3         0.94
00   0.49 0.142   3.2      0.477 0.155   1.2   1.0 0.235 0.035 0.035
03   3             3    1  230.9999.09999.     1.    1.    1.   0.5
04 106           106    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 107           107    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  16            16    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  17            17    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 206           206    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 207           207    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  26            26    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
```

```
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  27            27    2   6.97.62503.1431    1.     1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 306           306    2   6.97.62503.1431    1.     1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 307           307    2   6.97.62503.1431    1.     1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  36            36    2   6.97.62503.1431    1.     1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  37            37    2   6.97.62503.1431    1.     1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450

11K113.TXT      1111111C:\CYUSERDF\
00    1.
11KWEX.TXT      1111111C:\CYUSERDF\
00    1..00001  0.17 -0.17.00001.00001  15.0  0.02  3.61 -3.18 0.097  0.03   1.0
31 60.
35 3
43 16
43 17
43 106
43 107
43 26
43 27
43 206
43 207
43 36
43 37
43 306
43 307
```

KHMW.SF

Identical to KLMW.SF except for Card 11 where K140.TXT was used instead of K113.TXT

KLMWL1.SF

```
81KLMWL1.SF:Keowee OVH,@60cy MW LR,@720cy ON1 LOCA+1CBP Start,NO RCPs,nh=113'
90        1  1  1  1  1  1  1  1  1  1
92     1     3
93   106   107    16   117   118   119   120   121   133   134
93   135   136   137   140   153   154   155   159    17   115
95   1
95   2
95   3
95 101
95 102
95 112
95 115
95 116
95 129
95 122
95 125
95 126
95 127
95 138
95 139
95 141
95 142
95 116
95 156
95 157
95 158
95 162
01    .01   0.2    1.                500    2.    2. 2400.
03    1             1     3  13.8  87.5 4.578   1.    1.    1.   0.3          0.94
00   0.49 0.142   3.2      0.477 0.155   1.2   1.0 0.235 0.035 0.035
03    3             3     1  230.9999.09999.    1.    1.    1.   0.5
04 117            117     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 133            133     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 118            118     2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
  .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                1
  .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 134            134     2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
  .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                1
  .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 119            119     2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
  .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
  .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 135            135     2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
  .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
  .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 154            154     2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
  .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
  .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
```

```
04 120          120    2     .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 136          136    2     .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 153          153    2     .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 137          137    2     .43500.84156   0.0   0.0.07951.11634.01033.00525
 .65460.14067.01393.16713.19444.61111.900007.6091924.56.84365                1
 .19444.61111.900001.62472.96323.89134.2125.90374.69748.55447.50497
04 155          155    2     .43500.84156   0.0   0.0.07951.11634.01033.00525
 .65460.14067.01393.16713.19444.61111.900007.6091924.56.84365                1
 .19444.61111.900001.62472.96323.89134.2125.90374.69748.55447.50497
04 121          121    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 140          140    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 159          159    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 126         1261    2  0.6.00941.22365   0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 125         1251    2  .208.00282.22309  0.    0..06715.10073.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 127         1271    2  .208.00941.22365  0.    0..06722.10085.01726.01726
 .65878.16554.01014.10135.20000.60000.900003.00002175.0.80389                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 138         1381    2    .6.09412.22360  0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 138         1382    2    .6.09412.22360  0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141         1411    2    .6.00941.22365  0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141         1412    2    .6.00941.22365  0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141         1413    2    .6.00941.22365  0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 142         1421    2  .208.00941.22365  0.    0..06722.10085.01726.01726
 .65878.16554.01014.10135.20000.60000.900003.00002175.0.80389                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156         1561    2    .6.09412.22360  0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
```

```
04 156          1562    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156          1563    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 158          1581    2   .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 158          1582    2   .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 162          1621    2  .208.00282.22309   0.    0..06715.10073.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 106          106     2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 107          107     2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  16          16      2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  17          17      2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 206          206     2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 207          207     2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  26          26      2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  27          27      2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 306          306     2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 307          307     2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  36          36      2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  37          37      2  6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 115          115     2     1.70401.0900    0.0   0.0.09405.12720.01454.00477
 .63986.16014.01000.06000.20000.60000.850002.9366924.56.88037              1
 .20000.60000.850001.95133.85395.04305.7565.92859.78576.69649.64293
```

```
11K113.TXT      1111111C:\CYUSERDF\
00     1.
11KWEX.TXT      1111111C:\CYUSERDF\
00     1..00001  0.17 -0.17.00001.00001   15.0  0.02  3.61 -3.18 0.097  0.03   1.0
31 60.
35 3
43 16
43 17
43 106
43 107
43 26
43 27
43 206
43 207
43 36
43 37
43 306
43 307
31 720.
36 1               -.895 -4.063
36 126             -.1216-.0753
36 125             -.0002-.0001
36 138             -.561 -.3477
36 141             -.1148-.0711
36 3               -.195 -1.971
36 122             -.0001-.0001
36 112             -.319 -.198
36 142             -.0094-.0058
36 156             -.4046-.2507
36 162             -.0011-.0007
36 158             -.0196-.0121
36 127             -.0119-.0073
36 128                   -3.54
36 132                   -3.54
36 151                   -5.31
36 131                   -5.31
36 152                   -1.06
42  1562
42   135
42   120
42  1382
42   137
42   117
42   155
42  1271
42   159
42  1621
42  1421
42   118
42  1413
42  1411
42   154
42  1561
42   133
```

42	121	
42	134	
42	119	
42	1582	
42	140	
42	1563	
42	1381	
42	1412	
42	136	
42	1251	
42	153	
42	1261	
42	1581	
42	115	
31	735.	
36	128	3.54
36	152	1.06
36	131	5.31
36	151	5.31
36	132	3.54

KL75R4.SF

```
81KL75R4.SF: Keowee OVH, @60cy Separation and 75MW LR, @420cy Restart 4 RCPs
90          1  1  1  1  1  1  1  1  1
92    1     3
93   106   107   16   117   206   207   26   27   306   307
93    36    37   17
95   1
95   2
95   3
95 101
95 102
95 112
95 115
95 116
95 201
95 202
95 212
95 215
95 216
95 301
95 302
95 312
95 315
95 316
01   .01   0.2   1.             500   2.    2. 1800.
03   1           1     3  13.8  87.5 4.578   1.    1.    1.   0.3        0.94
00  0.49 0.142  3.2      0.477 0.155   1.2   1.0 0.235 0.035 0.035
03   3           3     1  230.9999.09999.    1.    1.    1.   0.5
04 106         106     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 107         107     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  16          16     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  17          17     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 206         206     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 207         207     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  26          26     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  27          27     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 306         306     2   6.97.62503.1431   1.    1..06720.10080.01375.00687
```

```
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577          0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 307         307    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577          0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  36          36    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577          0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  37          37    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577          0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450

11K113.TXT      1111111C:\CYUSERDF\
00    1.
11KWEX.TXT      1111111C:\CYUSERDF\
00    1..00001  0.17 -0.17.00001.00001  15.0  0.02  3.61 -3.18 0.097  0.03   1.0
31 60.
33 15       16          1  360.
33 15       17          1  360.
33 105      106         1  360.
33 105      107         1  360.
35 3
43 26
43 27
43 206
43 207
43 36
43 37
43 306
43 307
```

KHOOL123.SF

```
81KHOOL123.SF:KeoweeOVH,@60cy OMWLR,@180cy start ON1LOCA+ON2&3LOOP+1CBP+INRS
90        1  1  1  1  1  1  1  1  1  1
92    1     3
93  106   107    16   117   118   119   120   121   133   134
93  135   136   137   140   153   154   155   159    17   115
93  206   207    26    27   218   219   221   237   240   255
93  306   307    36    37   318   319   321   337   340   355
95    1
95    2
95    3
95  101
95  102
95  112
95  116
95  129
95  122
95  125
95  126
95  127
95  138
95  139
95  141
95  142
95  116
95  156
95  157
95  158
95  162
95  201
95  202
95  212
95  229
95  222
95  226
95  225
95  227
95  215
95  238
95  239
95  241
95  242
95  216
95  256
95  257
95  258
95  259
95  262
95  301
95  302
95  312
95  329
95  322
```

```
95 326
95 325
95 327
95 315
95 338
95 339
95 341
95 342
95 316
95 356
95 357
95 358
95 359
95 362
01   .01  0.2   1.          500   2.    2. 2400.
03   1            1    3  13.8  87.5 4.578   1.    1.    1.   0.3        0.94
00  0.49 0.142  3.2      0.477 0.155   1.2   1.0 0.235 0.035 0.035
03   3            3    1  230.9999.09999.    1.    1.    1.   0.5
04 117          117    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                  1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 217          217    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                  1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 317          317    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                  1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 133          133    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                  1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 233          233    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                  1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 333          333    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                  1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 118          118    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                  1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 218          218    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                  1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 318          318    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                  1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 134          134    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                  1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 234          234    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                  1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 334          334    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                  1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
```

```
04 119            119    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 219            219    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 319            319    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 135            135    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 235            235    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 335            335    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 154            154    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 254            254    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 354            354    2  4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 120            120    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 220            220    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 320            320    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 136            136    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 236            236    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 336            336    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 153            153    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 253            253    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 353            353    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
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04 137              137    2      .43500.84156    0.0    0.0.07951.11634.01033.00525
 .65460.14067.01393.16713.19444.61111.900007.6091924.56.84365                    1
 .19444.61111.900001.62472.96323.89134.2125.90374.69748.55447.50497
04 237              237    2      .52000.79790    0.0    0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527                    1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 337              337    2      .52000.79790    0.0    0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527                    1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 155              155    2      .43500.84156    0.0    0.0.07951.11634.01033.00525
 .65460.14067.01393.16713.19444.61111.900007.6091924.56.84365                    1
 .19444.61111.900001.62472.96323.89134.2125.90374.69748.55447.50497
04 255              255    2      .52000.79790    0.0    0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527                    1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 355              355    2      .52000.79790    0.0    0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527                    1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 121              121    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 221              221    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 321              321    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 140              140    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 240              240    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 340              340    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 159              159    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 259              259    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 359              359    2   0.6.12350.86247    0.0    0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936                    1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 126             1261    2   0.6.00941.22365    0.     0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                    1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 125             1251    2  .208.00282.22309    0.     0..06715.10073.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475                    1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 127             1271    2  .208.00941.22365    0.     0..06722.10085.01726.01726
 .65878.16554.01014.10135.20000.60000.900003.00002175.0.80389                    1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
```

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04 138          1381    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 138          1382    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141          1411    2   .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141          1412    2   .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141          1413    2   .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 142          1421    2 .208.00941.22365    0.    0..06722.10085.01726.01726
 .65878.16554.01014.10135.20000.60000.900003.00002175.0.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156          1561    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156          1562    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156          1563    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 158          1581    2   .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 158          1582    2   .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 162          1621    2 .208.00282.22309    0.    0..06715.10073.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 227          2271    2 .208.00094.22309    0.    0..06713.10070.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000217.27.80475               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 238          2381    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 238          2382    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 238          2383    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 256          2561    2   .6.02824.22357    0.    0..06176.09265.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.7552784.44.80361               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 256          2562    2   .6.02824.22357    0.    0..06176.09265.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.7552784.44.80361               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
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04 327          3271    2  .208.00094.22309    0.    0..06713.10070.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000217.27.80475                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 338          3381    2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 338          3382    2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 338          3383    2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 341          3411    2    .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 341          3412    2    .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 342          3421    2  .208.00282.22309    0.    0..06715.10073.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 356          3561    2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 356          3562    2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 356          3563    2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 358          3581    2    .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 358          3582    2    .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 362          3621    2  .208.00094.22309    0.    0..06713.10070.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000217.27.80475                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 106           106    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 107           107    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  16            16    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  17            17    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 206           206    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
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04 207           207   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  26            26   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  27            27   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 306           306   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 307           307   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  36            36   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  37            37   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 115           115   2      1.70401.0900   0.0   0.0.09405.12720.01454.00477
 .63986.16014.01000.06000.20000.60000.850002.9366924.56.88037                  1
 .20000.60000.850001.95133.85395.04305.7565.92859.78576.69649.64293
11K140.TXT     1111111C:\CYUSERDF\
00   1.
11KWEX.TXT     1111111C:\CYUSERDF\
00    1..00001  0.17 -0.17.00001.00001  15.0  0.02  3.61 -3.18 0.097  0.03   1.0
31 60.
35 3
43 16
43 17
43 106
43 107
43 26
43 27
43 206
43 207
43 36
43 37
43 306
43 307
31 180.
36 1          -.895 -4.063
36 3          -.195 -1.971
36 126        -.1216-.0753
36 125        -.0002-.0001
36 138        -.5610-.3477
36 141        -.1148-.0711
36 122        -.0001-.0001
36 112        -.3190-.1980
36 142        -.0094-.0058
36 156        -.4046-.2507
36 162        -.0011-.0007
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36 158	-.0196-.0121
36 127	-.0119-.0073
36 128	-3.54
36 132	-3.54
36 151	-5.31
36 131	-5.31
36 152	-1.06
36 262	-.0011-.0007
36 258	-.0068-.0043
36 241	-.1148-.0711
36 256	-.4182-.2592
36 242	-.0136-.0085
36 238	-.3315-.2054
36 227	-.0136-.0085
36 225	-.0002-.0001
36 222	-.0001-.0001
36 226	-.1148-.0711
36 252	-1.06
36 251	-5.31
36 232	-3.54
36 231	-5.31
36 228	-3.54
36 322	-.0001-.0001
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36 356	-.5746-.3561
36 342	-.0111-.0069
36 358	-.0128-.0080
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36 327	-.0128-.0080
36 341	-.1148-.0711
36 338	-.4208-.2608
36 362	-.0011-.0007
36 331	-5.31
36 328	-3.54
36 332	-3.54
36 351	-5.31
36 352	-1.06
42 1562	
42 135	
42 120	
42 1382	
42 137	
42 117	
42 155	
42 1271	
42 159	
42 1621	
42 1421	
42 118	
42 1413	
42 1411	
42 154	
42 1561	
42 121	

42	134	
42	119	
42	1582	
42	140	
42	133	
42	1563	
42	1381	
42	1412	
42	136	
42	1251	
42	153	
42	1261	
42	1581	
42	115	
42	218	
42	2561	
42	2562	
42	219	
42	2271	
42	2381	
42	2382	
42	2383	
42	255	
42	237	
42	221	
42	240	
42	3562	
42	3582	
42	3561	
42	3271	
42	3621	
42	3383	
42	319	
42	318	
42	3411	
42	340	
42	355	
42	337	
42	321	
42	3381	
42	3382	
42	3563	
42	3412	
42	3581	
42	3421	
31	195.	
36	128	3.54
36	152	1.06
36	131	5.31
36	151	5.31
36	132	3.54
36	252	1.06
36	228	3.54
36	231	5.31

36 232	3.54
36 251	5.31
36 331	5.31
36 332	3.54
36 328	3.54
36 351	5.31
36 352	1.06

KL75L231.SF

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81KL75L231.SF: Keowee OVH,@60cy 75MW LR,@1320cy start 2&3LOOP,@1920cy start 1LOCA+1CBP
90         1   1   1   1   1   1   1   1   1   1
92     1   3
93   106 107  16 117 118 119 120 121 133 134
93   135 136 137 140 153 154 155 159  17 115
93   206 207  26  27 218 219 221 237 240 255
93   306 307  36  37 318 319 321 337 340 355
95   1
95   2
95   3
95 101
95 102
95 112
95 116
95 129
95 122
95 125
95 126
95 127
95 138
95 139
95 141
95 142
95 116
95 156
95 157
95 158
95 162
95 201
95 202
95 212
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01   .01  0.2   1.              500   2.    2. 3000.
03   1            1    3  13.8  87.5 4.578   1.    1.    1.   0.3        0.94
00  0.49 0.142   3.2     0.477 0.155   1.2   1.0.0.235 0.035 0.035
03   3            3    1  230.9999.09999.    1.    1.    1.   0.5
04 117          117    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 217          217    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 317          317    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 133          133    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 233          233    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 333          333    2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
 .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                1
 .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 118          118    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 218          218    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 318          318    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 134          134    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 234          234    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 334          334    2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
 .83333.39216.19608   0.0.11111.38889.583333.1352924.56.62302                1
 .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
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04 119          119    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 219          219    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 319          319    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 135          135    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 235          235    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 335          335    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 154          154    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 254          254    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 354          354    2  4.16.521001.4260   0.0    0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 120          120    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 220          220    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 320          320    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 136          136    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 236          236    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 336          336    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 153          153    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 253          253    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 353          353    2       .36200.34137   0.0    0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
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04 137          137    2    .43500.84156   0.0   0.0.07951.11634.01033.00525
 .65460.14067.01393.16713.19444.61111.900007.6091924.56.84365              1
 .19444.61111.900001.62472.96323.89134.2125.90374.69748.55447.50497
04 237          237    2    .52000.79790   0.0   0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527              1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 337          337    2    .52000.79790   0.0   0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527              1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 155          155    2    .43500.84156   0.0   0.0.07951.11634.01033.00525
 .65460.14067.01393.16713.19444.61111.900007.6091924.56.84365              1
 .19444.61111.900001.62472.96323.89134.2125.90374.69748.55447.50497
04 255          255    2    .52000.79790   0.0   0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527              1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 355          355    2    .52000.79790   0.0   0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527              1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 121          121    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 221          221    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 321          321    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 140          140    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
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04 240          240    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 340          340    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
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04 159          159    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 259          259    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 359          359    2  0.6.12350.86247  0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
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04 126         1261    2  0.6.00941.22365  0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389              1
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04 125         1251    2  .208.00282.22309  0.    0..06715.10073.01724.01724
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 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 127         1271    2  .208.00941.22365  0.    0..06722.10085.01726.01726
 .65878.16554.01014.10135.20000.60000.900003.00002175.0.80389              1
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04 138          1381    2   .6.09412.22360    0.    0..06175.09264.01586.01586
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04 138          1382    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
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04 141          1411    2   .6.00941.22365    0.    0..06174.09262.01585.01585
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04 141          1413    2   .6.00941.22365    0.    0..06174.09262.01585.01585
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 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 142          1421    2 .208.00941.22365    0.    0..06722.10085.01726.01726
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 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156          1561    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156          1562    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
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04 156          1563    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 158          1581    2   .6.00941.22365    0.    0..06174.09262.01585.01585
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 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 158          1582    2   .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 162          1621    2 .208.00282.22309    0.    0..06715.10073.01724.01724
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04 227          2271    2 .208.00094.22309    0.    0..06713.10070.01724.01724
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04 238          2381    2   .6.09412.22360    0.    0..06175.09264.01586.01586
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 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 238          2382    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 238          2383    2   .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                  1
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04 256          2561    2   .6.02824.22357    0.    0..06176.09265.01586.01586
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04 256          2562    2   .6.02824.22357    0.    0..06176.09265.01586.01586
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04 338          3381    2   .6.09412.22360     0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                 1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 338          3382    2   .6.09412.22360     0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                 1
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04 338          3383    2   .6.09412.22360     0.    0..06175.09264.01586.01586
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04 341          3411    2   .6.00941.22365     0.    0..06174.09262.01585.01585
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04 341          3412    2   .6.00941.22365     0.    0..06174.09262.01585.01585
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 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475                 1
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04 356          3561    2   .6.09412.22360     0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                 1
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04 356          3562    2   .6.09412.22360     0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                 1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 356          3563    2   .6.09412.22360     0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372                 1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 358          3581    2   .6.00941.22365     0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                 1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 358          3582    2   .6.00941.22365     0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389                 1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 362          3621    2  .208.00094.22309    0.    0..06713.10070.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000217.27.80475                 1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 106           106    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 107           107    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  16            16    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  17            17    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 206           206    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
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04 207            207    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  26             26    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  27             27    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 306            306    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 307            307    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  36             36    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  37             37    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                 0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 115            115    2      1.70401.0900    0.0    0.0.09405.12720.01454.00477
 .63986.16014.01000.06000.20000.60000.850002.9366924.56.88037                 1
 .20000.60000.850001.95133.85395.04305.7565.92859.78576.69649.64293
11K113.TXT      1111111C:\CYUSERDF\
00    1.
11KWEX.TXT      1111111C:\CYUSERDF\
00    1..00001  0.17 -0.17.00001.00001  15.0  0.02  3.61 -3.18 0.097  0.03   1.0
31 60.
35 3
43 16
43 17
43 106
43 107
43 26
43 27
43 206
43 207
43 36
43 37
43 306
43 307
31 1320.
36 1           -.895 -4.063
36 3           -.1950-1.971
36 262         -.0011-.0007
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36 256         -.4182-.2592
36 242         -.0136-.0085
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36 225         -.0002-.0001
36 222         -.0001-.0001
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36 226	-.1148-.0711
36 252	-1.06
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36 332	-3.54
36 351	-5.31
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42 2381	
42 2382	
42 2383	
42 2561	
42 2562	
42 255	
42 237	
42 221	
42 240	
42 218	
42 3562	
42 3582	
42 3561	
42 3271	
42 3621	
42 3383	
42 319	
42 318	
42 3411	
42 340	
42 355	
42 337	
42 321	
42 3381	
42 3382	
42 3563	
42 3412	
42 3581	
42 3421	
31 1335.	
36 252	1.06

36	228	3.54
36	231	5.31
36	232	3.54
36	251	5.31
36	331	5.31
36	332	3.54
36	328	3.54
36	351	5.31
36	352	1.06
31	1920.	
36	126	-.1216-.0753
36	125	-.0002-.0001
36	138	-.5610-.3477
36	141	-.1148-.0711
36	122	-.0001-.0001
36	112	-.3190-.1980
36	142	-.0094-.0058
36	156	-.4046-.2507
36	162	-.0011-.0007
36	158	-.0196-.0121
36	127	-.0119-.0073
36	128	-3.54
36	132	-3.54
36	151	-5.31
36	131	-5.31
36	152	-1.06
42	1562	
42	135	
42	120	
42	1382	
42	137	
42	117	
42	155	
42	1271	
42	159	
42	1621	
42	1421	
42	118	
42	1413	
42	1411	
42	154	
42	1561	
42	133	
42	121	
42	134	
42	119	
42	1582	
42	140	
42	1563	
42	1381	
42	1412	
42	136	
42	1251	
42	153	

42	1261	
42	1581	
42	115	
31	1935.	
36	128	3.54
36	152	1.06
36	131	5.31
36	151	5.31
36	132	3.54

KL75L123.SF

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81KL75L123.SF: Keowee OVH,@60cy 75MW LR, @1320cy 1LOCA+2LOOP+1CBP
90         1   1   1   1   1   1   1   1   1   1
92    1    3
93  106  107   16  117  118  119  120  121  133  134
93  135  136  137  140  153  154  155  159   17  115
93  206  207   26   27  218  219  221  237  240  255
93  306  307   36   37  318  319  321  337  340  355
95    1
95    2
95    3
95 101
95 102
95 112
95 116
95 129
95 122
95 125
95 126
95 127
95 138
95 139
95 141
95 142
95 116
95 156
95 157
95 158
95 162
95 201
95 202
95 212
95 229
95 222
95 226
95 225
95 227
95 215
95 238
95 239
95 241
95 242
95 216
95 256
95 257
95 258
95 259
95 262
95 301
95 302
95 312
95 329
95 322
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95 326
95 325
95 327
95 315
95 338
95 339
95 341
95 342
95 316
95 356
95 357
95 358
95 359
95 362
01   .01   0.2    1.               500    2.    2. 2400.
03   1              1     3  13.8  87.5 4.578   1.    1.    1.   0.3          0.94
00  0.49 0.142   3.2        0.477 0.155   1.2   1.0 0.235 0.035 0.035
03   3              3     1  230.9999.09999.    1.    1.    1.   0.5
04 117            117     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                 1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 217            217     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                 1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 317            317     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                 1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 133            133     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                 1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 233            233     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                 1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 333            333     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                 1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 118            118     2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
  .83333.39216.19608    0.0.11111.38889.583333.1352924.56.62302                1
  .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 218            218     2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
  .83333.39216.19608    0.0.11111.38889.583333.1352924.56.62302                1
  .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 318            318     2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
  .83333.39216.19608    0.0.11111.38889.583333.1352924.56.62302                1
  .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 134            134     2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
  .83333.39216.19608    0.0.11111.38889.583333.1352924.56.62302                1
  .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 234            234     2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
  .83333.39216.19608    0.0.11111.38889.583333.1352924.56.62302                1
  .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
04 334            334     2  4.16.52300.42029   0.0   0.0.06347.09520.02244.01258
  .83333.39216.19608    0.0.11111.38889.583333.1352924.56.62302                1
  .11111.38889.583331.07971.27911.41871.7177.98008.93029.89543.82074
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04 119          119    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 219          219    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 319          319    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 135          135    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 235          235    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 335          335    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 154          154    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 254          254    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 354          354    2 4.16.521001.4260   0.0   0.0.05617.08426.00381.00660
 .65836.23676.01350.11423.20000.50000.900002.3991924.56.94475                  1
 .20000.50000.900001.45952.14883.06783.2975.89381.73452.52213.46903
04 120          120    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 220          220    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 320          320    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 136          136    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 236          236    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 336          336    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 153          153    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 253          253    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
 .16667.33333.666671.39941.79882.59763.3964.95368.90736.81472.72208
04 353          353    2      .36200.34137   0.0   0.0.08527.11408.02065.01047
 .72676.46479.08075.10141.16667.33333.666672.5647924.56.75186                  1
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000086

By: SC 5-12-94
Checked: QD 5/12/94


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04 137          137    2   .43500.84156   0.0   0.0.07951.11634.01033.00525
 .65460.14067.01393.16713.19444.61111.900007.6091924.56.84365              1
 .19444.61111.900001.62472.96323.89134.2125.90374.69748.55447.50497
04 237          237    2   .52000.79790   0.0   0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527              1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 337          337    2   .52000.79790   0.0   0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527              1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 155          155    2   .43500.84156   0.0   0.0.07951.11634.01033.00525
 .65460.14067.01393.16713.19444.61111.900007.6091924.56.84365              1
 .19444.61111.900001.62472.96323.89134.2125.90374.69748.55447.50497
04 255          255    2   .52000.79790   0.0   0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527              1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 355          355    2   .52000.79790   0.0   0.0.08419.11241.00769.00929
 .64338.14847.01980.17758.19444.61111.900003.2892924.56.67527              1
 .19444.61111.900001.22901.71962.05972.1775.90914.71444.57945.53272
04 121          121    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 221          221    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 321          321    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 140          140    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 240          240    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 340          340    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 159          159    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 259          259    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 359          359    2  0.6.12350.86247   0.0   0.0.12077.16745.03610.02202
 .65000.26000.02000.24691.20000.50000.90000.96782918.40.27936              1
 .20000.50000.900001.04381.10951.19711.2190.87360.68401.43122.36802
04 126         1261    2  0.6.00941.22365   0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 125         1251    2  .208.00282.22309   0.    0..06715.10073.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 127         1271    2  .208.00941.22365   0.    0..06722.10085.01726.01726
 .65878.16554.01014.10135.20000.60000.900003.00002175.0.80389              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
```

```
04 138        1381   2   .6.09412.22360   0.   0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 138        1382   2   .6.09412.22360   0.   0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141        1411   2   .6.00941.22365   0.   0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141        1412   2   .6.00941.22365   0.   0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 141        1413   2   .6.00941.22365   0.   0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 142        1421   2 .208.00941.22365   0.   0..06722.10085.01726.01726
 .65878.16554.01014.10135.20000.60000.900003.00002175.0.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156        1561   2   .6.09412.22360   0.   0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156        1562   2   .6.09412.22360   0.   0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 156        1563   2   .6.09412.22360   0.   0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 158        1581   2   .6.00941.22365   0.   0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 158        1582   2   .6.00941.22365   0.   0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 162        1621   2 .208.00282.22309   0.   0..06715.10073.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 227        2271   2 .208.00094.22309   0.   0..06713.10070.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000217.27.80475               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 238        2381   2   .6.09412.22360   0.   0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 238        2382   2   .6.09412.22360   0.   0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 238        2383   2   .6.09412.22360   0.   0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 256        2561   2   .6.02824.22357   0.   0..06176.09265.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.7552784.44.80361               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 256        2562   2   .6.02824.22357   0.   0..06176.09265.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.7552784.44.80361               1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
```

```
04 327        3271   2  .208.00094.22309    0.    0..06713.10070.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000217.27.80475              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 338        3381   2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 338        3382   2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 338        3383   2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 341        3411   2    .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 341        3412   2    .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 342        3421   2  .208.00282.22309    0.    0..06715.10073.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000651.81.80475              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 356        3561   2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 356        3562   2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 356        3563   2    .6.09412.22360    0.    0..06175.09264.01586.01586
 .65878.16554.01014.10135.20000.60000.900002.75522614.4.80372              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 358        3581   2    .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 358        3582   2    .6.00941.22365    0.    0..06174.09262.01585.01585
 .65878.16554.01014.10135.20000.60000.900002.7552261.39.80389              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 362        3621   2  .208.00094.22309    0.    0..06713.10070.01724.01724
 .65878.16554.01014.10135.20000.60000.900003.0000217.27.80475              1
 .20000.60000.900001.40002.20002.80003.00001.00001.00001.00001.0000
04 106         106   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 107         107   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  16          16   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  17          17   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 206         206   2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577              0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
```

```
04 207          207    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  26           26    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  27           27    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 306          306    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 307          307    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  36           36    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04  37           37    2   6.97.62503.1431    1.    1..06720.10080.01375.00687
 .90909.63636.25416.27273.05000.20000.500003.2944914.93.97577                  0
 .05000.20000.500001.07321.29291.73232.4645.98123.92490.81225.62450
04 115          115    2      1.70401.0900   0.0    0.0.09405.12720.01454.00477
 .63986.16014.01000.06000.20000.60000.850002.9366924.56.88037                  1
 .20000.60000.850001.95133.85395.04305.7565.92859.78576.69649.64293
11K113.TXT      1111111C:\CYUSERDF\
00    1.
11KWEX.TXT      1111111C:\CYUSERDF\
00    1..00001  0.17 -0.17.00001.00001  15.0  0.02  3.61 -3.18 0.097  0.03   1.0
31 60.
35 3
43 16
43 17
43 106
43 107
43 26
43 27
43 206
43 207
43 36
43 37
43 306
43 307
31 1320.
36 1          -.895 -4.063
36 3          -.195 -1.971
36 126        -.1216-.0753
36 125        -.0002-.0001
36 138        -.5610-.3477
36 141        -.1148-.0711
36 122        -.0001-.0001
36 112        -.3190-.1980
36 142        -.0094-.0058
36 156        -.4046-.2507
36 162        -.0011-.0007
```

36	158	-.0196-.0121
36	127	-.0119-.0073
36	128	-3.54
36	132	-3.54
36	151	-5.31
36	131	-5.31
36	152	-1.06
36	262	-.0011-.0007
36	258	-.0068-.0043
36	241	-.1148-.0711
36	256	-.4182-.2592
36	242	-.0136-.0085
36	238	-.3315-.2054
36	227	-.0136-.0085
36	225	-.0002-.0001
36	222	-.0001-.0001
36	226	-.1148-.0711
36	252	-1.06
36	251	-5.31
36	232	-3.54
36	231	-5.31
36	228	-3.54
36	322	-.0001-.0001
36	325	-.0002-.0001
36	356	-.5746-.3561
36	342	-.0111-.0069
36	358	-.0128-.0080
36	326	-.1216-.0753
36	327	-.0128-.0080
36	341	-.1148-.0711
36	338	-.4208-.2608
36	362	-.0011-.0007
36	331	-5.31
36	328	-3.54
36	332	-3.54
36	351	-5.31
36	352	-1.06
42	1562	
42	135	
42	120	
42	1382	
42	137	
42	117	
42	155	
42	1271	
42	159	
42	1621	
42	1421	
42	118	
42	1413	
42	1411	
42	154	
42	1561	
42	121	

42	134	
42	119	
42	1582	
42	140	
42	133	
42	1563	
42	1381	
42	1412	
42	136	
42	1251	
42	153	
42	1261	
42	1581	
42	115	
42	218	
42	2561	
42	2562	
42	219	
42	2271	
42	2381	
42	2382	
42	2383	
42	255	
42	237	
42	221	
42	240	
42	3562	
42	3582	
42	3561	
42	3271	
42	3621	
42	3383	
42	319	
42	318	
42	3411	
42	340	
42	355	
42	337	
42	321	
42	3381	
42	3382	
42	3563	
42	3412	
42	3581	
42	3421	
31	1335	
36	128	3.54
36	152	1.06
36	131	5.31
36	151	5.31
36	132	3.54
36	252	1.06
36	228	3.54
36	231	5.31

36 232	3.54
36 251	5.31
36 331	5.31
36 332	3.54
36 328	3.54
36 351	5.31
36 352	1.06

APPENDIX I - EFFECTS OF FREQUENCY ON A CV-7 RELAY

A test was conducted at Oconee Nuclear Station to determine the effect of frequency on a typical CV-7 relay. A similar test was also conducted by ABB and the corresponding results are included in Attachment 4. For the test at Oconee, the relay was set at 105V tap and 3 sec. @ 84V. For the ABB test the setting was 70V tap and time dial 6. The followings are the results from both tests:

FREQ (Hz.) / FREQ (pu)	Pick Up (V) / Freq. Factor	Comment
38 / 0.63	56.00 / 0.800	ABB test - 70V tap
45 / 0.75	57.00 / 0.814	ABB test
50 / 0.83	60.00 / 0.857	ABB test
60 / 1.00	/ 1.000	Normal frequency
63 / 1.05	108.2 / 1.030	At Oconee - 105V tap
66 / 1.10	111.1 / 1.058	At Oconee
69 / 1.15	114.2 / 1.088	At Oconee
70 / 1.17	77.00 / 1.100	ABB test
75 / 1.25	121.0 / 1.152	At Oconee
80 / 1.33	126.8 / 1.208	At Oconee
84 / 1.40	87.00 / 1.243	ABB test

When connecting to the overhead circuits, the open circuit voltage (Vb) at the secondary side of the startup transformers is calculated to be:

Vb = (Generator Voltage) (Keowee Main XMR ratio)(Startup XMR Ratio) / 4.16
= (13.8)(218.5/13.2)(4.16/218.5)(1/4.16)
Vb= 1.05 pu

Based on the CV-7 relay curve shown in Attachment 5, the open circuit voltage needs to be at least 110% of tap in order for the 27E Relays to reset within a defined time. For any voltages less than 110%, the reset time is not defined. Therefore, to be assured that the 27E Relays will start the reset process, this open circuit voltage needs to be at least 1.10 times the adjusted relay tap value , Vpf= Vp*Freq.Factor. Then,

Vb = 1.10*Vp*Freq.factor
Freq. factor = Vb / 1.10*Vp = 1.05/ 1.10*0.875 = 1.0909 or 1.10

Based on the above table, the frequency that would provide a frequency factor of 1.10 is FREQ=1.17 pu. At FREQ= 1.17pu, the open voltage is equal to 1.10 times the adjusted relay tap. If the frequency is to remain at this value (1.17pu), the adjusted tap will also remain (1.10pu), and the reset time would be approximately 5 seconds (see relay curve in Attachment 5). However, in this study the frequency continues to decay toward nominal, and the reset time should be less than 5 seconds and is estimated to be 4 seconds.

APPENDIX J: CYME PLOTS

In the following pages are some of the plots from the Cyme output. Figure J1 contains frequency responses for Cases 1L, 1H, 2L and 2H. Figure J2 contains current and speed for RBS 1A and is derived from Case 3L where the LOCA unit is being energized at 11 seconds. Figure J3 is the voltages for 1TC, 2TC and 3TC from Case 4L where 4 reactor coolant pump motors remain connected.

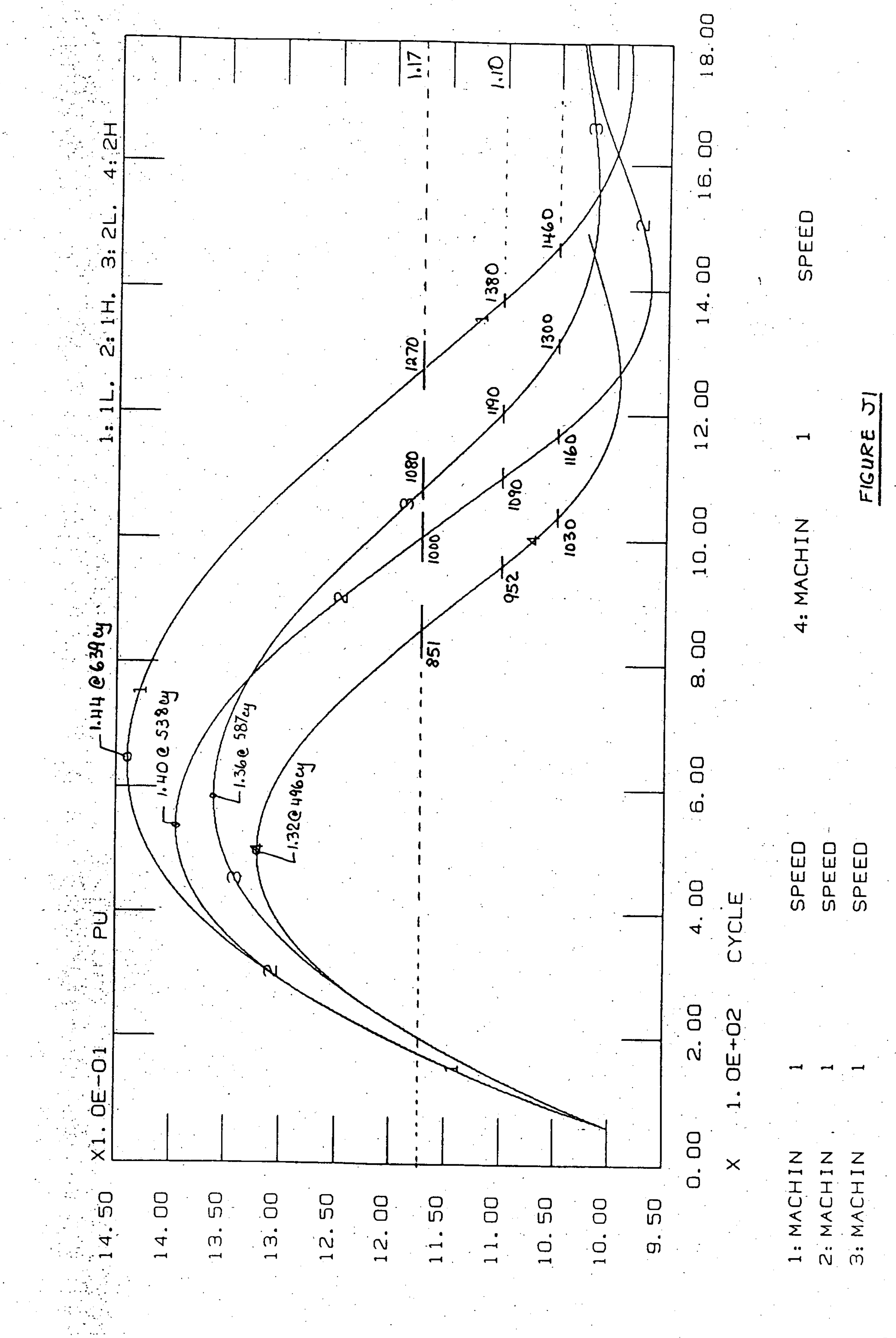

X1. 0E-01 PU
14.50
14.00
13.50
13.00
12.50
12.00
11.50
11.00
10.50
10.00
9.50
X 1. 0E+02 CYCLE
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
1: 1L. 2: 1H. 3: 2L. 4: 2H
1.44 @ 639 cy
1.40 @ 538 cy
1.36 @ 587 cy
1.32 @ 496 cy
1.17
1.10
851
952
1030
1000
1090
1160
1080
1190
1300
1270
1380
1460
1: MACHIN 1 SPEED
2: MACHIN 1 SPEED
3: MACHIN 1 SPEED
4: MACHIN 1 SPEED

FIGURE 51

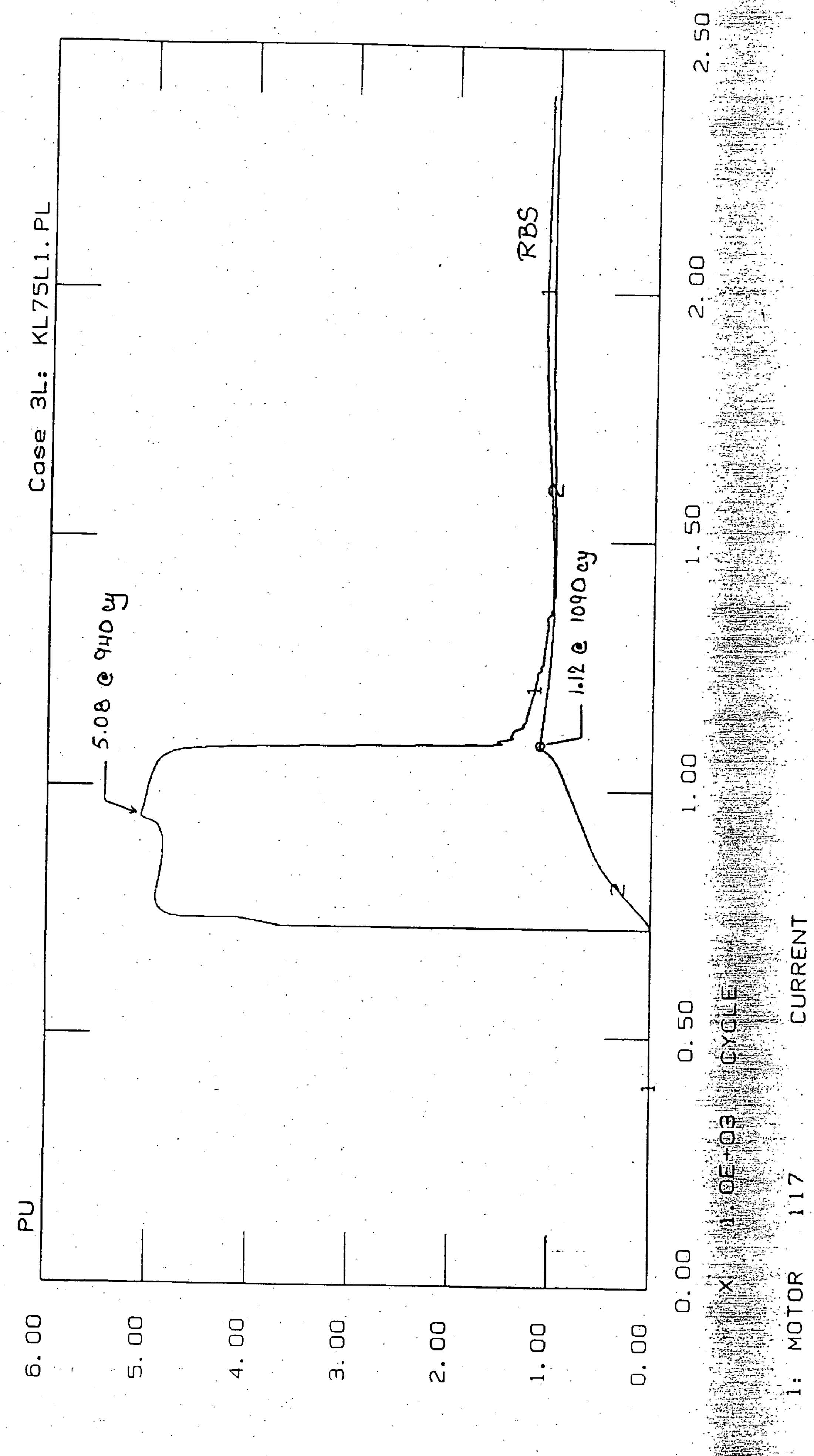


FIGURE J2

KLMWL1. SF: Keowee OVH. @60cv MW LR. @720cv

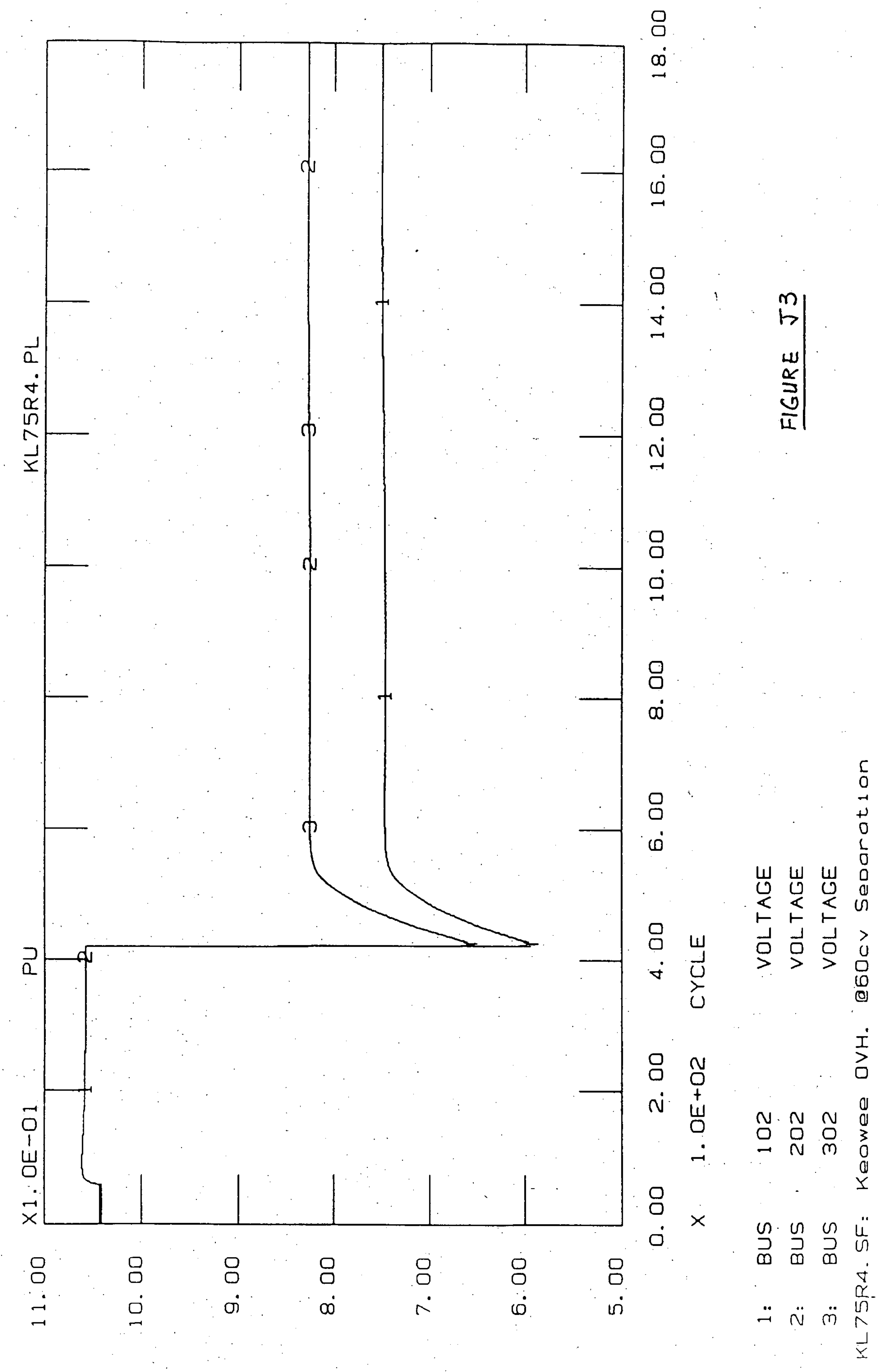

KL75R4.PL
X1.0E-01
PU
11.00
10.00
9.00
8.00
7.00
6.00
5.00
0.00
2.00
4.00
6.00
8.00
10.00
12.00
14.00
16.00
18.00
X 1.0E+02 CYCLE
1: BUS 102 VOLTAGE
2: BUS 202 VOLTAGE
3: BUS 302 VOLTAGE
KL75R4.SF: Keowee OVH. @60cv Separation

FIGURE J3

APPENDIX K: NSM-ON-52966

INTRODUCTION

The purpose of this appendix is to examine the impact of the subject NSM on the capability of Keowee unit to supply power to emergency loads at Oconee via the overhead path circuits. With the logic added under this NSM, the re-transfer of the LOCA unit from the underground to the start-up source due to the failure of the underground circuits will take place as early as 5 seconds after the main feeder bus 27 relay has been reset. Following a LOOP/LOCA and once the 27 relay has been reset, the LOOP units will be connected to the overhead path, the LOCA unit to the underground path, and a timer will start its 5-second time out (10 sec. prior to this MOD). The LOCA unit can transfer back to the overhead path only when this timer has timed out. This appendix examines cases where the LOCA unit is connected to the overhead path 5 seconds after the LOOP units.

TIMING AND FILES

Following a load rejection and with this MOD in place, the Keowee ACB breakers cannot be closed until the system frequency has slowed down to 1.10 pu. Once the breakers are closed, it will take approximately 3 seconds for undervoltage relays (27) to reset and energize the start-up buses at Oconee. The time of the start-up bus energization depends on the lake nethead and the amount of loads being rejected by the Keowee unit. Using the results shown in Figure J1- p. 91 (Cases 2L & 2H), times at which Oconee units are energized following Keowee unit rejecting 75MW of loads can be derived as follows:

Event / File Description	Case KL, nh= 113'	Case KH, nh= 140'
Load Rejection	@ 60 cy - 1 sec	@ 60 cy - 1 sec
Frequency = 1.10 pu	@ 1190 cy- 19.8 sec	@ 952 cy - 15.9 sec
3 sec. Later, LOOP Units Energized	@ 1370 cy- 22.8 sec	@ 1132 cy- 18.9 sec
5 sec. Later, LOCA Unit Transferred	@ 1670 cy- 27.8 sec	@ 1432 cy- 23.9 sec
Load Flow File	ONOHP75.SO	ONOHP75.SO
Control File	APDIXKL.SF	APDIXKH.SF
Plot File	APDIXKL.PL	APDIXKH.PL

CONTROL FILES

No. 4 cards included in actual control files APDIXKL.SF and APDIXKH.SF are the same as in Appendix H, p52 to p54. To reduce the printout volume, only the first No. 4 card is shown in each of the listings below.

```
81APDIXKL.SF:@60cy 75MW LR,@1370cy U2&U3 LOOP,@1670cy U1 LOCA+1CBP, nh=113'
90  1  1  1  1  1  1  1  1  1  1  1  1  0     0
92     1     3
93   106   107    16   117   118   119   120   121   133   134
93   135   136   137   140   153   154   155   159    17   115
```

93	206	207	26	27	218	219	221	237	240	255
93	306	307	36	37	318	319	321	337	340	355
95	1									
95	2									
95	3									
95	101									
95	102									
95	112									
95	116									
95	129									
95	122									
95	125									
95	126									
95	127									
95	138									
95	139									
95	141									
95	142									
95	116									
95	156									
95	157									
95	158									
95	162									
95	201									
95	202									
95	212									
95	229									
95	222									
95	226									
95	225									
95	227									
95	215									
95	238									
95	239									
95	241									
95	242									
95	216									
95	256									
95	257									
95	258									
95	259									
95	262									
95	301									
95	302									
95	312									
95	329									
95	322									
95	326									
95	325									
95	327									
95	315									
95	338									
95	339									
95	341									

```
95 342
95 316
95 356
95 357
95 358
95 359
95 362
01    .01   0.2    1.                 500     2.     2. 2700.
03    1            1     3  13.8  87.5 4.578   1.     1.     1.    0.3        0.94
00  0.49 0.142   3.2      0.477 0.155   1.2   1.0 0.235 0.035 0.035
03    3            3     1  230.9999.09999.    1.     1.     1.    0.5
04 117           117     2  4.16.22170.64523   0.0   0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                  1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 ...
11K113.TXT       1111111C:\CYUSERDF\
00    1.
11KWEX.TXT     1111111C:\CYUSERDF\
00    1..00001  0.17 -0.17.00001.00001  15.0  0.02  3.61 -3.18 0.097  0.03  1.0
31 60.
35 3
43 16
43 17
43 106
43 107
43 26
43 27
43 206
43 207
43 36
43 37
43 306
43 307
31 1370.
36 1          -.895 -4.063
36 3          -.1950-1.971
36 262        -.0011-.0007
36 258        -.0068-.0043
36 241        -.1148-.0711
36 256        -.4182-.2592
36 242        -.0136-.0085
36 238        -.3315-.2054
36 227        -.0136-.0085
36 225        -.0002-.0001
36 222        -.0001-.0001
36 226        -.1148-.0711
36 252              -1.06
36 251              -5.31
36 232              -3.54
36 231              -5.31
36 228              -3.54
36 322        -.0001-.0001
36 325        -.0002-.0001
36 356        -.5746-.3561
```

36 342	-.0111-.0069
36 358	-.0128-.0080
36 326	-.1216-.0753
36 327	-.0128-.0080
36 341	-.1148-.0711
36 338	-.4208-.2608
36 362	-.0011-.0007
36 331	-5.31
36 328	-3.54
36 332	-3.54
36 351	-5.31
36 352	-1.06
42 219	
42 2271	
42 2381	
42 2382	
42 2383	
42 2561	
42 2562	
42 255	
42 237	
42 221	
42 240	
42 218	
42 3562	
42 3582	
42 3561	
42 3271	
42 3621	
42 3383	
42 319	
42 318	
42 3411	
42 340	
42 355	
42 337	
42 321	
42 3381	
42 3382	
42 3563	
42 3412	
42 3581	
42 3421	
31 1385.	
36 252	1.06
36 228	3.54
36 231	5.31
36 232	3.54
36 251	5.31
36 331	5.31
36 332	3.54
36 328	3.54
36 351	5.31
36 352	1.06

```
31 1670.
36 126        -.1216-.0753
36 125        -.0002-.0001
36 138        -.5610-.3477
36 141        -.1148-.0711
36 122        -.0001-.0001
36 112        -.3190-.1980
36 142        -.0094-.0058
36 156        -.4046-.2507
36 162        -.0011-.0007
36 158        -.0196-.0121
36 127        -.0119-.0073
36 128              -3.54
36 132              -3.54
36 151              -5.31
36 131              -5.31
36 152              -1.06
42  1562
42   135
42   120
42  1382
42   137
42   117
42   155
42  1271
42   159
42  1621
42  1421
42   118
42  1413
42  1411
42   154
42  1561
42   133
42   121
42   134
42   119
42  1582
42   140
42  1563
42  1381
42  1412
42   136
42  1251
42   153
42  1261
42  1581
42   115
31 1685.
36 128               3.54
36 152               1.06
36 131               5.31
36 151               5.31
36 132               3.54
```

81APDIXKH.SF:@60cy 75MW LR,@1132cy U2&U3 LOOP,@1432cy U1 LOCA+1CBP, nh=140'

90	1	1	1	1	1	1	1	1	1	1	1	1	0	0
92	1	3												
93	106	107	16	117	118	119	120	121	133	134				
93	135	136	137	140	153	154	155	159	17	115				
93	206	207	26	27	218	219	221	237	240	255				
93	306	307	36	37	318	319	321	337	340	355				
95	1													
95	2													
95	3													
95	101													
95	102													
95	112													
95	116													
95	129													
95	122													
95	125													
95	126													
95	127													
95	138													
95	139													
95	141													
95	142													
95	116													
95	156													
95	157													
95	158													
95	162													
95	201													
95	202													
95	212													
95	229													
95	222													
95	226													
95	225													
95	227													
95	215													
95	238													
95	239													
95	241													
95	242													
95	216													
95	256													
95	257													
95	258													
95	259													
95	262													
95	301													
95	302													
95	312													
95	329													
95	322													
95	326													

```
95 325
95 327
95 315
95 338
95 339
95 341
95 342
95 316
95 356
95 357
95 358
95 359
95 362
01   .01   0.2    1.              500    2.    2. 2700.
03   1             1     3  13.8  87.5 4.578    1.     1.     1.    0.3        0.94
00  0.49 0.142    3.2      0.477 0.155    1.2   1.0 0.235 0.035 0.035
03   3             3     1  230.9999.09999.     1.     1.     1.    0.5
04 117            117    2  4.16.22170.64523    0.0    0.0.06637.09952.00846.00833
  .59631.08179.01319.10290.16667.61111.888892.2118924.56.87378                    1
  .16667.61111.888891.28042.02822.49562.6825.96648.87708.82121.79886
04 ...
   ...
   ...
11K113.TXT      1111111C:\CYUSERDF\
00    1.
11KWEX.TXT      1111111C:\CYUSERDF\
00     1..00001  0.17 -0.17.00001.00001   15.0  0.02  3.61 -3.18 0.097  0.03   1.0
31 60.
35 3
43 16
43 17
43 106
43 107
43 26
43 27
43 206
43 207
43 36
43 37
43 306
43 307
31 1132.
36 1            -.895 -4.063
36 3            -.1950-1.971
36 262          -.0011-.0007
36 258          -.0068-.0043
36 241          -.1148-.0711
36 256          -.4182-.2592
36 242          -.0136-.0085
36 238          -.3315-.2054
36 227          -.0136-.0085
36 225          -.0002-.0001
36 222          -.0001-.0001
36 226          -.1148-.0711
```

36	252	-1.06
36	251	-5.31
36	232	-3.54
36	231	-5.31
36	228	-3.54
36	322	-.0001-.0001
36	325	-.0002-.0001
36	356	-.5746-.3561
36	342	-.0111-.0069
36	358	-.0128-.0080
36	326	-.1216-.0753
36	327	-.0128-.0080
36	341	-.1148-.0711
36	338	-.4208-.2608
36	362	-.0011-.0007
36	331	-5.31
36	328	-3.54
36	332	-3.54
36	351	-5.31
36	352	-1.06
42	219	
42	2271	
42	2381	
42	2382	
42	2383	
42	2561	
42	2562	
42	255	
42	237	
42	221	
42	240	
42	218	
42	3562	
42	3582	
42	3561	
42	3271	
42	3621	
42	3383	
42	319	
42	318	
42	3411	
42	340	
42	355	
42	337	
42	321	
42	3381	
42	3382	
42	3563	
42	3412	
42	3581	
42	3421	
31	1147.	
36	252	1.06
36	228	3.54

36 231	5.31
36 232	3.54
36 251	5.31
36 331	5.31
36 332	3.54
36 328	3.54
36 351	5.31
36 352	1.06
31 1432.	
36 126	-.1216-.0753
36 125	-.0002-.0001
36 138	-.5610-.3477
36 141	-.1148-.0711
36 122	-.0001-.0001
36 112	-.3190-.1980
36 142	-.0094-.0058
36 156	-.4046-.2507
36 162	-.0011-.0007
36 158	-.0196-.0121
36 127	-.0119-.0073
36 128	-3.54
36 132	-3.54
36 151	-5.31
36 131	-5.31
36 152	-1.06
42 1562	
42 135	
42 120	
42 1382	
42 137	
42 117	
42 155	
42 1271	
42 159	
42 1621	
42 1421	
42 118	
42 1413	
42 1411	
42 154	
42 1561	
42 133	
42 121	
42 134	
42 119	
42 1582	
42 140	
42 1563	
42 1381	
42 1412	
42 136	
42 1251	
42 153	
42 1261	

42	1581	
42	115	
31	1447.	
36	128	3.54
36	152	1.06
36	131	5.31
36	151	5.31
36	132	3.54

TABULATED RESULTS

VARIABLES	KL / APDIXKL.PL		KH / APDIXKH.PL	
	Following LOOP	Following LOCA	Following LOOP	Following LOCA
V102 min, Tcy V102=0.8, Tcy V102= 0.9, Tcy V102=.963, Tcy 27 relay tripped?	NA	.658@1670cy .800@1710cy .900@1800cy .964@1860cy NT	NA	.658@1432cy .800@1470cy .900@1570cy .963@1640cy NT
V202 min, Tcy V202=0.8, Tcy V202=0.9, Tcy V202= .963, Tcy 27 relay tripped?	.673@1370cy .851@1390cy .901@1400cy .963@1480cy NT	.836@1670cy ... .903@1690cy .963@1740cy NT	.678@1132cy .851@1150cy .902@1160cy .963@1230cy NT	.837@1440cy ... .905@1450cy .964@1500cy NT
N max, Tcy N= 1.10, Tcy	1.36@587cy 1.10@1190cy		1.32@496cy 1.10@951cy	
N @application N=0.95, Tcy N min, Tcy N=0.95, Tcy	1.04@1370cy ... .979@1820cy ...		1.01@1132cy ... .969@1300cy ...	
Irbs 117, Ts Irl, Tt Ib=30.77, Irlp=60	NA	5.38 for 120cy 2.76, 180cy@3.0 NT	NA	5.37 for 128cy 2.75, 180cy@3.0 NT
Ilps 118, Ts Irl, Tt Ib=72.59, Irlp=120	NA	5.07 for 80cy 3.07, 100cy@4.0 NT	NA	5.07 for 78cy 3.07, 100cy@4.0 NT
Ihpi 119, Ts Irl, Tt Ib=72.31, Irlp=120	NA	7.28 for 150cy 4.39, 270cy@4.5 NT	NA	7.29 for 158cy 4.39, 270cy@4.5 NT
Ilpi 120, Ts Irl, Tt Ib=50.24, Irlp=90	NA	4.15 for 80cy 2.32, 120cy@2.5 NT	NA	4.15 for 78cy 2.32, 120cy@2.5 NT
Irbf 121[6], Ts Irl, Tt Ib=118.8, Irlp=220	NA	3.84 for 230cy 2.07, 480cy@2.5 NT	NA	3.83 for 238cy 2.07, 480cy@2.5 NT
Iefw 155, Ts Irl, Tt Ib=72.17[7], Irlp=100	NA	5.20 for 190cy 3.75, 300cy@4.0 NT	NA	5.19 for 208cy 3.75, 300cy@4.0 NT
V158-6/1XS3 min V158=0.85, Tcy	NA	.552@1670cy .852@1820cy	NA	.553@1432cy .850@1590cy

[6] For RBF 1B, Irbf 159= 3.71, Ts= 250cy
[7] There are two different EFWP motors. The higher rated current is used to determine relay trip time

VARIABLES	KL / APDIXKL.PL		KH / APDIXKH.PL	
	Following LOOP	Following LOCA	Following LOOP	Following LOCA
V162-2/1XS3 min V162=0.85, Tcy	NA	.553@1670cy .851@1810cy	NA	.555@1432cy .850@1580cy
Ilps 218, Ts Irl, Tt Ib=72.59, Irlp=120	5.81 for 70cy 3.51, 100cy@4.0 NT	Running	5.80 for 58cy 3.51, 100cy@4.0 NT	Running
Ihpi 219, Ts Irl, Tt Ib=72.31, Irlp=120	8.36 for 140cy 5.04, 270cy@6.0 NT	Running	8.34 for 133cy 5.03, 270cy@6.0 NT	Running
Irbf 221, Ts Irl, Tt Ib=118.8, Irlp=220	4.27 for 200cy 2.31, 480cy@2.5 NT	Running	4.27 for 188cy 2.31, 480cy@2.5 NT	Running
Iefw 255, Ts Irl, Tt Ib=72.17, Irlp=100	5.83 for 140cy 4.21, 240cy@4.5 NT	Running	5.83 for 128cy 4.21, 240cy@4.5 NT	Running
V258-6/2XS3 min V258=0.85, Tcy	.660@1370cy .850@1390cy	.834@1670cy .850@1680cy	.666@1132cy .850@1150cy	.835@1440cy .850@1440cy
V262-2/2XS3 min V262=0.85, Tcy	.676@1370cy .862@1390	.854@1680cy ...	.681@1132cy .862@1150cy	.855@1440cy ...

Notes:

1. Irbs 117, Ts (5.38 for 120cy): RBS (motor 117) draws LRC of 5.38 pu for 120cy.
2. Irl,Tt (2.76,180cy@3.0): LRC=2.76xRelay PU. Trip time is 180cy if LRC=3.0xRel PU
3. NT: Relay not tripped
4. Ib: Cyme motor base current
5. Irlp: Relay pick up in ampere
6. Time given in "@xxx cy" are real time, not elapsed time

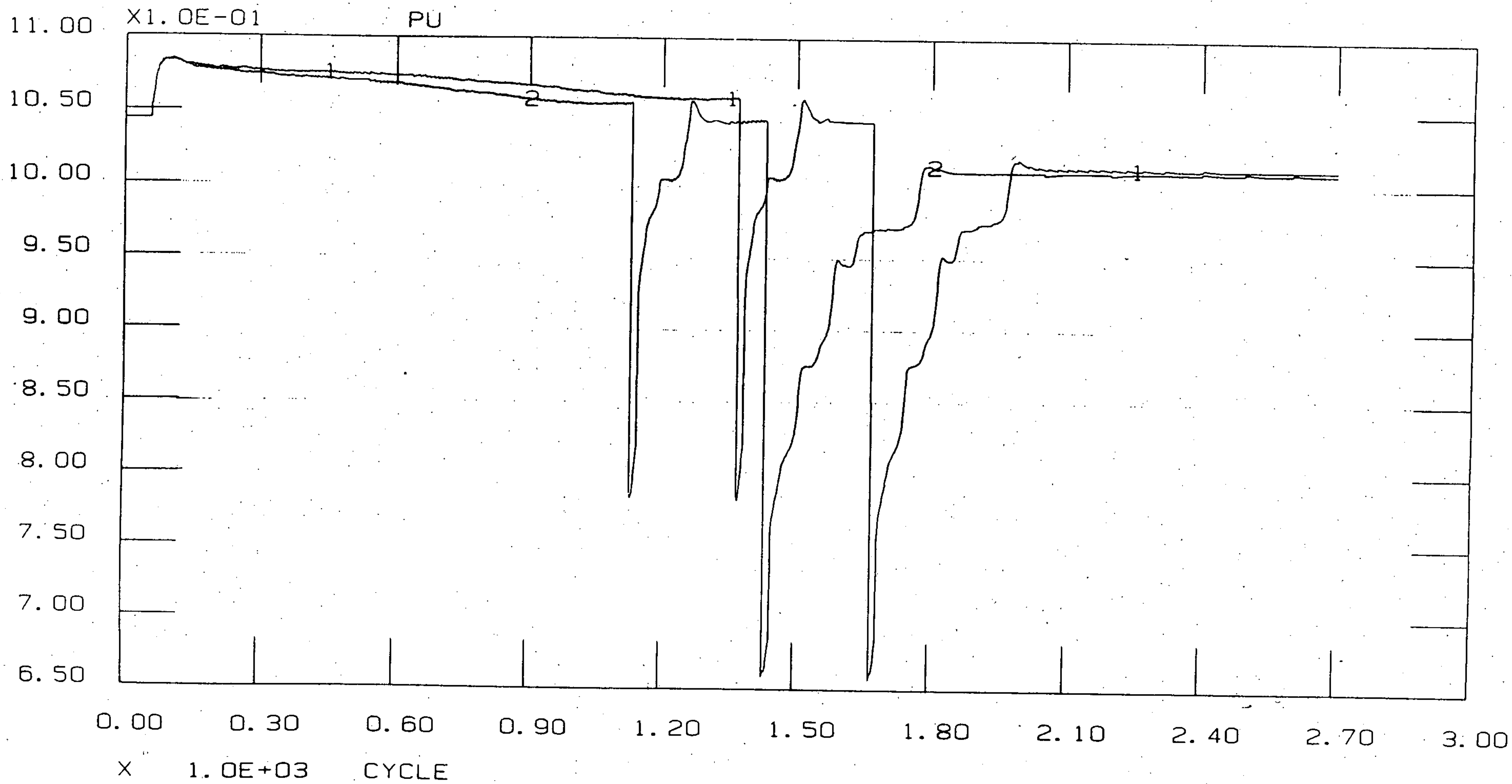
CONCLUSION

The results tabulated in the previous pages show that

1. The undervoltage relays will not trip, power to the auxiliaries will remain once the corresponding start-up buses are energized, and

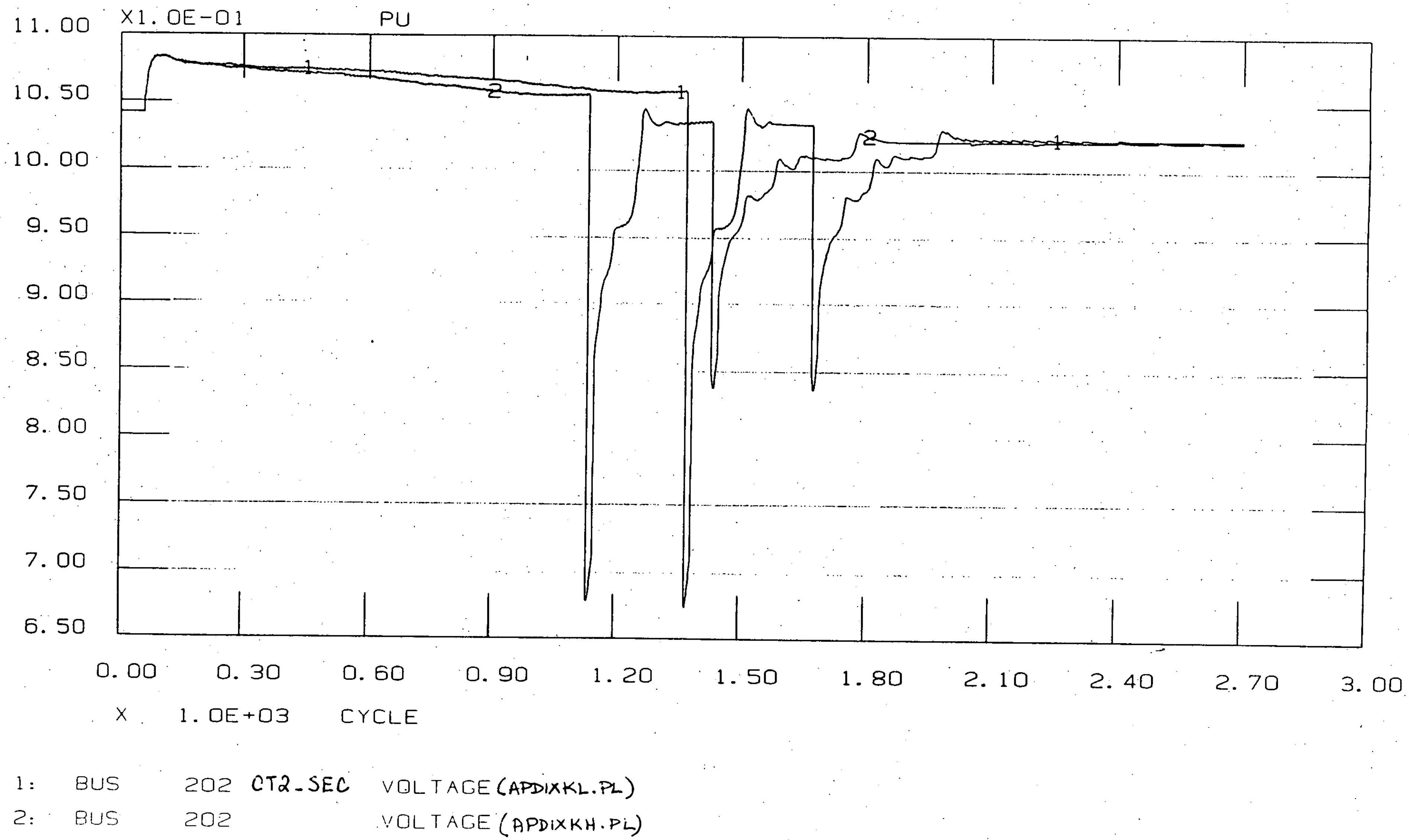
2. Safety motors will start and run as designed, and voltages on low voltage buses will recover to above 85% very quickly, within 2.5 seconds.

Therefore, it can be concluded that the new MOD does not have any negative effects on the capability of the Keowee to supply power to emergency loads at Oconee via the overhead path circuit.

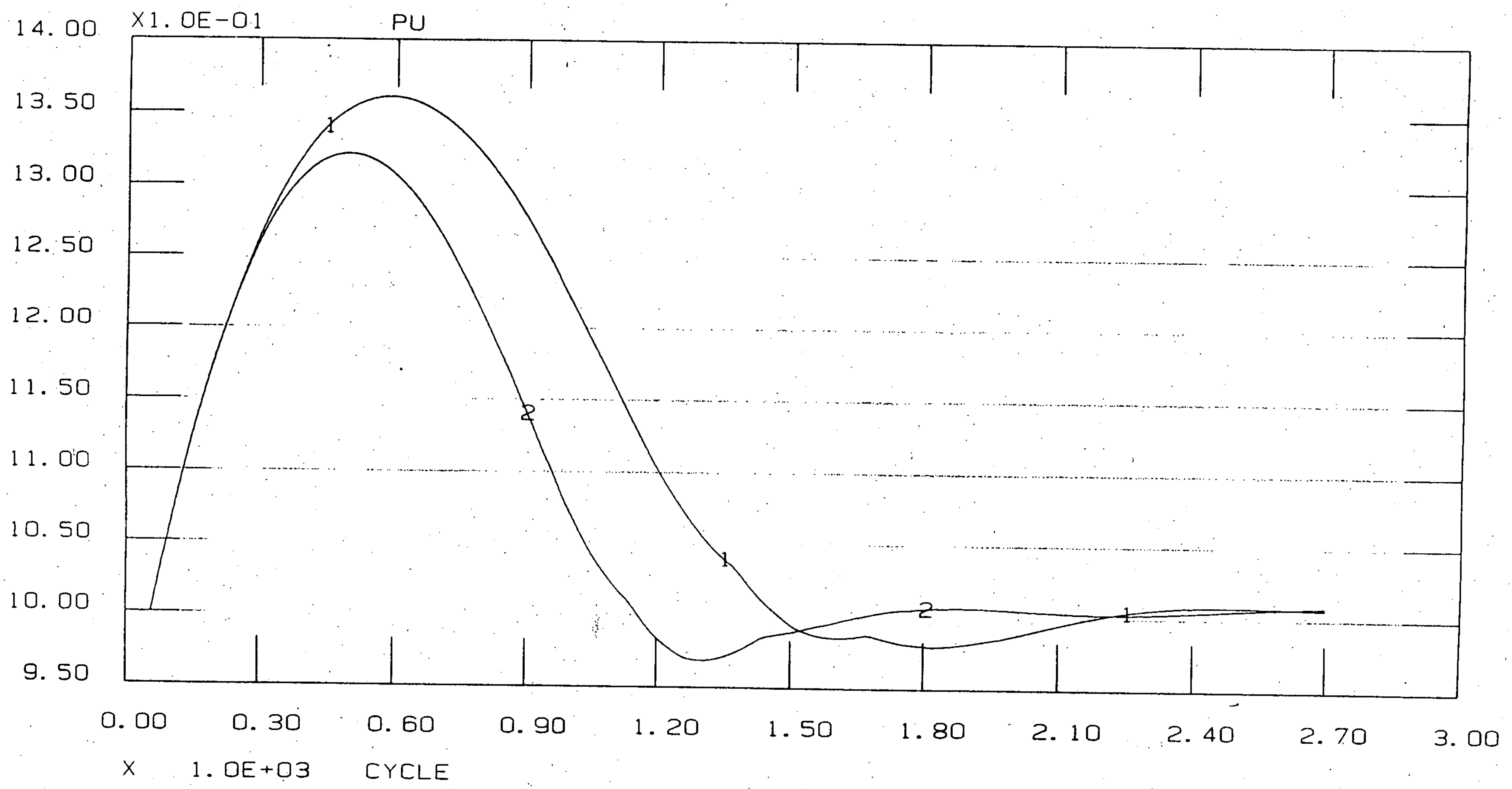


1: BUS 102 CT1_SEC VOLTAGE (APDIXKL.PL)
2: BUS 102 VOLTAGE (APDIXKH.PL)

By: J. CRHall 3/2/95
Checked: QO 3/2/95

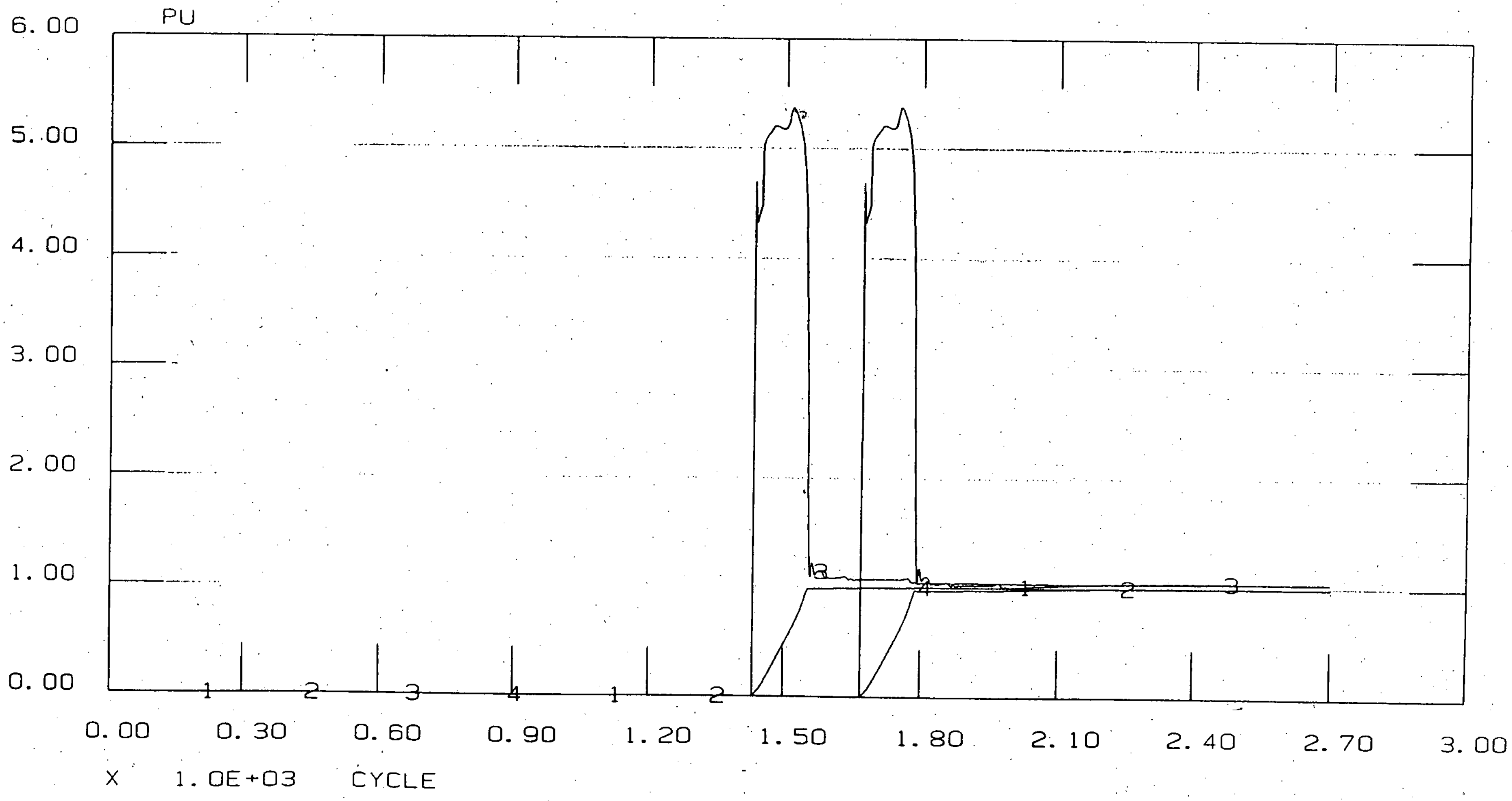


By: J. CRHall 3/2/95
Checked: GD 3/2/95



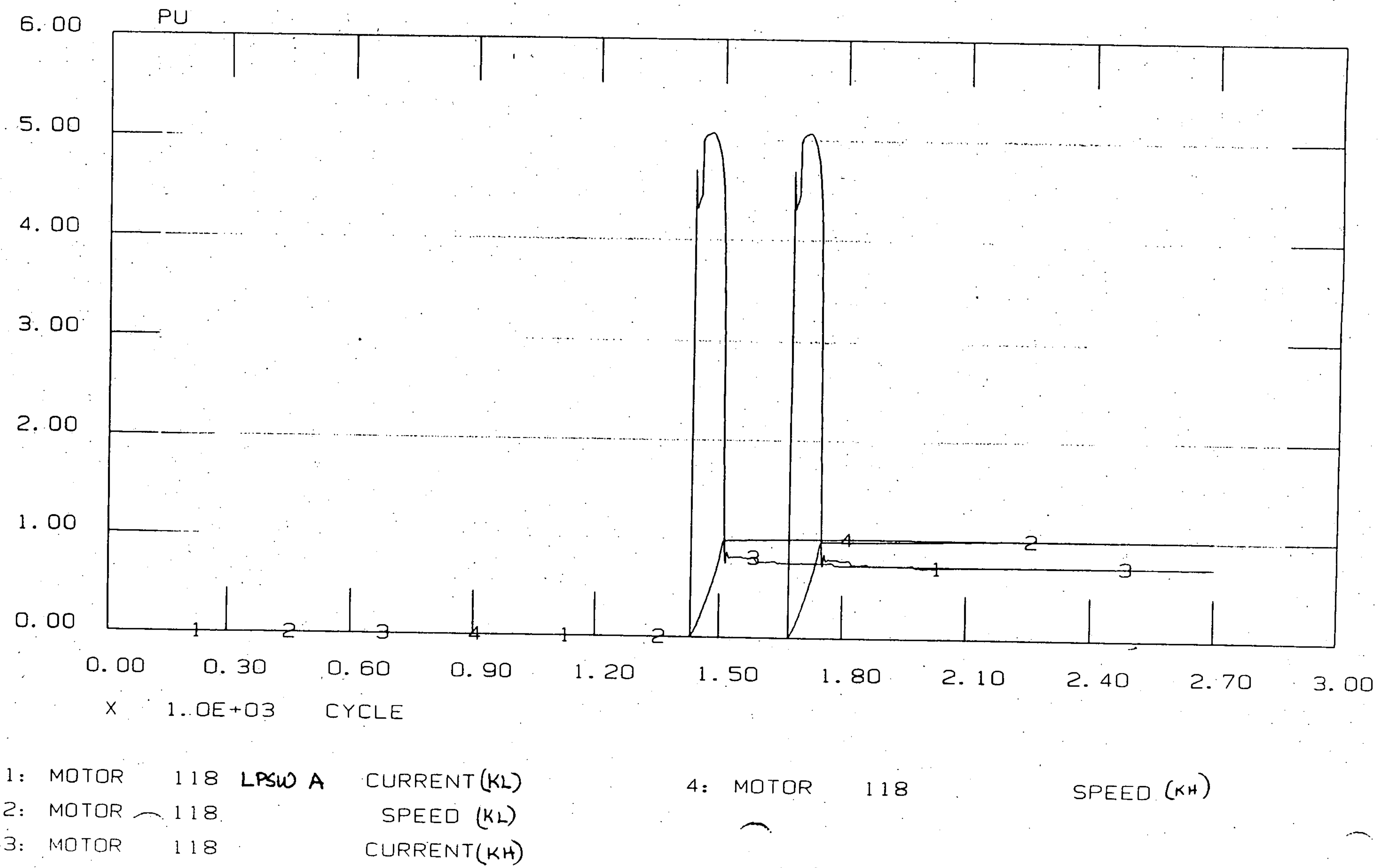
1: MACHIN 1 SPEED (APDIXKL.PL)
: SPEED (APDIXKH.PL)

By: J. ClHall 3/2/95
Checked: QB 3/2/95



1: MOTOR 117 RBS IA CURRENT(KL)
2: MOTOR 117 SPEED (KL)
3: MOTOR 117 CURRENT(KH)
4: MOTOR 117 SPEED(KH)

By: J. CRHall 3/2/95
Checked: GB 3/2/95



By: S. CAHall 3/2/95
Checked: UB 3/2/95

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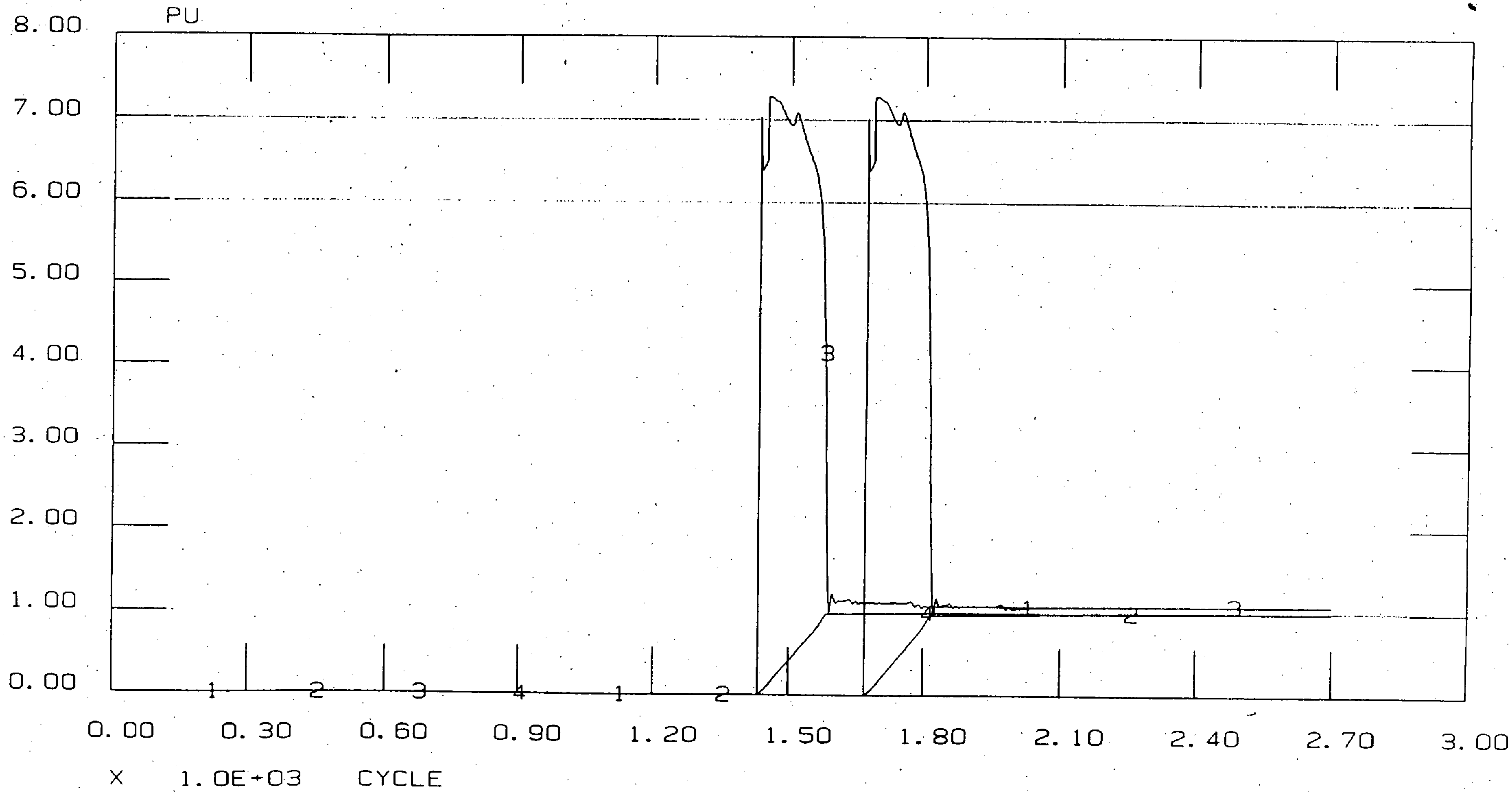
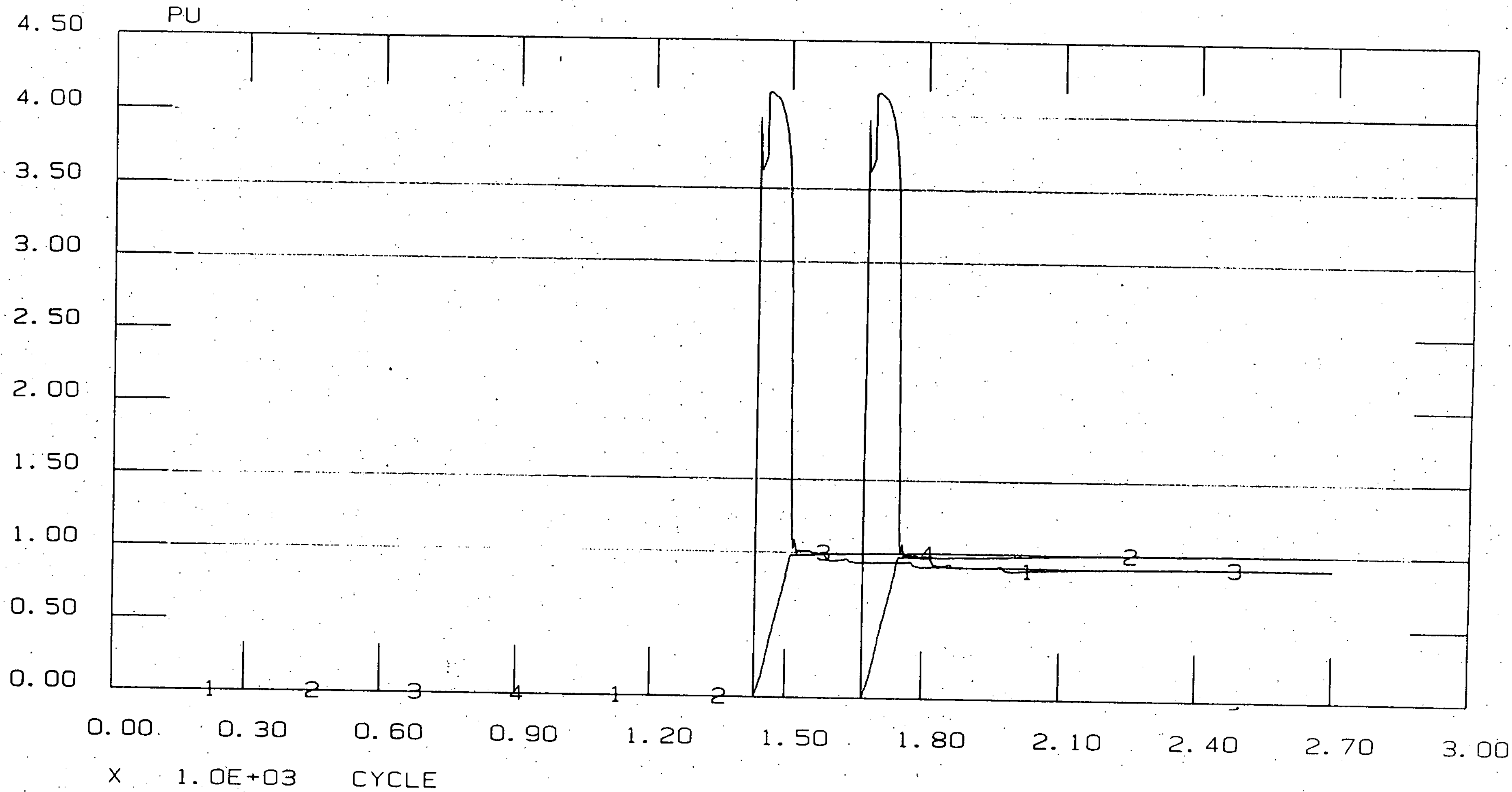
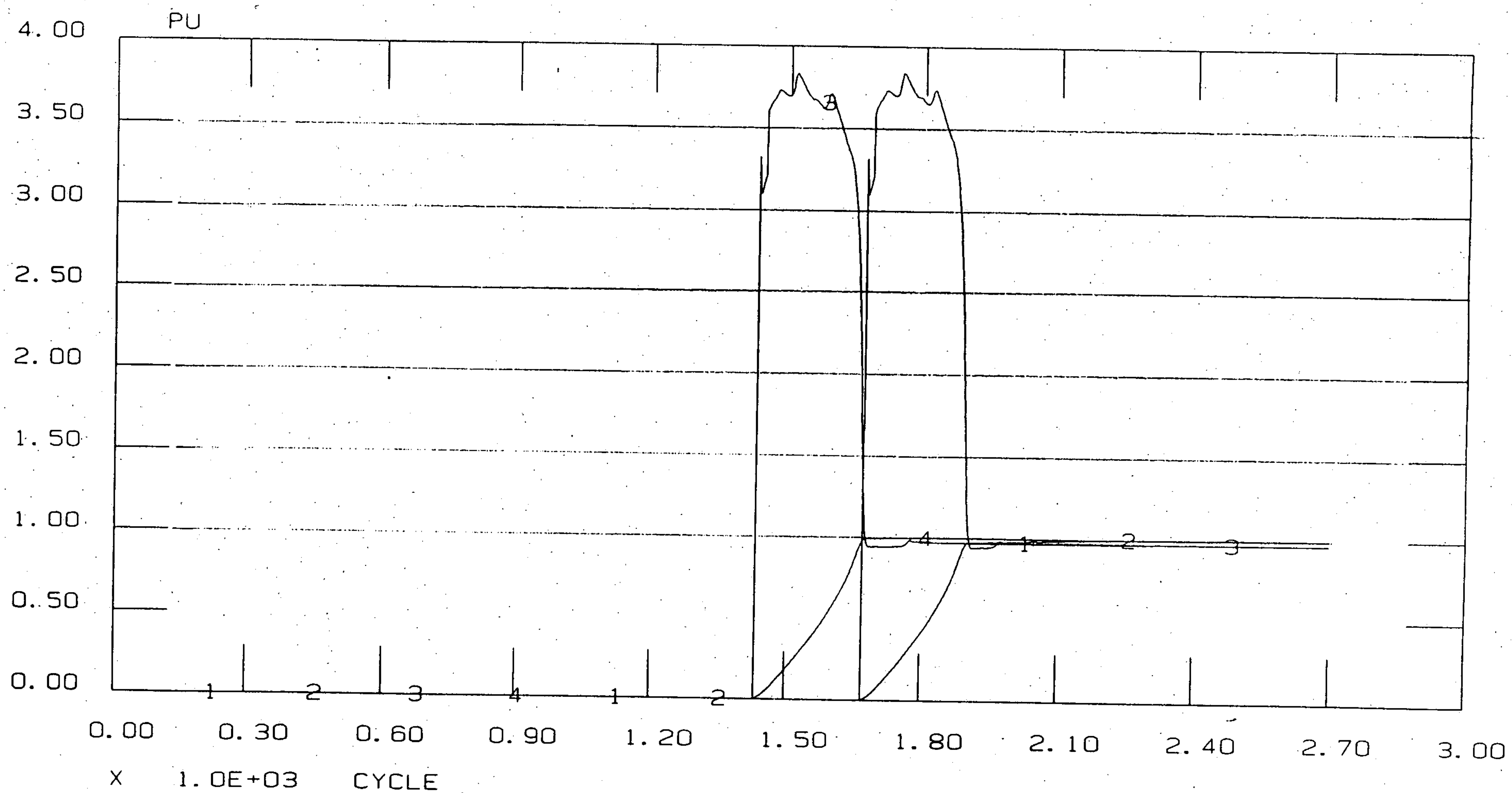


1: MOTOR 119 HPI 1A CURRENT (KL)
2: MOTOR 119 SPEED (KL)
3: MOTOR 119 CURRENT (KH)
4: MOTOR 119 SPEED (KH)

By: S. CRHall 3/2/95
Checked: QB 3/2/95



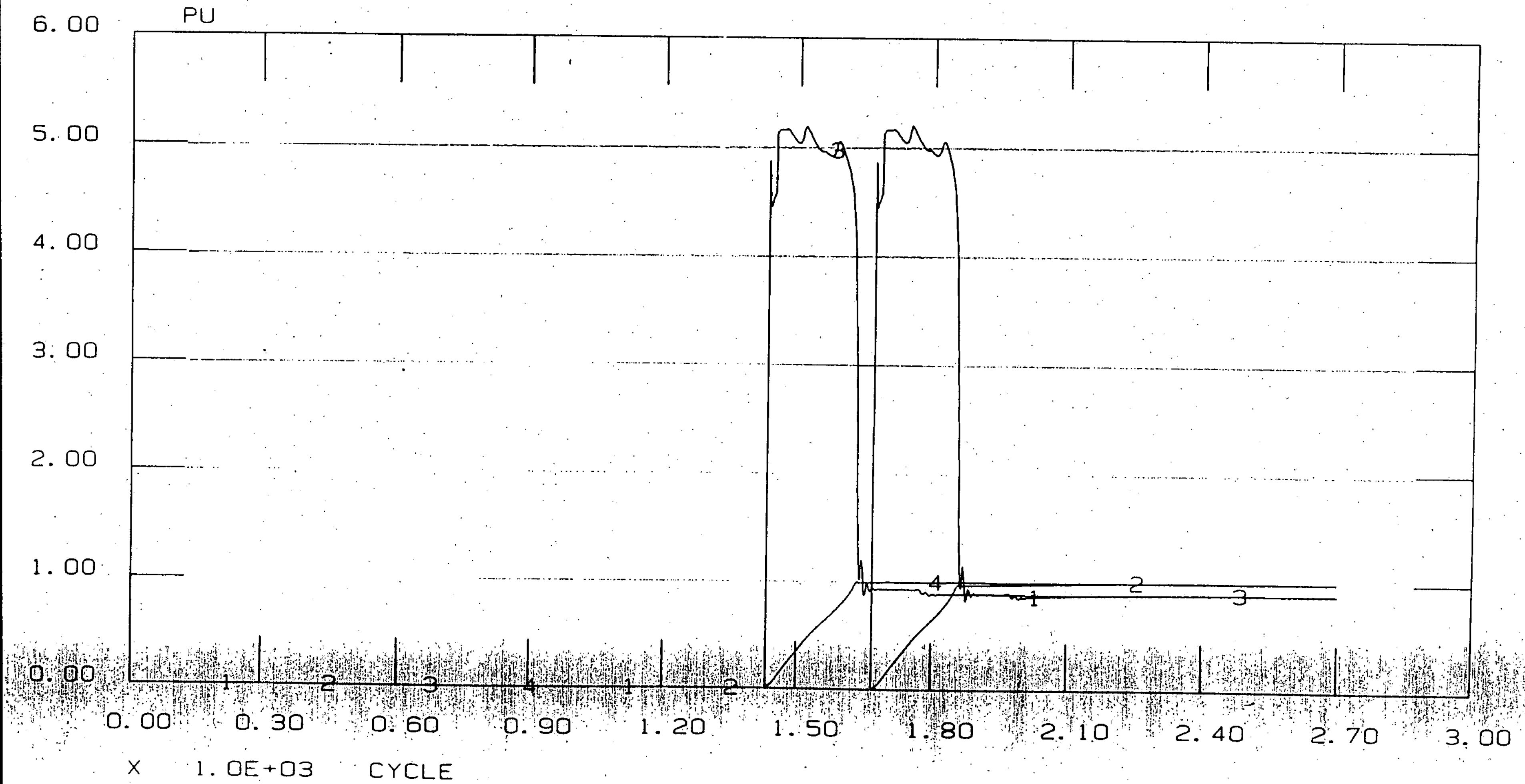
1: MOTOR 120 LPI-1A CURRENT (KL)
2: MOTOR 120 SPEED (KL)
3: MOTOR 120 CURRENT (KH)
4: MOTOR 120 SPEED (KH)



1: MOTOR 121 R8CF 1A CURRENT (KL)
SPEED (KL)
(KH)

4: MOTOR 121 SPEED (KH)

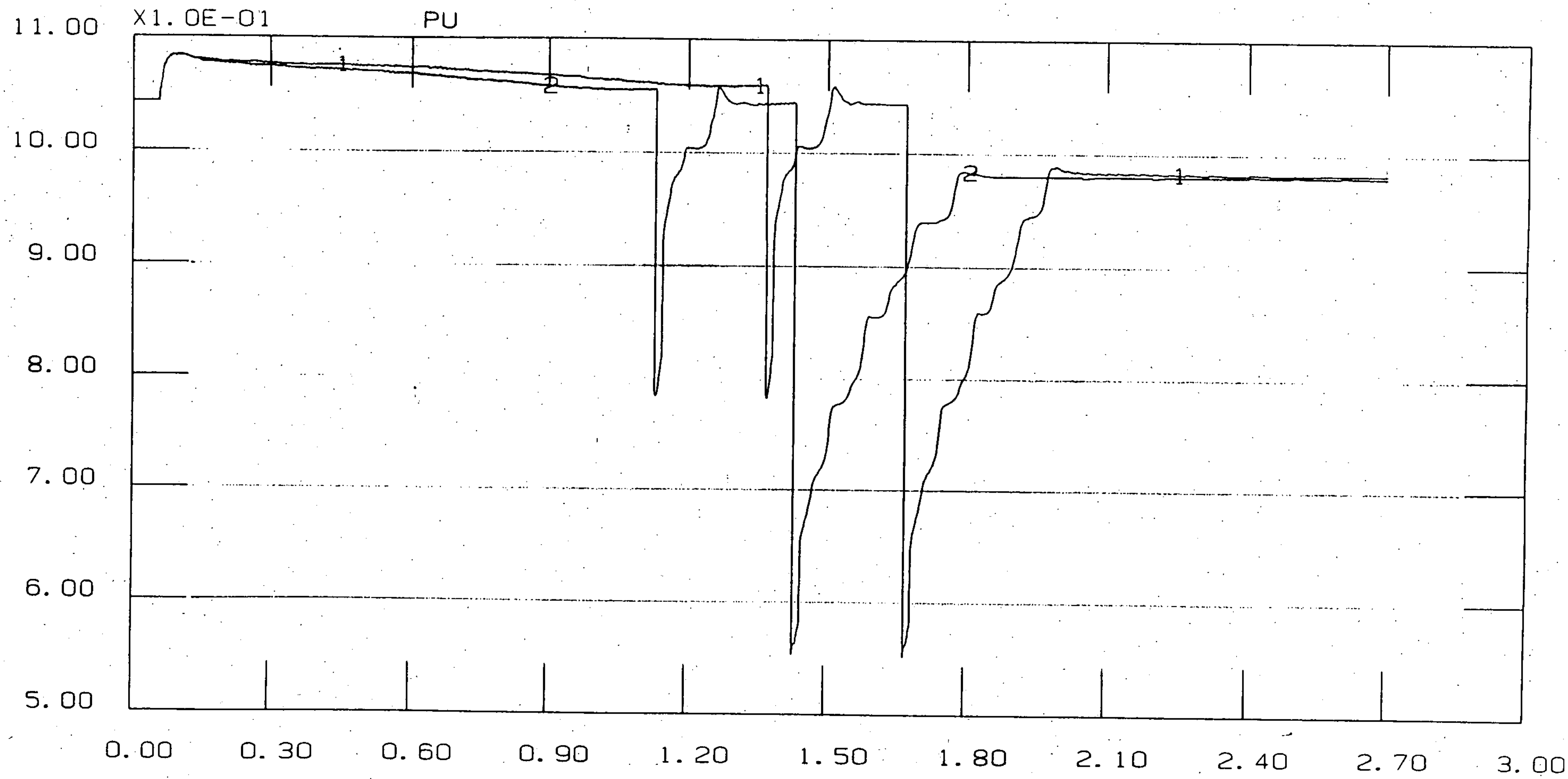
By: J. CAHall. 3/2/95
Checked: QB 3/2/95



1: MOTOR 155 EFW-1B CURRENT (KL)
2: MOTOR 155 SPEED (KL)
3: MOTOR 155 CURRENT (KH)
4: MOTOR 155 SPEED (KH)

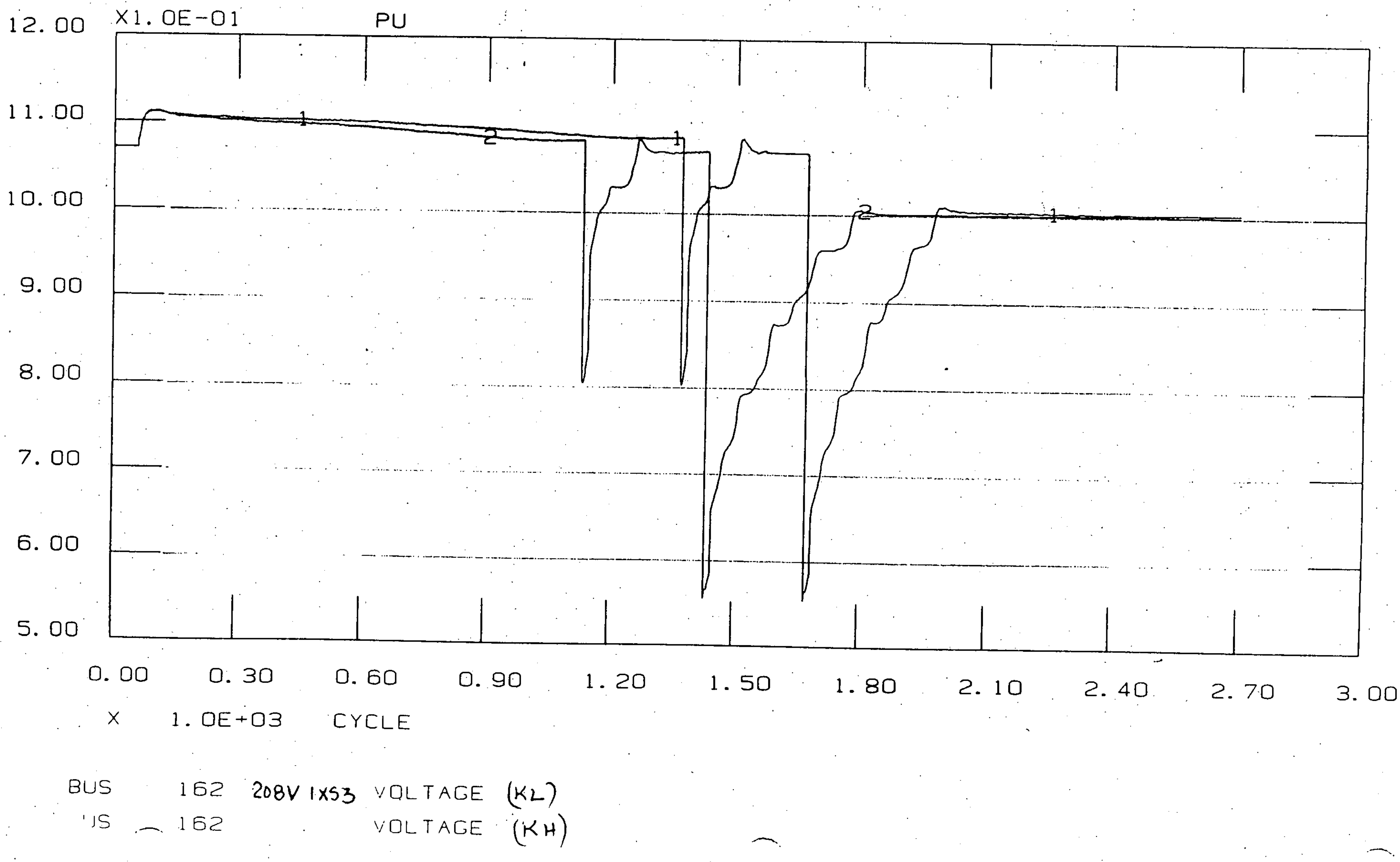
Intentionally left blank

By: √ CLHall. 3/2/95
Checked: QB 3/2/95

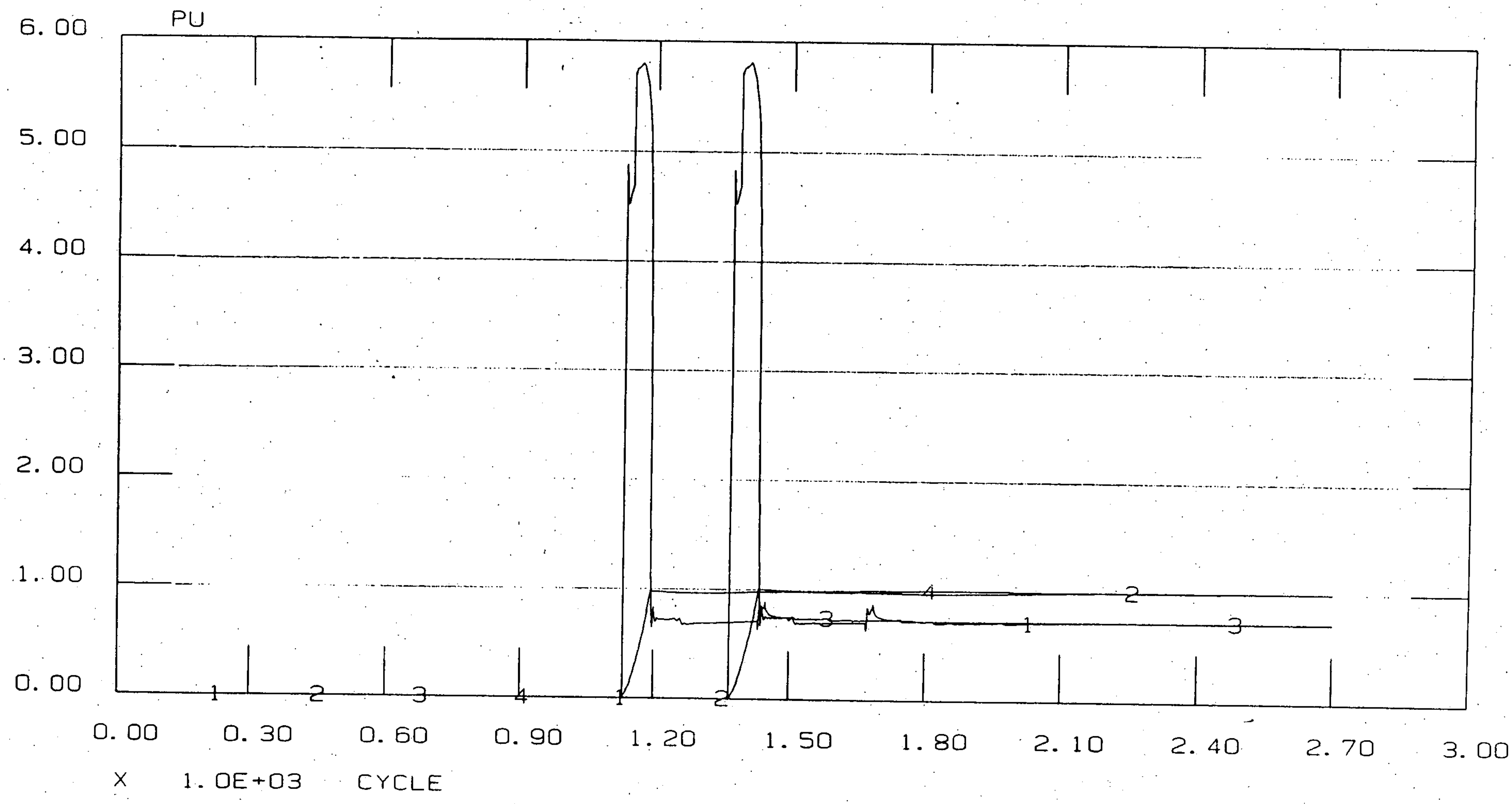


1: BUS 158 600V 1XS3 VOLTAGE (KL)
2: BUS 158 VOLTAGE (KH)

By: S. CAHall 3/2/95
Checked: QB 3/2/95

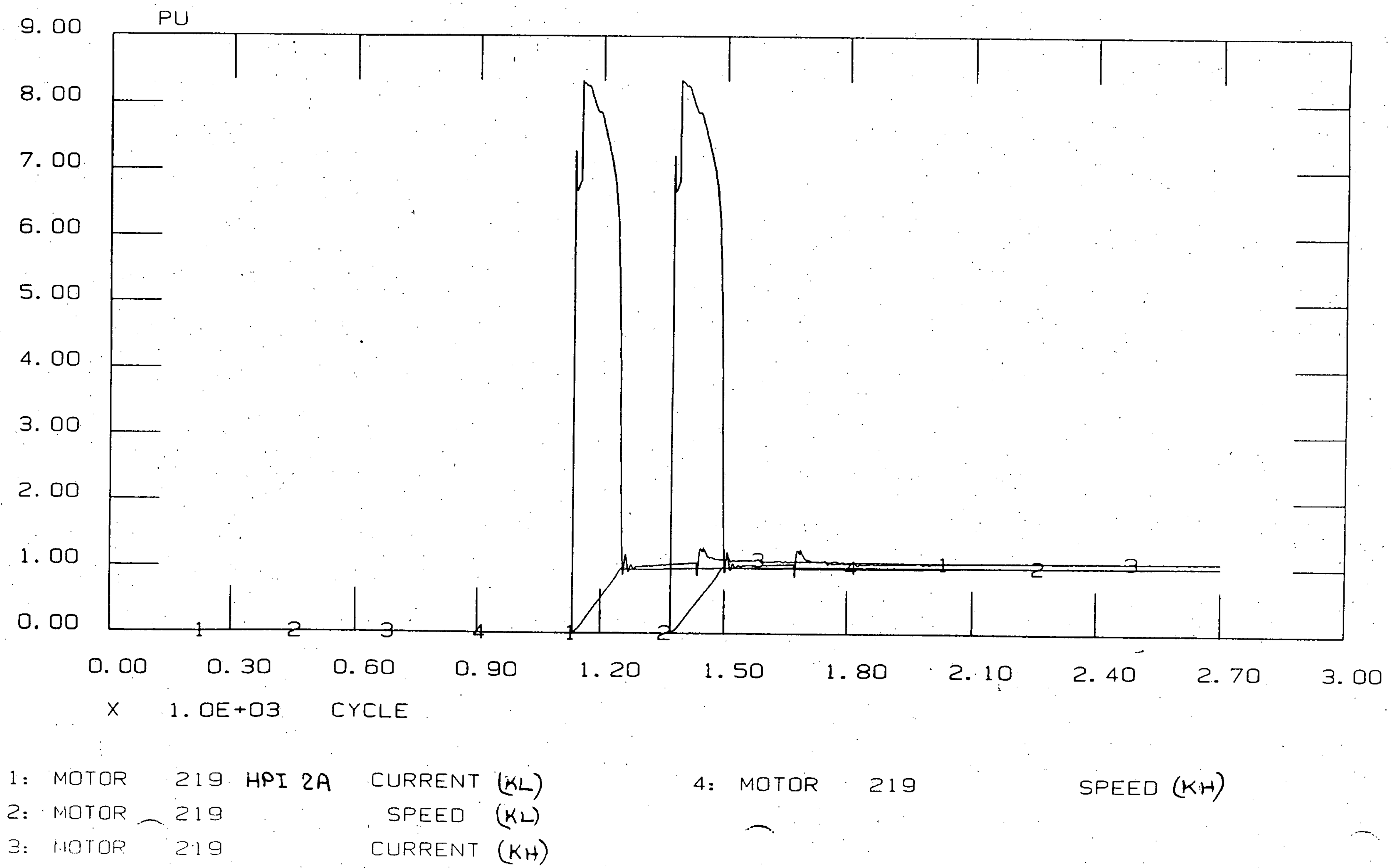


By: J. Cattell. 3/2/95
Checked: QB 3/2/95

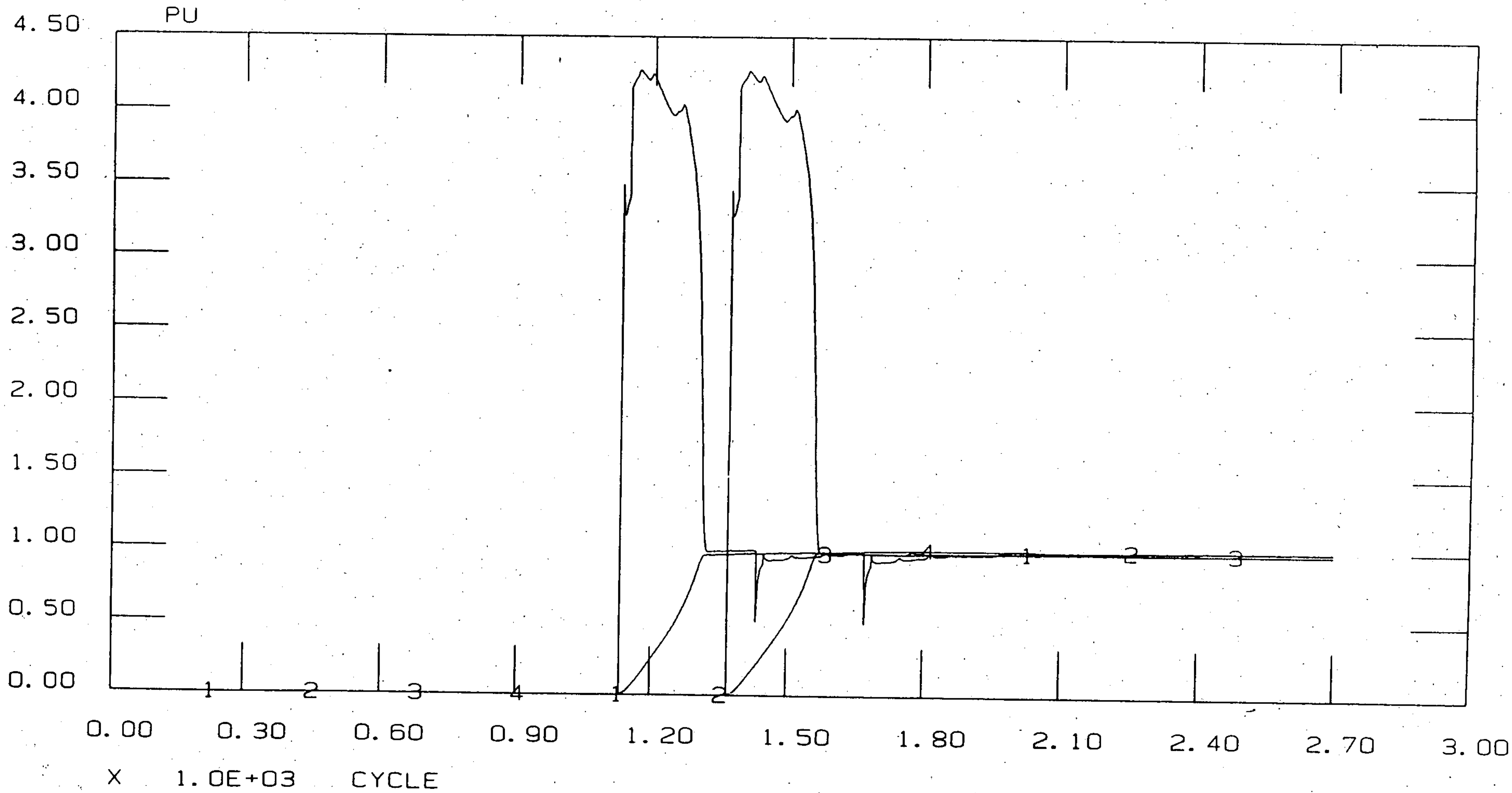


1: MOTOR 218 LPSW C CURRENT (KL)
SPEED (KL)
(KH)
4: MOTOR 218 SPEED (KH)

By: J. Chhall 3/2/95
Checked: QB 3/2/95



By: J. Chitall 3/2/95
Checked: QA 3/2/95

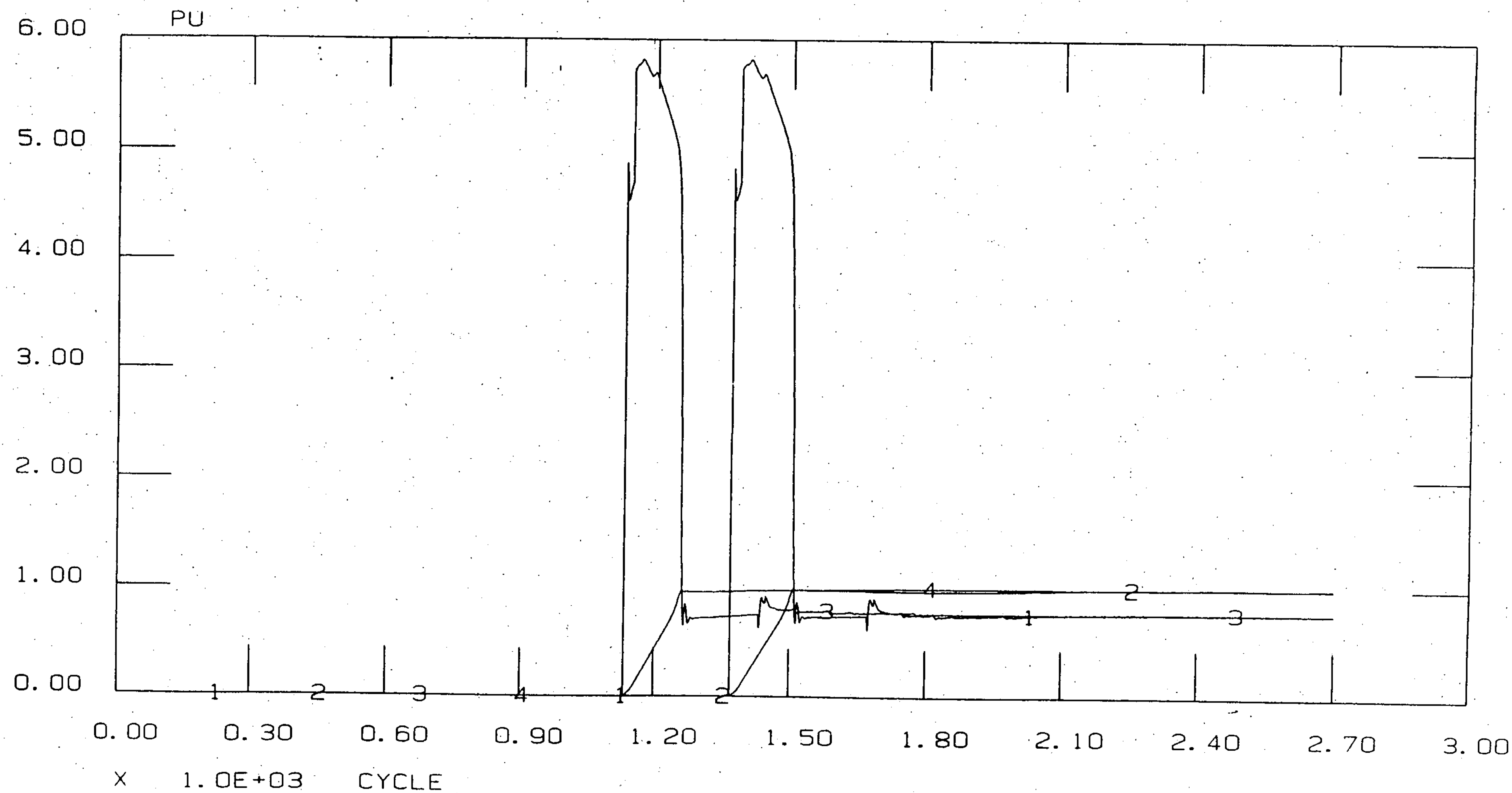


1: MOTOR 221 RBCF 2A CURRENT (KL)
2: MOTOR 221 SPEED (KL)
3: MOTOR 221 CURRENT (KH)
4: MOTOR 221 SPEED (KH)

Intentionally left blank

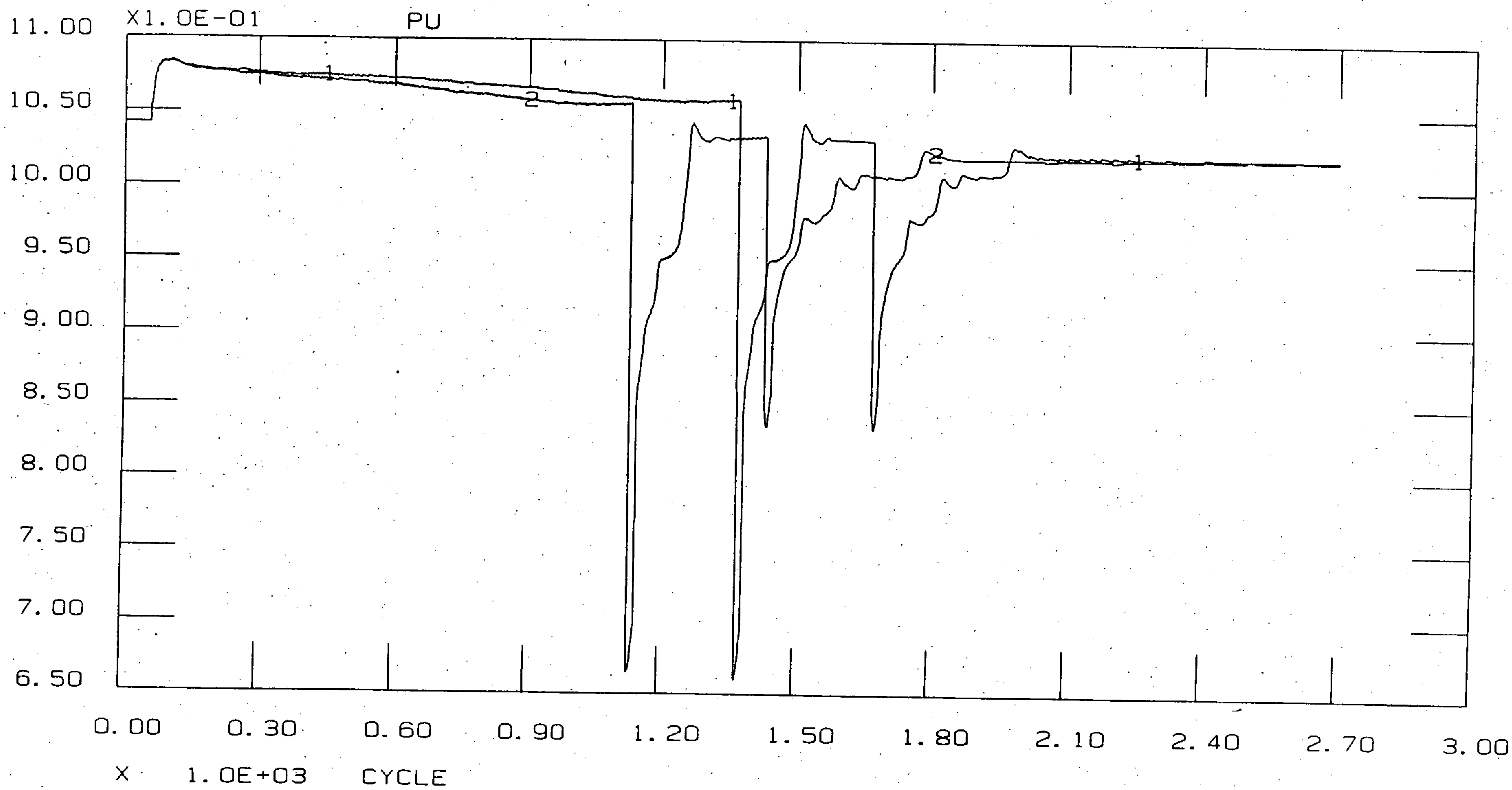
By: J. Crandall 3/2/95
Checked: QB 3/2/95

OSC 5701 Rev.01, Page 123
kw_onop1.doc



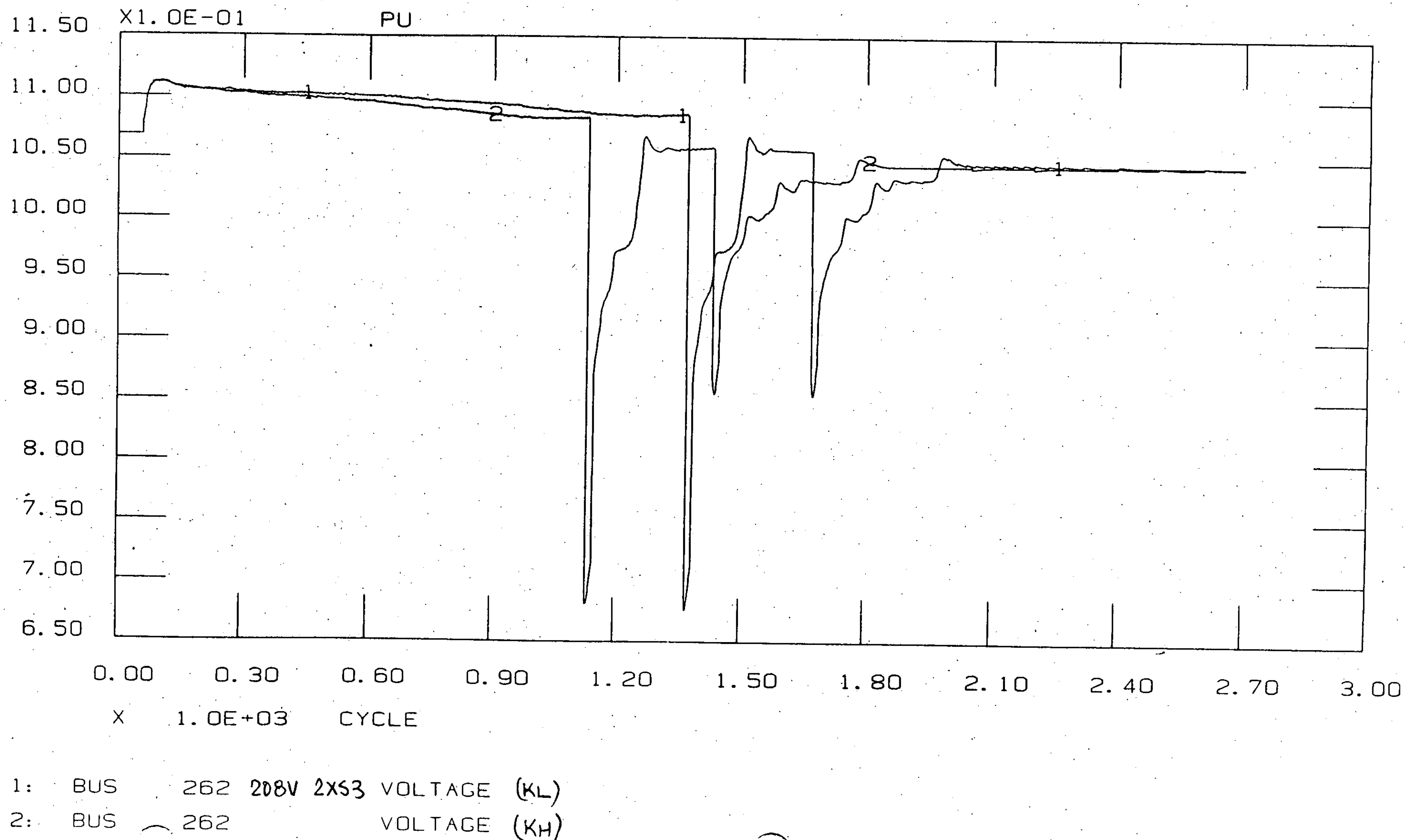
1: MOTOR 255 EFW 2B CURRENT (KL)
2: MOTOR 255 SPEED (KL)
3: MOTOR 255 CURRENT (KH)
4: MOTOR 255 SPEED (KH)

By: S. Cahall 3/2/95
Checked: QO 3/2/95



1: BUS 258 600V 2X53 VOLTAGE (KL)
- .OLTAGE (KH)

By: J Chittell 3/2/95
Checked: QB 3/2/95



ATTACHMENT 1
Information On Transformer Inrush

OSC 5701
SC 5/12/94
QB 5/12/94

000003

From: ANB5706 --PRDC
To: SNC8383 --PRDC Sokha Chhak Date and time 08/23/93 10:49:31

From: Aldean Benge
Subject: Oconee Startup Transformer Inrush Current

I requested the inrush current for the startup transformers from ABB and received an answer from Debra James at 10:45am on 08/23/93. I asked specifically about S/N D596857. Since all three transformers are the same, the answer is applicable to all three transformers. Per Debra;

Peak Inrush Current = 8-10 times rated
The current will decay in a few cycles.

I asked her if a few cycles meant 4-5 cycles and she indicated that was correct. Please note that the inrush is peak value, not rms.

------ PRDC.ANB5706 -------------------- PHONE: 382-4243 ------

Att. 1 of OSC 5701
Sh. 1 of 13
SC 5/12/94

000007

ABB Power T&D Company Inc.
Dry Type Transformer Division
St. Rt. 42, PO Box 38
Bland, Va. 24315

ABB
ASEA BROWN BOVERI

Telephone: (703) 688 - 3325
FAX: (703) 688 - 4588

FAX to Number: 803-885-4418

To: ALDEEN BENGE (-EC09F)

Location: DUKE POWER

Date: 2/09/93

Number of Pages (Including Cover Sheet) 4

From: Rob Brizendine

Message: ALDEEN,
I WAS UNABLE TO LOCATE THE OLD SEAL DRY TYPE DESIGNS THAT YOU ASKED ABOUT. HOWEVER, I WAS ABLE TO FIND SOME COMPARABLE VENT DRY DESIGNS PER OUR CURRENT DESIGN STANDARDS. AS FOR THE POWER FACTOR, WE HAVE SEEN THE VALUES VARY FROM UNIT TO UNIT ON VENT DRY TYPES. I KNOW OF NO GOOD WAY TO ACCURATELY PREDICT WHAT VALUES TO USE FOR YOUR UNITS. LOOKING THROUGH OUR TEST DATA, I HAVE SEEN VALUES RANGING FROM .3% TO 3.98%. I HOPE THIS DATA WILL HELP YOU OUT SOME.

ROB

Att. 1 of OSC 5701 Sh 2 of 13
SC 5/12/94

Inrush Data

kVA: 300 HV: 4160 LV: [illegible]

Cycle	Time-Sec	[illegible]	Amperes
1	0.025	[illegible]	[illegible]
2	0.042	[illegible]	[illegible]
3	0.058	[illegible]	[illegible]
4	0.075	[illegible]	[illegible]
5	0.092	[illegible]	[illegible]
6	0.108	[illegible]	[illegible]
7	0.125	[illegible]	[illegible]
8	0.142	[illegible]	[illegible]
9	0.158	[illegible]	[illegible]
10	0.175	[illegible]	[illegible]

1. 4160 (30 KV BIL)
2. 480Y/277 (10 KV BIL)
3. 150°C RSE
4. COPPER CONDUCTOR (HV+LV)
5. IMPEDANCE → 5.75%
6. 60 HZ

Att. 1 of DSC 5701 Sh. 3 of 13
SC 5/12/94

[illegible]

KVA: 1000 HV: 4160 X/R: 8

Cycle	Time-Sec	Pu Mag	Amperes
1	0.025	4.807	667.1
2	0.042	4.423	615.3
3	0.058	4.139	579.2
4	0.075	3.820	530.1
5	0.092	3.540	494.4
6	0.108	3.272	462.4
7	0.125	3.125	433.6
8	0.142	2.877	407.3
9	0.158	2.767	384.6
10	0.175	2.612	362.4
[illegible]	0.242	1.595	221.4
30	0.508	1.083	150.3

1. SAME RATINGS AS 300 KVA

Att. 1 of OSE 5701 Sh 4 of 13
SE 5/12/94

[illegible]

-- KVA: 1500 -HV: 4160 -LV: [illegible]

Cycle	Time-Sec	pu Mag	Amperes
1	0.025	4.716	981.6
2	0.042	4.356	910.1
3	0.058	4.091	851.9
4	0.075	3.830	797.3
5	0.092	3.593	748.0
6	0.108	3.380	703.5
7	0.125	3.183	663.1
8	0.142	3.009	626.3
9	0.158	2.847	592.7
10	0.175	2.695	561.6
20	0.342	1.701	354.2
30	0.508	1.173	245.1

1) SAME RATINGS AS 300 kVA

Att. 1 of OSC 5701 Sh. 5 of 13
SC 5/12/94

0000081

Page 1 of COST SEARCH - 300_150_D/C_4160-D_30_480Y_10_5.75_60_VENT - as of 02/09/93

[illegible]	CNST	KVA	FEE	CND	HVV	HV	HVB	LVV	LV	LVB	ZZ	HZ	TYP	BR	TE	LWN	LWHT	LVS	HVS	NL	LLZ	CCWT	COST	
[illegible]-01	8889	300	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	107.6	33	22.021	2.0923	2.4669	1047	6974	2083	[illegible]	
P1306400?1	8889	300	150	D/C	4160	D	30	480	Y	10	5.73	60	VENT	Ms	107.3	30	21.571	1.7216	2.4669	1140	6291	2247	2580	
33P4800?1	8831	300	150	D/C	4500	D	30	480	Y	10	5.75	60	VENT	Ms	107.6	33	22.021	2.0921	2.3335	1078	6857	2157	2517	
P1718D?01	8889	300	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	107.6	33	22.021	1.8194	1.9563	1092	5821	2231	2557	
33?06-01	8889	300	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	107.6	33	22.021	1.8192	1.9564	1092	5842	2237	2566	
		1500	750		21440		150	2400		50	28.75	300			537.6	162	**.***	9.5446	*.****	5453	31775	10955	12473	Sum
		300	150		4288		30	480		10	5.75	60			107.5	32	21.931	1.9089	2.2464	1091	6355	2191	2495	Ave
		0	0		31920		0	0		0	0.00	0			0.0	2	0.041	0.0296	0.0690	1194	*****	4910	6577	Var
		0	0		179		0	0		0	0.0[illegible]	0			0.2	1	0.201	0.1720	[illegible]	35	545	70	81	Std
33216-01	8880	300	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	107.3	30	21.571	1.7216	1.9563	1047	5821	2083	2333	Min
P13064?01	8889	300	150	D/C	4500	D	30	480	Y	10	5.75	60	VENT	Ms	107.6	33	22.021	2.0923	2.4669	1140	6974	2247	2566	Max

Number of Observations: 5

Att. 1 of OSC 5701 Sh. 6 of 13
SE 5/12/94

SN	INST	KVA	REE	CND	HVV	HV	HVB	LVV	LV	LVB	IZ	HZ	TYP	BR	B	LVN	LVHT	LVB	HVB	NL	LLI	ICWT	ICST	
[illegible]050	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	111.0	17	22.000	2.1869	2.1095	3052	13581	4143	5010	
3T2079062	SRSD	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	111.0	15	22.000	2.1869	1.9190	2694	13075	4513	5175	
33623-02	SRSR	1000	150	D/C	4800	D	30	480	Y	10	5.75	60	VENT	Mb	105.9	14	22.000	1.8226	1.8791	2873	11876	4576	5197	
32033-02	MRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	106.6	15	22.000	1.8226	2.0207	2517	14890	4267	5261	
33580L07A	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	108.8	16	22.000	1.8226	2.0706	2225	14535	4443	5357	
32679-01	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	108.8	16	22.000	1.8026	1.9126	2325	13975	4521	5490	
33472-034	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	108.8	16	22.000	1.8226	1.7786	2357	13273	4565	5564	
9017E001	MRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	107.4	17	22.000	1.8226	1.6772	2791	12931	4587	5576	
33451-01	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	110.5	16	22.000	1.3670	2.0016	2471	12699	4643	5639	
33472-03	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	107.4	17	22.000	1.8226	1.7786	2185	13759	4558	5661	
33819-01	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	109.1	17	22.000	1.8226	1.7819	2255	13658	4530	5775	
33703-01	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	107.4	17	22.000	1.8226	1.6772	2185	13277	4688	5797	
3301[illegible]L01	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	109.4	15	22.000	1.8226	1.5312	2540	13766	4755	5772	
32270-01	MRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	108.8	16	22.000	1.5187	1.6239	3291	11544	5006	6099	
32731-02	SRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	107.8	15	22.000	1.3670	1.7077	2463	11732	5051	6361	
		15000	***		62040		450	7200		150	86.25	900			***.*	242	**.***	*.****	*.****	37486	*****	68999	83539	Sum
		1000	150		4200		30	480		10	5.75	60			108.8	16	22.000	1.7902	1.8510	2499	13410	4600	5569	Ave
		0	0		27307		0	0		0	0.00	0			1.5	1	0.000	0.0541	0.0231	90801	*****	61221	*****	Var
		0	0		165		0	0		0	0.00	0			1.7	1	0.000	0.2326	0.1521	301	1108	247	339	Stv
32230-01	MRSB	1000	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Mb	105.6	14	22.000	1.3670	1.6239	2185	11732	4142	5010	Min
3T2079062	SRSR	1000	150	D/C	4800	D	30	480	Y	10	5.75	60	VENT	Mb	111.0	13	22.000	2.1869	2.1095	3291	15581	5051	6361	Max

Number of Observations: 15

Att. 1 of OSC 5701 Sh 7 of 13
SC 5/12/94

[illegible]

[illegible]	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0501	2.0.72	4906	18415	5977	6675	
DD974-01A	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0505	2.0622	3464	19461	5974	6803	
DD914-01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0505	1.7774	3464	20301	5984	6819	
DD237-01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0507	1.7561	4906	15586	6049	6829	
DD523-01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.3026	2.0927	3464	18666	6028	6833	
DD967-01	BREB	1500	150	D/C	4800	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0505	2.1414	3485	20021	5941	6848	
890544V01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0505	2.1774	3464	20026	5990	6873	
DD634-01B	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0505	2.1517	3591	20157	6133	6989	
DD634-01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0505	2.1517	3591	20157	6133	6989	
DD634-01A	BREB	1500	150	D/C	4800	D	30	480	Y	10	5.75	60	VENT	Ms	108.8	12	22.000	1.0507	1.9459	3574	19074	6201	7105	
928145V01	BREB	1500	150	D/C	4800	D	30	480	Y	10	5.75	60	VENT	Ms	108.9	12	22.000	1.0507	1.9459	3374	19161	6213	7159	
DD502L01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.6404	1.5441	3464	17164	6286	7412	
DD781-01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0505	1.5447	3464	17133	6268	7425	
DD747-01Y	BREB	1500	150	D/C	1300	D	30	480	Y	10	5.75	60	VENT	Ms	103.1	12	30.000	1.7160	1.7597	5252	17576	7298	7564	
927100V01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	99.7	12	22.000	1.0505	1.8713	3029	19209	6637	7581	
890433V01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.0505	1.5811	3506	17170	6375	7675	
DD970-01	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	22.000	1.6404	1.7446	3779	16805	6694	7792	
DD260-01	MREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	79.0	12	22.000	1.1717	1.6551	2359	15161	8146	5975	
		27000	+++		77440		540	8640		180	++.++	+++			+++.+	216	++.+++	+.++++	+.++++	66255	+++++	+++++	+++++	Sum
		1500	150		4302		30	480		10	5.75	60			106.7	12	22.441	1.2049	1.9719	3681	18599	6351	7244	Ave
		0	0		72959		0	0		0	0.00	0			151.6	0	7.556	0.0581	0.0465	+++++	+++++	+++++	+++++	Var
		0	0		274		0	0		0	0.00	0			7.2	0	1.886	.2410	0.2156	689	1454	563	536	Sdv
[illegible]	BREB	1500	150	D/C	4160	D	30	480	Y	10	5.75	60	VENT	Ms	79.0	12	22.000	1.1717	1.5812	2359	15161	5941	6675	Min
[illegible]01	BREB	1500	150	D/C	4800	D	30	480	Y	10	5.75	60	VENT	Ms	109.0	12	30.000	1.0505	2.1774	5252	20301	8146	8975	Max

Number of Observations: 18

Att. 1 of OSC 5701 Sh. 8 of 13
SE 5/12/94

Inrush Data

[illegible] [illegible] [illegible] [illegible] [illegible] 4800 [illegible] 5

Cycle	Time-Sec	Pu Mag	Amperes
1	0.025	7.7?8	275.8
2	0.042	6.075	217.8
3	0.058	4.897	176.7
4	0.075	4.075	147.1
5	0.092	3.457	124.8
6	0.108	2.980	107.8
7	0.125	2.598	93.8
8	0.142	2.287	82.6
9	0.158	2.034	73.4
10	0.175	[illegible]	65.7

Att. 1 of OSC 5701 Sh. 9 of 13
SC 5/12/94

Inrush Data

DBN: ~~[illegible]~~ TYP: VENT KVA: 1500 HVV: 4160 HVC: D

60 BIL

Cycle	Time-Sec	Pu Mag	Amperes
1	0.025	5.065	1065.0
2	0.042	4.745	987.4
3	0.058	4.425	927.5
4	0.075	4.193	870.0
5	0.092	3.955	820.3
6	0.108	3.705	775.3
7	0.125	3.540	737.0
8	0.142	3.355	699.1
9	0.158	3.191	664.2
10	0.175	3.036	632.0
20	0.342	1.970	410.1
30	0.508	1.355	289.2
40	0.675	1.035	215.6

Att. 1 of OSC 5701 Sh. 10 of 13
SC 5/12/94

000013

ABB Power T&D Company Inc.
Dry Type Transformer Division
St. Rt. 42, PO Box 38
Bland, Va. 24315

ASEA BROWN BOVERI

Telephone: (703) 688 - 3325
FAX: (703) 688 - 4588

FAX to Number: 704-382-3993

To: ALDEEN BENGE

Location: DUKE POWER

Date: 8/5/93

Number of Pages (Including Cover Sheet) 2

From: Rob Brizendine

Message: HERE IS A BASIC EQUATION THAT CAN BE USED TO CALCULATE INRUSH CURRENT. I HOPE THIS WILL BE OF SOME BENEFIT. NOTE THAT THIS INFORMATION DOES NOT INCLUDE THE DECAYING FUNCTION YOU HAD ASKED ABOUT. IT IS CALCULATED BASICALLY USING $e^{-t/\tau}$, WITH τ BEING L/R.

Att. 1 of OSC 5701 Sh. 11 of 13
SC 5/12/94

INRUSH CURRENT

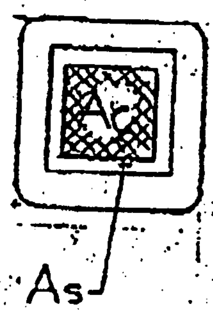
INSTANTANEOUS PEAK = i_{MAX}

$$i_{MAX} = \frac{10^3 hA_C [B_{RES} + 2B_{MAX} - 130]}{3.2 n A_S} \cong 2.85 \times 10^4 \frac{h}{h} \frac{A_c}{A_s}$$

$.6 B_{MAX} + 2 B_{MAX}$
$= 221 - 130 = 91$ 85KL/IN^2

PRI ADJACENT CORE

A_C = XSECTION OF CORE
A_S = AREA WITHIN COIL
h = COIL LENGTH (INCHES) W.L. PRI.
n = NO. OF TURNS IN COIL.



B_{RES} = 60% B_{MAX}

3Ø CORE TYPE Y, i_{MAX} ~ 2/3 OF 1Ø VALUE [redacted]
(OR 3-1Ø Y-A)

3Ø Δ = 1Ø VALUE COIL i = LINE i

Att. 1 of OSC 5701 Sh. 12 of 13
SC 5/12/94

August 11, 1993

Ali Moshref

Subject: Modeling Transformer Inrush RMS Amperes

Below is typical data for inrush amperes for a ventilated dry type transformer.

TYPICAL EXAMPLE OF TRANSFORMER INRUSH CHARACTERISTIC

KVA: 1000 4160/600V

CYCLE	RMS - PU
1	3.399
2	3.076
3	2.906
4	2.701
5	2.519
6	2.356
7	2.210
8	2.077
9	1.957
10	1.846
20	1.128
30	0.766

I talked to the transformer manufacturer and he indicated that it would be reasonable to scale the inrush current directly with the applied voltage. He also indicated that the decay is basically $e^{-t/\tau}$.

Thus, the relationship would be:

I = (Voltage at Transf. Term./Transf. Voltage Rating) * $A*e^{-t/\tau}$
where A is the current at t=0

If you could develope a user defined model which represents a load decaying with time as indicated above, I would appreciate it.

Aldean Benge

Att. 1 of DSC 5701 Sh 13 of 13
SC 5/12/94

ATTACHMENT 2
Information on Lake Levels

Att. 2 of DSC 5701
SE 5/12/94
AB 5/12/94

From: JBB8097 --PRDC Date and time 02/21/94 10:35:20
To: SNC8383 --PRDC
cc: JBB8097 --PRDC WRS7360 --PRDC W. Reed Severance

From: John B. Beckman
Design Eng. Oconee Div.
Mechanical/Nuclear Section 885-4825
Subject: Keowee Lake Level

Att. 2 of OSC 5701 Sh. 1 of 1
SC 5/12/94

Head Water Levels:
Tech Spec Limit for Emergency Ops.........775'
Min Level for Power Ops (Based On SLIC)...785'
Max Normal Level (Top Of Dam).............800'
Flood Ele. (FSAR).........................808'

Tail Water Elev
River Bed Bottom..........................655'
Min Tail Elevation with One on............660'
Max normal 2 units running 100%...........672.5'
Max Tail (With Spillways open)............693'

The max Head water elevation (808) and Tail Water Evelvation (693) would probably occur at the same time.

John B. Beckman
Design Engineer
*** Forwarding note from SNC8383 --PRDC 02/21/94 08:49 ***
To: JBB8097 --PRDC

Subject: Keowee Lake Level

John,

Please provide the maximum and the minimum values for the lake and tailrace level at Keowee. I would like to know the design values, historical values and the values that you had given to Voith.

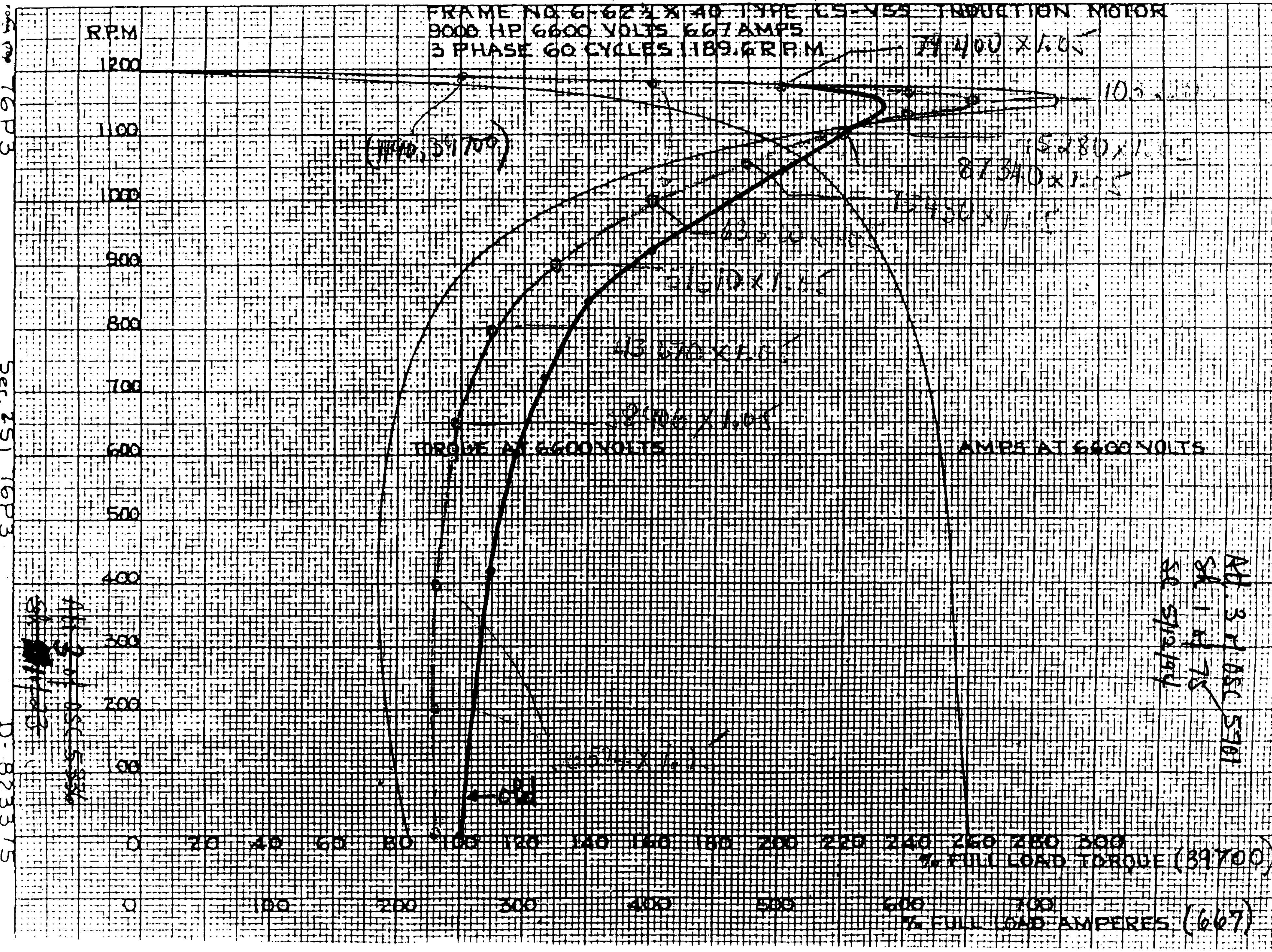
Thanks,

SOKHA CHHAK, Nucl GO/Engineering Sup/Electrical Syst&Equip
Ext: 2-3907, Fax: 2-3993, Prof ID: SNC8383
Mail Code: EC09F, Location: ECII 940-26
WKHR: Mon-Thu (7-6)

ATTACHMENT 3
Motor Data

Att. 3 of OSC 5701
SC 5/12/94
AB 5/12/94

Test @ 4000 Volts o.c.



WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627767

000022

Form M-3
November 15, 1967

DUKE POWER COMPANY
ENGINEERING DEPARTMENT
VERTICAL SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
(To be submitted with Form M-1 or M-2 Data Sheets on Vertical Motor Applications)

1. Motor Application *Reactor Coolant Pump* Mill-Power Order No. ______
2. Manufacturer *Westinghouse* Order No. *CH-35100-P S.O. 76P0001*
3. Motor Type *CS-VSS* Frame No. *62 Sel.* Enclosure *Enclosed with Cooler*
4. Thrust Bearing Type *Double Kingsbury* Lubrication *Forced Oil Circulation*
5. Maximum Design Thrust:
   Momentary Downthrust *139,000* lbs. Momentary Upthrust *185,000* lbs.
   Continuous Downthrust *100,400* lbs. Continuous Upthrust *137,850* lbs.
   Average Life *40* years
6. Thrust Bearing Losses *125,000* watts
7. Thrust Bearing Cooler: Yes *✓* No ______
   Cooler Material *ALL MATERIAL IN CONTACT WITH COOLING WATER IS 90-10 CU-NI*
   Cooling Water Requirements *125* gpm *@ 85°F*
   Pressure Drop Across Cooler *5* psi
8. Lower Guide Bearing Type *PIVOTED PAD* Lubrication *SELF-LUBRICATED*
   Upper Guide Bearing Type *PIVOTED PAD* Lubrication *FORCED*
9. Lower Guide Bearing Cooler: Yes *✓* No ______
   Cooler Material *ALL MATERIAL IN CONTACT WITH COOLING WATER IS 90-10 CU-NI*
   Cooling Water Requirements *5* gpm
   Pressure Drop Across Cooler *3* psi
10. Solid Shaft *X* Hollow Shaft ______
11. Anti-Reverse Device: Yes *X* No ______
    If Yes, Type *Ratchet*
12. Self-Release Coupling: Yes ______ No *X*
    If Yes, Type ______
13. Do efficiencies shown on Form M-1 or Form M-2 Data Sheets include bearing losses?
    Yes *X* No ______
    If No, what are the motor efficiencies including bearing losses at
    F.L. ______; 3/4 Load ______
14. Date Data Sheet Submitted *[signature] 12/14/67*

Att. 3 of OSC 5701
Sh 2 of 75

Charlotte, N.C./cl

~~*Att. 3 of OSC 5336*~~ *2A*
~~*Sh. 2 of 23*~~

Form M-2
Rev. 4-21-67

Att. 3 of OSC 5701
Sh 3 of 75

DUKE POWER COMPANY
ENGINEERING DEPARTMENT
SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
FOR MOTORS RATED 100 HP AND ABOVE

1. Motor Application Reactor Coolant Mill-Power Order No. ______
2. Manufacturer Westinghouse Order No. CH-39100-P S.O. 76P0001
3. Motor Type CS-VSS Frame No. 62 Spl. Enclosure Enclosed with Cooler
4. Bearing Type Double Kingsbury Thrust Segmented Shoe Guide Lubrication Forced oil Circulation
5. Rated HP 9000 Speed-RPM: Syn 1200 F.L. 1190
6. Volts 6600 Phases 3 Cycles 60 FL Current Guar - 670 Calc - 665 Service Factor 1.15-50°C Amb.
7. Locked Rotor Current and Power Factor at: ⊙
   A. 100% Voltage: LRC 4425 P.F. 22.6%
   B. 90% Voltage: LRC 3870 P.F. 21.5%
   C. 80% Voltage: LRC 3370 P.F. 19.4%
8. Insulation: Type Thermalastic - Epoxy: class F Rated Temp. Rise/Ambient 70 °C/ by Detector 50 °C
9. % Eff. - F.L. 94.2/94.4 3/4 Load 93.7/93.9 1/2 Load 91.8/92.4 } Guar/calc
10. % P.F. - F.L. 93.0/93.5 3/4 Load 93.0/93.5 1/2 Load 91.0/91.6
11. Torque at 100% voltage: F.L. 39,700 L.R. 100 % Breakdown 225%
12. Torque at 80% voltage: F.L. 40,000 L.R. 55% Breakdown 140%
13. Transient reactance in per cent and based on kva of the motor 21.5%
14. WK^2 of Motor Rotor + Flywheel: 70,000 lb-ft² Max. Load WK^2 2,000 lb-ft²
15. Starting current vs time curves (acceleration under equipment WK^2 and load) and time-current heating curves (time for motor to reach thermal limits vs current). Curves are to be on same sheet, use the same scales, and be given at 110%, 100%, 90% and 80% voltage. Curve # M022367-3-A
16. Time motor will withstand locked rotor current without damage 11 Sec. @ 100% Voltage
17. Permissible successive attempts to start with motor at: Ambient Temp. 3 Rated Temp. 3
18. Time required for motor to return to rated temp. with: Motor Running 30 Min.
    Motor at standstill after attempted starts 60 Min
19. Furnish % Eff. and % P.F. vs HP curve. M-022367-2-A
20. Furnish Speed Torque Curve at ~~110%~~, 100%, ~~90%~~ and 80% voltage. M-022367-1-A
21. Furnish % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage. Not Avail. Will furnish later if req'd.
22. Date curves and data sheet submitted E.F. Merrill 12/11/67

⊙ Calc. Design Values

~~Att. 3 of OSC 5336~~
~~Sh. 3 of 23~~

Charlotte, N.C./cl

TEST DATA 000024
WESTINGHOUSE FORM 30504

Duke Power Company

Reactor Coolant Pump Motor

S.O. 76P3 Serial No. 1S-76P3 G.O. CH-39100-P

9000 HP 6600 Volts 667 Amperes 3 phase 60 cycles 1190 RPM

Summary of heat run performed at the Bingham Pump Co.

Date		1-29-69
Hours		7-1/4
Horsepower Output		10300
Volts		6600
Amperes		770
Kilowatts Input		8200
RPM		1187
°C Temperature data at HP =		10300
Stator core by T.C.		44.1
Stator Winding by R.T.D.		68.9
Sta. Wdg. by Bingham Recorder		67.6
Air Cooler Temperatures		
Air to Cooler		72.4
Air from Cooler (Amb)		38.4 - Calc. from cooler data obtained in Factory Test
Air Cooler Water Data		
Temp. of Water to Cooler		20.0
Temp. of Water from Cooler		24.0
Water Flow	G.P.M.	228
Thrust Brg. & Upper Guide Brg Cooler Data		
Oil to Cooler		53.0
Oil from Cooler		49.5
Water to Cooler		20.1
Water from Cooler		26.1
Water Flow	G.P.M.	158
Lower Brg. Cooling Coil		
Water to Cooler		27.1
Water from Cooler		30.0
Water Flow	G.P.M.	4.9
Bearing Temperatures		
Upper Guide		62.0
Upper Thrust Shoes		57.0
Lower Guide		49.5
Lower Thrust Shoes		67.0

Att. 3 of OSC 5701
Sh 4 of 75

E. E. [illegible] 3/11/69

~~Att. 3 of OSC 5336~~
~~SA 4 of 23~~

TEST DATA 000025
WESTINGHOUSE FORM 30504

Duke Power Company

S.O. 76P3 Serial No. 1S-76P3 G.O. CH-39100-P

9000 HP 6600 Volts 667 Amperes 3 Phase 60 Cycles 1190 RPM

Temperature Test Performed at Bingham Pump Company

Date					1-29-69
Hours					7-1/4
Horsepower Output					10300
Volts					6600
Amperes					770
Kilowatts Input					8200
RPM					1187
				Machine Temperatures (Total)	
Stator Copper by R.T.D.					
Test Meter					
RTD	No. 6	ØA		°C	104.0
	5	ØC		°C	106.5
	4	ØB		°C	107.3
Control Room					
RTD	No. 1	ØB		°C	106.0
	2	ØC		°C	102.0
	3	ØA		°C	103.0
Stator Iron by T.C.					
T.C. No. (See Dwg. 614F001 & 4932D58)					
G5X			Test T.C.	°C	77.0
G6X			" "	°C	79.2
G7X			" "	°C	74.7
G8X			" "	°C	77.8
G9X			" "	°C	82.5
G5Y			" "	°C	81.0
G6Y			" "	°C	80.1
G7Y			" "	°C	74.7
G8Y			" "	°C	78.5
G9Y			" "	°C	78.5
G5Z			" "	°C	78.5
G6Z			" "	°C	78.5
G7Z			" "	°C	78.0
G8Z			" "	°C	75.0
G9Z			" "	°C	77.5
				°C	77.5
Cooler Air					
G10	Cold Air from Top Cooler			°C	25.1
G11	" " " " "			°C	24.7
G12	" " " " "			°C	22.5
G13	" " " Bottom Cooler			°C	25.5
G15	" " " " "			°C	25.5
G14	" " " " "			°C	23.8
				°C	25.6
G16	Warm Air to Top Cooler			°C	73.1
G18	" " " " "			°C	73.1
G21	" " " " "			°C	73.1
G20	" " " Bottom Cooler			°C	71.0
				°C	74.9
Air Cooler Water Data					
G22	Water to Cooler			°C	20.0
G23	Water From Cooler			°C	24.0
	Water Flow			GPM	228.0

G10–G14: T.C.'s on Cooler Pipes Instead of in Air Stream — 78°F

G20 Bottom Cooler: 167°F

Att 3 of OSC 5701
Sh 5 of 75

~~Att. 3 of OSC 5336~~
~~Sh. 5 of 23~~

[signature]
3/11/65

2

TEST DATA
WESTINGHOUSE FORM 30504 Duke Power Company

S.O. 76P3 Serial No. 1S-76P3 G.O. CH-39100-P

9000 HP 6600 Volts 667 Amperes 3 Phase 60 Cycles 1190 RPM

Temperature Test Performed at Bingham Pump Company

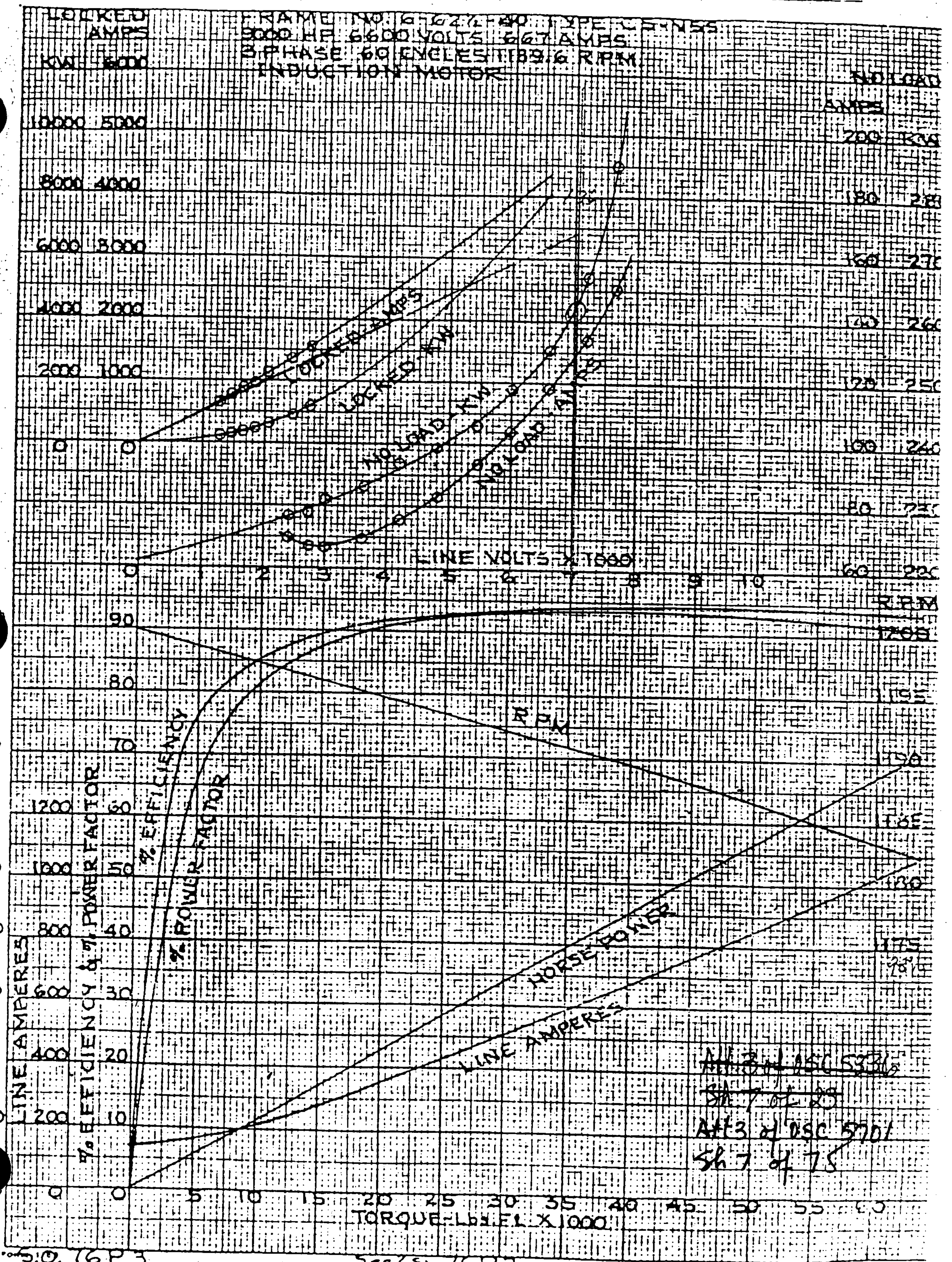
T.C. No.	Oil Cooler Data			
G4	Top oil cooler - water in	°C	20.1	
G3	Top oil cooler - water out	°C	26.1	79°F
	Top oil cooler - water flow GPM		158.0	
G28	Bottom oil cooler - water in	°C	27.1	87°F
	Bottom oil cooler - water out	°C	30.0	
	Bottom oil cooler - water flow GPM		4.9	
	Oil Data			
G2	Oil to cooler	°C	52.8	127°F
G1	Oil from cooler	°C	49.4	121°F
	Bearing Data			
6A	Upper Guide Brg.	°C	61.6	143°F
3A	Upper Thrust Brg.	°C	57.2	135°F
7A	Lower Guide Brg.	°C	49.4	121°F
2G	Lower Thrust Brg.	°C	67.1	153°F

Att. 3 of OSC 5701
Sh 6 of 75

~~Att. 3 of OSC 5336~~
~~Sh. 6 of 23~~

E F Merrill
3/17/69

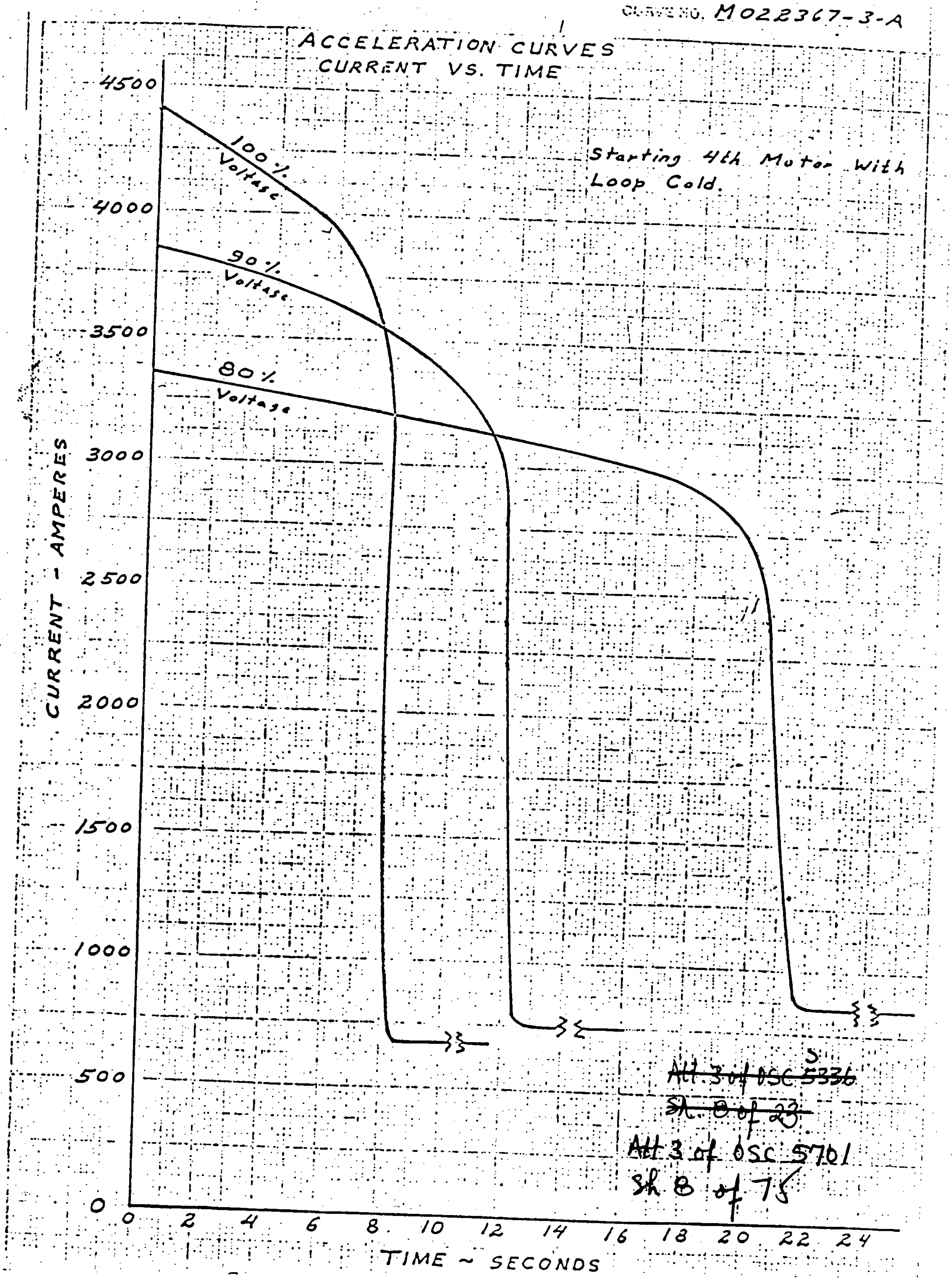
CURVE NO. 627760



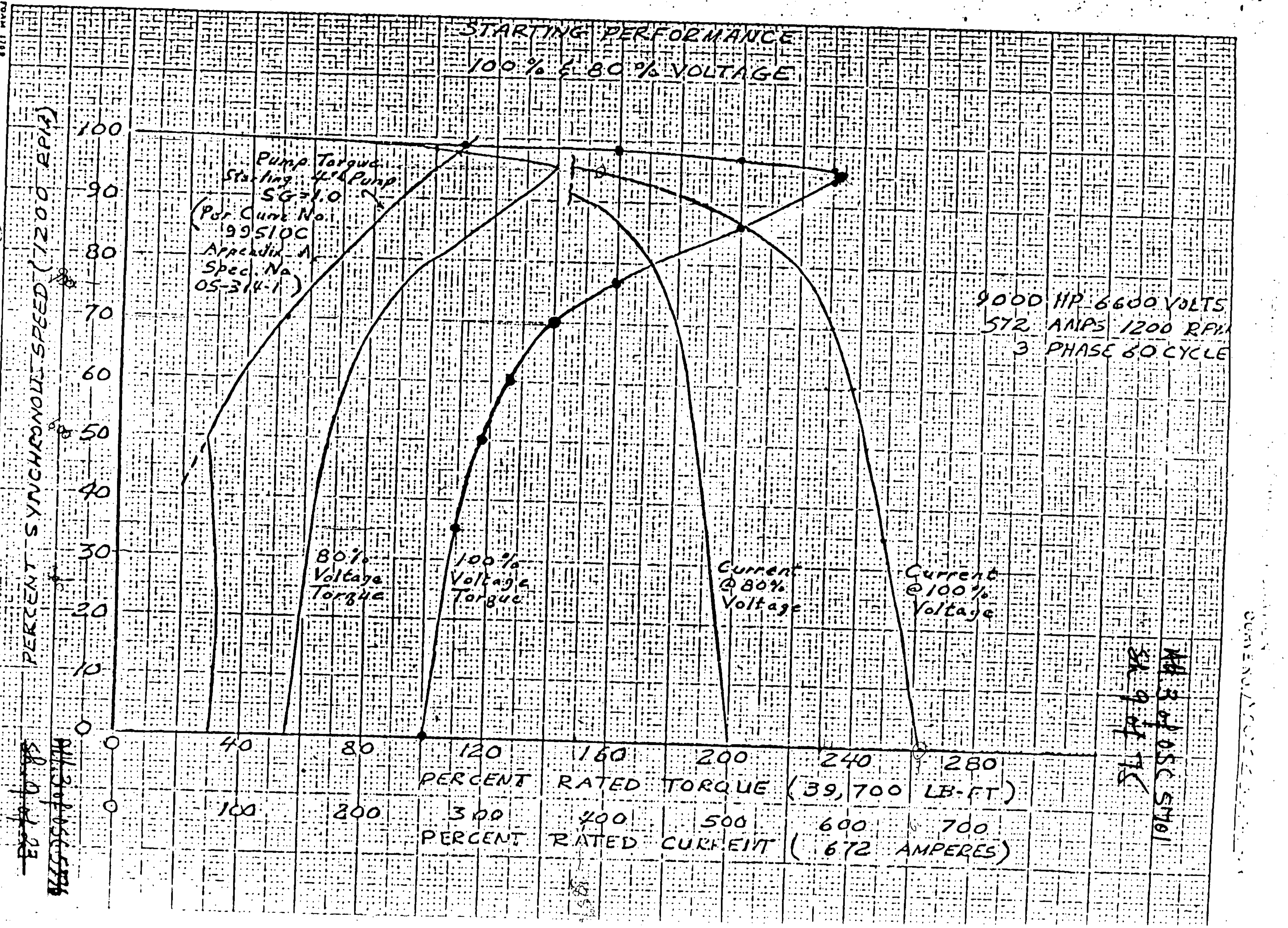
S.O. 76P3 Ser.25, 76P3 D-823375

SIGNATURE Z. Malinowski DATE 8-26-68 CURVE NO. 627760

CURVE NO. M022367-3-A



~~Att. 3 of OSC 5335~~
~~Sh. 8 of 23~~
Att 3 of OSC 5701
Sh 8 of 75



SIGNATURE [signature] DATE 2/5/62

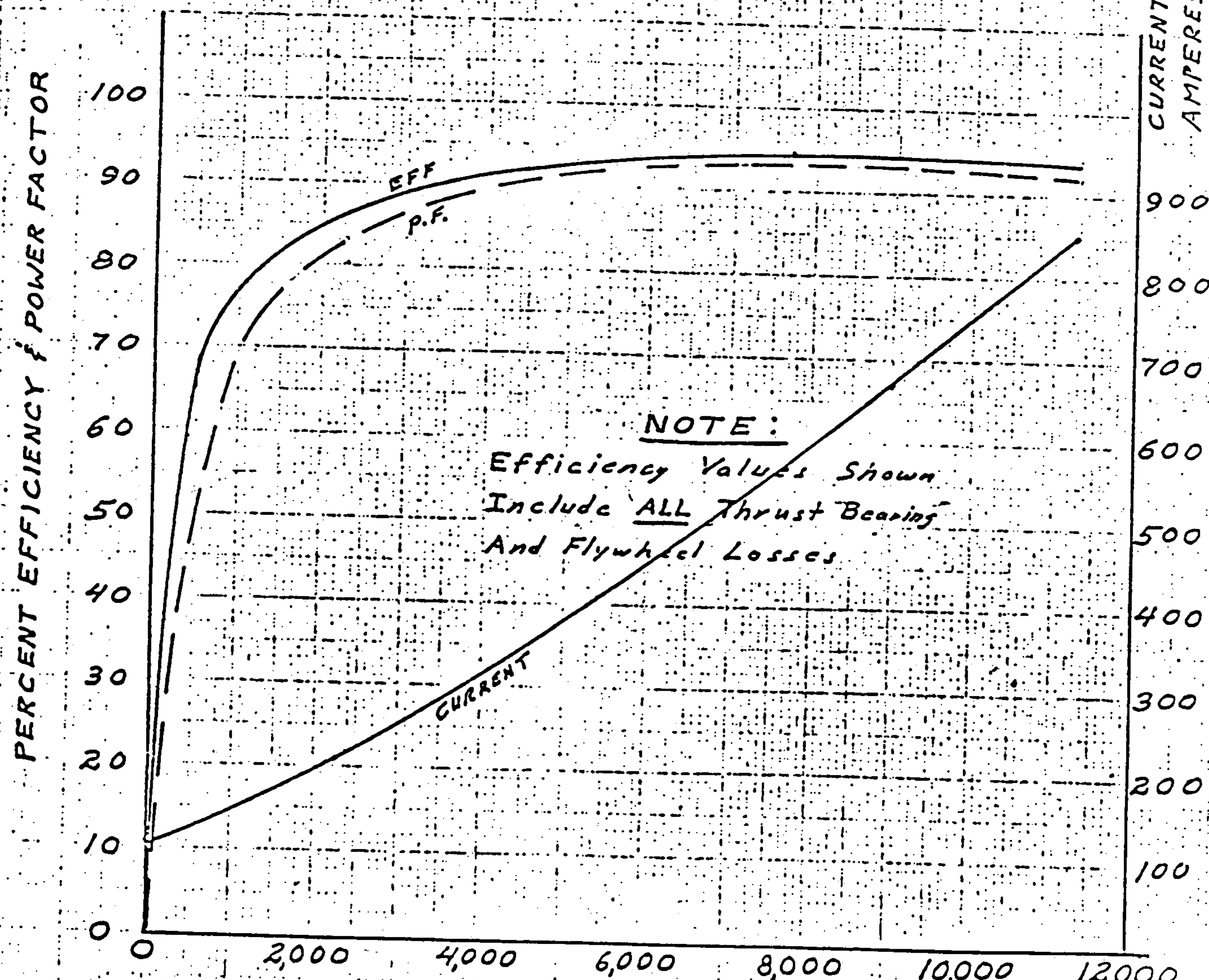
CURVE NO. M02236-1-A

CURVE NO. M022367-2-AB

9000 HP 6600 Volt
3 Phase 60 Cycle
1200 RPM CS Motor

EFFICIENCY AND POWER FACTOR CURVES

Att. 3 of OSC 5701
Sh 10 of 75



~~Att. 3 of OSC 5336~~
~~Sh. 10 of 23~~

B- Current Curve Added
S.F.M. 10/4/67

000031

Westinghouse
Electric Corporation

Energy Systems

Electro Mechanical Division

Cheswick Avenue
Cheswick Pennsylvania 15024
Cable WECHESWICK
412 963 5000
Telex 703366

January 15, 1993

Westinghouse Electric Corporation
Power Systems Field Sales
P.O. Box 32817
Charlotte, NC 28232

ATTENTION: Mary Richardson

SUBJECT: CH 10400
EMD 4QZ50

Attached are the following curves for Oconee:

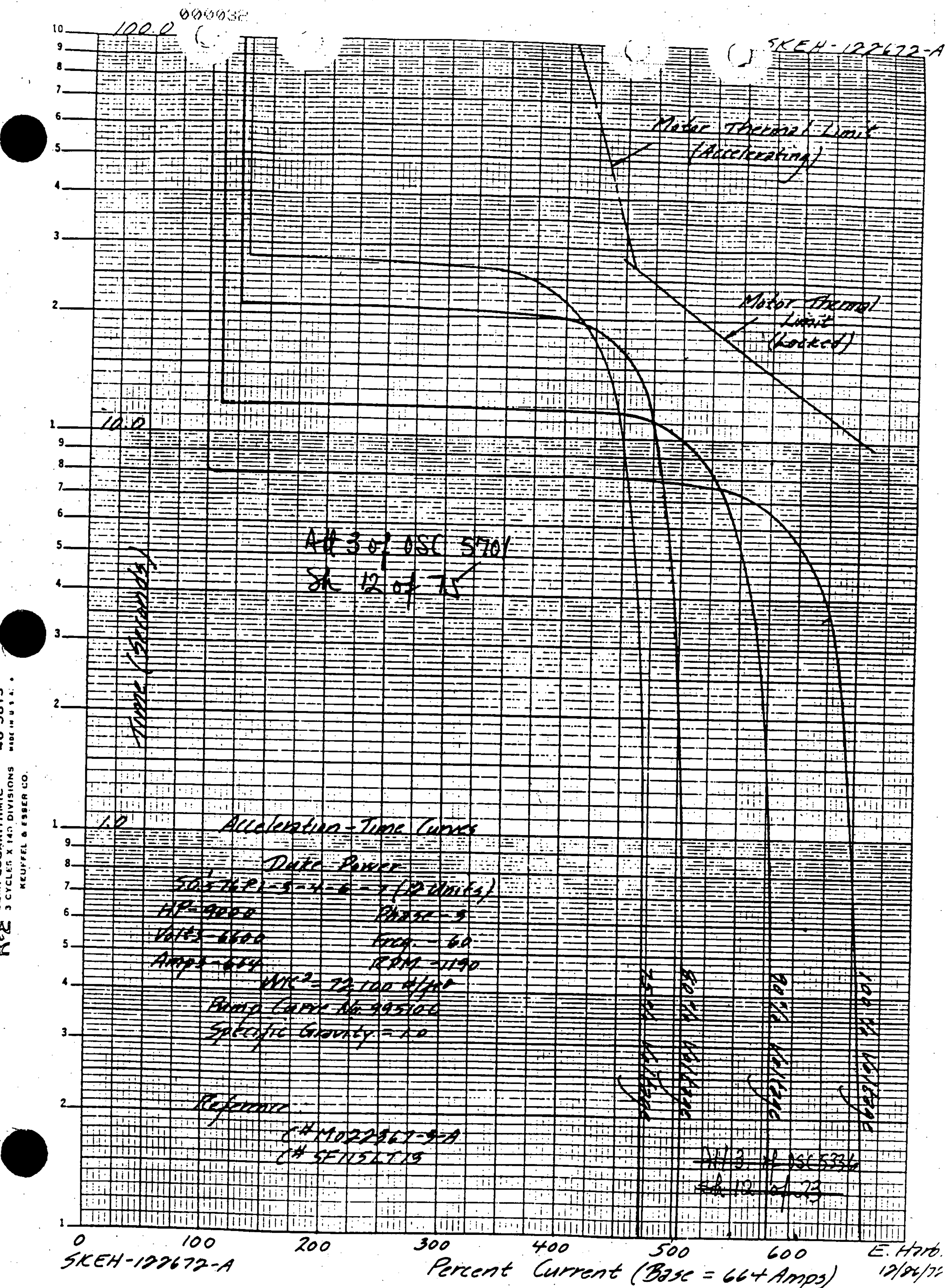
EH-122672-A		Thermal Limit Curve
627760	a)	No Load & Locked Saturation Data for 2S-76P3
	b)	Amps, Horsepower, Eff., P.F., and Speed vs. Torque
627761		Eff. and P.F. vs. Torque @ 110% Voltage for 2S-76P3
627762		Eff. and P.F. vs. Torque @ 105% Voltage for 2S-76P3
627763		Eff. and P.F. vs. Torque @ 100% Voltage for 2S-76P3
627764		Eff. and P.F. vs. Torque @ 95% Voltage for 2S-76P3
627765		Eff. and P.F. vs. Torque @ 90% Voltage for 2S-76P3
627766		Eff. and P.F. vs. Torque @ 80% Voltage for 2S-76P3
627767		Speed vs. Torque and Current vs. Torque
627768		Stray Load Loss vs. Current for 2S-76P3 .
627971		No-Load Saturation Test for 1S-76P1
627774		No-Load Saturation Test for 1S-76P3

These are all the curves we have for Oconee. The load torque vs. speed curve was customer supplied (Curve 99510C - Appendix A, Spec. 05-314-1), and we do not have a copy any longer. Motors are all the same so 627760 should answer most questions. Approximate motor rotating inertia (wk^2) ~ 72,200 lb.-ft.^{2}.

E R Manspeaker
E. R. Manspeaker
CM-93-034

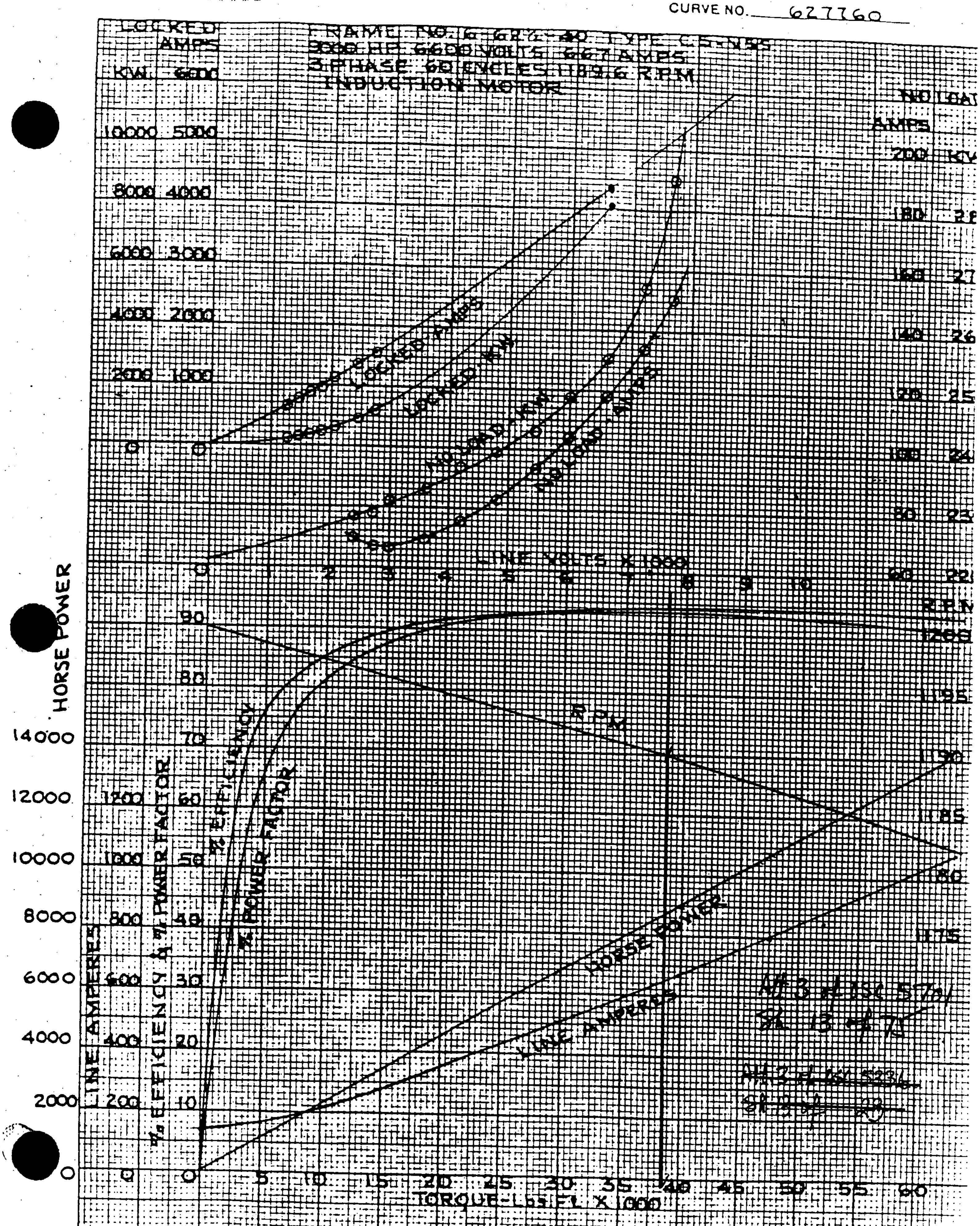
Att. 3 of OSC 5701
Sh 11 of 75

~~Att. 3 of OSC 5336~~
~~Sh. 11 of 23~~


000032
SKEH-127672-A
100.0
10.0
1.0
Motor Thermal Limit (Accelerating)
Motor Thermal Limit (Locked)
Att 3 of OSC 5701
Sh 12 of 15
Time (Seconds)
Acceleration-Time Curves
Duke Power
HP-9000
Phase-3
Volts-6600
Freq.-60
Amps-664
RPM-1190
Pump Curve No. 995100
Specific Gravity = 1.0
Reference
75% Voltage
80% Voltage
90% Voltage
100% Voltage
0
100
200
300
400
500
600
Percent Current (Base = 664 Amps)
SKEH-127672-A
E. Harb.
K+E 3 CYCLES X 140 DIVISIONS
KEUFFEL & ESSER CO.
MADE IN U.S.A.

000033

CURVE NO. 627760



S.O. 76P3

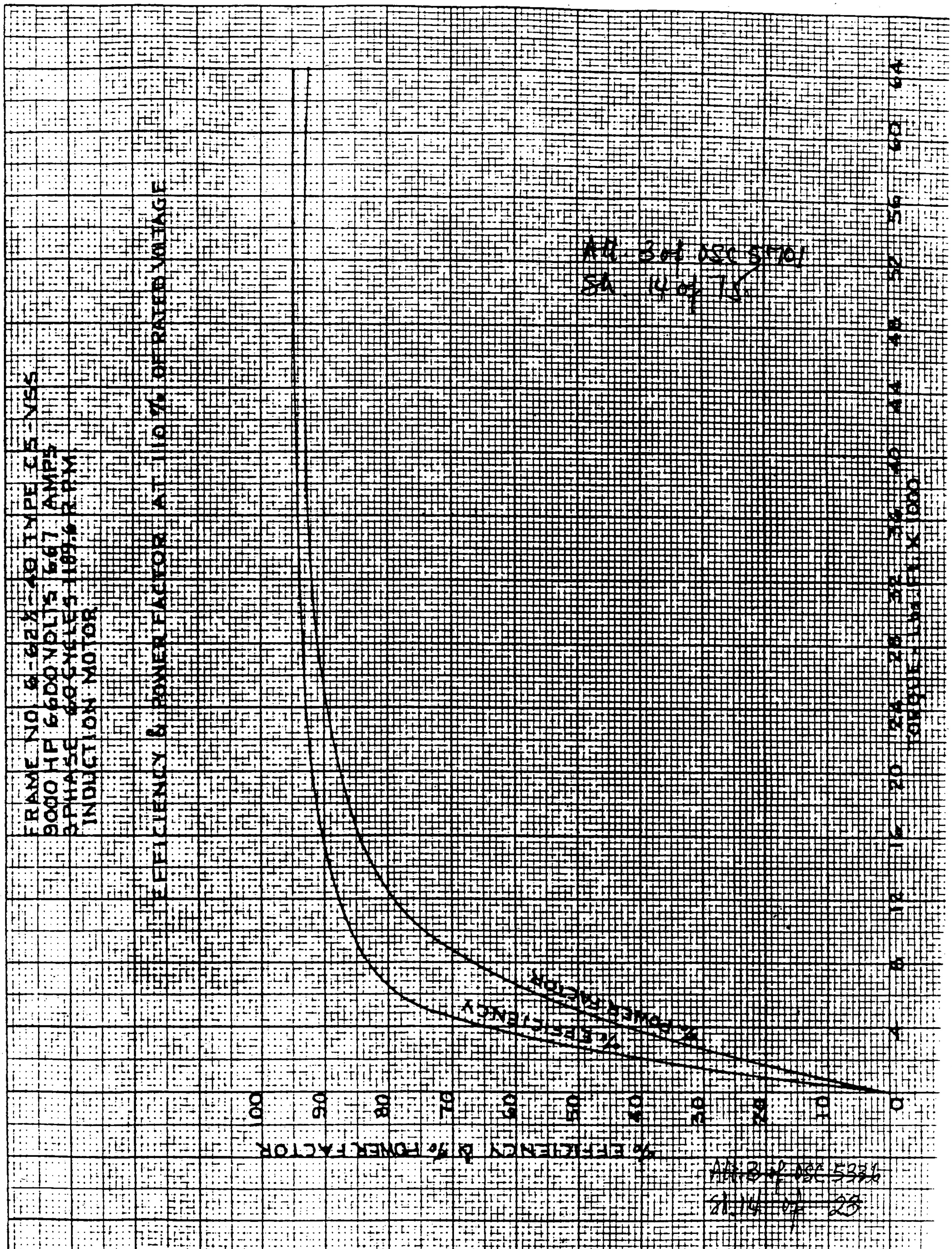
Ser. 23, 76P3 2R

SIGNATURE Z. Malinowski DATE 8-26-68 CURVE NO. 627760

D-823375

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627761

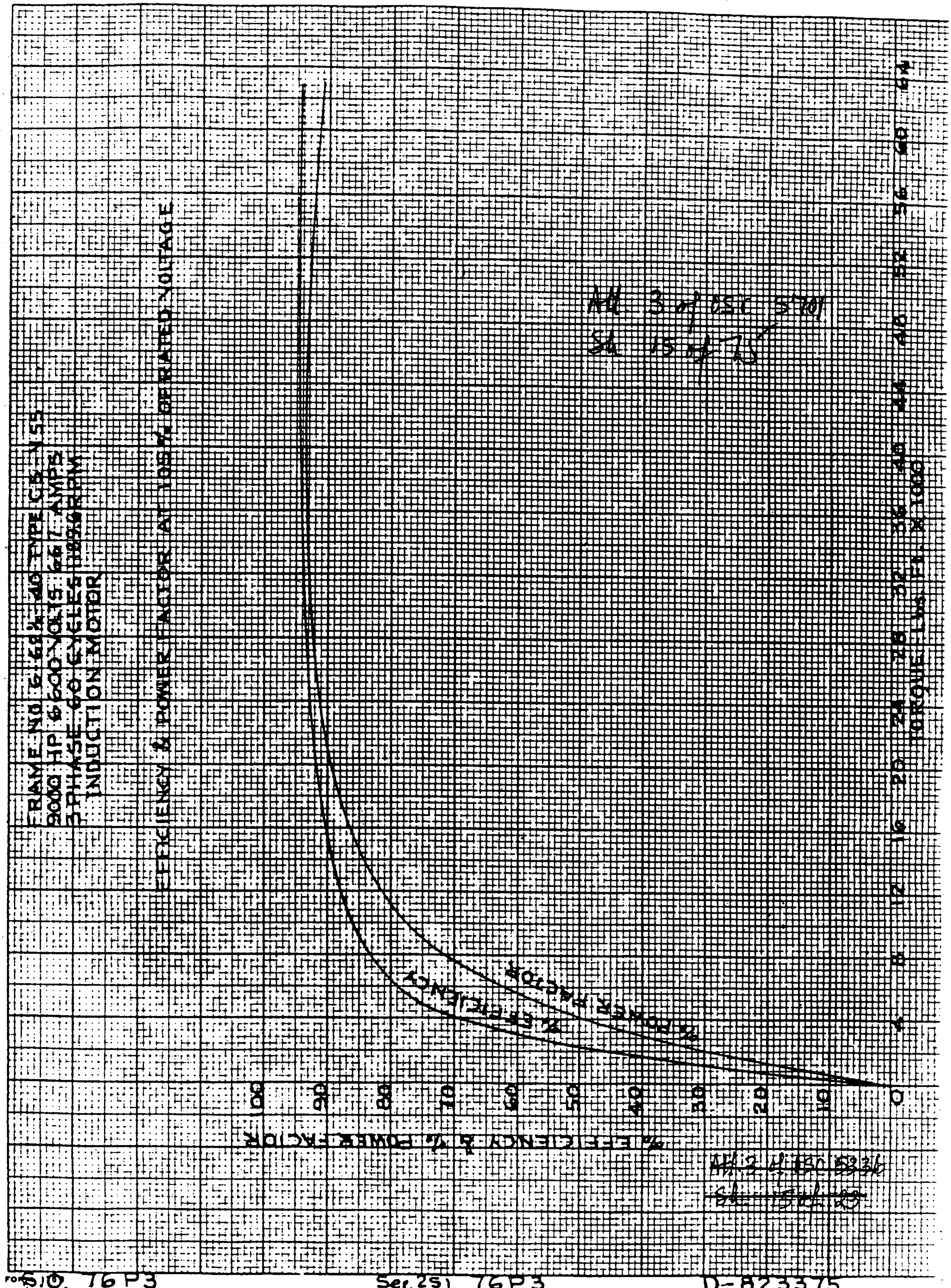


S.O. 76P3 Ser. 25 2R } 76P3 D-823375

DATE 8-14-68 CURVE NO. 627761

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627762

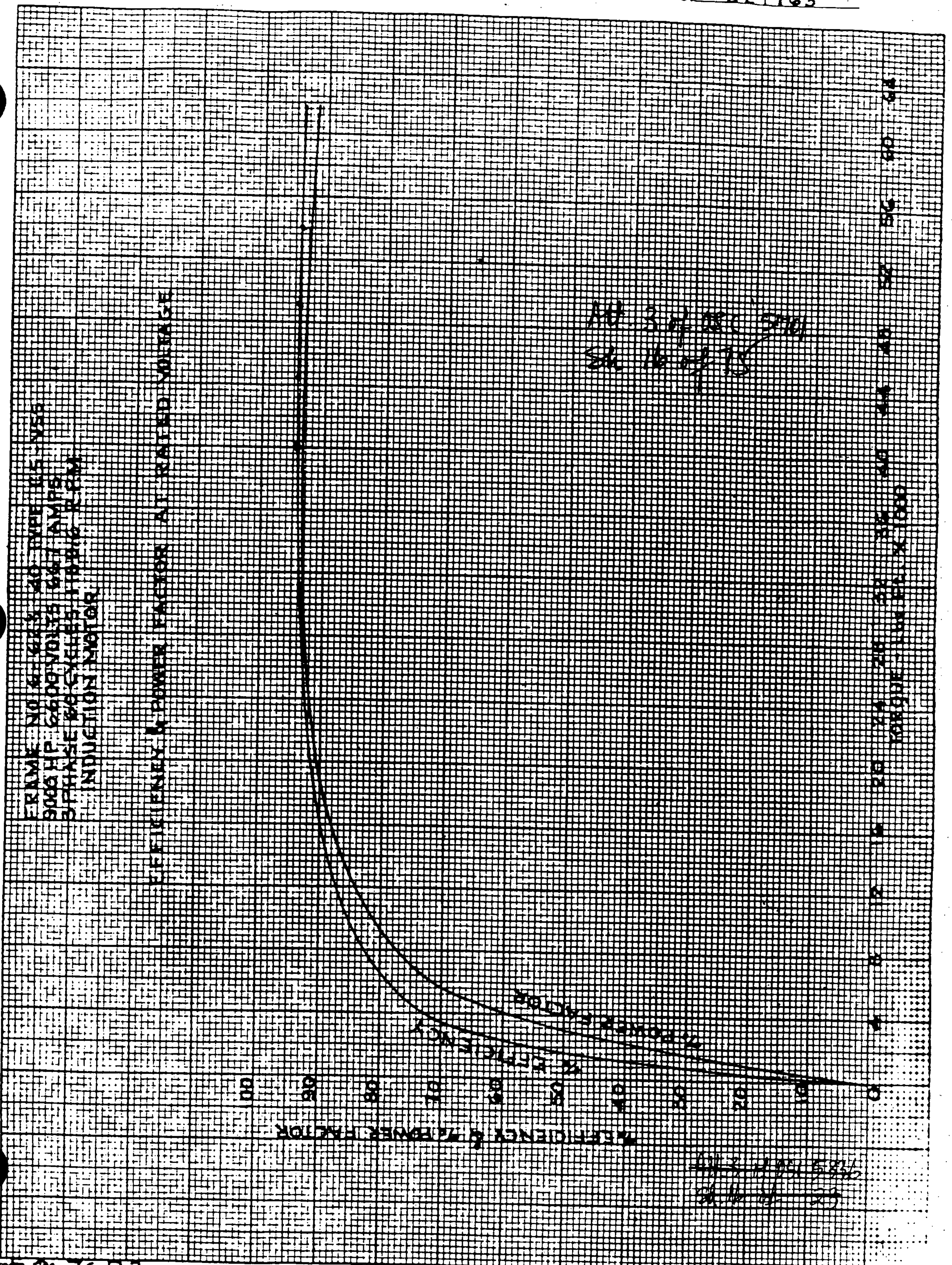


S.O. 76P3 Ser. 2S 76P3 2R D-823375

SIGNATURE Z. Malinowski DATE 8-14-68 CURVE NO. 627762

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627763

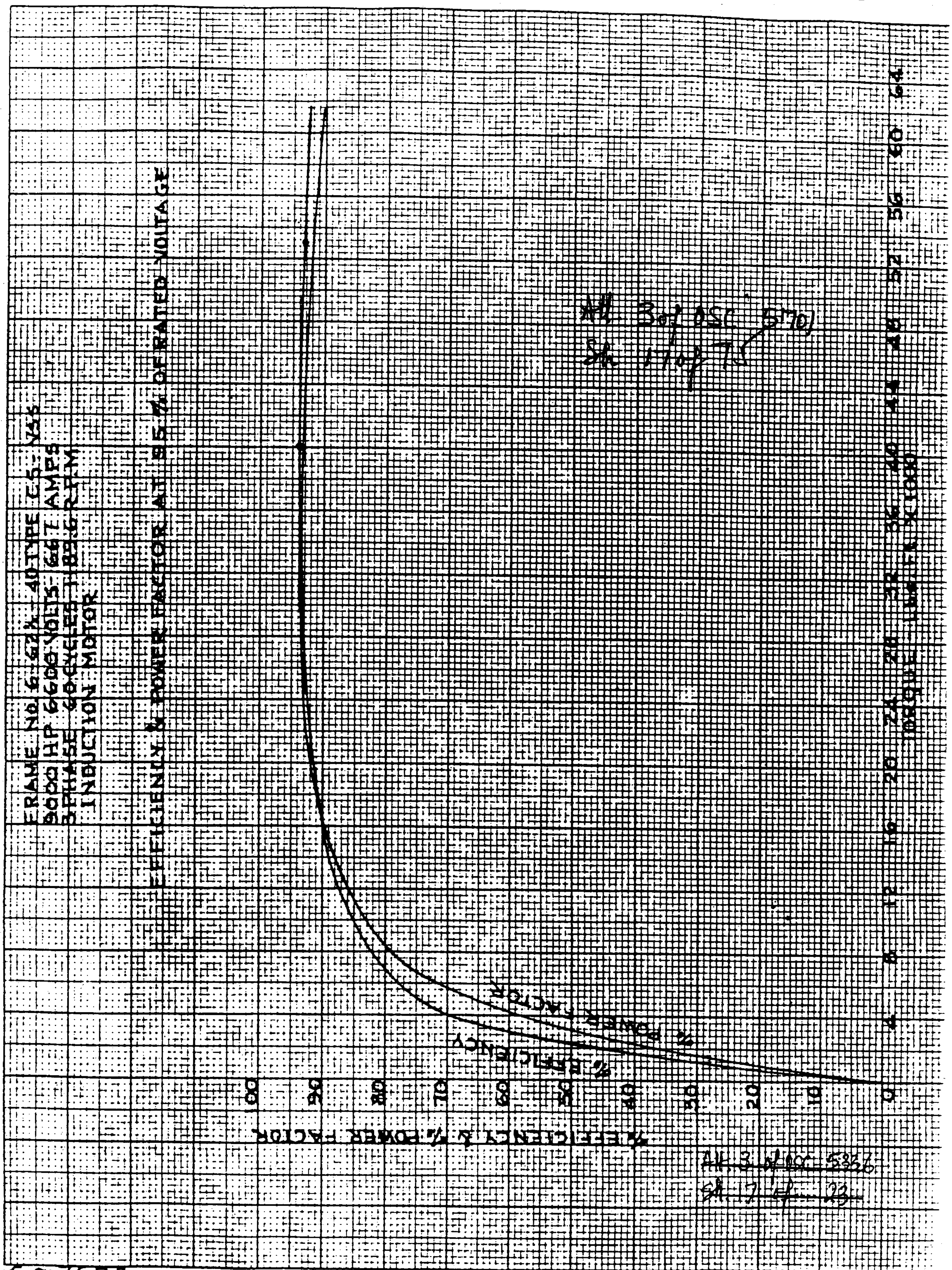


S.O. 76P3 Ser. 25 2R } 76P3 D-823375

SIGNATURE Z. Malinowski DATE 8-15-68 CURVE NO. 627763

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627764

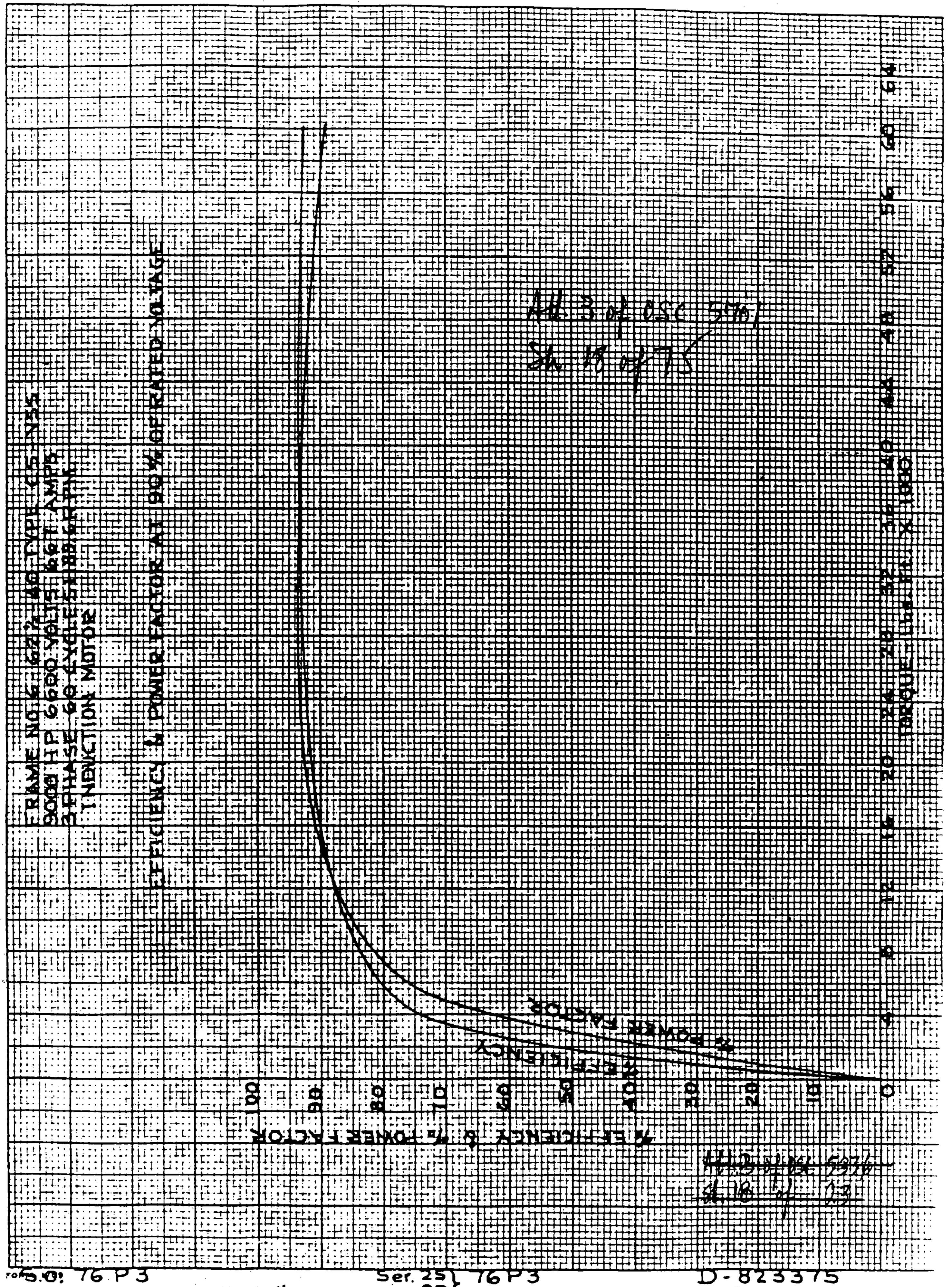


60" 76P3 Ser. 25 } 2R } 76P3 D-823375

SIGNATURE Z. Malinowski DATE 8-14-68 CURVE NO. 627764

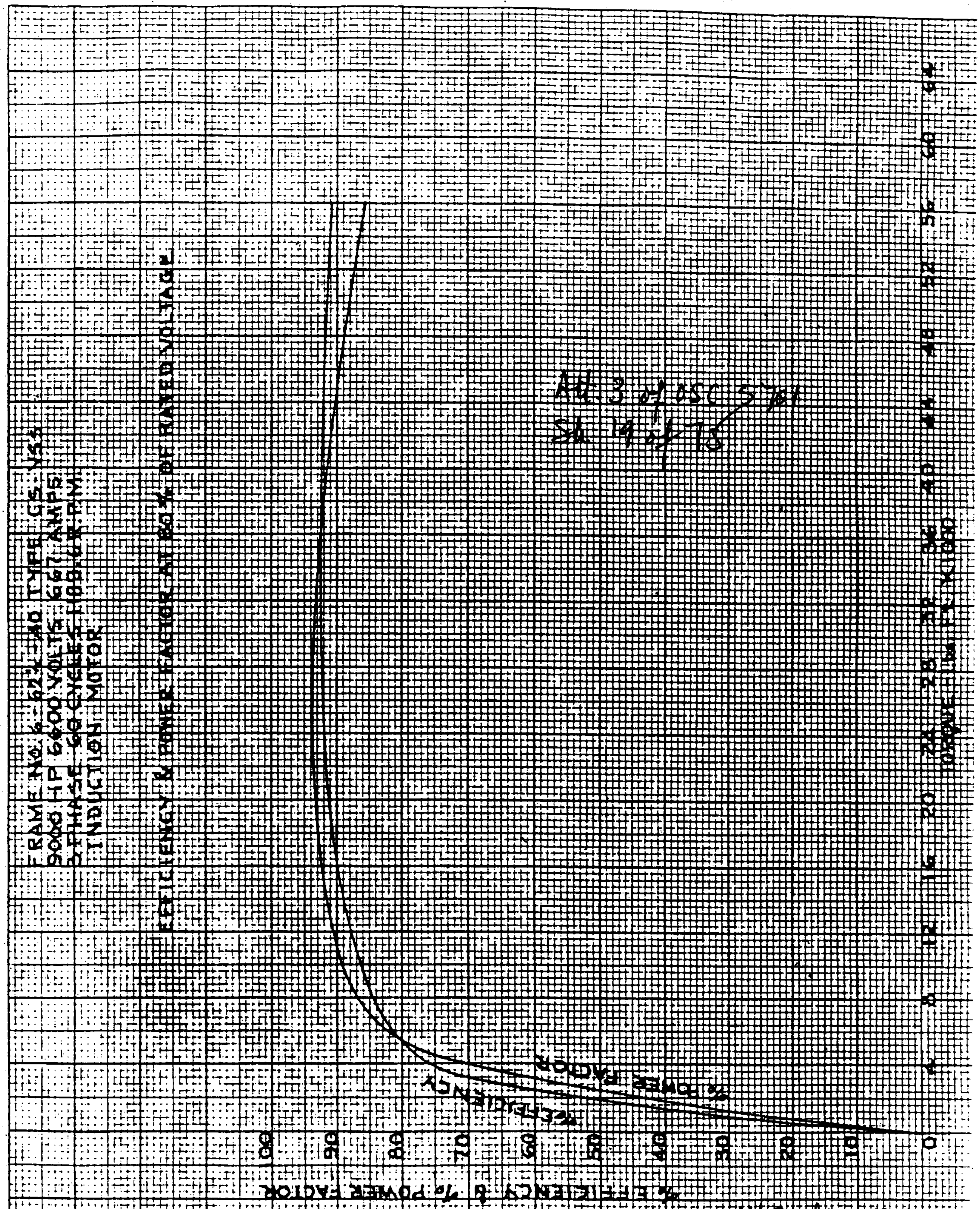
WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627765



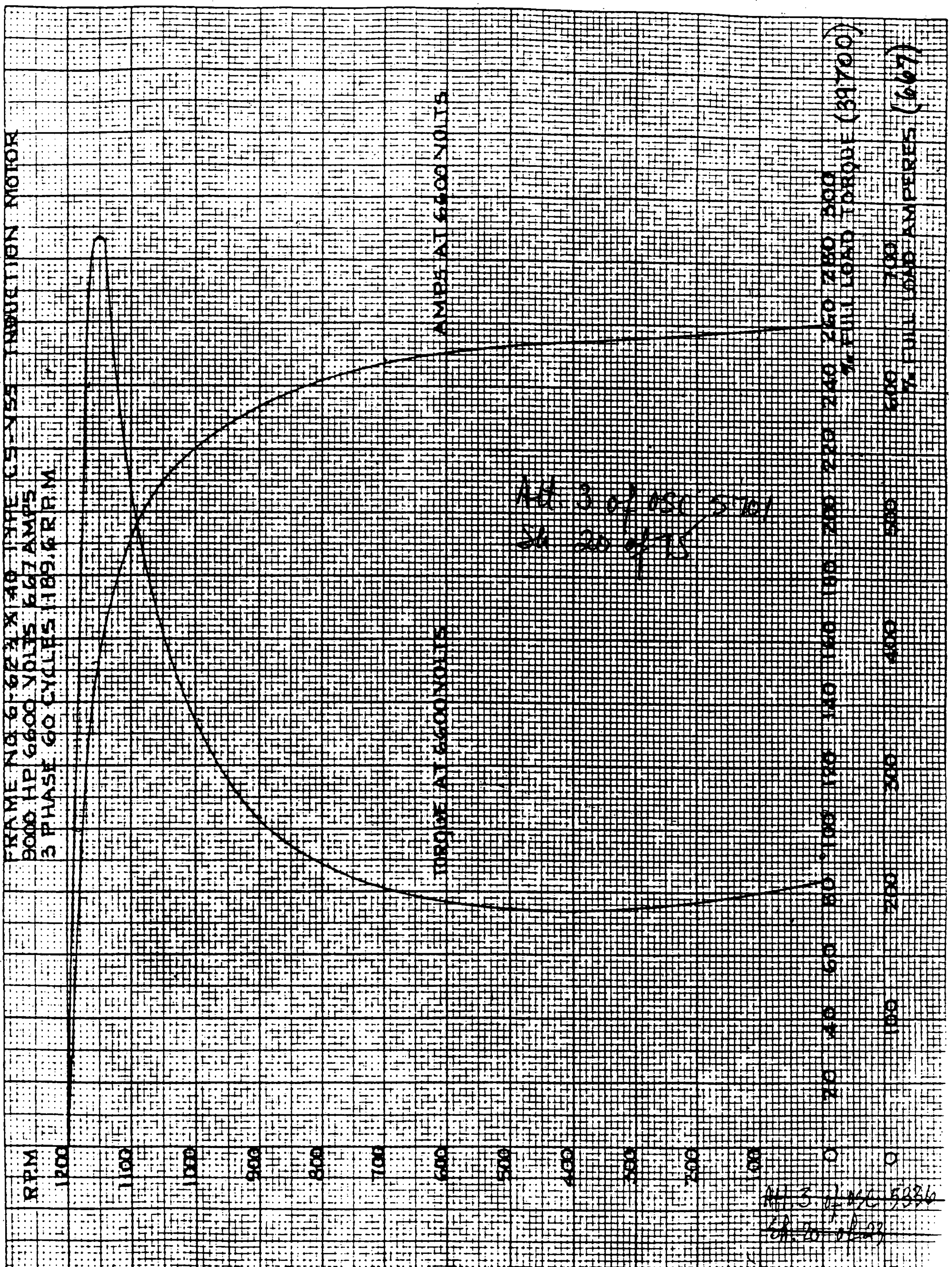
S.O. 76 P3 Ser. 25 76 P3 D-823375

Z Malinowski 2R DATE 8-14-68 CURVE NO. 627765


9000 HP 6600 VOLTS 667 AMPS
INDUCTION MOTOR
EFFICIENCY & POWER FACTOR AT 80% OF RATED VOLTAGE
% EFFICIENCY & % POWER FACTOR
% POWER FACTOR
% EFFICIENCY
0 10 20 30 40 50 60 70 80 90 100
0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64
Att. 3 of OSC 5701
Sh. 14 of 78
Att 3 of OSC 4336
Sh. 14 of 23

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627767



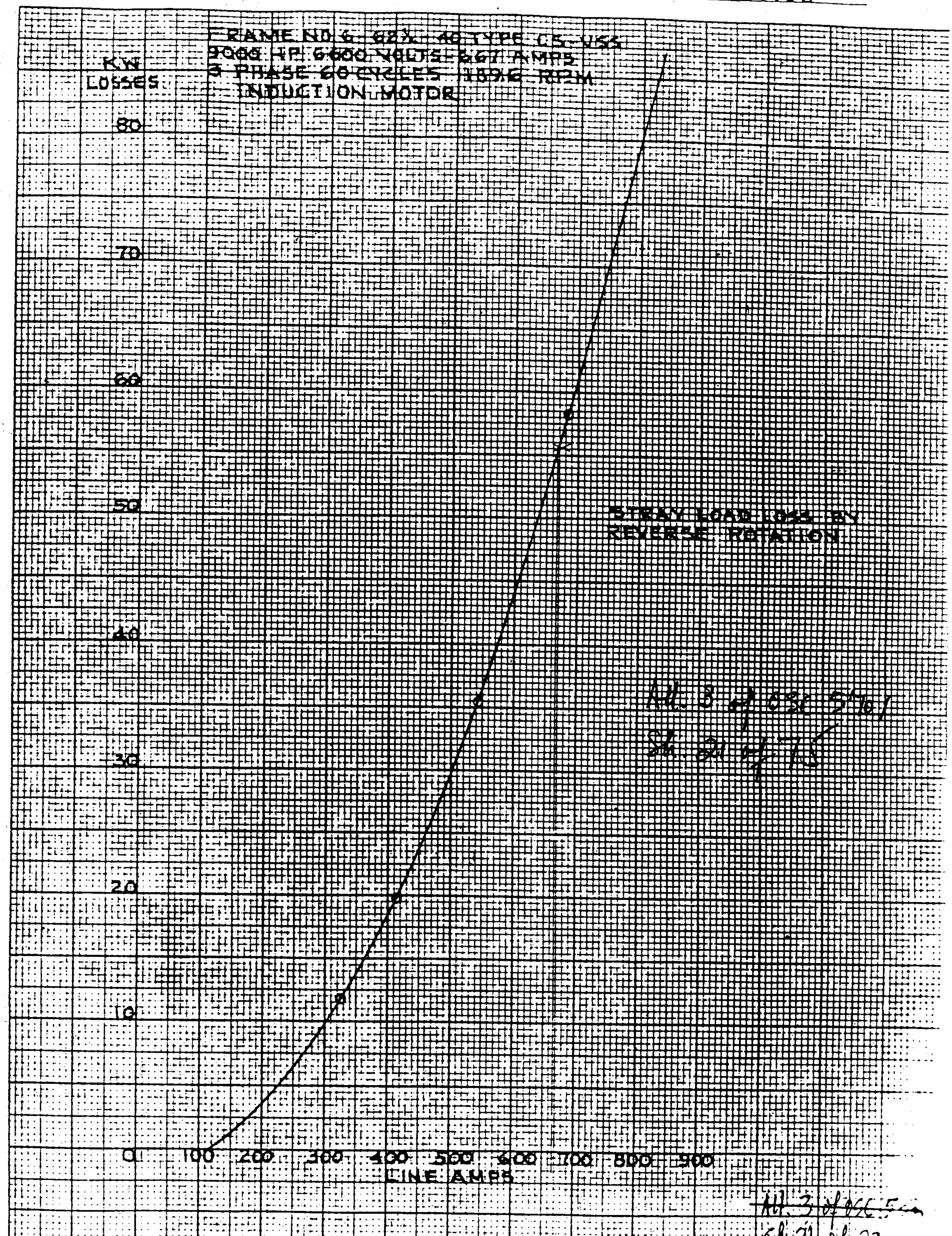
Test @ 4000 Volts o.c.

S.O. 76P3 Ser. 251 76P3 D-823375

SIGNATURE Z Malinowski 2R DATE 8-5-68 CURVE NO. 627767

000041

CURVE NO. 627768

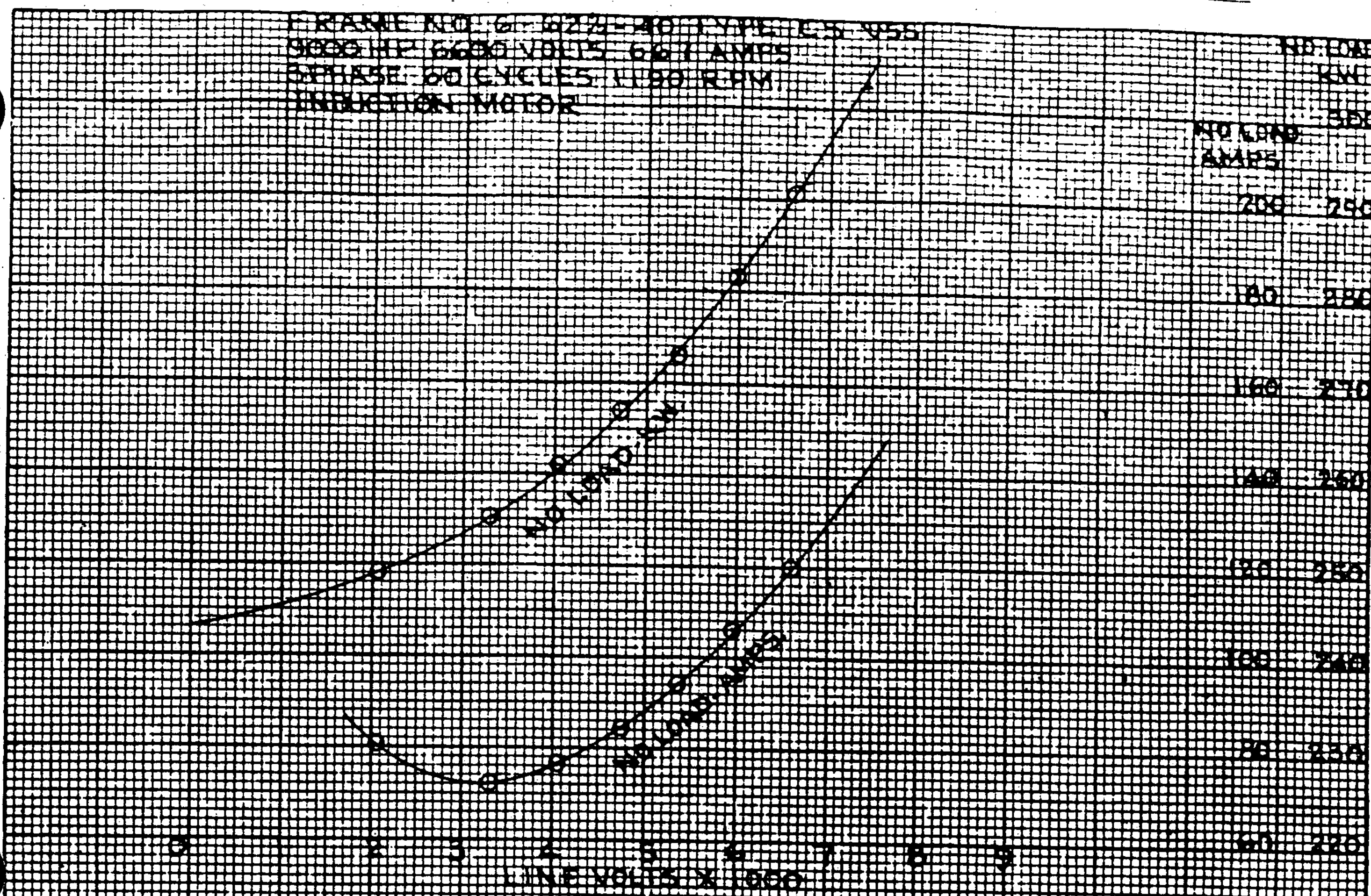


76P3

SIGNATURE M. Chilcote Ser. 23 2R } 76P3 DATE 8-2-68

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627971



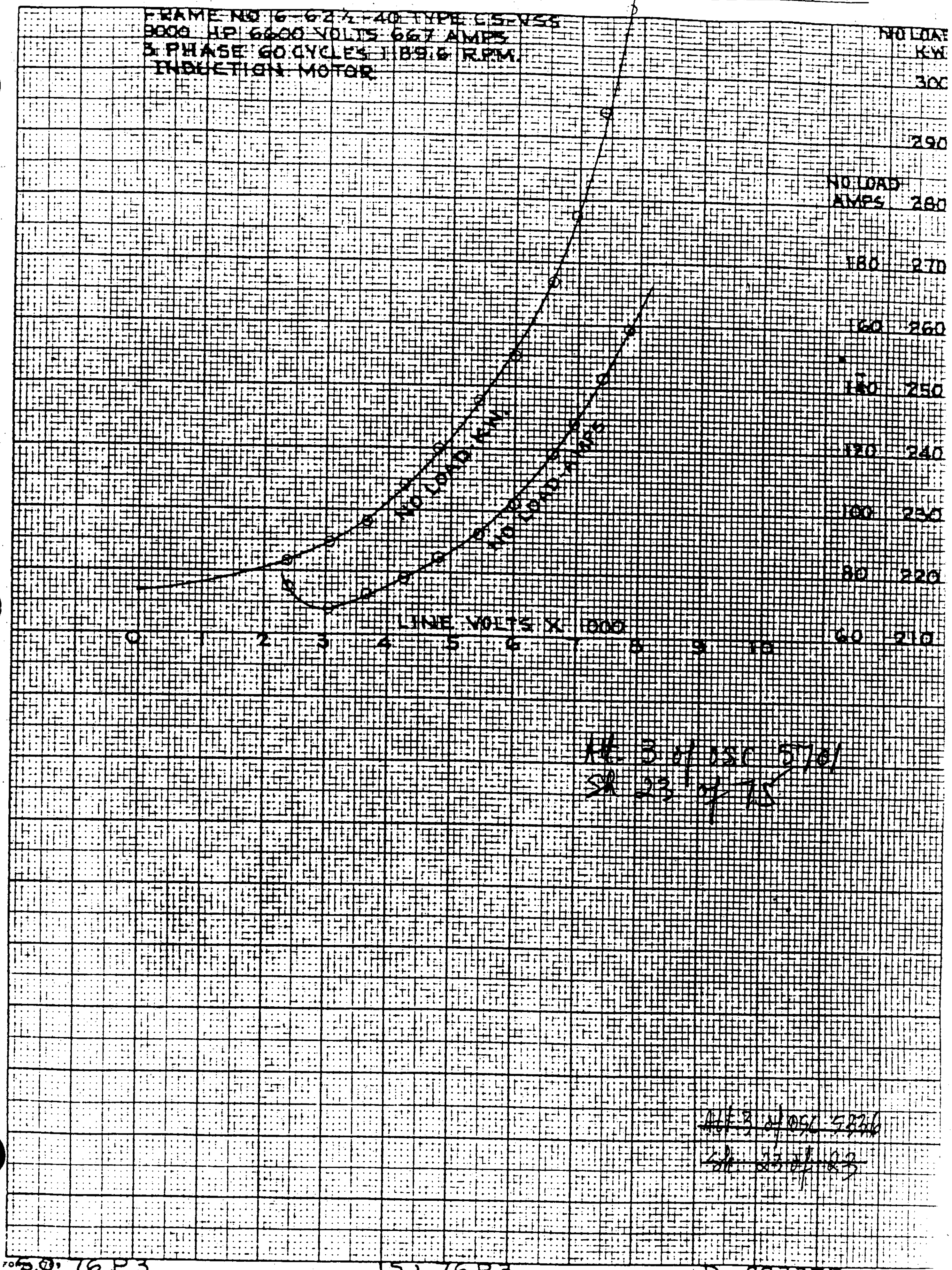
Att. 3 of OSC 5901
Sh. 22 of 75

~~Att. 3 of OSC 5??6~~
~~Sh. 22 of 23~~

000043

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 627774



S.O. 76P3 15 } 76P3 D-823375

SIGNATURE Z Molinowski 1R } DATE 8-28-68 CURVE NO. 627774

SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
FOR MOTORS RATED 100 HP AND ABOVE

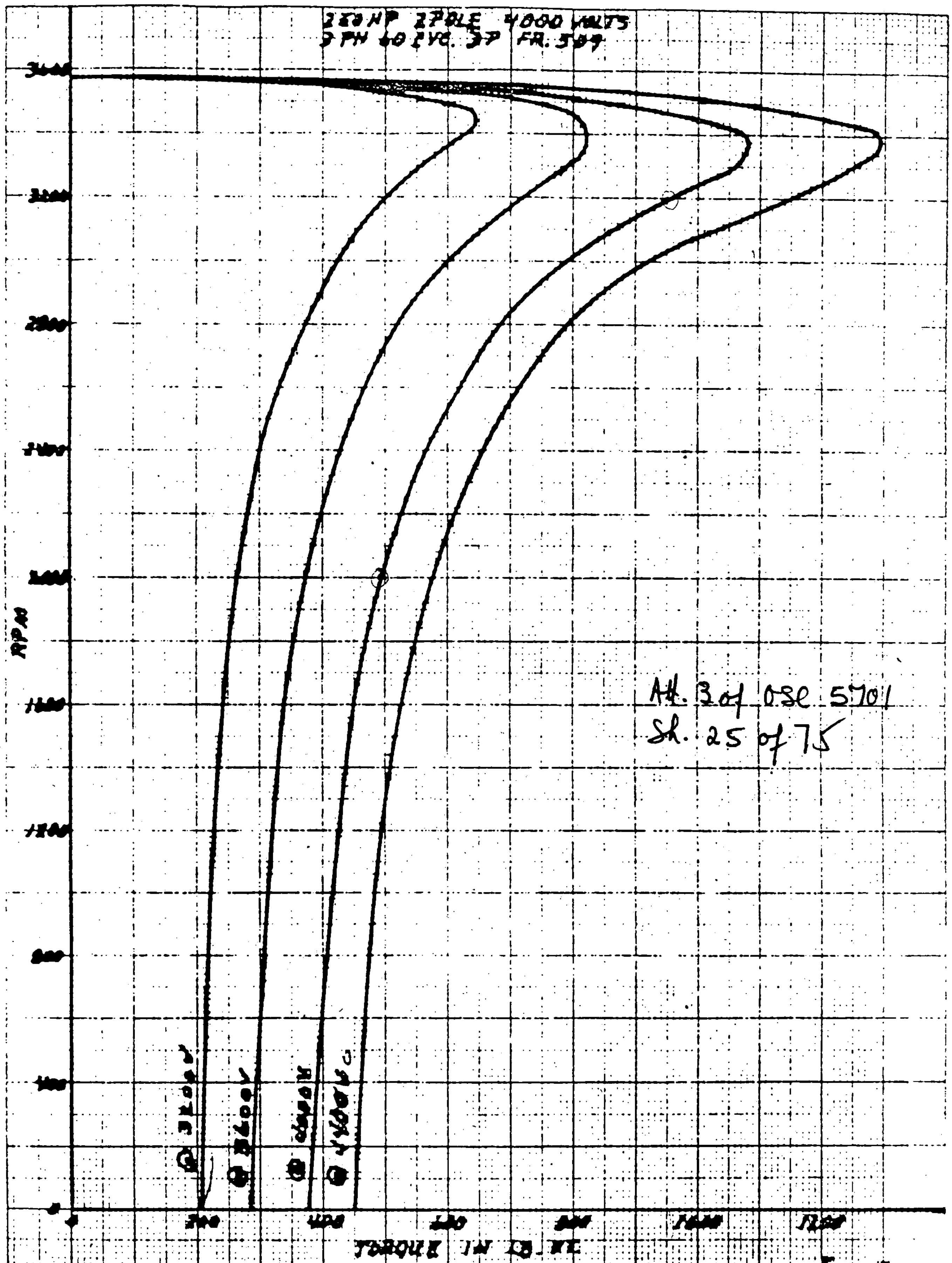
1. Motor Application Reactor Bldg. Spray Pump Mill-Power Order No. OS-314-16 R-92360
2. Manufacturer Westinghouse Electric Corp. Order No. CH-43316-L7 S.O. 68F17398 68F17399
3. Motor Type LLA Frame No. 509-US Enclosure Dripproof
4. Bearing Type Ball Lubrication Grease
5. Rated HP 250 Speed-RPM: Syn 3600 F.L. 3570
6. Volts 4000 Phases 3 Cycles 60 FL Current 32 Service Factor 1.15
7. Locked Rotor Current and Power Factor at:
   A. 100% Voltage: LRC 215 Amps P.F. .198
   B. 90% Voltage: LRC 186 Amps P.F. .195
   C. 80% Voltage: LRC 157 Amps P.F. .193
8. Insulation: Type F Rated Temp. Rise/Ambient 60°C/60°C
9. % Eff. - F.L. 93.8 3/4 Load 93.2 1/2 Load 91.5
10. % P.F. - F.L. 89.3 3/4 Load 87.2 1/2 Load 80.9
11. Torque at 100% voltage: F.L. 368# Ft. L.R. 378# Ft. Breakdown 1020# Ft.
12. Torque at 80% voltage: F.L. 369# Ft. L.R. 216# Ft. Breakdown 643# Ft.
13. Transient reactance in per cent and based on kva of the motor 12.3%
14. WK^2 of Motor Rotor 45# $Ft.^2$ Max. Load WK^2 2.75# $Ft.^2$
15. Starting current vs time curves (acceleration under equipment WK^2 and load) and time-current heating curves (time for motor to reach thermal limits vs current). Curves are to be on same sheet, use the same scales, and be given at 110%, 100%, 90% and 80% voltage. (Curve 557349)
16. Time motor will withstand locked rotor current without damage 10 Seconds - 80%V
17. Permissible successive attempts to start with motor at: Ambient Temp. 2 Rated Temp. 1
18. Time required for motor to return to rated temp. with: Motor Running 5 Minutes Motor at standstill after attempted starts 15
19. Furnish % Eff. and % P.F. vs HP curve. (Curve 557348)
20. Furnish Speed Torque Curve at 110%, 100%, 90% and 80% voltage. (Curve 557347)
21. Furnish % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage. (Table 557350)
22. Date curves and data sheet submitted 9/26/68

Att. 3 of FSC 5701
Sh. 24 of 75

000045

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 557347



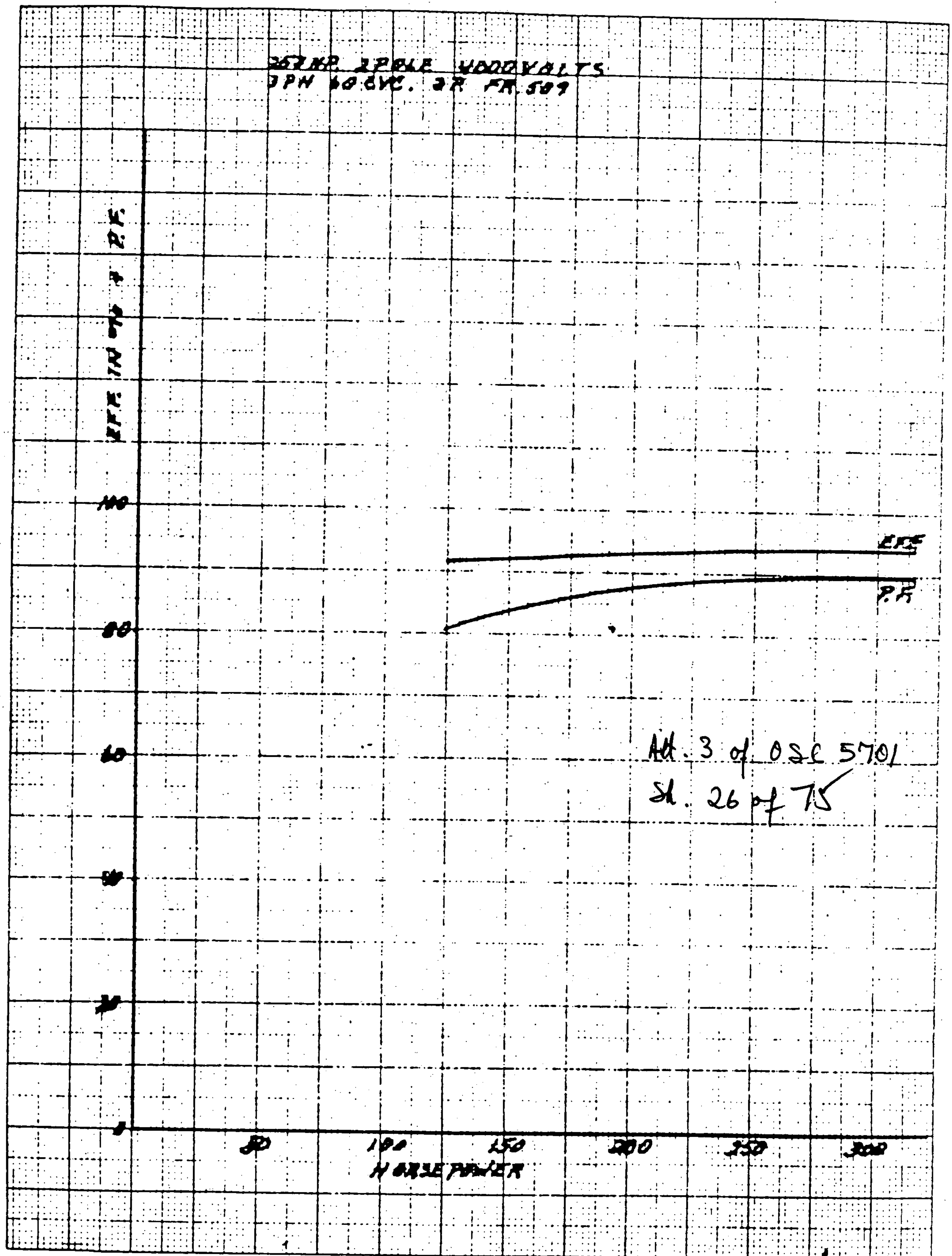
FORM 1787

SIGNATURE [signature] DATE CURVE NO. 557347

000046

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 557348

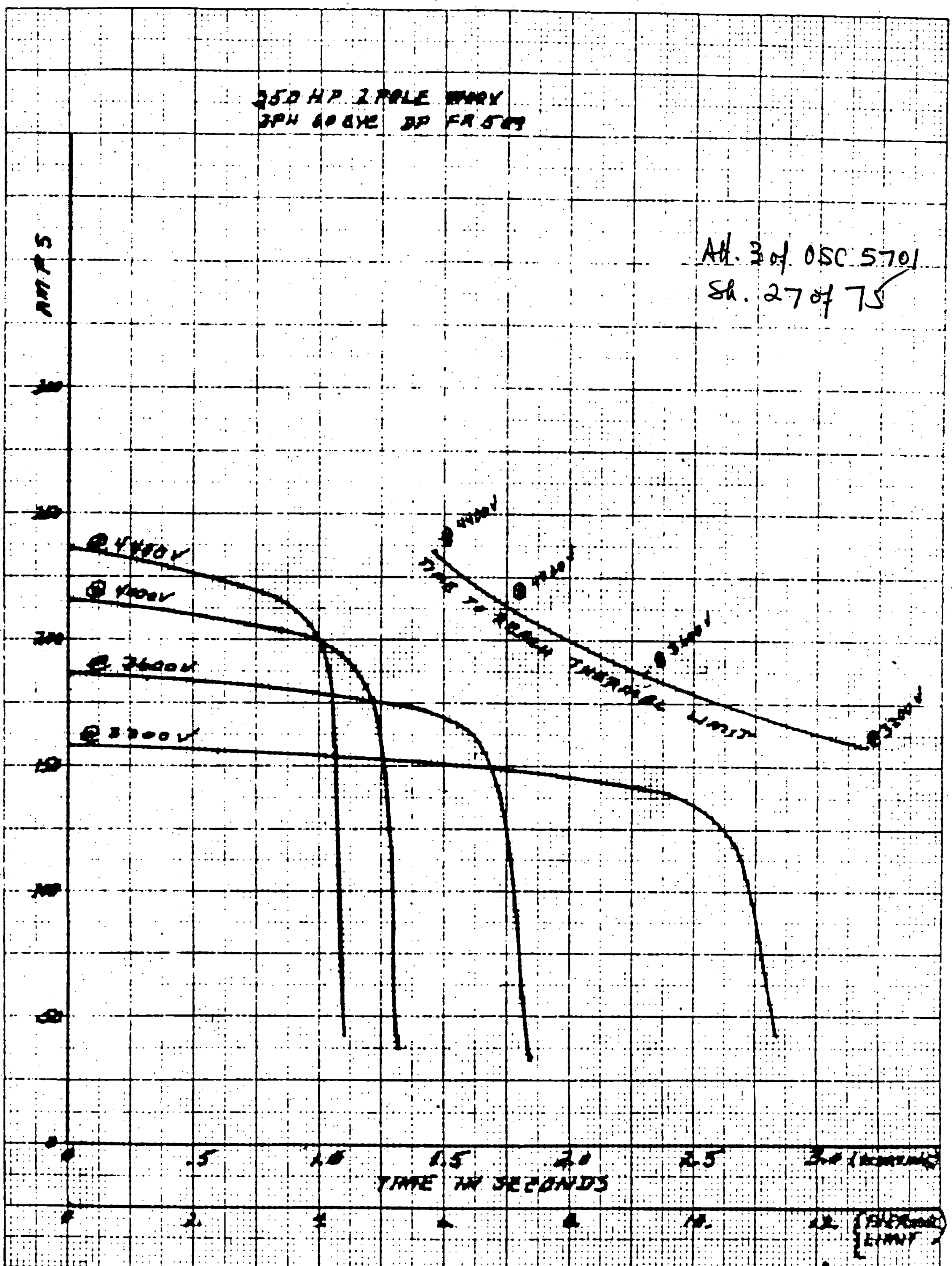


FORM 1707

SIGNATURE James Love DATE 10-9-68 CURVE NO. 557348 A

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 557349



FORM 1707

SIGNATURE *[signature]* DATE CURVE NO. 557349 A

REACTOR BLDG. SPRAY PUMP MOTOR
TABLE NO. 557350

RPM	P.F. @ 4400 V	4000 V	3600 V	3200 V
0	19.8	19.8	19.1	18.2
180	20.0	20.0	19.4	18.4
360	20.2	20.2	19.6	18.6
540	20.5	20.5	19.8	18.9
720	20.7	20.8	20.1	19.2
900	21.0	21.1	20.5	19.5
1080	20.9	21.0	20.4	19.4
1260	21.3	21.5	20.8	19.8
1440	21.8	2.20	21.3	20.3
1620	22.4	22.7	21.9	20.9
1800	23.1	23.4	22.7	21.6
1980	23.9	24.3	23.5	22.4
2160	25.0	25.4	24.6	23.4
2340	26.4	26.8	26.0	24.7
2520	28.1	28.6	27.7	26.3
2700	30.5	31.0	30.0	28.5
2880	33.9	34.4	33.4	31.7
3060	39.0	39.5	38.4	36.4
3240	48.9	49.5	48.0	45.5
3258	50.3	51.0	49.4	46.7
3276	51.8	52.5	50.9	48.1
3294	53.4	54.1	52.4	49.4
3312	55.1	55.7	54.0	50.8
3330	56.9	57.5	55.7	52.9
3348	58.8	59.3	57.4	55.2
3366	60.7	61.2	59.3	57.7
3384	62.7	63.2	61.0	60.3
3402	64.8	65.2	62.9	63.2
3420	66.9	67.1	65.9	66.2
3438	69.0	69.1	69.2	69.5
3456	71.0	72.0	72.6	73.0
3474	73.6	75.6	76.2	76.6
3492	77.1	79.1	79.8	80.2
3510	80.5	82.6	83.4	83.8
3528	83.6	85.7	86.6	87.1
3546	85.7	88.2	89.2	89.9
3564	85.7	89.9	90.4	---

Data Sheet It. #21; Values of P.F. fall so closely together, it is difficult to plot in curve form; therefore the above tabulation is submitted.
250 HP, 2 Pole, 4000 Volts, 3 Phase, 60 Cycles, DP. FR 509

Att. 3 of OSC 5701
Sh 28 of 75

OSC-2444

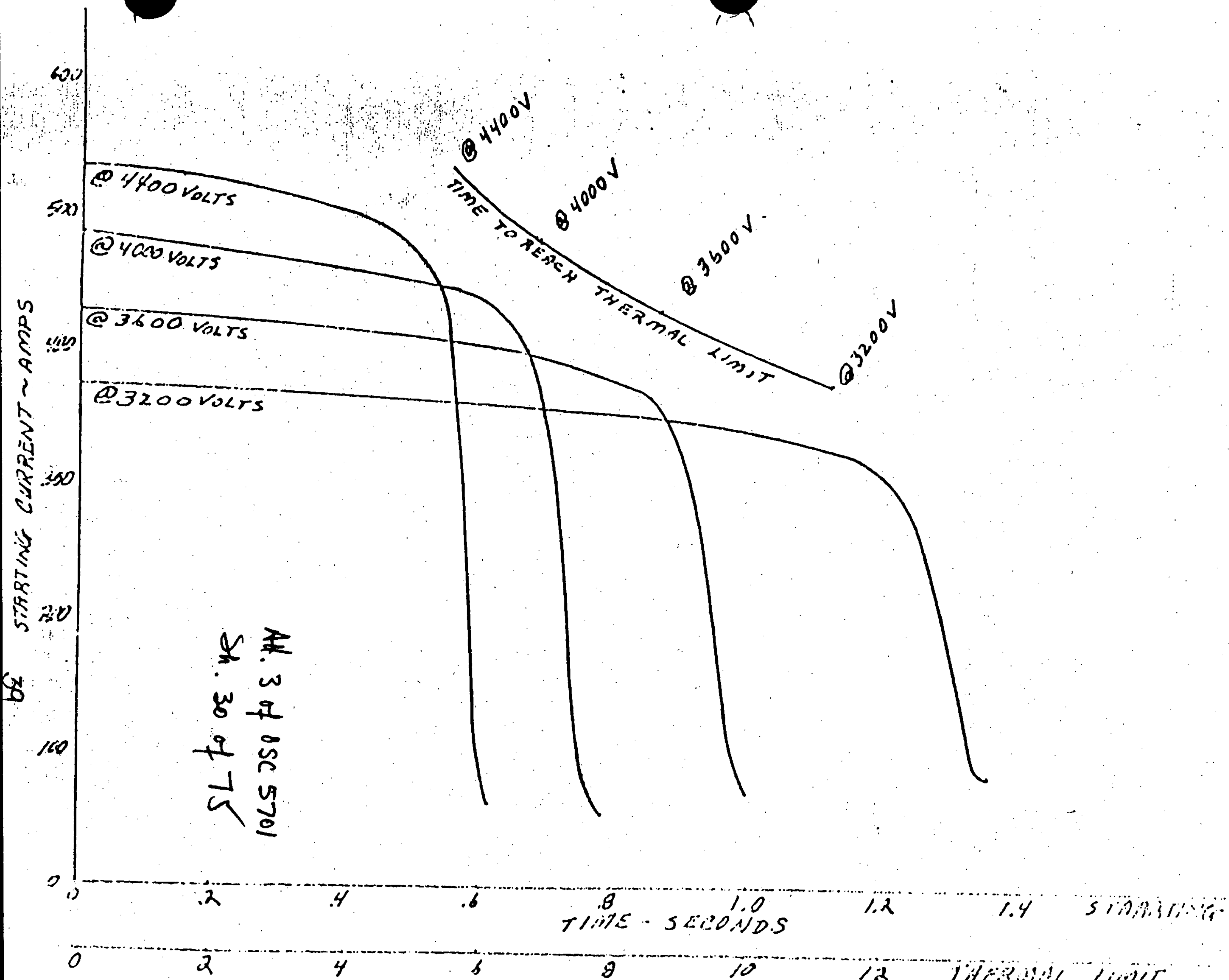
SC 4/24/87
QB 4/24/87

From OM 314-120

SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
FOR MOTORS RATED 100 HP AND ABOVE
CALCULATED DATA NOT GUARANTEED

1. Motor Application Low Pressure Service   Mill-Power Order No. OS-314-10 R92360
2. Manufacturer Westinghouse   Order No. 68F19685-86 CH-43310
3. Motor Type CSP   Frame No. 688.5S   Enclosure Dripproof
4. Bearing Type Split Sleeve   Lubrication Oil
5. Rated HP 600   Speed-RPM: Syn 900   F.L. 888
6. Volts 4000   Phases 3   Cycles 60   F.L. Current 75.5   Service Factor
7. Locked Rotor Current and Power Factor at:
   A. 100% Voltage: LRC 480.8 Amps   P.F. 29.0%
   B. 90% Voltage: LRC 427.0 Amps   P.F. 28.6%
   C. 80% Voltage: LRC 374.0 Amps   P.F. 28.2%
8. Insulation: Type Class F   Rated Temp. Rise/Ambient 60°C/40°C
9. % Eff. - F.L. 93.6   3/4 Load 94.0   1/2 Load 93.9
10. % P.F. - F.L. 91.4   3/4 Load 89.7   1/2 Load 84.5
11. Torque at 100% voltage: F.L. 3549# Ft.   L.R. 101% F.L.   Breakdown 287% F
12. Torque at 80% voltage: F.L. 3588# Ft.   L.R. 61% F.L.   Breakdown 178% F
13. Transient reactance in per cent and based on kva of the motor 13.5
14. WK^2 of Motor Rotor 960# Ft.^{2} Max. Load WK^2 12250# Ft.^{2}, Pump WK^2 = 214# Ft
15. Starting current vs time curves (acceleration under equipment WK^2 and load) time-current heating curves (time for motor to reach thermal limits vs curren Curves are to be on same sheet, use the same scales, and be given at 110%, 10 90% and 80% voltage. (Curve 557314)
16. Time motor will withstand locked rotor current without damage 10 Sec.
17. Permissible successive attempts to start with motor at: Ambient Temp. 2 Rated Temp. 1
18. Time required for motor to return to rated temp. with: Motor Running 5 Motor at standstill after attempted starts 15
19. Furnish % Eff. and % P.F. vs HP curve. (Curve 557315)
20. Furnish Speed Torque Curve at 110%, 100%, 90% and 80% voltage. (Curve 5573:
21. Furnish % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage. (Table 557313)
22. Date curves and data sheet submitted 8/30/68

Att. 3 of OSC 5701
Sh 29 of 75



FROM OM 3H-120

LOW PRESSURE SERVICE WATER PUMP MOTOR

600HP 8 POLE 4000VOLTS

OSC-2444

2537 3/4

SC 4/24/87

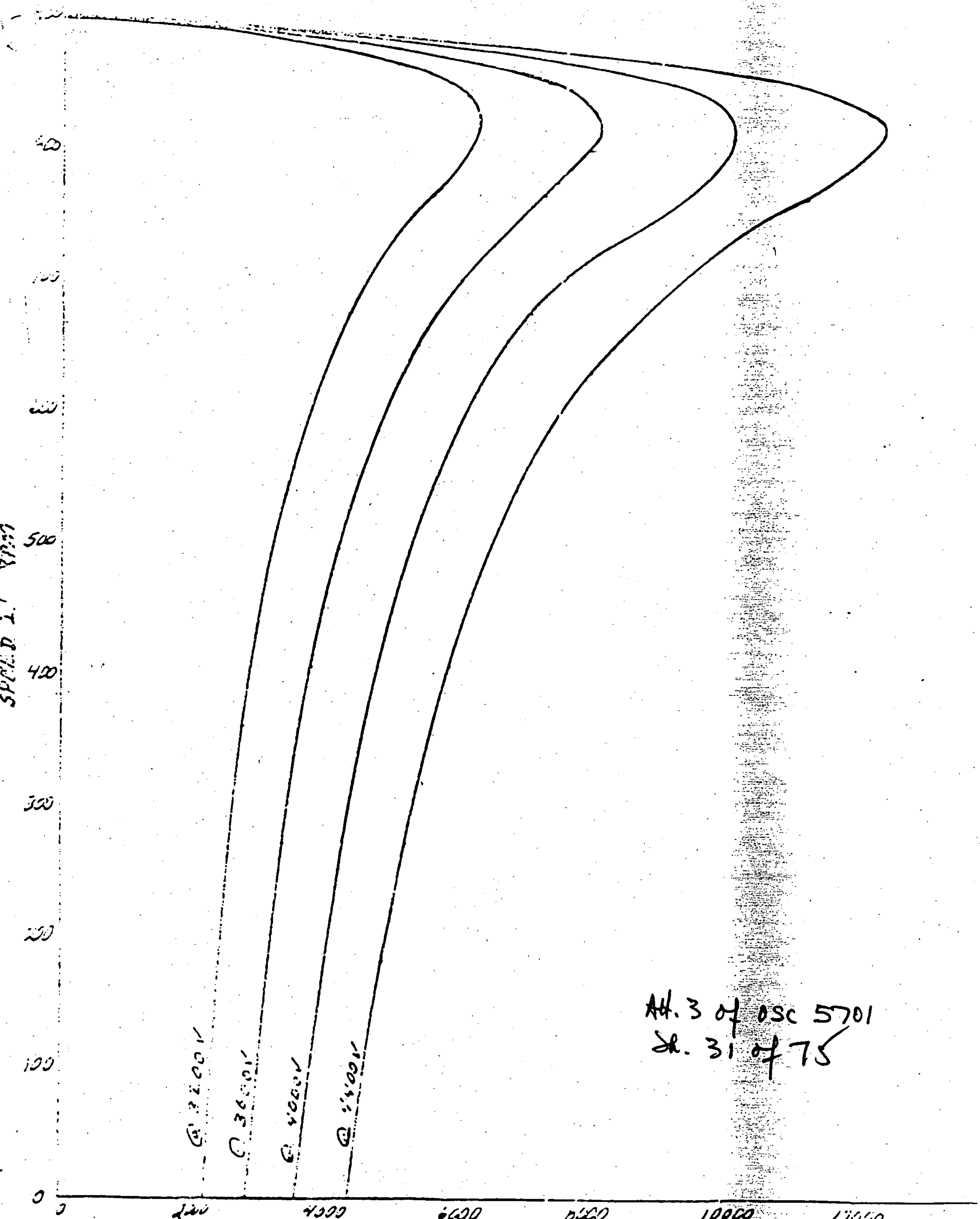
QB 4/24/87

000001

FROM DM 314-120 OSC-2444

LOW PRESSURE SERVICE WATER PUMP MOTOR SC 4/24/87 AB 4/24/87

600HP 8POLE 4000VOLTS
3PH 60CYC. DP. FR. 558.5-S



0 0 3 6 7 0 9 1 4

Att. 3 of OSC 5701
Sh. 31 of 75

40

FROM OM 314-12

OSC-2444

SC 4/24/87
QB 4/24/87

LOW PRESSURE SERVICE WATER PUMP MOTOR
TABLE NO. 557313

RPM	P.F. @ 4400 V	4000 V	3600 V	3200 V
0	29.3	29.0	28.6	28.2
45	29.6	29.3	28.9	28.5
90	30.0	29.7	29.3	28.9
135	30.4	30.1	29.7	29.3
180	30.9	30.6	30.2	29.7
225	31.4	31.1	30.7	30.2
270	32.0	31.7	31.3	30.8
315	32.6	32.3	31.9	31.4
360	33.4	33.0	32.6	32.1
405	34.2	33.9	33.5	33.0
450	35.2	34.9	34.5	34.0
495	36.4	36.1	35.7	35.1
540	37.9	37.6	37.1	36.6
585	39.7	39.4	38.9	38.3
630	42.0	41.6	41.2	40.6
675	44.9	44.5	44.1	43.4
720	49.7	49.3	48.8	48.1
765	57.3	57.0	56.5	55.7
810	68.3	68.1	67.6	66.8
815	69.6	69.4	68.9	68.1
819	71.0	70.8	70.3	69.5
823	72.4	72.2	71.7	71.1
828	73.8	73.6	73.1	72.6
832	75.2	75.1	74.6	74.2
887	76.7	76.6	76.2	75.9
841	78.2	78.1	77.8	77.6
846	79.2	79.6	79.6	79.4
850	81.2	81.3	81.3	81.2
855	82.7	83.0	83.1	83.0
859	84.3	84.7	84.8	84.8
864	85.9	86.3	86.5	86.5
868	87.4	87.9	88.1	88.1
873	88.6	89.3	89.6	89.8
877	89.7	90.5	91.0	91.2
882	90.4	91.4	92.0	92.3
886	90.2	91.6	92.4	--
891	87.5	89.7	--	--

Data Sheet Items: The values of P.F. fall so closely together, it is difficult to plot 4 curves, therefore the above tabulation is submitted. 600 HP, 8 Pole, 4000 V, 3 Phase, 60 Cycle, DP. Fr. 688.5-S

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00367709015

71-F-13120
5

~~OSC-2444~~

MOTOR SPECIFICATION NO. OS-314-10
DATE June 12, 1968

From OS 95-K

~~SE 4/24/87~~
~~QR 4/24/87~~

OCONEE 1, 2 & 3
DUKE POWER COMPANY
ENGINEERING DEPARTMENT
CHARLOTTE, N.C.

1. Use: Low Pressure Service Water Pump Motor.

2. Design and Application Information. The motor will be directly connected to an Ingersoll-Rand Type 18ALV centrifugal water pump through a Fast flexible coupling. The WK^2 of the pump is 214 lb-ft^2 wet. The speed torque curve item 3A.3 is attached. The normal motor load will range from 422HP to 583HP break horsepower, depending on the temperature . . the inlet water. Therefore, it is desirable that the motors be optimally designed for maximum efficiency and power factor around 514 horsepower.

   It is desirable that the starting KVA inrush be kept low and the power factor be kept as high as practical, commensurate with good motor design. The length of time required for acceleration is not considered an operating problem.

3. Quantity Required. Five (5)

4. General Design. The motors shall have design features proposed and agreed upon during negotiations and they shall be identical to insure complete interchangeability of parts.

5. Electrical Type. Squirrel cage induction motor.

6. Starting Requirements. The motor shall be capable of accelerating the driven equipment under the speed-torque conditions and WK^2 as outlined in Section 2 without damage. The minimum repetitive starting duty under this load shall be two successive starts from ambient temperature or once from rated motor temperature with additional repetitive starts spaced not greater than 20 minutes apart with the motor running. The motor shall meet the above requirements under across-the-line starting conditions with the motor terminal voltage 90% of rated voltage. The manufacturer shall attach a nameplate to the motor in a conspicuous location spelling out the starting capabilities of the motor.

7. Rated Voltage. 4000 volts, 3 phase, 60 hertz.

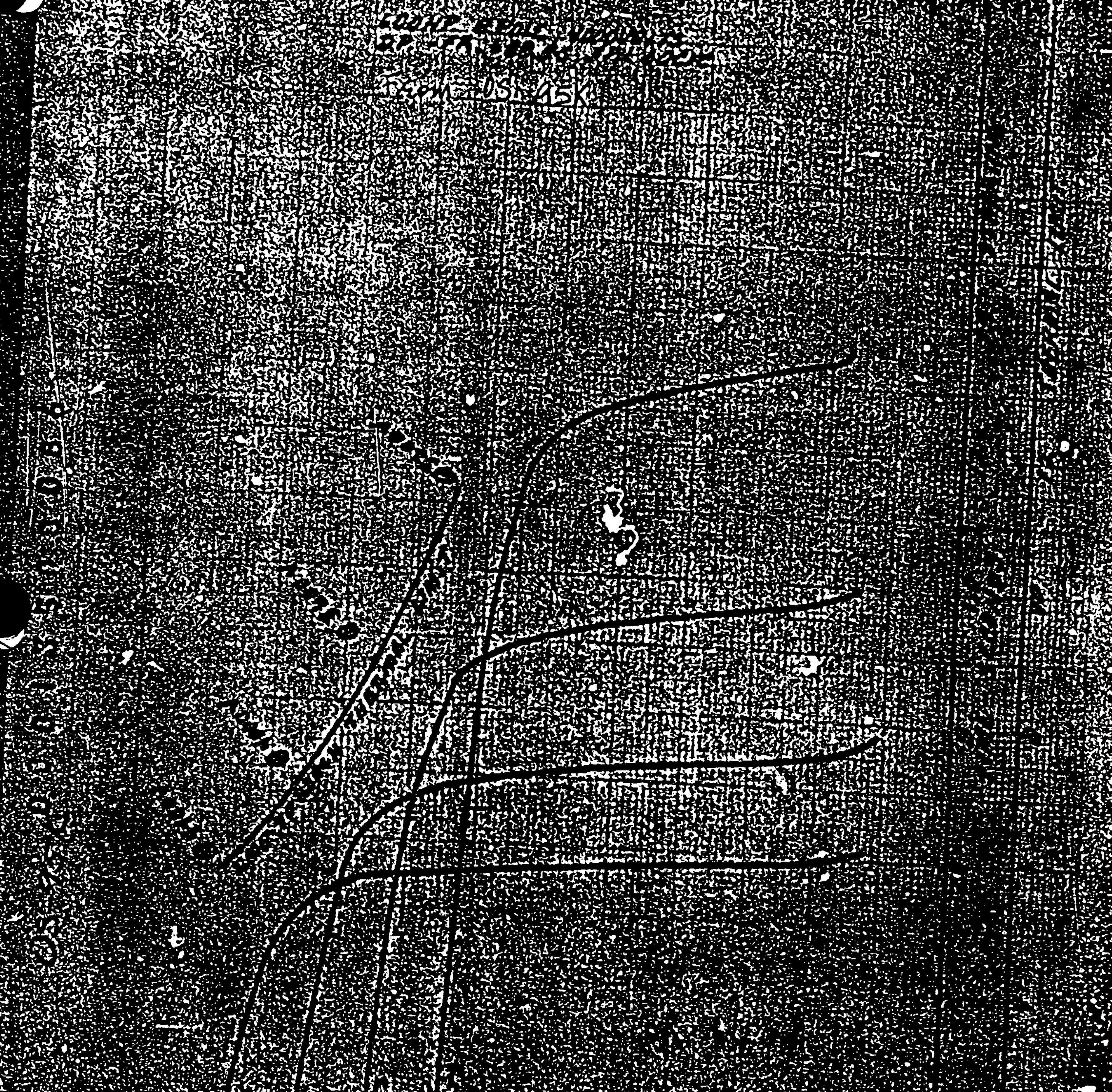
8. Insulation: Stator winding shall be full Class F Thermalastic epoxy insulation system.

9. Rated Horsepower and Temperature Rise. 600 horsepower continuous at a temperature rise of 60°C over an air ambient temperature of 40°C. Information furnished on the motor data sheets is to be based on this rating.

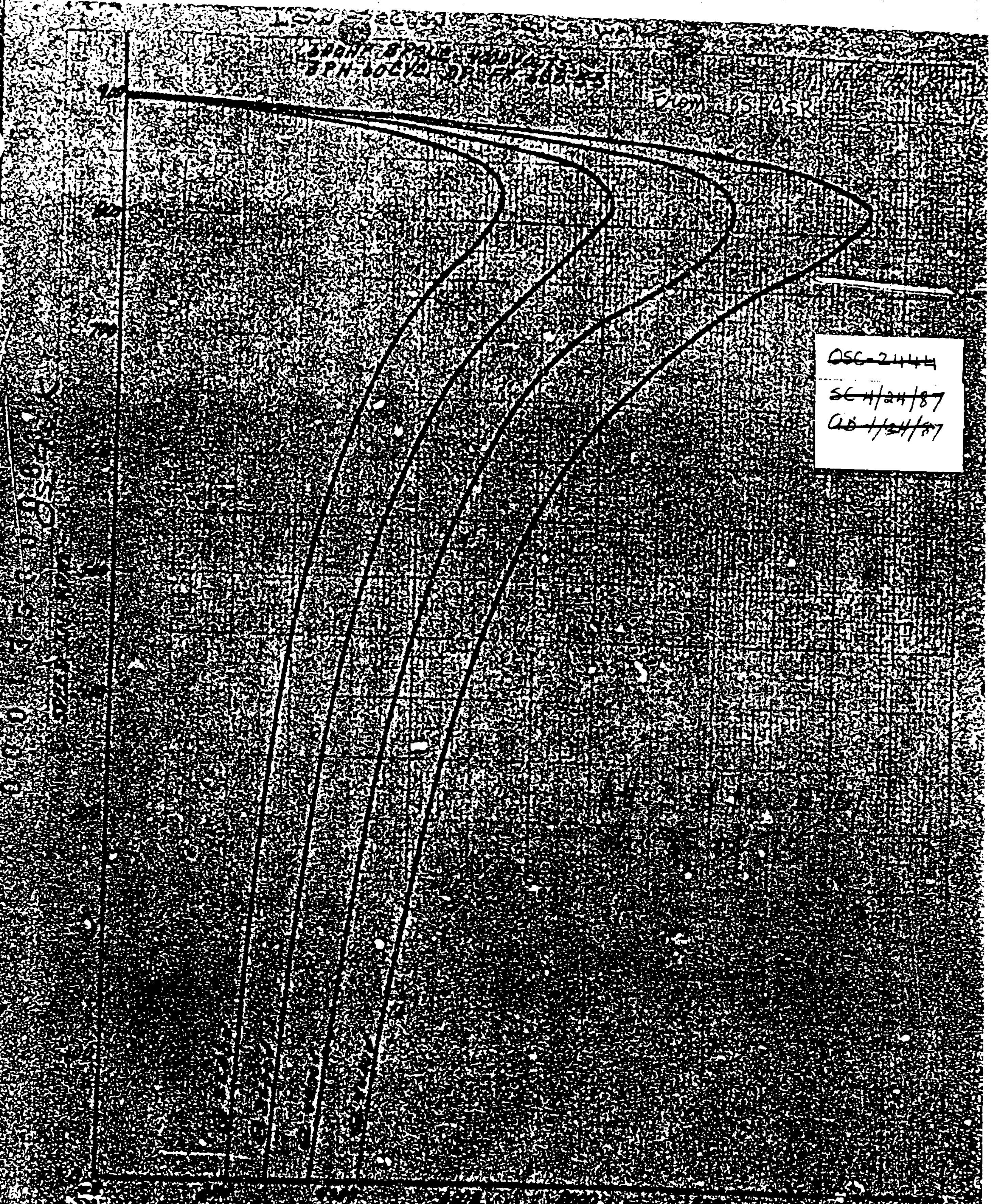
Att. 3 of OSC 5701
SA. 33 of 75

~~OSC 2444~~

~~SC 11/24/87~~
~~QB 11/24/87~~



000055

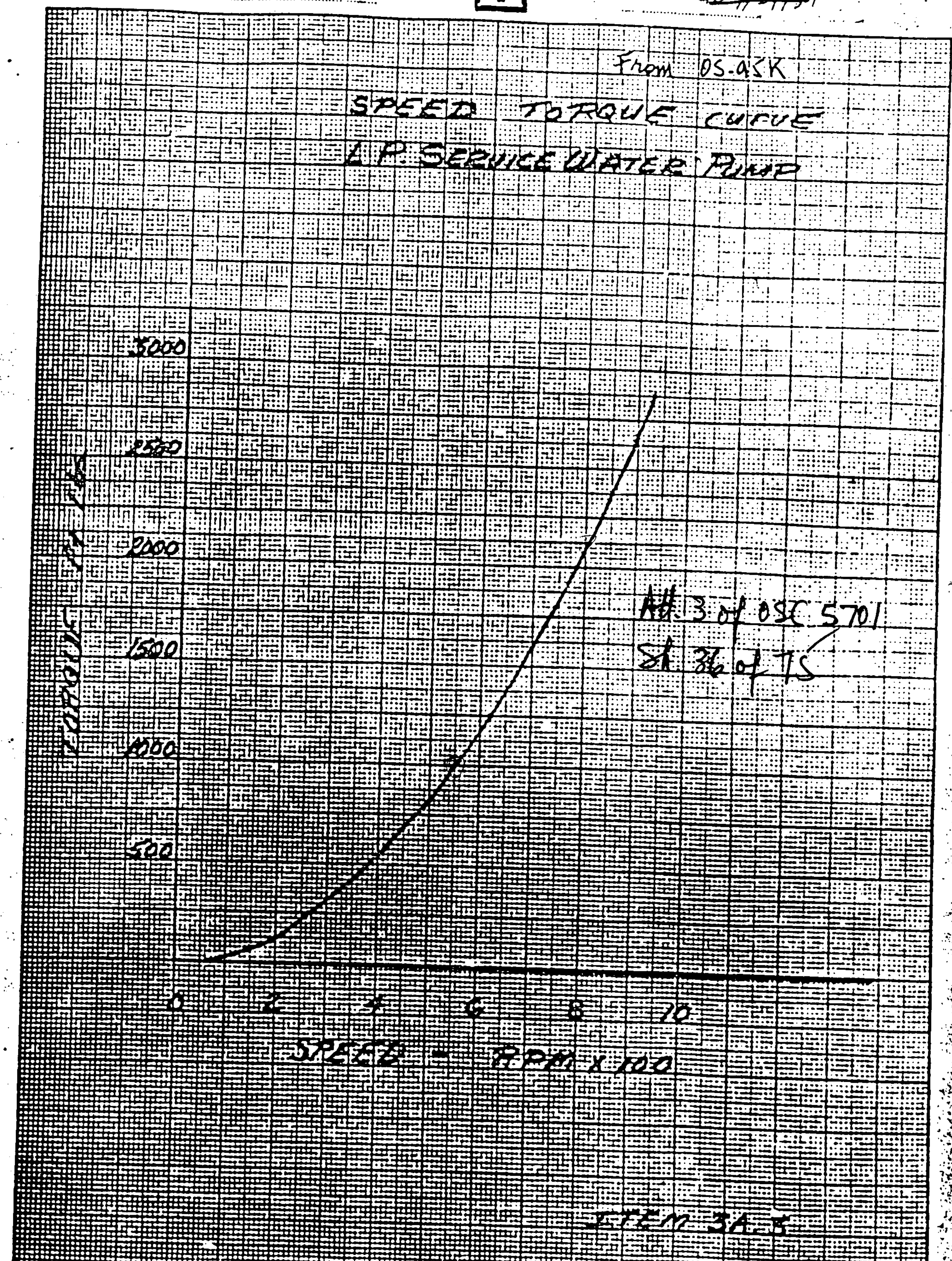


OSC-2444
SC 11/24/87
AB 11/24/87

000056

OSC-2444

~~SC 4/24/87~~ OS-95K
~~QD 4/24/87~~



1-10

45

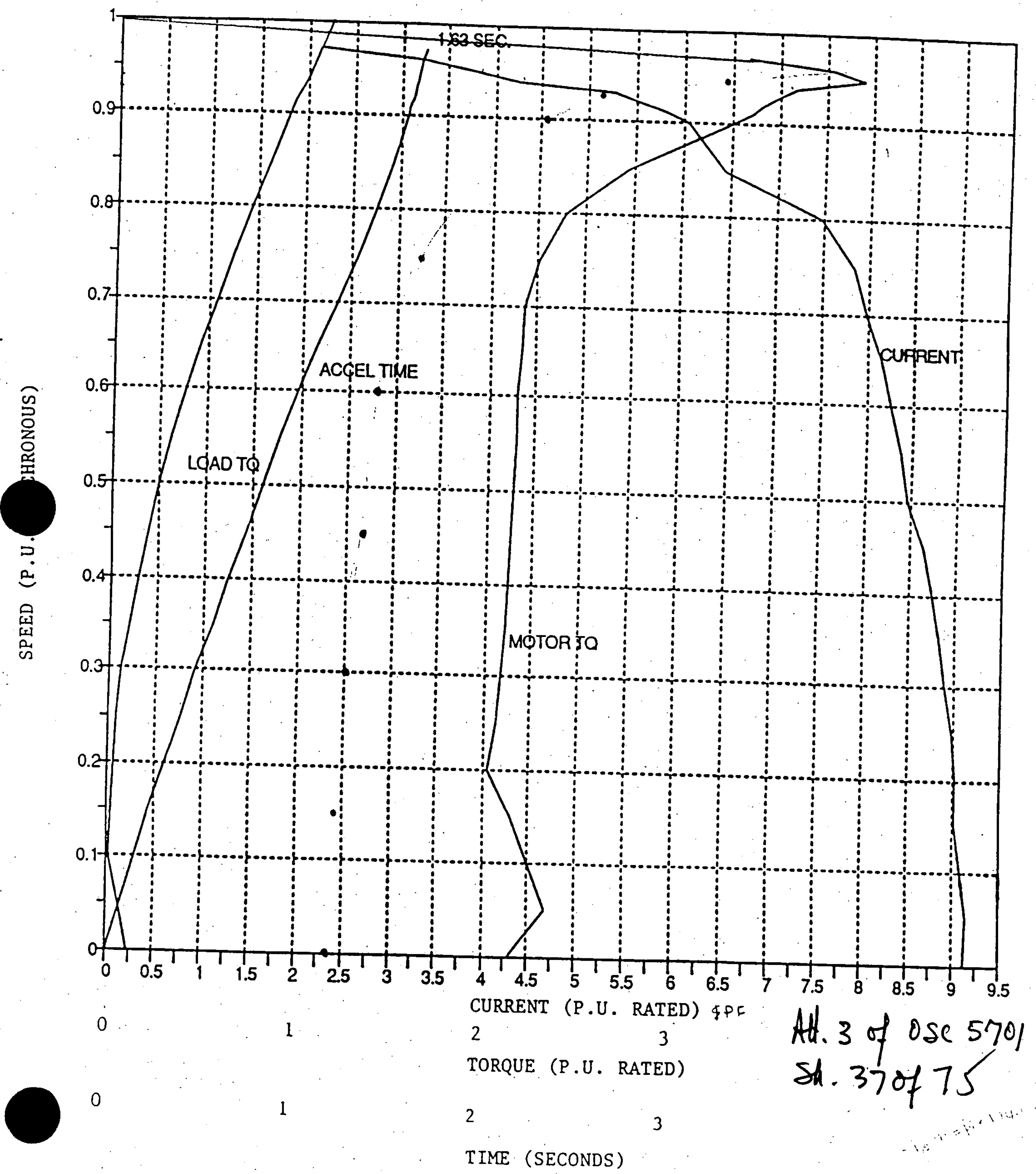
DRG. NO.

0 0 3 8 7 7 0 0 1 5 5 0 0 0 6 1

0000INDUCTION MOTOR STARTING CHARACTERISTICS ~~Rev 2 OSC 3444~~
(CALCULATED) AT 100% LINE VOLTAGE

~~[illegible] 3-9-90~~ BKK 3/13/90

CUSTOMER DUKE POWER APPLICATION INJECTION PUMP DRIVE ENGR D. MCEACHRON
S.O. 68F20801/74L10298 LOAD CURVE HH42868
HP 600 VOLTS 4000 PH 3 HZ 60 POLES 2 RPM(FL) 3587
PF [illegible]0.091 FL AMPS 75.2 LOCKED AMPS(%) 912 RPM(SYN) 3600
[illegible]RQUE (LB-FT) 878 LOCKED TORQUE (%) 215
[illegible] INERTIA (LB-FT-SQ) 32 MOTOR INERTIA (LB-FT-SQ) 216 FRAME 686.5



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Sh. 37 of 75

WESTINGHOUSE HIMSC, ROUND ROCK, TEXAS

SIGNATURE D McEachron DATE 2/5/90 CURVE DMC020590C-1

OM 314-120

SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
FOR MOTORS RATED 100 HP AND ABOVE
CALCULATED DATA NOT GUARANTEED

1. Motor Application Low Pressure Injection Pump Mill-Power Order No. OS-314-8 R-92360

2. Manufacturer Westinghouse Electric Corp. Order No. 68F19739-40-41 CH 43308

3. Motor Type LLA Frame No. 509US Enclosure Dripproof

4. Bearing Type Ball Lubrication Grease

5. Rated HP 400 Speed-RPM: Syn 1800 F.L. 1780

6. Volts 4000 Phases 3 Cycles 60 FL Current 52.2 Service Factor 1.15

7. Locked Rotor Current and Power Factor at:
   A. 100% Voltage: LRC 285.7 Amps P.F. 30.2%
   B. 90% Voltage: LRC 253.3 Amps P.F. 29.8%
   C. 80% Voltage: LRC 208.6 Amps P.F. 34.2%

8. Insulation: Type Class F Rated Temp. Rise/Ambient 60°C/60°C

9. % Eff. - F.L. 94.0 3/4 Load 94.3 1/2 Load 94.1

10. % P.F. - F.L. 87.9 3/4 Load 87.5 1/2 Load 83.4

11. Torque at 100% voltage: F.L. 1180 Lb. Ft. L.R. 120% F.L. Breakdown 227% F.L.

12. Torque at 80% voltage: F.L. 1208 Lb. Ft. L.R. 89% F.L. Breakdown 146% F.L.

13. Transient reactance in per cent and based on kva of the motor 15.8%

14. WK^2 of Motor Rotor 130 Lb. $Ft.^2$ Max. Load WK^2 315 Lb. $Ft.^2$

15. Starting current vs time curves (acceleration under equipment WK^2 and load) and time-current heating curves (time for motor to reach thermal limits vs current). Curves are to be on same sheet, use the same scales, and be given at 110%, 100%, 90% and 80% voltage. (Curve 557346)

16. Time motor will withstand locked rotor current without damage 10 sec.

17. Permissible successive attempts to start with motor at: Ambient Temp. 2 Rated Temp. 1

18. Time required for motor to return to rated temp. with: Motor Running 5 Motor at standstill after attempted starts 15

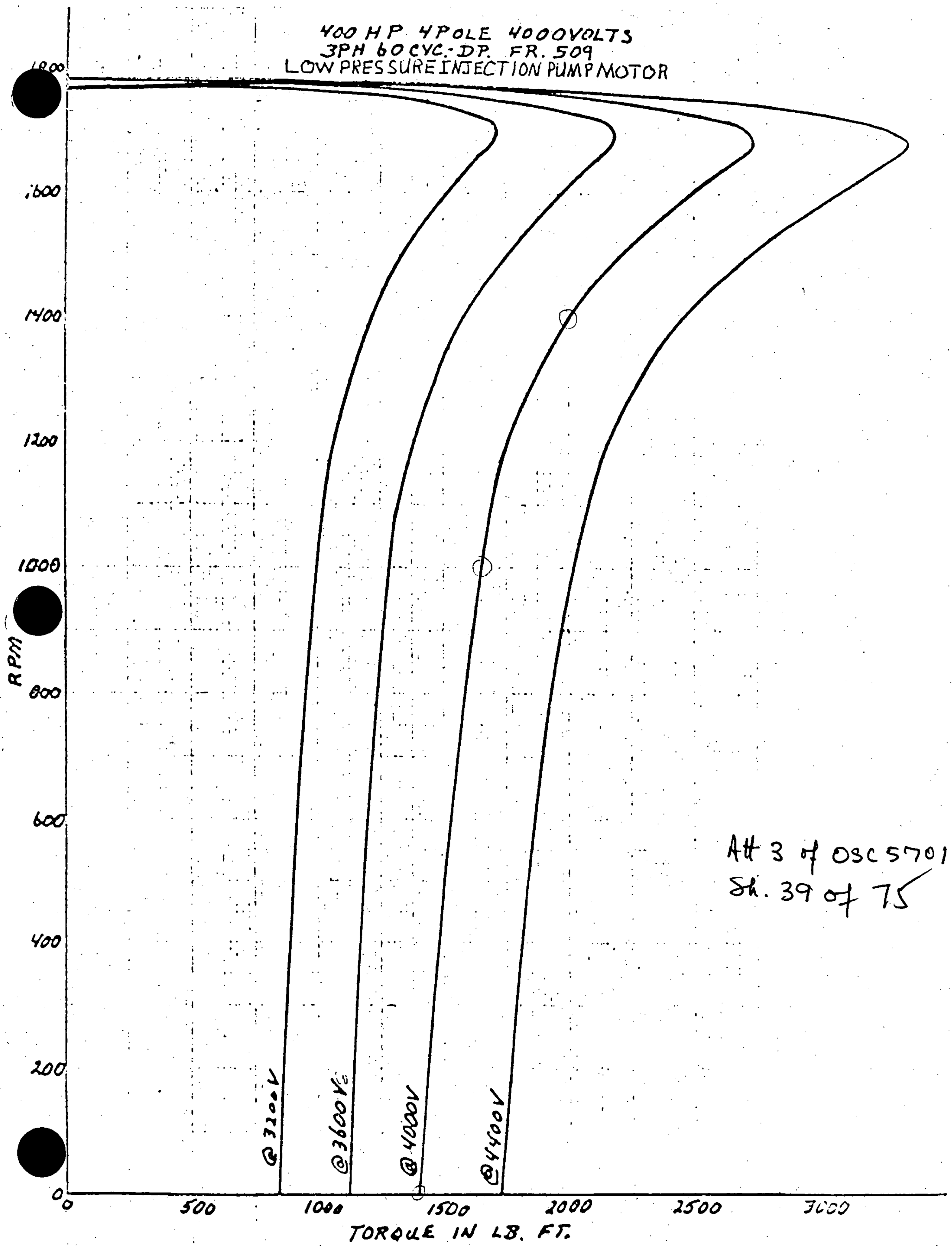
19. Furnish % Eff. and % P.F. vs HP curve. (Curve 557345)

20. Furnish Speed Torque Curve at 110%, 100%, 90% and 80% voltage. (Curve 557344)

21. Furnish % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage. (Table 557347)

22. Date curves and data sheet submitted 9/26/68

Att. 3 of OSC 5701
Sh 38 of 75



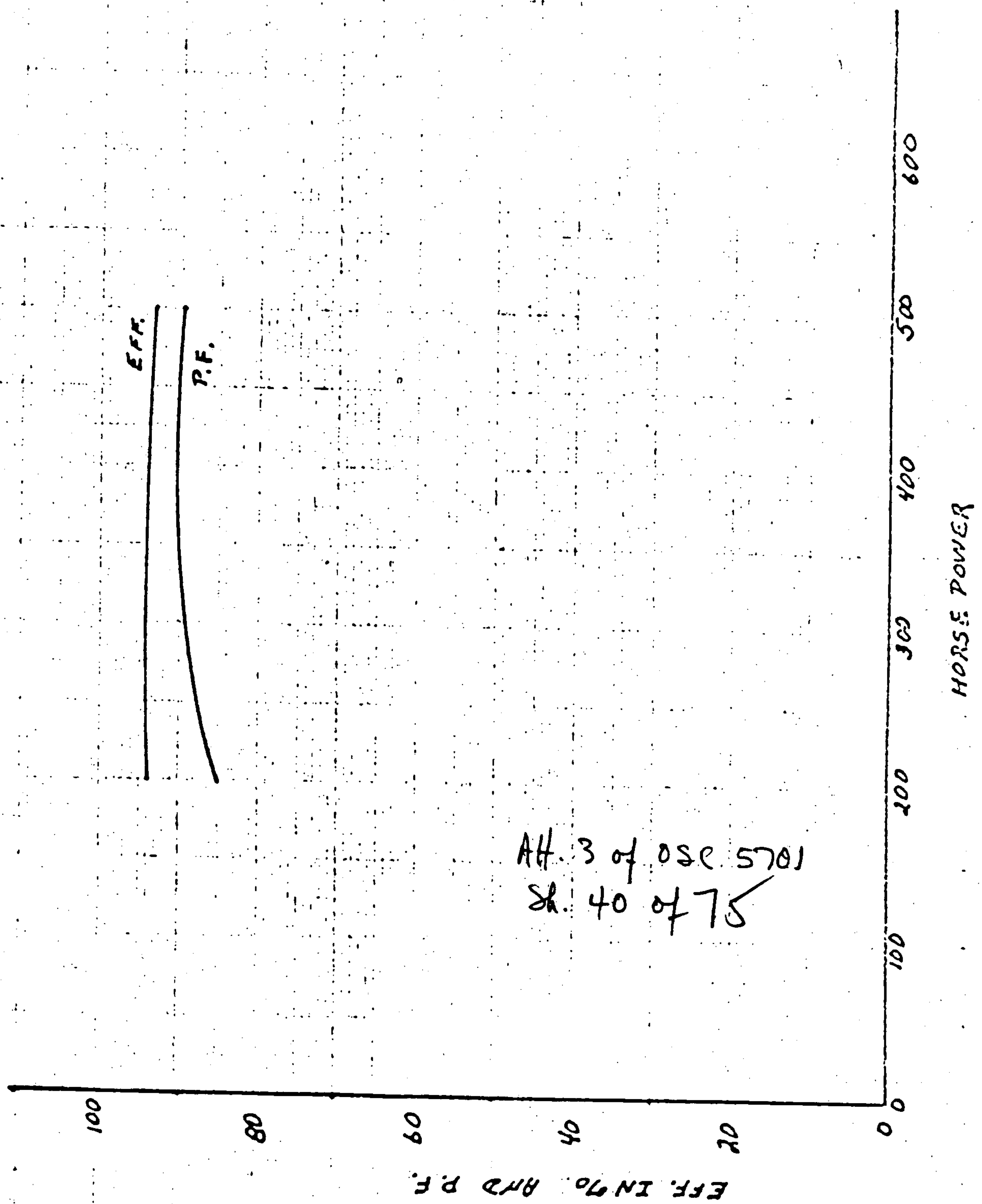
Att 3 of OSC 5701
Sh. 39 of 75

SIGNATURE James M Love 10-8-68

CURVE NO. 557345

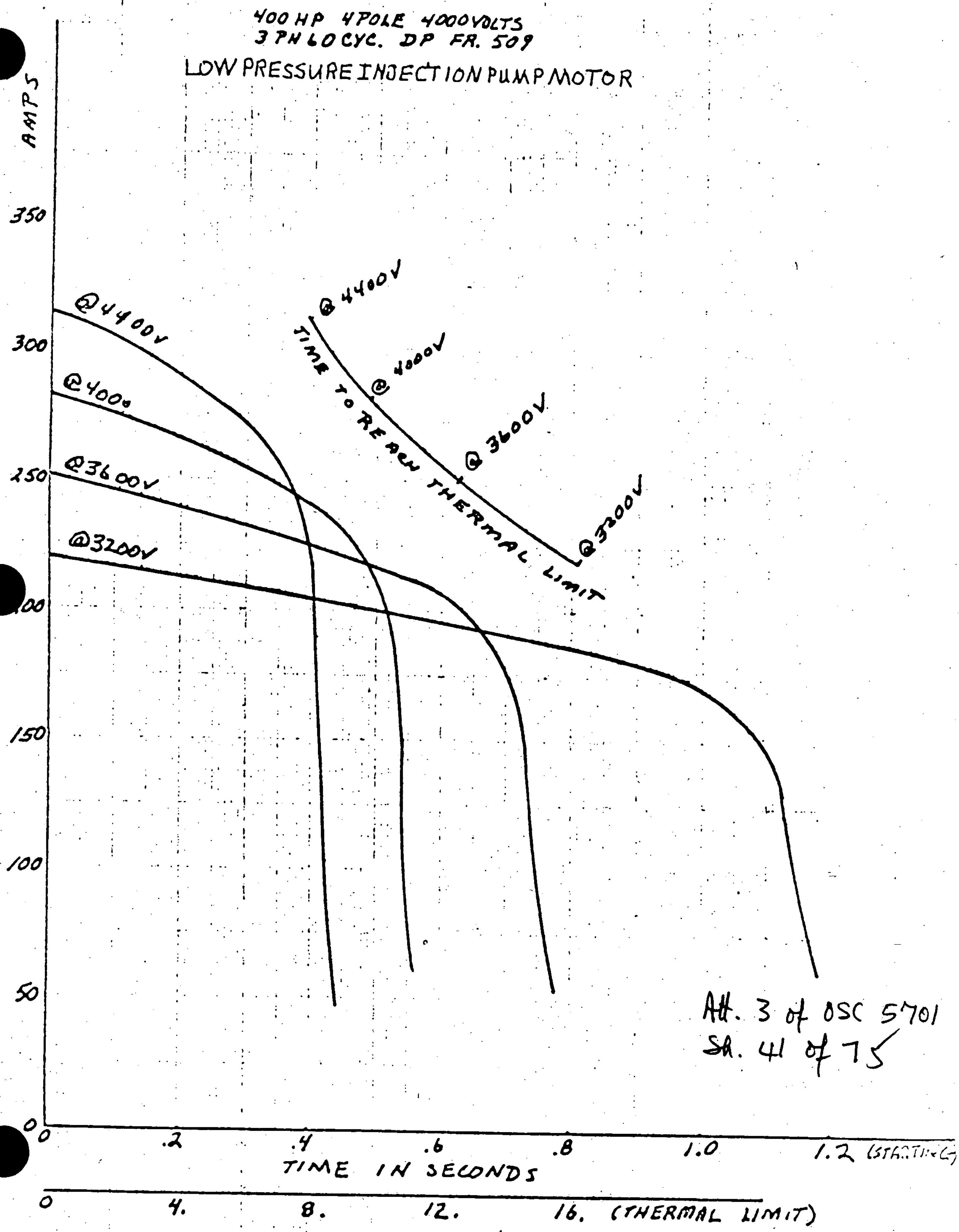
400 HP. 4 POLE 4000 VOLTS
3 PH 60 CYC. DP. FR. 507

LOW PRESSURE INJECTION PUMP MOTOR



Att. 3 of OSC 5701
Sh. 40 of 75

SIGNATURE James W Love DATE 10-8-68 CURVE NO. 557345


400 HP 4 POLE 4000 VOLTS
3 PH 60 CYC. DP FR. 509
LOW PRESSURE INJECTION PUMP MOTOR
AMPS
350
300
250
200
150
100
50
00
@4400V
@4000
@3600V
@3200V
@4400V
@4000V
@3600V
@3200V
TIME TO REACH THERMAL LIMIT
0
.2
.4
.6
.8
1.0
1.2 (STARTING)
TIME IN SECONDS
0
4.
8.
12.
16. (THERMAL LIMIT)
Att. 3 of OSC 5701
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LOW PRESSURE INJECTION PUMP MOTOR
TABLE NO. 557347

RPM	P.F. @ 4400 V	4000 V	3600 V	3200 V
0	30.6	30.3	30.0	29.6
90	30.9	30.6	30.2	29.8
180	31.1	30.9	30.5	30.1
270	31.5	31.2	30.8	30.4
360	31.7	31.5	31.1	30.7
450	32.0	31.7	31.4	30.9
540	32.3	32.1	31.7	31.3
630	32.7	32.5	32.1	31.6
720	33.2	32.9	32.6	32.1
810	33.8	33.5	33.1	32.6
900	34.4	34.2	33.8	33.3
990	34.4	34.1	33.7	33.3
1080	35.5	35.2	34.8	34.2
1170	36.8	36.5	36.1	35.5
1260	38.5	38.2	37.8	37.2
1350	40.8	40.5	40.1	39.4
1440	44.0	43.7	43.2	42.5
1530	44.8	48.5	48.0	47.2
1620	56.8	56.5	55.9	55.2
1629	57.8	57.5	56.9	56.3
1638	58.5	58.2	57.6	56.9
1647	60.1	59.8	59.2	58.6
1656	61.8	61.5	60.9	60.4
1665	63.6	63.3	62.6	62.3
1674	65.5	65.2	64.7	64.3
1683	67.5	67.2	66.8	66.4
1692	69.6	69.2	69.0	68.6
1701	71.7	71.5	71.3	70.9
1710	73.9	73.9	73.7	73.3
1719	76.2	76.3	76.2	75.8
1728	78.6	78.8	78.7	78.4
1737	81.1	81.3	81.2	80.9
1746	83.5	83.8	83.7	83.4
1755	85.7	86.0	86.0	86.2
1764	87.4	88.1	88.5	88.7
1773	88.9	89.9	90.3	----
1782	88.6	----	----	----

Data Sheet It. #21; Values of P.F. fall so closely together, it is difficult to plot in curve form: therefore the above tabulation is submitted.
400 HP, 4 Pole, 4000 Volts, 3 Phase, 60 Cycle, DP. FR 509

Att. 3 of OSC 5701
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0000635
load information only

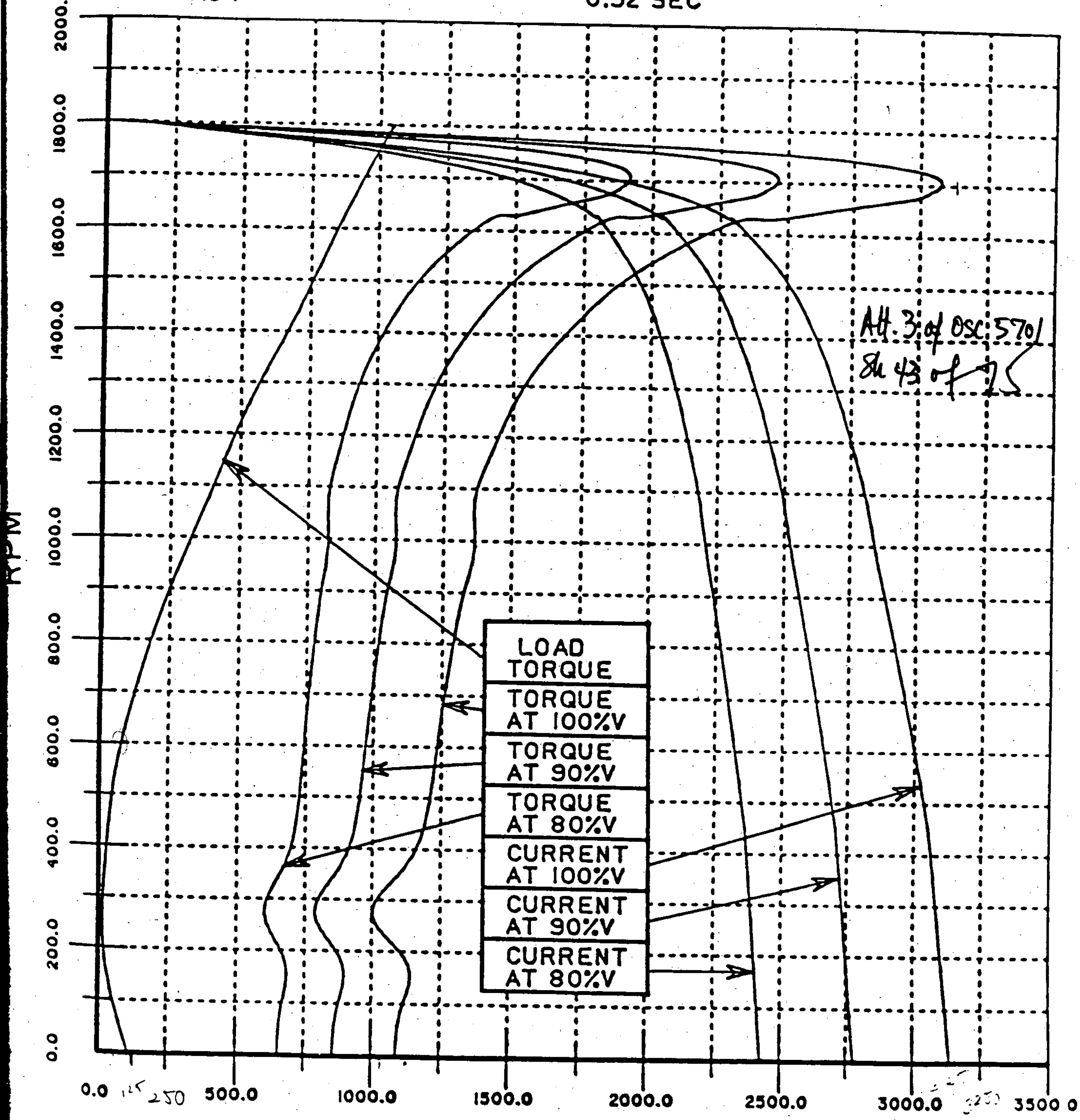
D. X. Pham 9/19/89
LRB 10/6/89

WESTINGHOUSE ELECTRIC CORPORATION

CURVE NO. 737201-E

G.O. CH 12769L7
S.O. 81F32526
FRAME 5010SZ 400 HP 4 POLE
4000 V 3 PH 60 HZ
70°C RISE BY DETECTOR AT
1.00 S.F.
F.L.A.: 49.4
L.R.A.: 309
L-270A84

F.L. RPM: 1780
F.L. TORQUE: 1180 FT-LBS
STARTING TORQUE: 1125
MAX L.R. TIME: 16 SEC
MOTOR INERTIA: 136 LB FT SQ
LOAD INERTIA: 35 LB FT SQ
TOTAL INERTIA: 171 LB FT SQ
ACCELERATING TIME AT 100% V
0.92 SEC

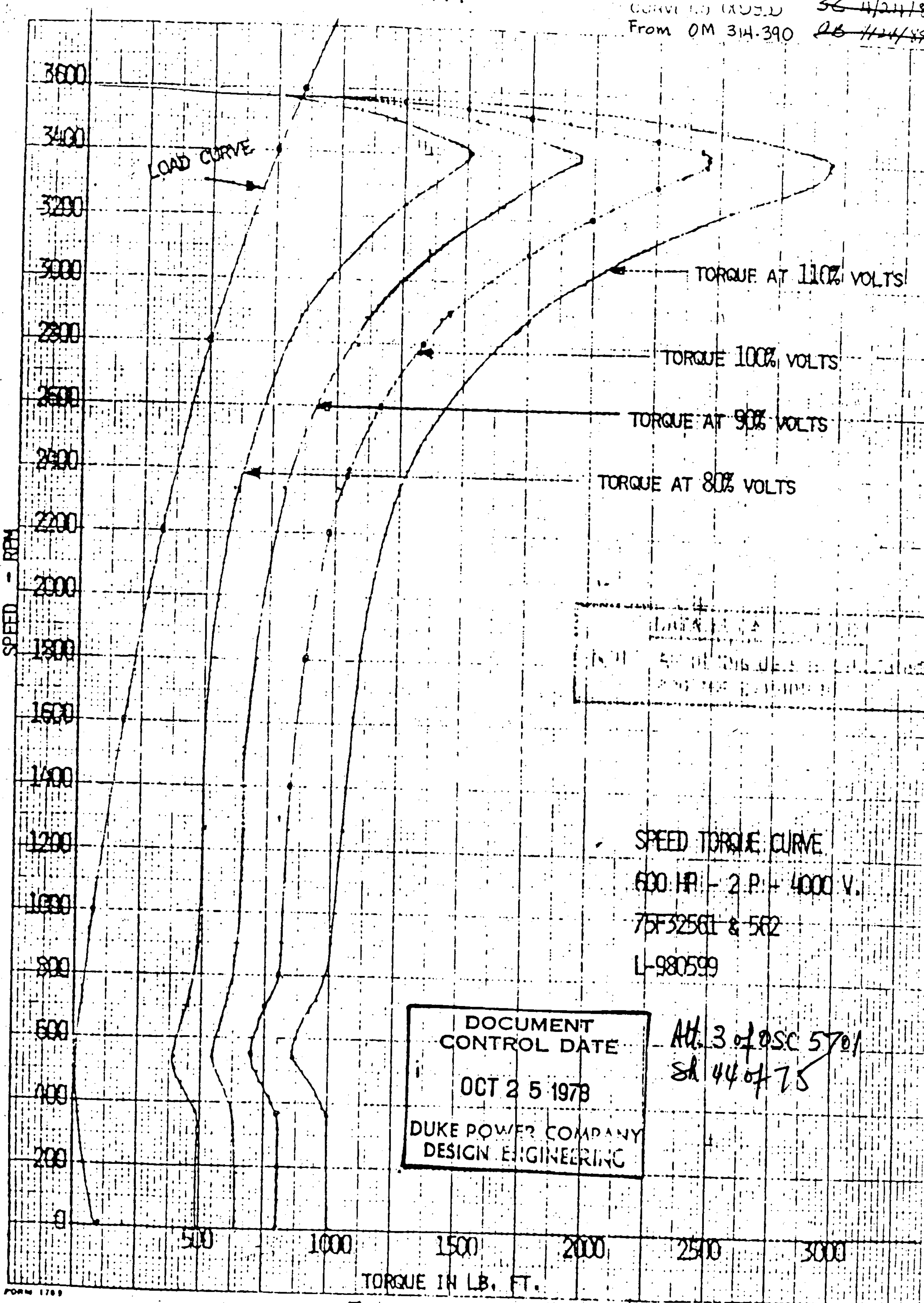


SIGNATURE J. Riley   DATE 2/4/88   CURVE NO. 737...

000064

~~OSC-2444~~

CURVES ISSUED From OM 314-390 ~~SG 4/24/78~~ ~~[illegible]~~



DOCUMENT CONTROL DATE
OCT 25 1978
DUKE POWER COMPANY
DESIGN ENGINEERING

Att. 3 of OSC 5701
Sh 44 of 75

003670708

FORM 1789

SIGNATURE ______ 34 ______ DATE ______ CURVE NO. 663953

000065

Squirrel Cage Induction Motor Data Sheet for Motors Rated ...

~~3C 11/24/87~~ ~~QB 11/24/87~~

1. Motor Application AUX. FEED WATER PUMP MOTORS From OM 31H 388
2. Quantity 2 Mill-Power Order No. A711...
3. Manufacturer WESTINGHOUSE Order No. CH-1...
4. Motor Type LLD Frame No. 5809H Enclosure TEWAC
5. Bearing Type SPLIT SLEEVE Lubrication OIL
6. Rated H.P. 600 Speed-RPM: Syn 3600 F.L. 3563
7. Volts 4000 Phases 3 Hertz 60 F.L. Current 75 Service Factor 1.
8. Locked Rotor Current and Power Factor at:
   - A. 100% Voltage: LRC 455 P.F. 20.7%
   - B. 90% Voltage: LRC 405 P.F. 18.6%
   - C. 80% Voltage: LRC 353 P.F. 18.2%

DOCUMENT CONTROL DAT...
OCT 2 5 1978
DUKE POWER COMP...
DESIGN ENGINEERI...

9. Heater Data: A. Watts 220 B. Volts 115 C. Phases 1 PH.
10. Insulation: Class F Rated Temp. Rise/Ambient 40 °C/80 RISE BY ...
11. % Eff. - F.L. 94.5 3/4 Load 94.3 1/2 Load 93.3
12. % P.F. - F.L. 91.7 3/4 Load 91.0 1/2 Load 87.5
13. Torque at 100% voltage: F.L. 884 FT.LBS L.R. 812 FT. LBS. Breakdown 2393 FT. ...
14. Torque at 80% voltage: F.L. - L.R. 486 FT. LBS. Breakdown 1503 FT. ...
15. Subtransient reactances in percent and based on kva of the motor
    X_d'' = 0.155 P.U. (447.6 KVA BASE)
16. WK^2 of Motor Rotor 128 LB.FT.^{2} Max. Load WK^2 10.5 LB.FT.^{2}
17. Time motor will withstand locked rotor current without damage 7 SEC. COLD OR HOT
18. Permissible successive attempts to start motor from ambient temperature and rated temperature without damaging the motor insulation system: Ambient Temp. 3
    Rated Temp. 1
19. Time required for motor to return from the maximum temperature limit of its insulat... system to a temperature that will allow another safe start with:
    Mtr. Running 20 MIN.
    Motor at standstill after attempted starts 60 MIN.
20. Noise Level does not exceed 85 DBA/ ____ DBC between the sound frequency lev... 20 HZ to 10,000 HZ at a distance of 5' from the motor.
21. Curves Furnished:
    - A. % Eff. and % P.F. vs H.P. Curve: No. 663952 Dated 5/12/75.
    - B. Speed Torque Curve at 110%, 100%, 90% and 80% voltage: No. 663953 Dated 5/1...
    - C. % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage: No. 663954 Dated 5/1...
    - D. Starting current vs time curves (acceleration under equipment WK^2 and load) and current heating curves (time for motor to reach thermal limits vs current). Cu... are to be on same sheet, use the same scales, and be given at 110%, 100%, 90%, 80% voltage. No. 663955 Dated 5/12/75.
      663956 5/12/75
22. Heat Exchanger Cooling Water Requirements
    Design Inlet: Temperature (°F) 95° Pressure(psig) 150 Flow(GPM) 15
    Max. Tube ΔT(°F) 300 Max. Tube ΔP(PSI) 3
    Tube Design: Material 90-10 CU. Ni. Velocity(ft/sec) 250
    Pressure(psig) 150 Fouling Factor .001
23. Date Curves and Data Sheet submitted 5/12/75

75-F-32563

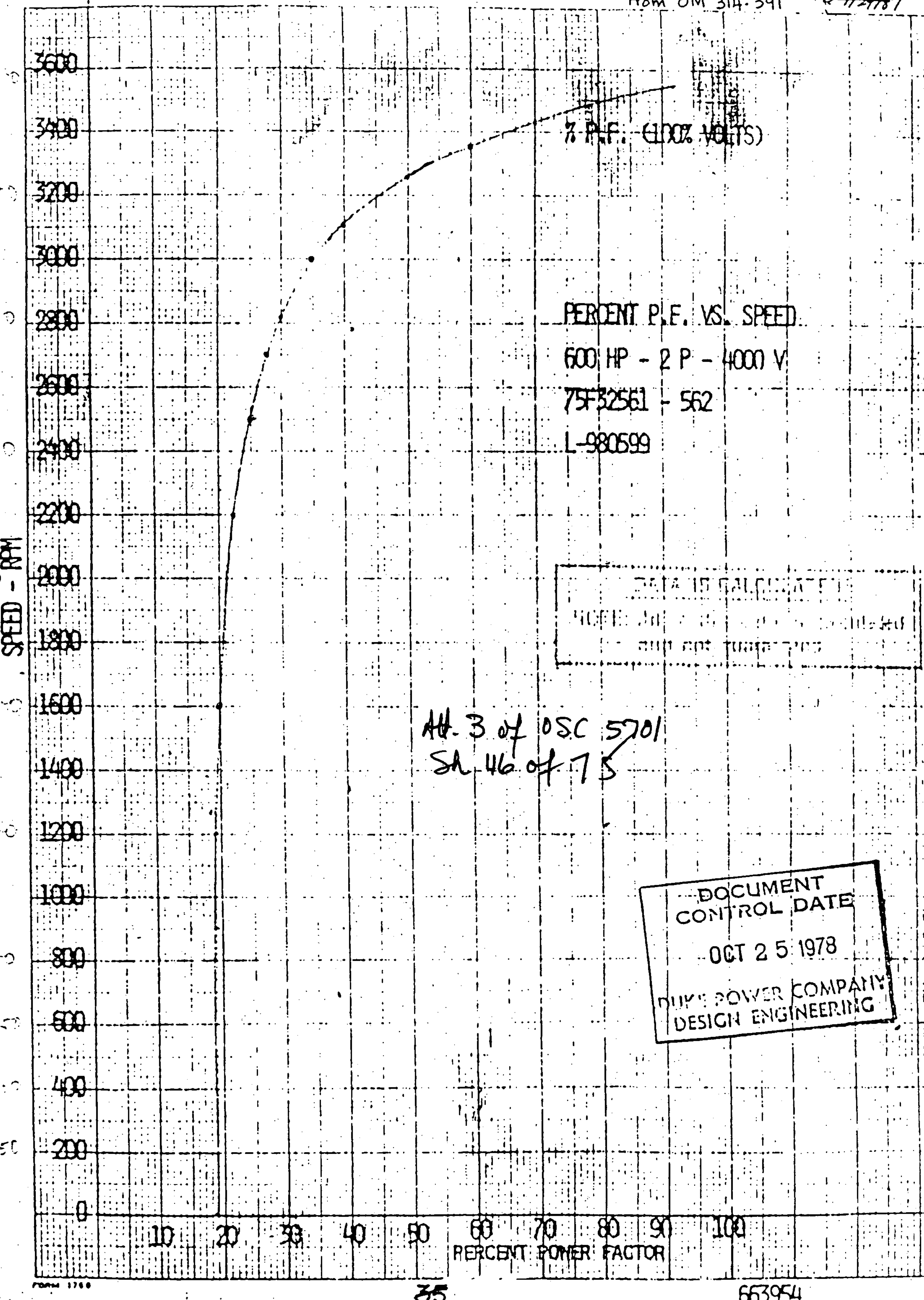
0 0 3 6 7 0 7 0 7

Att. 3 of OSC 5701 Sh 45 of 75

000066

~~OSC-2444~~ ~~SC 11/21/87~~

From OM 314-391



Att. 3 of OSC 5701
Sh. 46 of 75

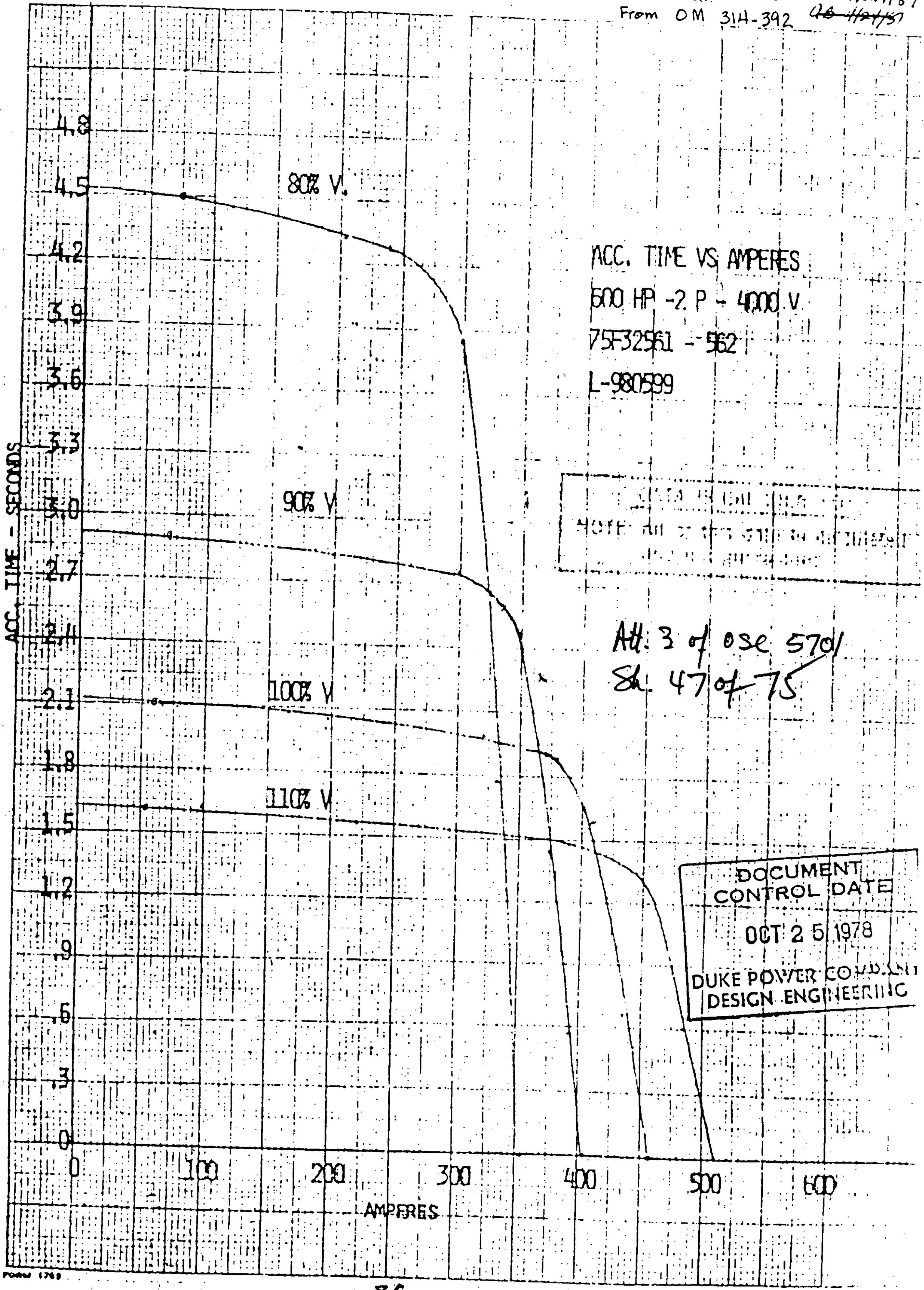
DOCUMENT CONTROL DATE
OCT 2 5 1978
DUKE POWER COMPANY
DESIGN ENGINEERING

SIGNATURE ______ 35 DATE ______ CURVE NO. 663954

000067

~~OSC 2444~~

CURVE NO. 663955 ~~SC 4/22/87~~
From OM 314-392 ~~4/24/87~~



Att. 3 of OSC 5701
Sh. 47 of 75

DOCUMENT CONTROL DATE
OCT 2 5 1978
DUKE POWER COMPANY
DESIGN ENGINEERING

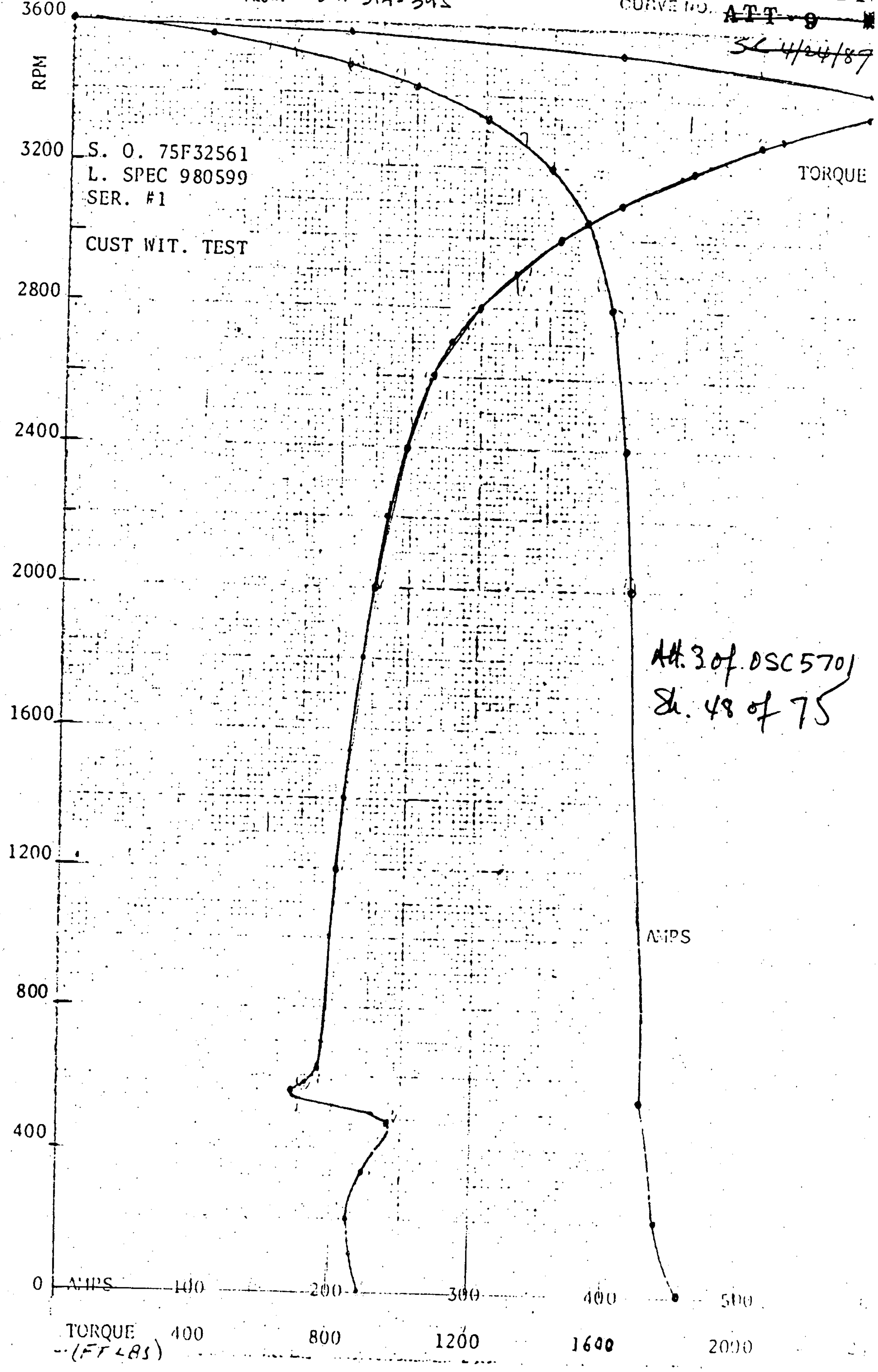
SIGNATURE ___ 36 DATE ___ CURVE NO. 663955

000068

WESTINGHOUSE ELECTRIC CORPORATION

From OM 314-395

CURVE NO. ~~OSC-244~~ ~~ATT-9~~ SC 4/24/89



Att. 3 of OSC 5701
Sh. 48 of 75

000069

From OM 314-395

Westinghouse Electric Corporation

BUFFALO, N.Y.

~~SC 4/24/87~~
~~OSC 2444~~ 4
~~ATT 9~~

Cust. Witness Test

Date 6/28/77

Purchaser Duke Power Co.

Stock Order No. 75F32561 #1

S.O. No. CH-18016-L7 H.P. 600 Volts 4000 Phase 3 Class B Insulation

Apparatus 580911 HSHX SB Poles 2 R.P.M. 3563 Cycles 60

	1	2	3	COMMENTS
Amperes Per Terminal at no load 4000 Volts	15.77			Stator Res. @ 26°C
Watts Input at no load	10,810			T1T2 - .5024
Stator Res. (T-T) at 75° C - ohms	.5957			T2T3 - .5022
Starting Winding Res. at 75° C - ohms				T1T3 - .502
Rotor Res. (bet rings) at 75° C - ohms				
LOSSES IN WATTS AT FULL LOAD				Vibration
Stray Load Loss				Front Rear
Stator I^2R Loss				Horiz. .00009 .000036
Rotor I^2R Loss				Vert. .00025 .00031
Core Loss				Axial .00008 .000076
Friction and Windage Loss				
% Efficiency - Full Load	94.5			Phasing
- ¾ Load	94.4			L1L2L3 CCW End Opp.
- ½ Load	93.6			T1T2T3 Shaft Ext.
% Power Factor Full Load	89.1			Stator Bore 14.446 ~~Front~~
- ¾ Load	87.5			14.442
- ½ Load	82.7			
				14.441 ~~Rear~~
RPM at Full Load	3562			14.441
Amperes Per Term. at full load	76.7			Air Gaps
KW input at full load	473.7			.088 .088 .088 .088
Amperes per Term-Rotor locked 4000 V	450.7			
KW input - Rotor locked	672.8			Frt. R
Max. Sec. Volts between rings				
Sec. Amps per ring at full load				.088 .090 .088 .088
Full Load Torque (F.L.T.) in lb. ft.	884			
Max. Torque in % of F.L.T.	253			Rotor Diam. 14.255
Starting Torque in % of F.L.T.	99.5			
End Play Tested	OK			Bearing Insulation - OK
Balance Tested	OK			
Stator Ins Tested 9000 V 60 Sec.	OK			Heaters - Volts - 115
Rotor Ins Tested V Sec.				Amps - 2.0
TEMPERATURE TESTS				
Length of Test in hours	6.00			Stator Slot T. C's (...)
Volts	4000			1 50.5
% Normal Full Load Amp.	100			2 52
Temp. Rise in degrees C — Stator Copper by Res.	48			3 52.5
Stator Iron				4 52.5
~~Frame Temp~~ Air into Hx	60	(air out of motor)		5 51.5
~~Frame~~ Air out of Hx	40	(air into motor)		6 52
Room temperature in °C	26			
Water into Hx	35.5°C	15 GPM per Hx		Att 3 of OSC 5701
Water out of Hx	38°C			
Bearings Front	64) Total Temp.			Sh. 49 of 75
Rear	57)			
Curve Nos.				

0036771385

The above is a true and correct record of data obtained from tests made at the works of Westinghouse Electric Corporation.

REPORT OF TESTS ON INDUCTION MOTORS
FORM 7958 K

Signed [signature] 7/8/77

WR^2 = 9.2 Lb. Ft.^{2}

OPEN VALVE

Torque 680 Lb. Ft.

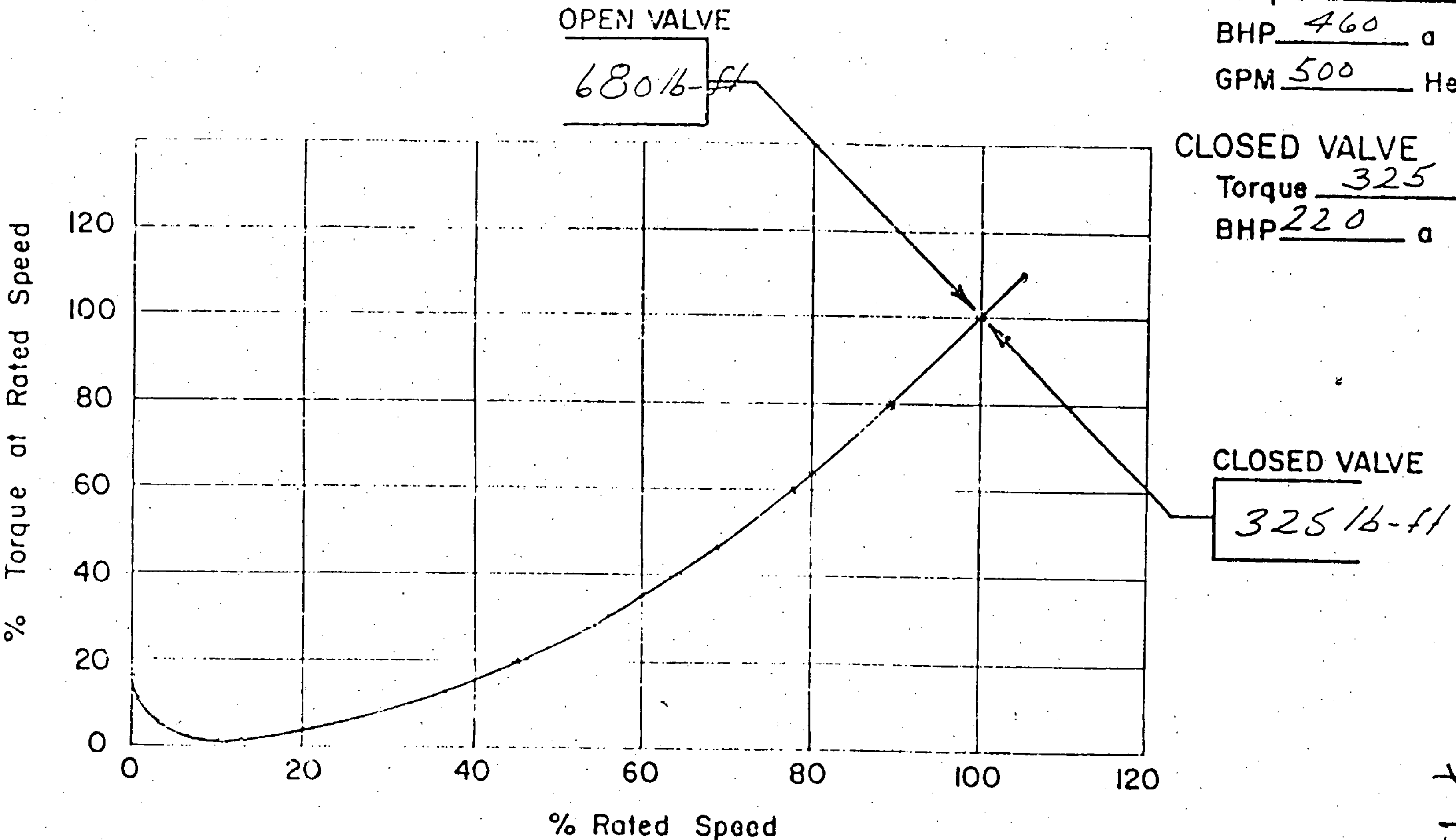
BHP 460 @ Sp.Gr. 1.0

GPM 500 Head 2600

CLOSED VALVE

Torque 325 Lb. Ft.

BHP 220 @ Sp. Gr. 1.0



ENGINEERING SECTION

SPEED TORQUE CURVE and WR^2 VALUE

~~Exam Attachment 9~~

Att. 3 of OSC 5701

Sh. 50 of 75

DRAWING NO. WP-465

MILL POWER CO. DUKE POWER CO AUXILIARY FEEDWATER PUMPS BINGHAM 14210666/9	CHARACTERISTIC CURVE SHEET Bingham Portland, Ore. Shreveport, La. — Vancouver B.C., Canada	IMPELLER MAX. DIA. 10 1/8 MIN. DIA. EYE AREA 11.9 SQ IN	3X4X9E - 8 STAGE PUMP DIA. IMPELLER 9.77 N.P.S.H. REQUIRED	IMPELLER PATT. REFERENCE 34870	3560 R.P.M. CURVE NO. 35813

MODIFIED FOR USE AT OCONEE (FORMERLY CATAWBA)

OSC-2444 Att. 9

SC 4/24/87

000071

From OM 314-216

DUKE POWER COMPANY
ENGINEERING DEPARTMENT
SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
FOR MOTORS RATED 100 HP and ABOVE

Att. 3 of OSC 5701 Rev. 1
Sh. 51 of 75
~~OSC-2444~~
~~ATT. 9~~
SC 4/24/87

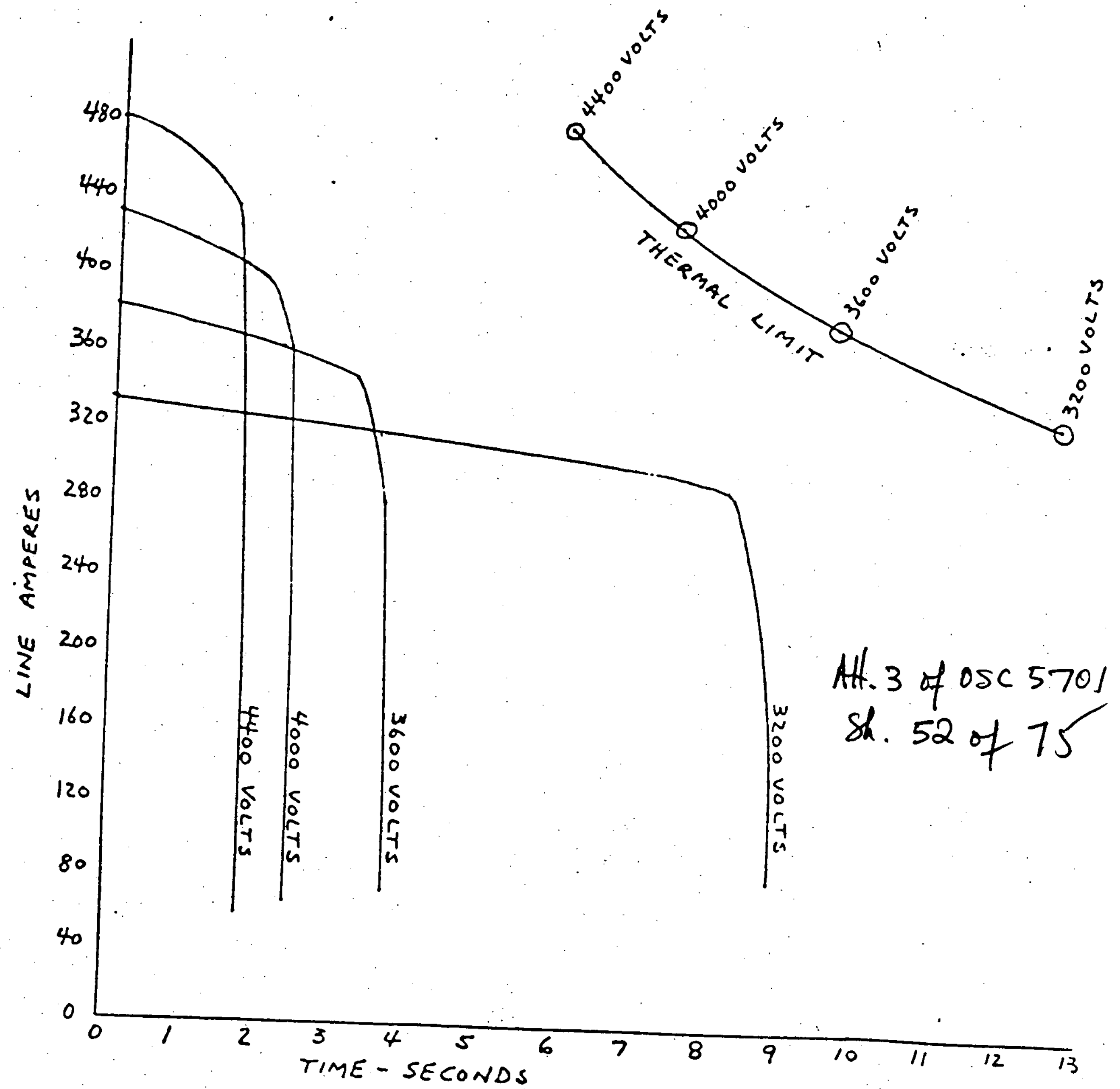
1. Motor Application AUXILIARY FEEDWATER PUMP
2. Quantity 4 Mill-Power Order No. W-371
3. Manufacturer WESTINGHOUSE ELECTRIC CORPORATION Order No. GH-1341
4. Motor Type SQ. CAGE LLD Frame No. 5808H Enclosure ~~HEAT EXCHANGER~~
5. Bearing Type SPLIT SLEEVE Lubrication OIL
6. Rated H.P. 500 Speed-RPM: Syn 3600 F.L. 3580
7. Volts 4000 Phases 3 Hertz 60 F.L. Current 62.8 Service Factor 1.2
8. Locked Rotor Current and Power Factor at:
   A. 100% Voltage: LRC 429 P.F. 20.2
   B. 90% Voltage: LRC 379 P.F. 19.9
   C. 80% Voltage: LRC 331 P.F. 19.5
9. Heater Data: A. Watts 220 B. Volts 115 C. Phases 1
10. Insulation: Class F Rated Temp. Rise/Ambient 60/80 THERMO/DETECTOR C/ 40
11. % Eff. - F.L. 94.3 3/4 Load 94.0 1/2 Load 92.8
12. % P.F. - F.L. 90.9 3/4 Load 89.9 1/2 Load 85.9
13. Torque at 100% voltage: F.L. 733 L.R. 883 Breakdown 2124
14. Torque at 80% voltage: F.L. 736 L.R. 526 Breakdown 1293
15. Subtransient reactances in percent and based on kva of the motor
    X_d'' = 12.78
16. WK^2 of Motor Rotor 113 Max. Load WK^2 381
17. Time motor will withstand locked rotor current without damage 7 SECONDS
18. Permissible successive attempts to start motor from ambient temperature and rated temperature without damaging the motor insulation system: Ambient Temp. 3
    Rated Temp. 2
19. Time required for motor to return from the maximum temperature limit of its insulati[on] system to a temperature that will allow another safe start with:
    Mtr. Running 5 MINUTES
    Motor at standstill after attempted starts 15 MINUTES
20. Noise Level does not exceed 85 DBA/ ______ DBC between the sound frequency leve[l] 20 HZ to 10,000 HZ at a distance of 5' from the motor.
21. Curves Furnished:
    A. % Eff. and % P.F. vs H.P. Curve: No. 558986 Dated 7/19/72.
    B. Speed Torque Curve at 110%, 100%, 90% and 80% voltage: No. 558987 Dated
    C. % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage: No. 558988 Dated
    D. Starting current vs time curves (acceleration under equipment WK^2 and load) current heating curves (time for motor to reach thermal limits vs current) are to be on same sheet, use the same scales, and be given at 110%, 100%, 80% voltage. No. 558285 Dated 7/17/72.
22. Heat Exchanger Cooling Water Requirements
    Design Inlet: Temperature (°F) 95°F Pressue(psig) 100 PSIG Flow(GPM) 30 / 15
    Tube Design: Max. Tube ΔT (°F) 25.4°F Max. Tube ΔP(PSI) 1.2 FT H_2O (.52)
    Material 90-10 CU-NI Velocity(ft/sec) 1.1 FT/SEC.
    Pressure(psig) 150 PSIG Fouling Factor 0.001
23. Date Curves and Data Sheet submitted

0036760906

From OM 314-216

~~OSC-2444ATT. 9~~
~~558485~~ SC 4/24/8

CURRENT VS. TIME
500 HP 2 POLES 4000 VOLTS
AUXILIARY FEEDWATER PUMP
Oconee NUCLEAR STATION



Att. 3 of OSC 5701
Sh. 52 of 75

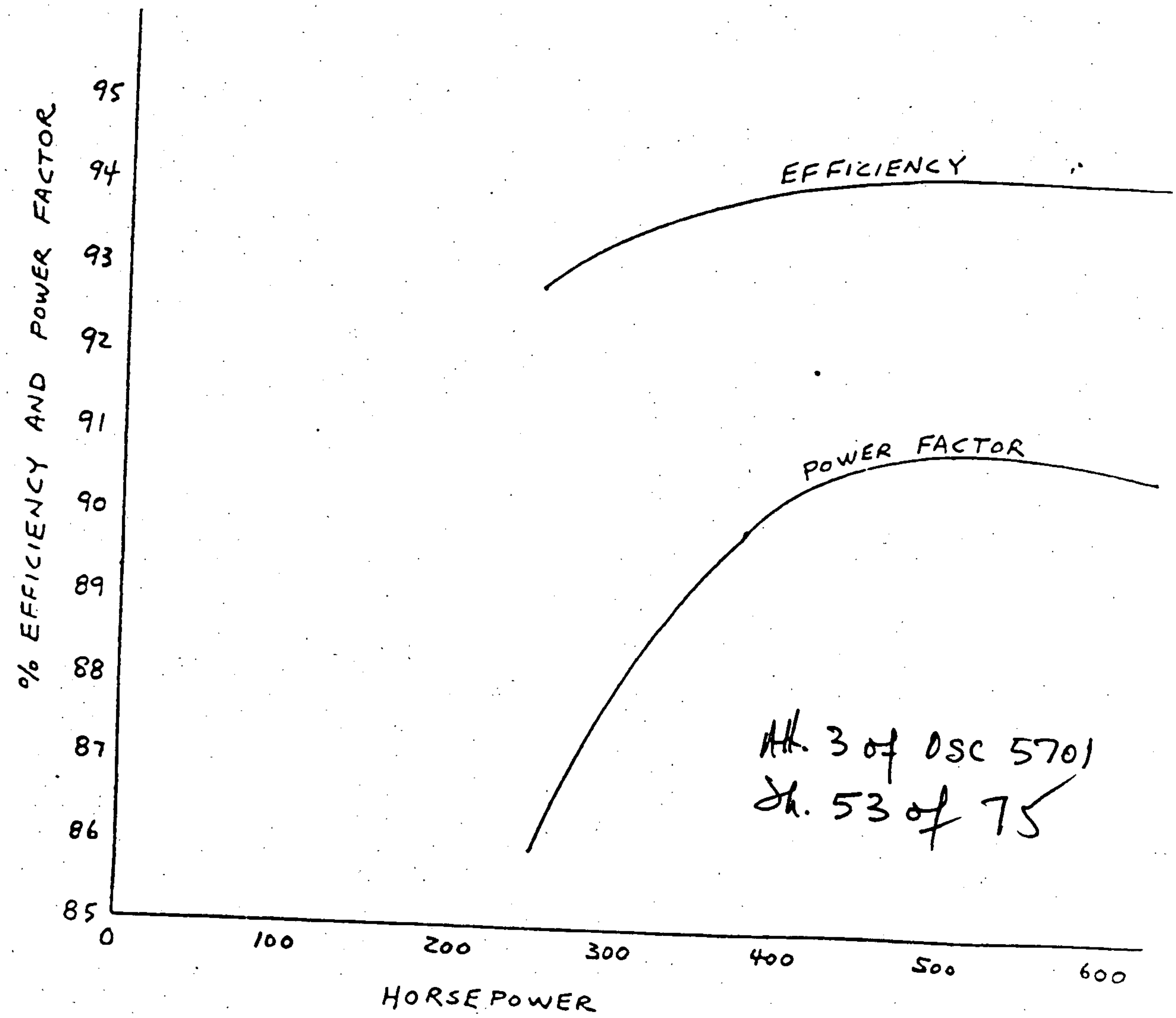
J. Hibbard 7-17-72 558985

000073

~~SC 4/24/87~~
~~OSC 2444~~
~~ATT. 9~~
558986

From OM 314-216

EFFICIENCY AND POWER FACTOR
500 HP 2 POLES 4000 VOLTS
AUXILIARY FEEDWATER PUMP
Oconee NUCLEAR STATION



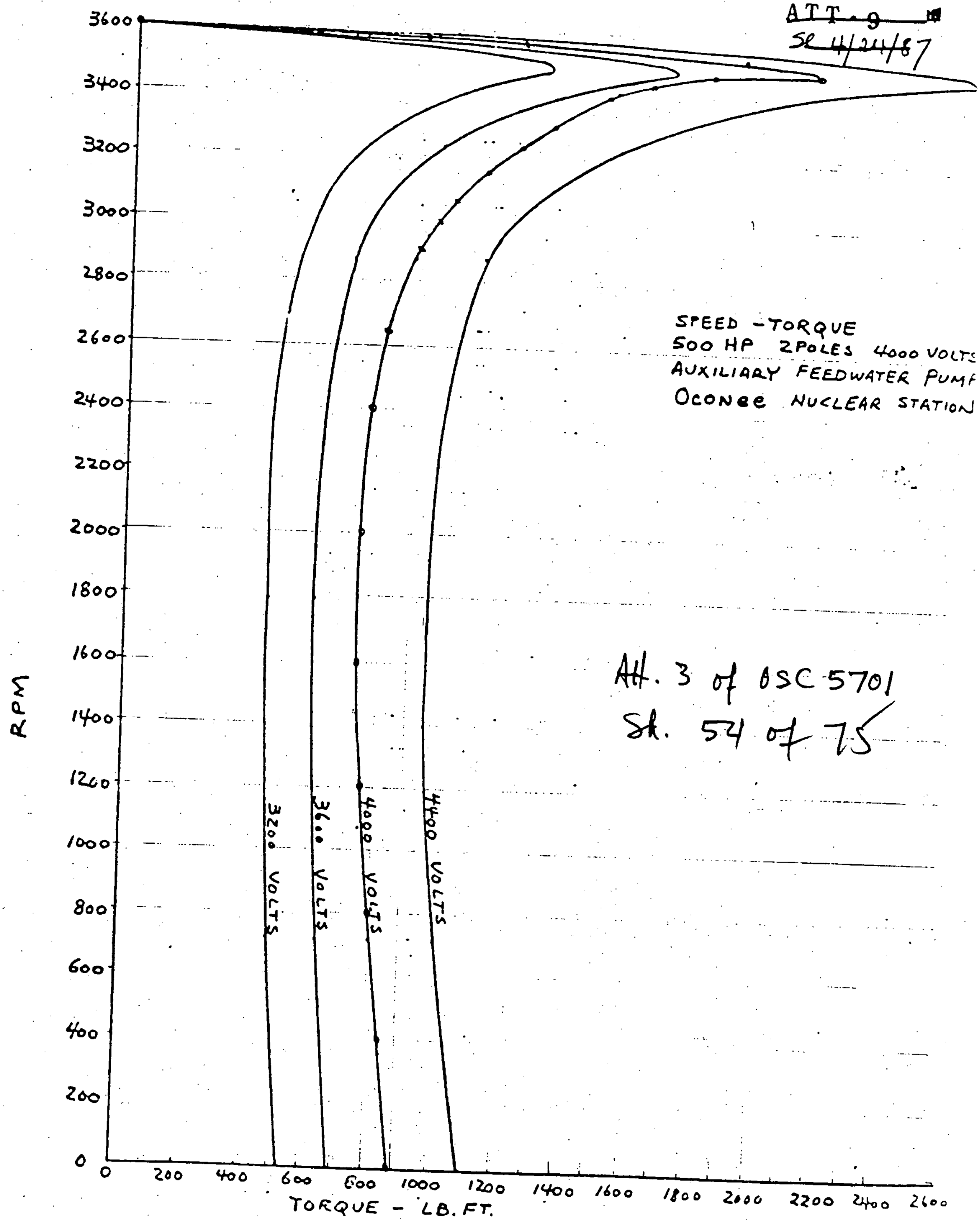
Att. 3 of OSC 5701
Sh. 53 of 75

J. Hibbard 7-19-72 558986

0036771208

From OM 31H-216 558987

~~OSC-2444~~
~~ATT. 9~~
SL 4/24/87



SPEED - TORQUE
500 HP 2POLES 4000 VOLTS
AUXILIARY FEEDWATER PUMP
OCONEE NUCLEAR STATION

Att. 3 of OSC 5701
Sh. 54 of 75

J. Hibbard 7-19-72

558987

From OM 314-216

TABULATION JH 397

CURVE NO. 558988

~~SC 4/24/87~~
~~OSC-244~~4
~~ATT. 9~~

Att. 3 of OSC 5701
Sh. 55 of 75

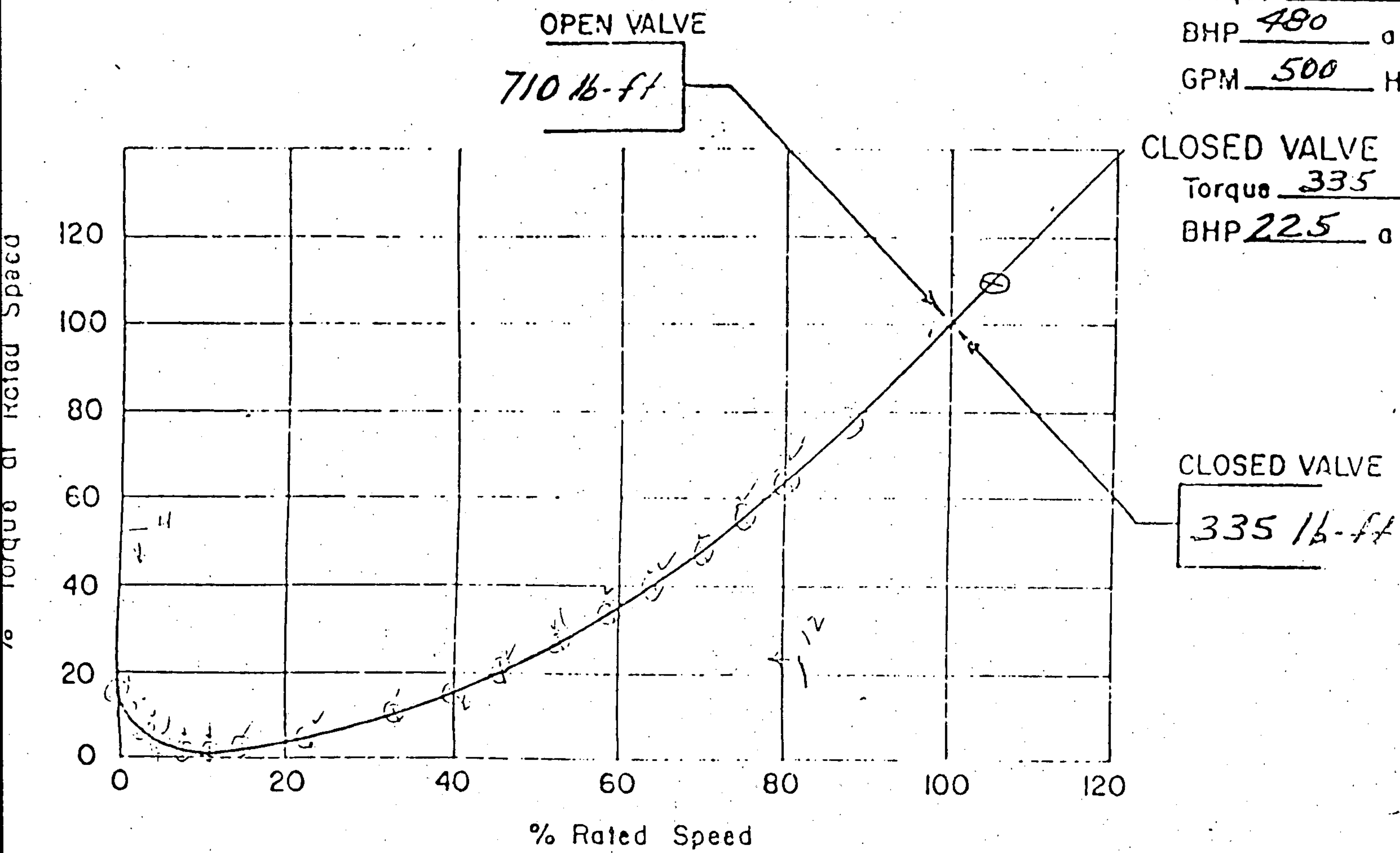
RPM	PERCENT POWER FACTOR			
	110% VOLTAGE	100% VOLTAGE	90% VOLTAGE	80% VOLTAGE
0	20.5	20.2	19.9	19.5
180	20.8	20.4	20.1	19.7
360	21.0	20.7	20.3	20.0
540	21.3	21.0	20.6	20.3
720	21.6	21.3	20.9	20.6
900	22.0	21.6	21.3	20.9
1080	22.1	21.7	21.4	21.0
1260	22.5	22.2	21.8	21.4
1440	23.0	22.6	22.3	21.9
1620	23.5	23.2	22.8	22.4
1800	24.2	23.8	23.5	23.1
1980	24.9	24.6	24.2	23.8
2160	25.4	25.0	24.7	24.2
2340	26.5	26.1	25.7	25.3
2520	27.6	27.5	27.1	26.6
2700	29.6	29.3	28.8	28.4
2880	32.1	31.7	31.3	30.8
3060	35.8	35.4	34.9	34.4
3240	42.8	42.4	41.9	41.3
3258	43.9	43.5	43.0	42.4
3276	45.1	44.7	44.2	43.6
3294	46.4	46.0	45.5	44.9
3312	47.4	47.0	46.5	45.9
3330	49.3	48.9	48.4	47.8
3348	51.3	50.9	50.4	49.8
3366	53.5	53.1	52.6	52.0
3384	55.9	55.6	55.0	54.3
3402	58.5	58.2	57.6	56.8
3420	61.3	61.0	60.3	59.3
3438	64.3	63.9	63.1	61.9
3456	67.3	66.8	65.8	64.7
3474	70.2	69.6	68.8	67.7
3492	73.1	72.7	71.9	71.0
3510	76.3	76.2	75.7	75.1
3528	80.2	80.3	80.2	79.8
3546	84.6	84.9	84.9	84.7
3564	88.2	89.1	89.3	89.4
3580	94.4	94.3		

00367 1211

WR^2 = 9.2 Lb. Ft²

OPEN VALVE
Torque 710 Lb. Ft.
BHP 480 a Sp. Gr. 1.0
GPM 500 Head 2750

CLOSED VALVE
Torque 335 Lb. Ft.
BHP 225 a Sp. Gr. 1.0



ENGINEERING SECTION
SPEED TORQUE CURVE and WR² VALUE

~~From Attachment 9~~

Att. 3 of OSC 5701
& 56 of 75

DRAWING NO. WP-465

CHARACTERISTIC CURVE SHEET Bingham Portland, Ore.	IMPELLER MAX DIA 10.9	3X4X9E -8 STAGE PUMP		
	MIN DIA	DIA IMPELLER 10'	IMPELLER PATT.	3560 R.P.M.
	EFF 119	NPSH REQUIRED	REFERENCE 33155	CURVE No 3581IT

IMPORTANT

OSC 2444 Att 9

000077
Att. 3 of OSC 5701
Sh. 57 of 75

DUKE POWER COMPANY
ENGINEERING DEPARTMENT
SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
FOR MOTORS RATED 100 HP and above

APPROVED
DUKE POWER CO.
DATE JAN 7 1975
C. J. WYLIE
CHIEF ENGINEER
By: ELECTRICAL DIVISION

REV. 12/2
~~SC 11/24/8~~
~~OSC-244~~
~~ATT. 9~~

1. Motor Application AUXILIARY FEEDWATER PUMP
2. Quantity 4 Mill-Power Order No. W-37110
3. Manufacturer WESTINGHOUSE ELECTRIC CORPORATION Order No. CP-13416-1
4. Motor Type SQ. CAGE LLD Frame No. 5808H Enclosure HEAT EXCHANGER
5. Bearing Type SPLIT SLEEVE Lubrication OIL
6. Rated H.P. 500 Speed-RPM: Syn 3600 F.L. 3580
7. Volts 4000 Phases 3 Hertz 60 F.L. Current 62.8 Service Factor 1.15
8. Locked Rotor Current and Power Factor at:
   A. 100% Voltage LRC 429 P.F. 20.2
   B. 90% Voltage LRC 379 P.F. 19.9
   C. 80% Voltage: LRC 331 P.F. 19.5

DUKE POWER COMPANY
DESIGN ENGINEERING

9. Heater Data: A. Watts 220 B. Volts 115 C. Phases 1
10. Insulation: Class F Rated Temp. Rise/Ambient 60/80 THERMO/DETECTOR °C/ 40
11. % Eff. - F.L. 94.3 3/4 Load 94.0 1/2 Load 92.8
12. % P.F. - F.L. 90.9 3/4 Load 89.9 1/2 Load 85.9
13. Torque at 100% voltage: F.L. 733 L.R. 883 Breakdown 2124
    Torque at 80% voltage: F.L. 736 L.R. 526 Breakdown 1293
15. Subtransient reactances in percent and based on kva of the motor
    X''_d = 12.76
16. WK^2 of Motor Rotor 113 Max. Load WK^2 381
17. Time motor will withstand locked rotor current without damage 7 SECONDS
18. Permissible successive attempts to start motor from ambient temperature and rated temperature without damaging the motor insulation system: Ambient Temp. 3
    Rated Temp. 2

MCM 1318 · 16-3

19. Time required for motor to return from the maximum temperature limit of its insulation system to a temperature that will allow another safe start with:
    Mtr. Running 5 MINUTES
    Motor at standstill after attempted starts 15 MINUTES

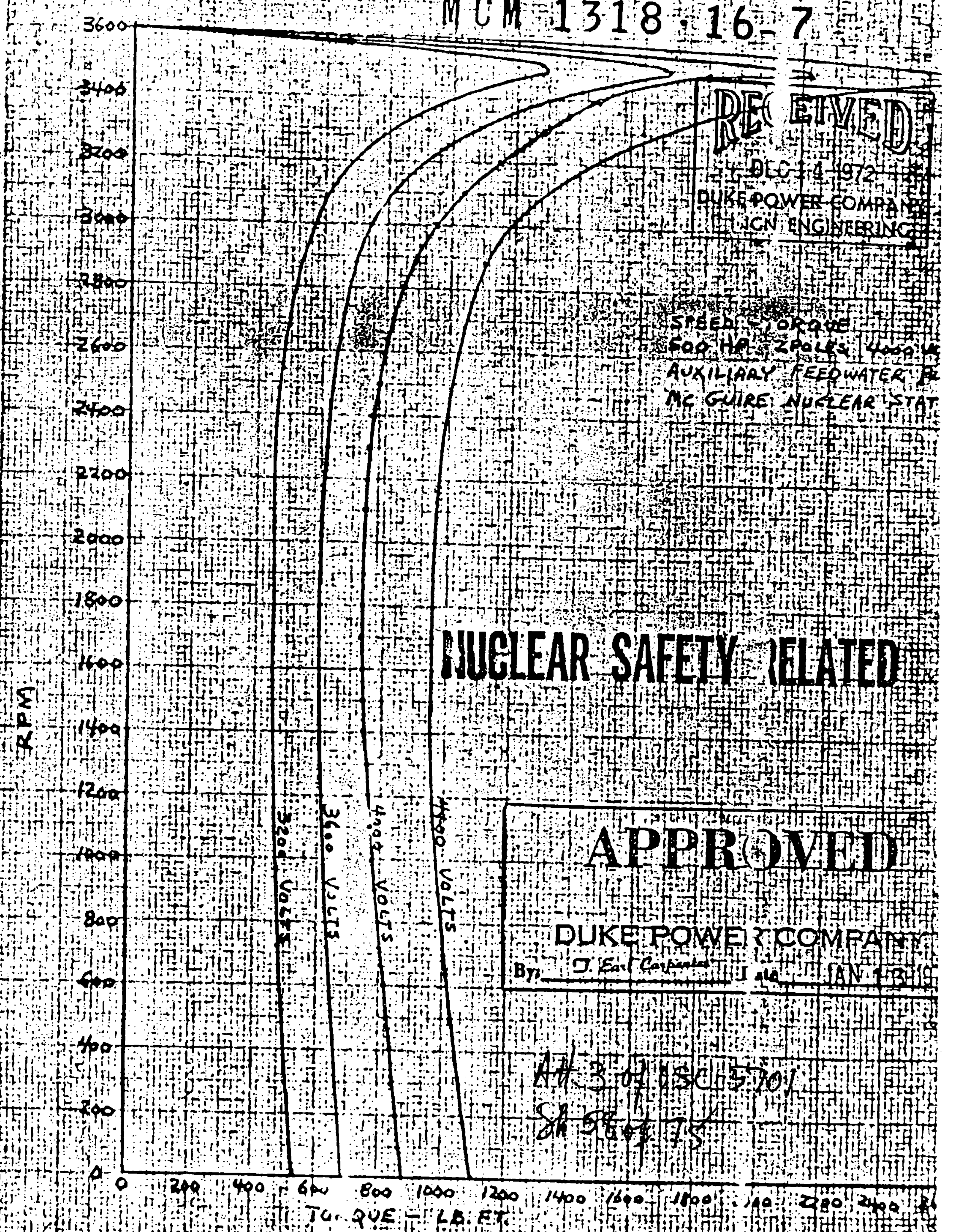
NUCLEAR SAFETY RELATED

20. Noise Level does not exceed 85 DBA/ DBC between the sound frequency levels 20 HZ to 10,000 HZ at a distance of 5' from the motor.
21. Curves Furnished:
    A. % Eff. and % P.F. vs H.P. Curve: No. 558986 Dated 7/19/72.
    B. Speed Torque Curve at 110%, 100%, 90% and 80% voltage: No. 558937 Dated 7/19/
    C. % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage: No. 558988 Dated 7/19/
    D. Starting current vs time curves (acceleration under equipment WK^2 and load) and time current heating curves (time for motor to reach thermal limits vs current). Curves are to be on same sheet, use the same scales, and be given at 110%, 100%, 90%, and 80% voltage. No. 558985 Dated 7/17/72.
22. Heat Exchanger Cooling Water Requirements
    Design Inlet: Temperature (°F) 95°F Pressure(psig) 150 psig Flow(GPM) 30 GPM 15 GPM
    Max. Tube ΔT (°F) [illegible] Max. Tube ΔP(PSI) [illegible]
    Tube Design: Material 90-10 Cu-Ni Velocity(ft/sec) [illegible]

WESTINGHOUSE ELECTRIC CORPORATION OSC 2444

CURVE NO. 55B9E ATT 8

MCM 1318.16-7



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DUKE POWER COMPANY
DESIGN ENGINEERING

NUCLEAR SAFETY RELATED

APPROVED
DUKE POWER COMPANY
By: J. Earl Carpenter Date JAN 18 19

Att 3 of OSC 5701
Sh 5 of 75

SIGNATURE J. Hibbard DATE 7-19-72

000079

TABULATION JH 397 MCM 1318-16 OSC-2444

CURVE NO. 558988

~~[illegible] 4/24/87~~

OSC-2444

NUCLEAR SAFETY RELATED

RPM	PERCENT POWER FACTOR			
	110% VOLTAGE	100% VOLTAGE	90% VOLTAGE	80% VOLTAGE
0	20.5	20.2	1[illegible].9	19.5
180	20.8	20.4	2[illegible].1	19.7
360	21.0	20.7	2[illegible].3	20.0
540	21.3	21.0	2[illegible].6	20.3
720	21.6	21.3	2[illegible].9	20.6
900	22.0	21.6	21.3	20.9
1030	22.1	21.7	21.4	21.0
1260	22.5	22.2	21.8	21.4
14[illegible]	23.0	22.6	22.3	21.9
1620	23.5	23.2	22.8	22.4
1800	24.2	23.8	23.5	23.1
1980	24.9	24.6	24.2	23.8
2160	25.4	25.0	24.7	24.2
2340	26.5	26.1	25.7	25.3
25[illegible]0	27.6	27.5	27.1	26.6
27[illegible]0	29.6	29.3	2[illegible].8	28.4
2880	32.1	31.7	3[illegible].3	30.8
3060	35.8	35.4	3[illegible].9	34.4
3240	42.8	42.4	41.9	41.3
3258	43.9	43.5	[illegible]3.0	42.4
3276	45.1	44.7	4[illegible].2	43.6
3294	46.4	46.0	4[illegible].5	44.9
3312	47.4	47.0	4[illegible].5	45.9
3330	49.3	48.9	4[illegible].4	47.8
3348	51.3	50.9	5[illegible].4	49.8
3366	53.5	53.1	5[illegible].6	52.0
3384	55.9	55.6	5[illegible].0	54.3
3402	58.5	58.2	5[illegible].6	56.8
3420	61.3	61.0	6[illegible].3	59.3
3438	64.3	63.9	6[illegible].1	61.9
3456	67.3	66.8	6[illegible].8	64.7
3474	70.2	69.6	6[illegible].8	67.7
3492	73.1	72.7	7[illegible].9	71.0
3510	76.3	76.2	7[illegible].7	75.1
3528	80.2	80.3	8[illegible].2	79.8
3546	84.4	84.9	8[illegible].9	84.7
3564	88.2	89.1	8[illegible].3	89.4
~~3580~~	~~94.4~~	94.3		

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DUKE POWER COMPANY
DESIGN ENGINEERING

APPROVED
DUKE POWER COMPANY
By [illegible] Date JAN 13 1973

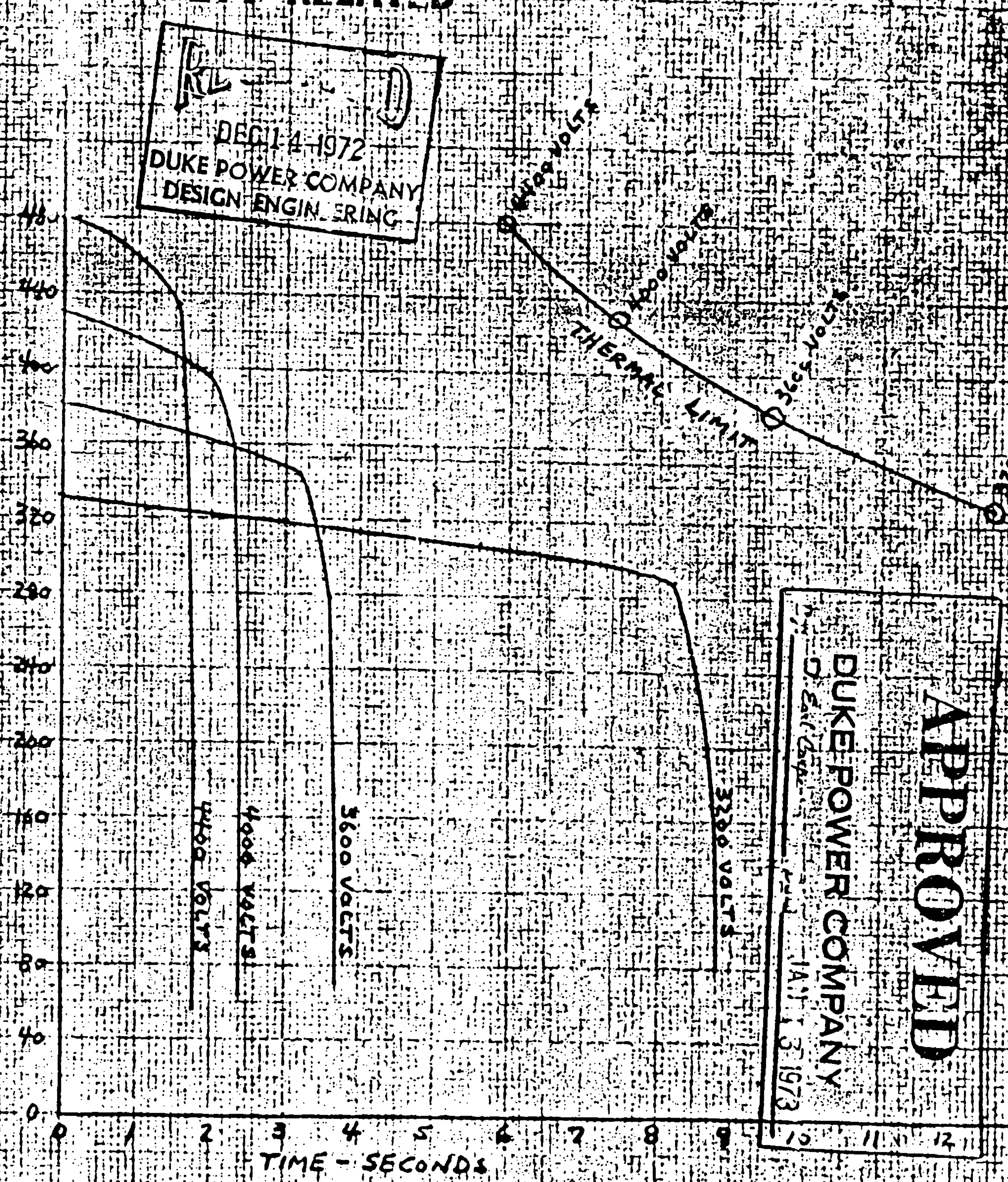
Att. 3 / OSC 5701 [illegible]

~~OSC-2444~~ CURVE NO. 55 985
~~ATT 9~~ SC 11/24/87

MCM 1318.16.6

NUCLEAR SAFETY RELATED

CURRENT VS. TIME
500 HP 2 POLES 4000 VOLTS
AUXILIARY FEEDWATER PUMP
MCGUIRE NUCLEAR STATION



Att 3 of OSC 5701
Sh 60 of ~~78~~

SIGNATURE J. Hibbard DATE 7-17-72 CURVE NO. 558 85

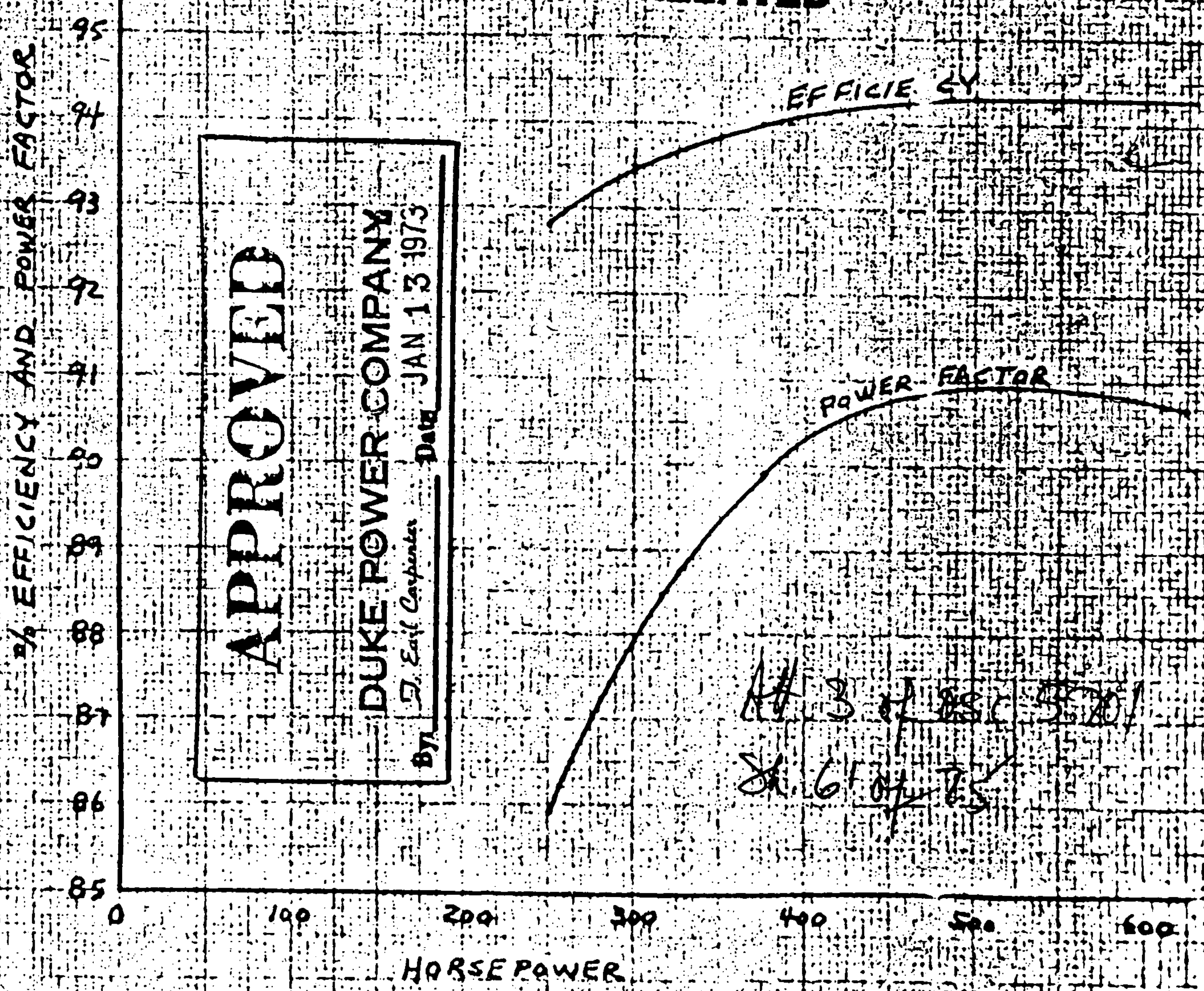
~~SC 4/24/89~~ ~~OSC 2444~~ CURVE NO. S-8986
~~ATT 9~~

MCM 1318-16-5 EFFICIENCY AND POWER FACTOR
500 HP 2 POLES 4000 VOLTS
AUXILIARY FEEDWATER PUMP
MC GUIRE NUCLEAR STATION

RECEIVED
DEC 14 1972
DUKE POWER COMPANY
DESIGN ENGINEERING

NUCLEAR SAFETY RELATED

APPROVED
DUKE POWER COMPANY
By: J. Earl Carpenter Date JAN 13 1973



Att 3 of OSC 5201
Sh. 6 of 75

SIGNATURE J. Hibbard DATE 7-19-72 CURVE NO. S-8986

000002

REPORT NO.
Form 31-2
Rev. 4-21-67

ATT. 9
~~OSC-2444~~
~~SC 4/24/87~~

DUKE POWER COMPANY
ENGINEERING DEPARTMENT
SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
FOR MOTORS RATED 100 HP AND ABOVE

1. Motor Application Nuclear Containment Oconee Mill-Power Order No.
2. Manufacturer Reliance Electric Co. Order No. X-322174
3. Motor Type Induction Frame No. DC-5005 Enclosure TEAO
4. Bearing Type ______ Lubrication ______
5. Rated HP 150/75 Speed-RPM: Syn 1200/600 F.L. 1185/590
6. Volts 575 Phases 3 Cycles 60 FL Current 135/124 Service Factor 1.0
7. Locked Rotor Current and Power Factor at:
   A. 100% Voltage: LRC 623 P.F. .516
   B. 90% Voltage: LRC 552 P.F. .634
   C. 80% Voltage: LRC 480 P.F. .721
8. Insulation: Type Super "H" Rated Temp. Rise/Ambient 125. °C/ 40 °C
9. % Eff. - F.L. 87.6 3/4 Load 86.2 1/2 Load 82.8
10. % P.F. - F.L. 51.6 3/4 Load 42.1 1/2 Load 31.4
11. Torque at 100% voltage: F.L. 662 #ft. L.R. 835 #ft. Breakdown 1900 #ft.
12. Torque at 80% voltage: F.L. 662 #ft. L.R. 520 #ft. Breakdown 1220 #ft.
13. Transient reactance in per cent and based on kva of the motor [illegible]
14. WK^2 of Motor Rotor 80 #ft.^{2} Max. Load WK^2 2400 #ft.^{2}
15. Starting current vs time curves (acceleration under equipment WK^2 and load) and time current heating curves (time for motor to reach thermal limits vs current). Curves are to be on same sheet, use the same scales, and be given at 110%, 100%, 90% and 80% voltage. OUT
16. Time motor will withstand locked rotor current without damage 10 sec
17. Permissible successive attempts to start with motor at: Ambient Temp. 2 st. Rated Temp. 1 st.
18. Time required for motor to return to rated temp. with: Motor Running 1 hr.
    Motor at standstill after attempted starts 2 hr.
19. Furnish % Eff. and % P.F. vs HP curve.
20. Furnish Speed Torque Curve at 110%, 100%, 90% and 80% voltage.
21. Furnish % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage.
22. Data curves and data sheet submitted 11-19-69.

Att 3 of OSC-5701 Sh. 62 of 73

000003

SC 1124187

RELIANCE ELECTRIC COMPANY CLEVELAND, OHIO, U.S.A.

OSC-2444 ATT-9

APPENDIX
REPORT NO. X-378

CALCULATED
A-C ROTOR PERFORMANCE CURVES

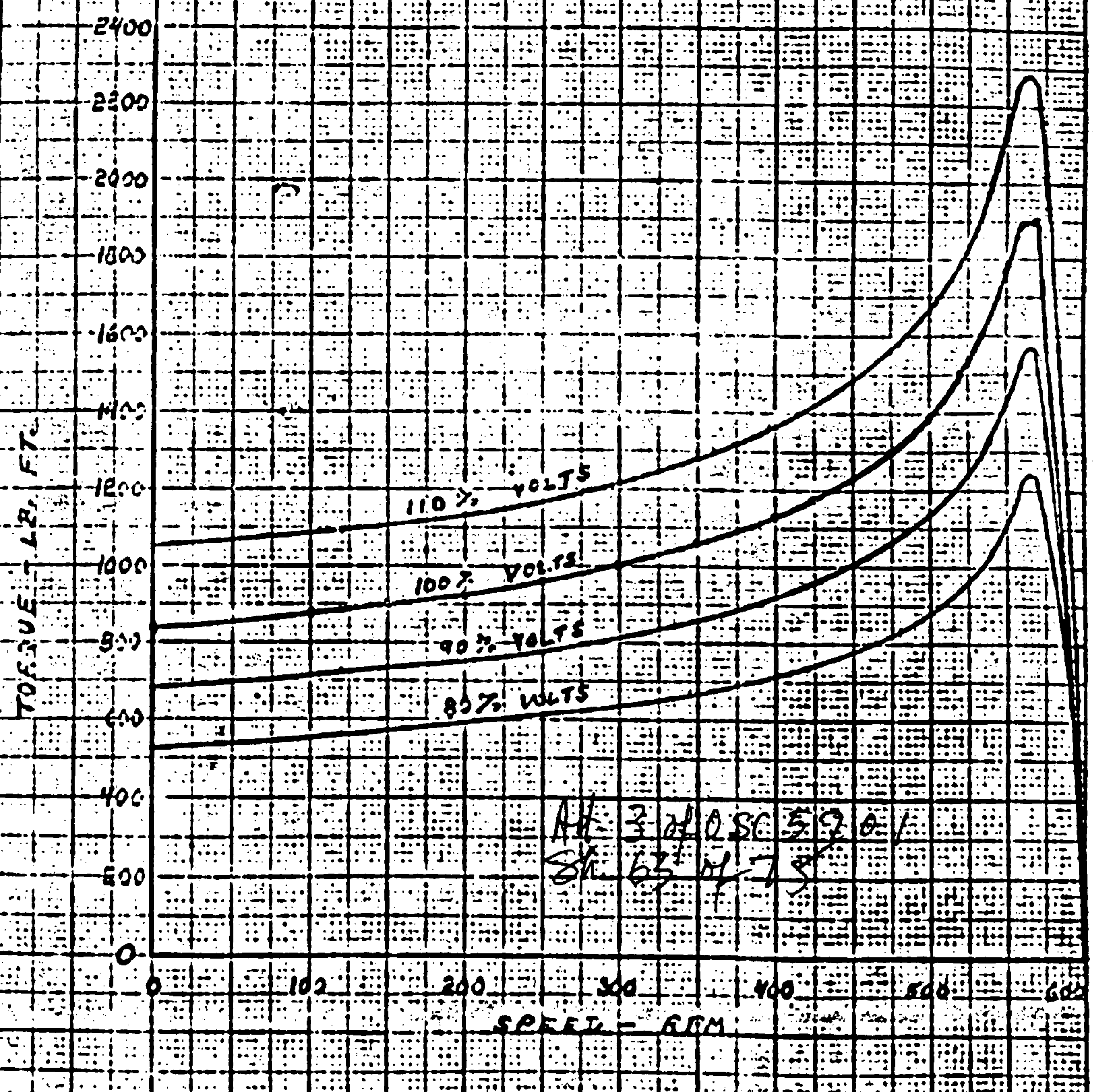
DRAWING NUMBER
SK 58046
SH 6 OF 6

SPECIFICATION DATA:

NAMEPLATE DATA:

E/S 324426	FRAME 12 DC-5005	H.P. 150/75	CYCLES 60
ROTOR 67741-R	DUTY CONT.	RPM 1185/590	CODE H.
TEST S.O. X-322174	PHASE 3	VOLTS 575	TEMP. RISE SPCL.
TEST DATE 7-30-69	TYPE/FORM M/YB	AMPS 135/78	NEMA DESIGN ~
RES. .0961/.127			ENCLOSURE TEAO
AT 25C			

LOW SPEED



AH 3 HOSC 5901
SK 63 of 73

TOT. 9-30-69

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RE 1372Y PRINTED IN U.S.A.

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SC 4/24/87

RELIANCE ELECTRIC COMPANY CLEVELAND, OHIO, U.S.A.

OSC-2444

REPORT NO. X-378

CALCULATED
A C MOTOR PERFORMANCE CURVES

DRAWING NUMBER SK 58846
SH 4 OF 6

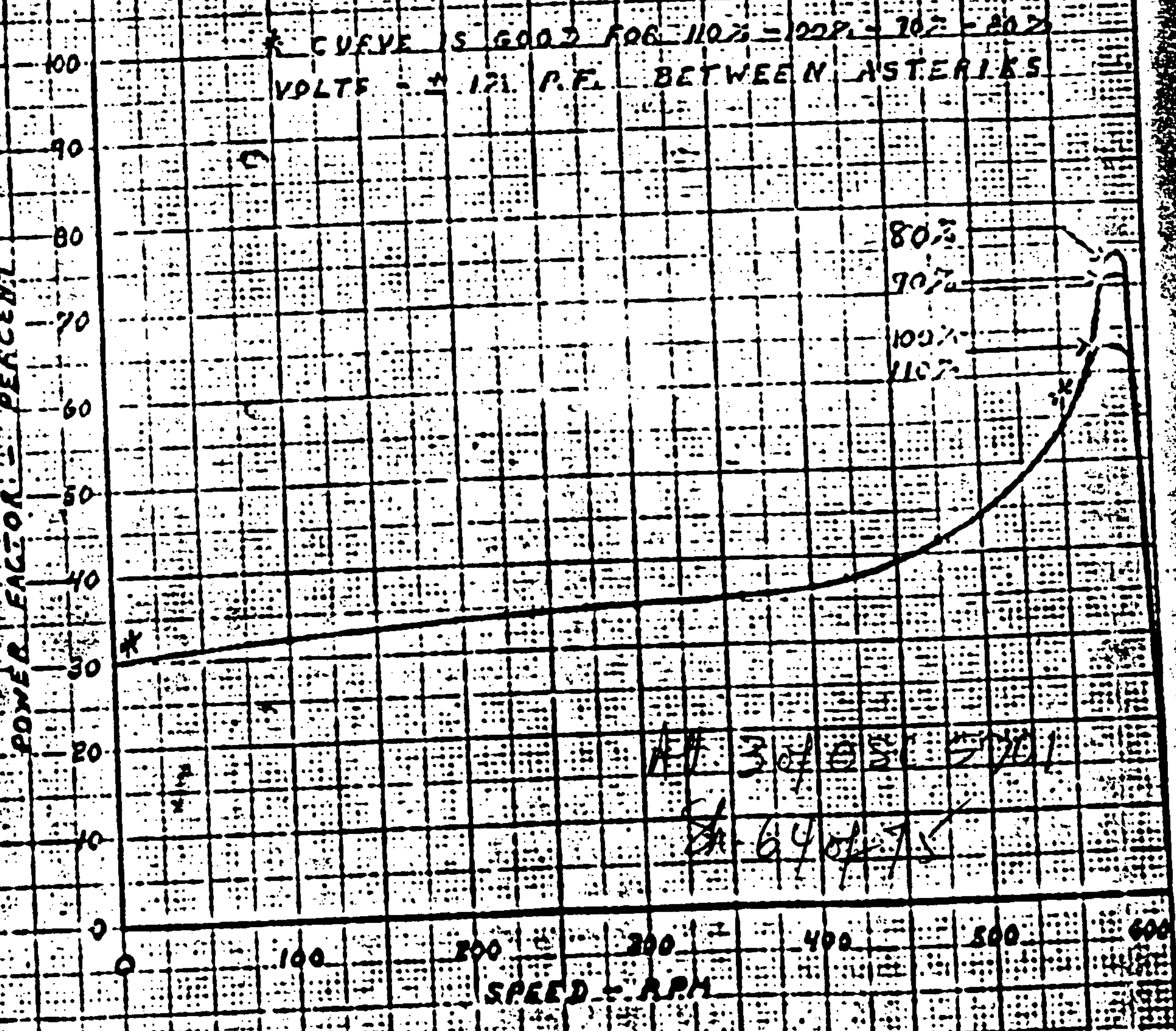
NAMEPLATE DATA

SPECIFICATION DATA:

E/S 527426	FRAME 12 DC-5055	H.P. 150/75
ROTOR. 67951-R	DUTY CONT.	RPM. 1185/590
S.O. X-322174	PHASE 3	VOLTS 575
DATE 9-30-69	TYPE/FORM M/YE	AMPS 135/124
RES. .096/.127 AT 25C		

CYCLES 60
CODE H
TEMP. RISE SPCL.
NEMA DESIGN
ENCLOSURE TEAO

LOW SPEED



Att 3 of OSC 2701
Sh 64 of 75

JOT 9-30-69

-7-

RE 1577V PRINTED IN U.S.A.

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→ Hi Speed ←

APPENDIX
REPORT NO. X-378
Form M-2
Rev. 4-21-67

DUKE POWER COMPANY
ENGINEERING DEPARTMENT
SQUIRREL CAGE INDUCTION MOTOR DATA SHEET
FOR MOTORS RATED 100 HP AND ABOVE

~~OSC-2444~~
ATT. 9

1. Motor Application Nuclear Containment Oconee Mill-Power Order No. SC 4/24/87
2. Manufacturer Reliance Electric Co. Order No. X-322174
3. Motor Type Induction Frame No. DC 5005 Enclosure TEAO
4. Bearing Type ______ Lubrication ______
5. Rated HP 150/75 Speed-RPM: Syn 1200/600 F.L. 1185/590
6. Volts 575 Phases 3 Cycles 60 FL Current 135/124 Service Factor 1.0
7. Locked Rotor Current and Power Factor at:
   A. 100% Voltage: LRC 1036 P.F. .899
   B. 90% Voltage: LRC 924 P.F. .910
   C. 80% Voltage: LRC 710 P.F. .905

Att. 3 of OSC 5701
Sh. 65 of 75

8. Insulation: Type Spec "H" Rated Temp. Rise/Ambient 125 °C / 40 °C
9. % Eff. - F.L. 92.8 3/4 Load 93.5 1/2 Load 93.5
10. % P.F. - F.L. 89.9 3/4 Load 87.5 1/2 Load 81.0
11. Torque at 100% voltage: F.L. 662 #ft. L.R. 635 #ft. Breakdown 1655 #ft.
12. Torque at 80% voltage: F.L. 662 #ft. L.R. 386 #ft. Breakdown 1030 #ft.
13. Transient reactance in per cent and based on kva of the motor [illegible]
14. WK^2 of Motor Rotor 80 #ft² Max. Load WK^2 2400 #ft.
15. Starting current vs time curves (acceleration under equipment WK^2 and load) and time-current heating curves (time for motor to reach thermal limits vs current). Curves are to be on same sheet, use the same scales, and be given at 110%, 100%, 90% and 80% voltage.
16. Time motor will withstand locked rotor current without damage 10 sec.
17. Permissible successive attempts to start with motor at: Ambient Temp. 2 st. Rated Temp. 1 st.
18. Time required for motor to return to rated temp. with: Motor Running 1 hr.
    Motor at standstill after attempted starts 2 hr.
19. Furnish % Eff. and % P.F. vs HP curve.
20. Furnish Speed Torque Curve at 110%, 100%, 90% and 80% voltage.
21. Furnish % P.F. vs speed curve at 110%, 100%, 90% and 80% voltage.
22. Date curves and data sheet submitted 11-19-69

0067-01254

RELIANCE ELECTRIC COMPANY
CLEVELAND, OHIO, U.S.A.

OSC-2444 ATT-9

APPENDIX
REPORT NO. X-378

DRAWING NUMBER SK 58946
SH 5 OF 6

CALCULATED
A-C MOTOR PERFORMANCE CURVES

SPECIFICATION DATA:

DS 5 4420
ROTOR 67941-A
. SO X-3-2174
DATE 9-30-69
RES. .096/.127
AT 25C

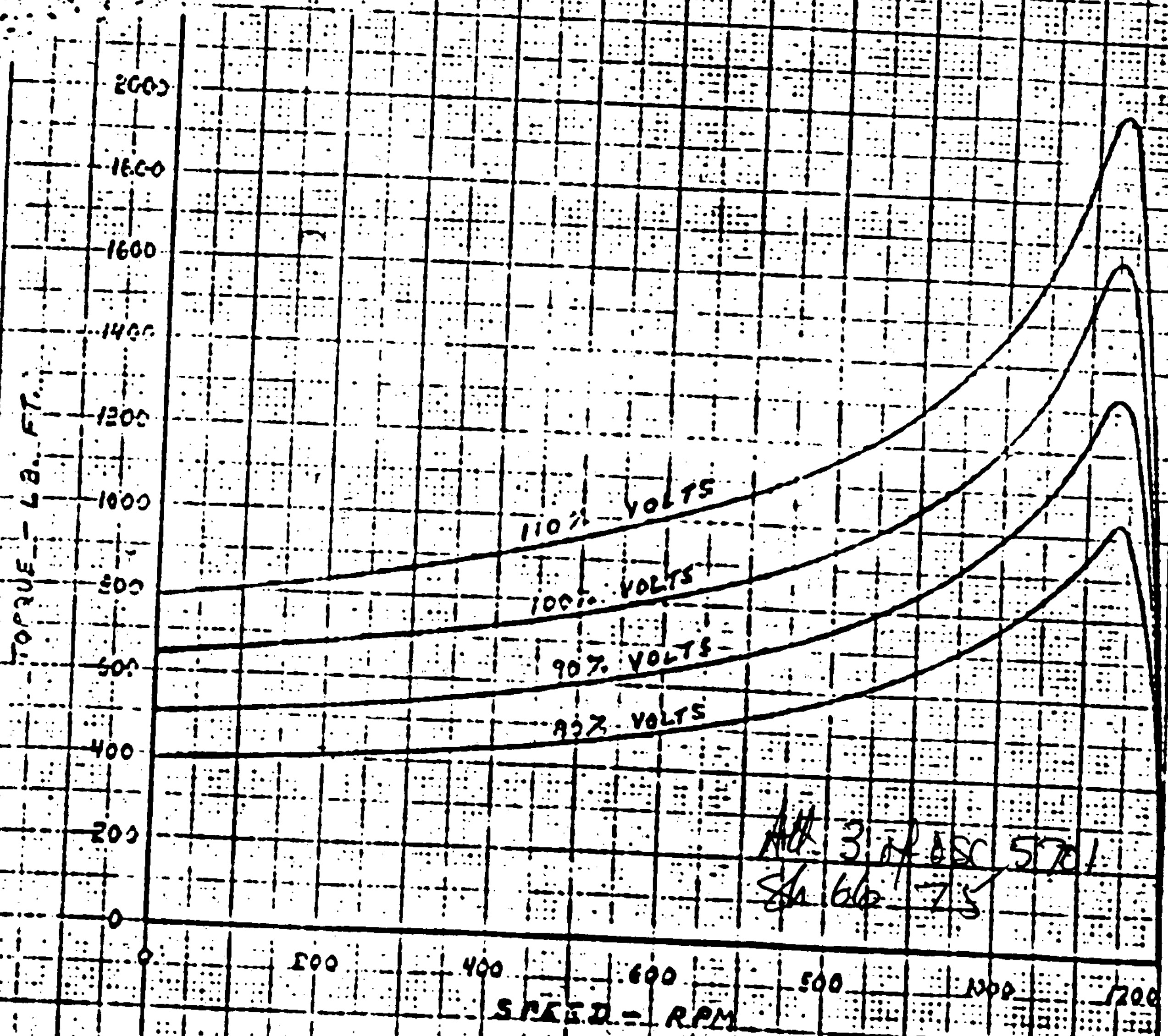
NAMEPLATE DATA:

FRAME 12 DC-5005
DUTY CONT.
PHASE 3
TYPE/FORM M/YE

HP. 150/75
RPM 1185/590
VOLTS 575
AMPS 135/124

CYCLES 60
CODE H
TEMP. RISE 5/CL.
NEMA DESIGN --
ENCLOSURE TEAO

HIGH SPEED



Att 3 of OSC 5701
Sh 66 75

TOT 9-30-69

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SC 4184187

RELIANCE ELECTRIC COMPANY CLEVELAND, OHIO, U.S.A.

ATT. 9 OSC-2444 ATT. 9

APPENDIX
REPORT NO. X-378

DRAWING NUMBER SA 59836
SH 3 OF 6

CALCULATED
A-C MOTOR PERFORMANCE CURVES

SPECIFICATION DATA:

E/S 524420
ROTOR 67741-9
TEST S.O. X-322174
TEST DATE 9-30-64
RES. .096/.127
AT-3C

FRAME 12 DC-5005
DUTY CONT.
PHASE 3
TYPE/FORM M/YE

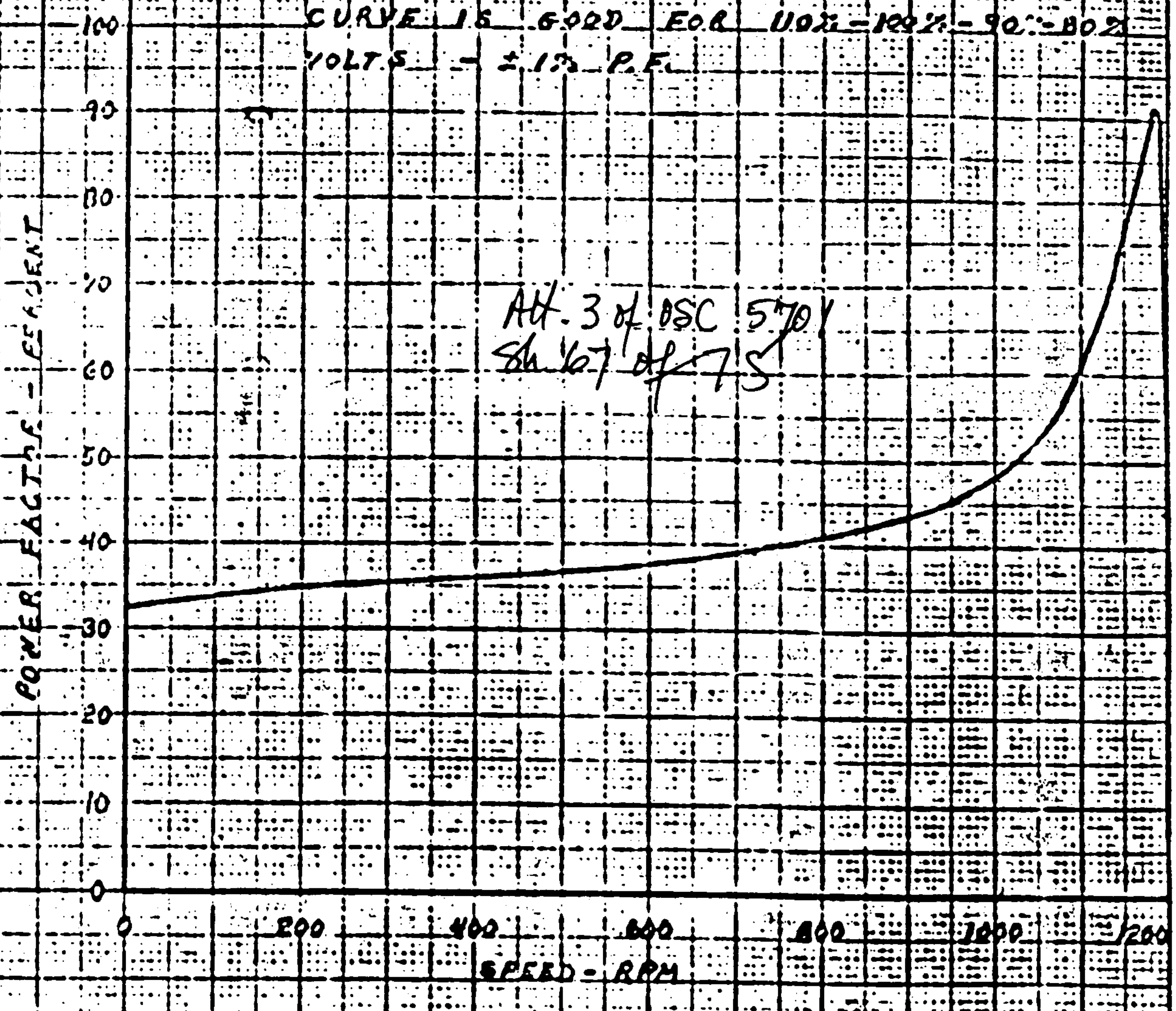
NAMEPLATE DATA:

H.P. 150/75
RPM 1185/570
VOLTS 575
AMPS 135/124

CYCLES 60
CODE H
TEMP. RISE 5/CL.
NEMA DESIGN —
ENCLOSURE T. AO

HIGH SPEED

CURVE IS GOOD FOR 110%-100%-90%-80% VOLTS - ±1% P.F.



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Sh 67 of 75

JOT 9-17-64

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RE 1572V PRINTED IN U.S.A.

~~OSC-2444~~
~~ATT. 9~~
~~SC 4/24/87~~

DUKE POWER COMPANY

OCONEE 1, 2 & 3

REACTOR BUILDING COOLING FANS

FAN DATA SHEET

MODEL 66-30-1170/585

	TEST	EMERGENCY	NORMAL	REFUEL
CFM	56,000	58,000	108,000	54,000
TOTAL PRESSURE	7.26"	3.40"	6.25"	1.60"
DENSITY	0.364 #/Ft.^{3}	0.192 #/Ft.^{3}	0.075 #/Ft.^{3}	0.075 #/Ft.
FAN RPM	585	585	1170	585
BHP	85	44	140	17.5
FAN EFFICIENCY	75.2%	70.5%	76%	77.8%
MOTOR EFFICIENCY	87.8%	83.0%	93%	80%
AIR TEMP.	60°F	286°F	70°F	70°F

FAN WR^2	1200 LBS/FT^2
RPM HIGH SPEED	1170
RPM LOW SPEED	585
FAN CASING DIAMETER ID	66"
FAN ROTOR DIAMETER OD	65.8"
MOTOR SHAFT DIAMETER	3-1/2"
MOTOR SHAFT MATERIAL	STEEL

Att. 3 of OSC 5701
Sh. 68 of 75

000009

~~OSC 244~~4
~~ATT 8~~ ~~SC 4/24/87~~

January 27, 1987

MBHV-87-019

T C McMeekin

Attention: Sokha Chhak

Re: Oconee Nuclear Station
Reactor Building Cooling Units
File: OS-161

This is to confirm the following information concerning the Oconee Reactor Building cooling unit fans as requested.

Speed	Air Density	Torque
1200 RPM	0.075 lb/ft^3	630 ft-lb
600 RPM	0.075 lb/ft^3	180 ft-lb
600 RPM	0.1924 lb/ft^3	405 ft-lb

This information applies to the following fans:

1RBCAH0020A	2RBCAH0020A	3RBCAH0020A
1RBCAH0020B	2RBCAH0020B	3RBCAH0020B
1RBCAH0020C	2RBCAH0020C	3RBCAH0020C

The torques shown above may be applied to the attached speed-torque characteristics to determine motor torque as a function of speed.

Please contact me at 3-8823 if you have questions.

T F Wyke, Chief Engineer
Mechanical/Nuclear Division

R.H. Burley

By: R H Burley, Design Engineer I

Att. 3 of OSC 5701
Sh. 69 of 75

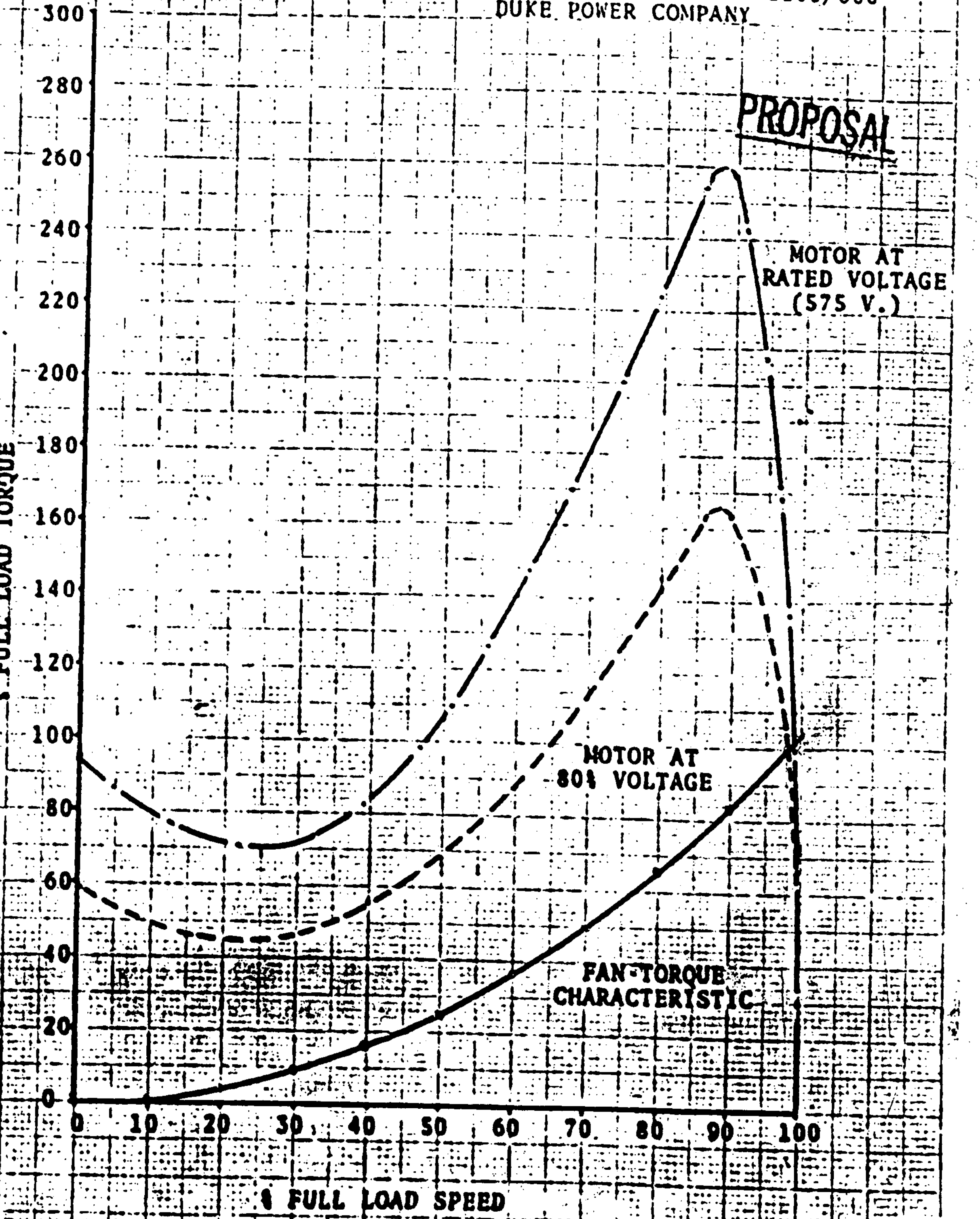
RHB/spf

Attachment

cc: R R Weidler
C A Driggers, Jr.
CENTRAL RECORDS

SPEED-TORQUE CHARACTERISTIC
HIGH SPEED WINDING (1200 RPM)
JOY AXIVANE FAN, MODEL 60-30-1200/600
DUKE POWER COMPANY

PROPOSAL



Att-3 of OSC 5701 Sh 70 of 75

CONDENSATE BOOSTER PUMP
2000 HP, F/A CS MOTOR
G.O. CH-43303-P; SPEC. OS-314-3
S.O. 77P495, 77P496 AND 77P497

MOTOR DATA

1. Motor Type CS-F/A, Frame No. 3B30, Enclosure Dripproof
2. Bearing Type Spherical Seat Sleeve, Lubrication Self Ring Oiled
3. Rated HP 2000, Speed-RPM: Syn. 3600, F.L. 3580
4. Volts 4000, Phases 3, Cycles 60, FL Current 246, Service Factor 1.25
5. Locked Rotor Current and Power Factor at:
   A. 100% Voltage: LRC 1480 Amps., P.F. 21%
   B. 90% Voltage: LRC 1320 Amps., P.F. 19%
   C. 80% Voltage: LRC 1150 Amps., P.F. 16%
6. Insulation: Class F, Type Therm-Epoxy, Rated Temp. Rise/Ambient $60^{\circ}C/40^{\circ}C$
7. % Eff. - F.L. 96.3, 3/4 Load 96.2, 1/2 Load 95.5
8. % P.F. - F.L. 91.0, 3/4 Load 90.5, 1/2 Load 87.0
9. Torque at 100% Voltage: F.L. 2935 lbs.-ft., L.R. 1760 (Min.) Breakdown 5870 (Min.)
10. Torque at 80% Voltage: F.L. 2940 lbs.-ft., L.R. 995, Breakdown 3760
11. Transient Reactance in per cent and based on Kva of the Motor 24%
12. WK^2 of Motor Rotor 460 lbs.-ft.^{2}. Max. Load WK^2 1096 Pump WK^2 - 160 lbs.-ft.^{2}
13. Starting current vs time curves (acceleration under equipment WK^2 and load) and time curr heating curves (time for motor to reach thermal limits vs current). Curves are to be on same sheet, use the same scales, and be given at 110%, 100%, 90% and voltage, Curve M-091868-2-B
14. Time motor will withstand locked rotor current without damage 9 sec. @ full voltage
15. Permissible successive attempts to start with motor at: Ambient Temp. 3 Rated Temp. 3
16. Time required for motor to return to rated temp. with: Motor Running 15 min. Motor at standstill after attempted starts 45 min.
17. Furnish % Eff. and % P.F. vs HP Curve M-NCHU-794-2-C
18. Furnish Speed Torque Curve at 110%, 100%, 90% and 80% Voltage, Curve M-010269-1-A
19. Furnish % P.F. vs Speed Curve at 110%, 100%, 90% and 80% Voltage, Curve M-010269-2-A
20. Outline Drawing 212C666; Instruction Book 1300-FA-1

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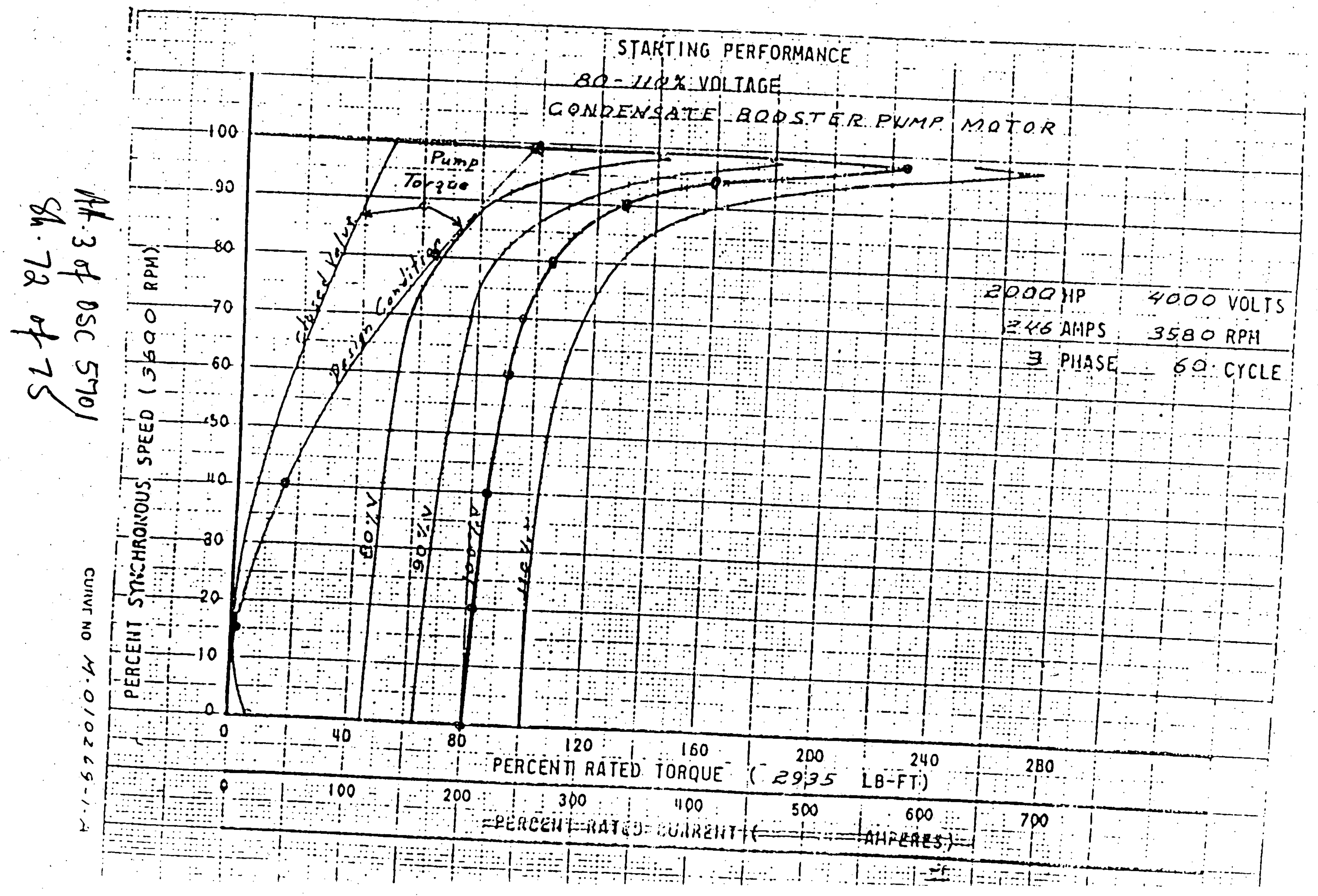
Sh. 71 of 75


STARTING PERFORMANCE
80-110% VOLTAGE
CONDENSATE BOOSTER PUMP MOTOR
Pump Torque
Design Condition
80%V
90%V
100%V
110%V
2000 HP
4000 VOLTS
246 AMPS
3580 RPM
3 PHASE
60 CYCLE
PERCENT SYNCHRONOUS SPEED (3600 RPM)
PERCENT RATED TORQUE (2935 LB-FT)
PERCENT RATED CURRENT (AMPERES)
CURVE NO M-01026-1-1
Att. 3 of OSC 5701
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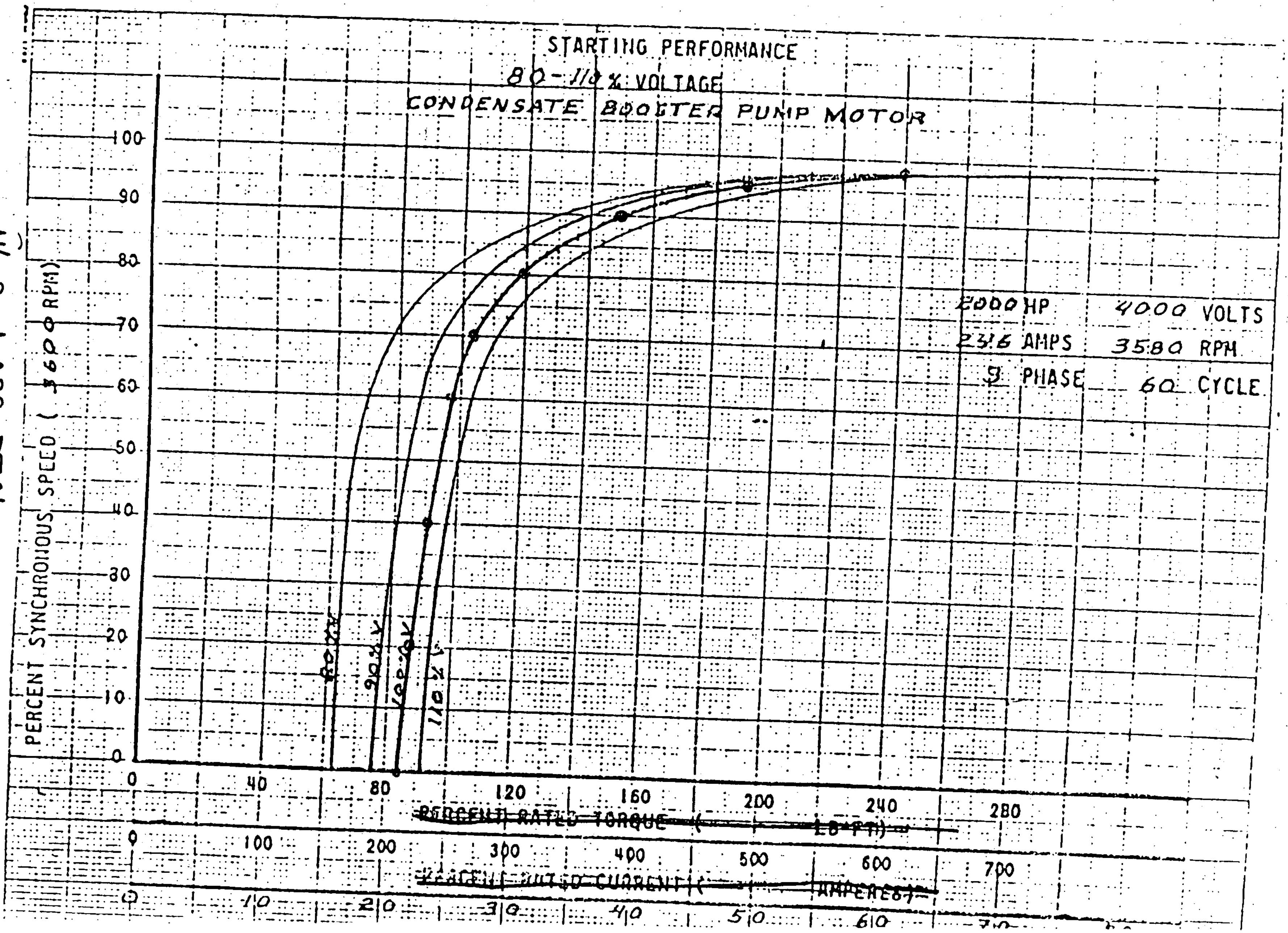
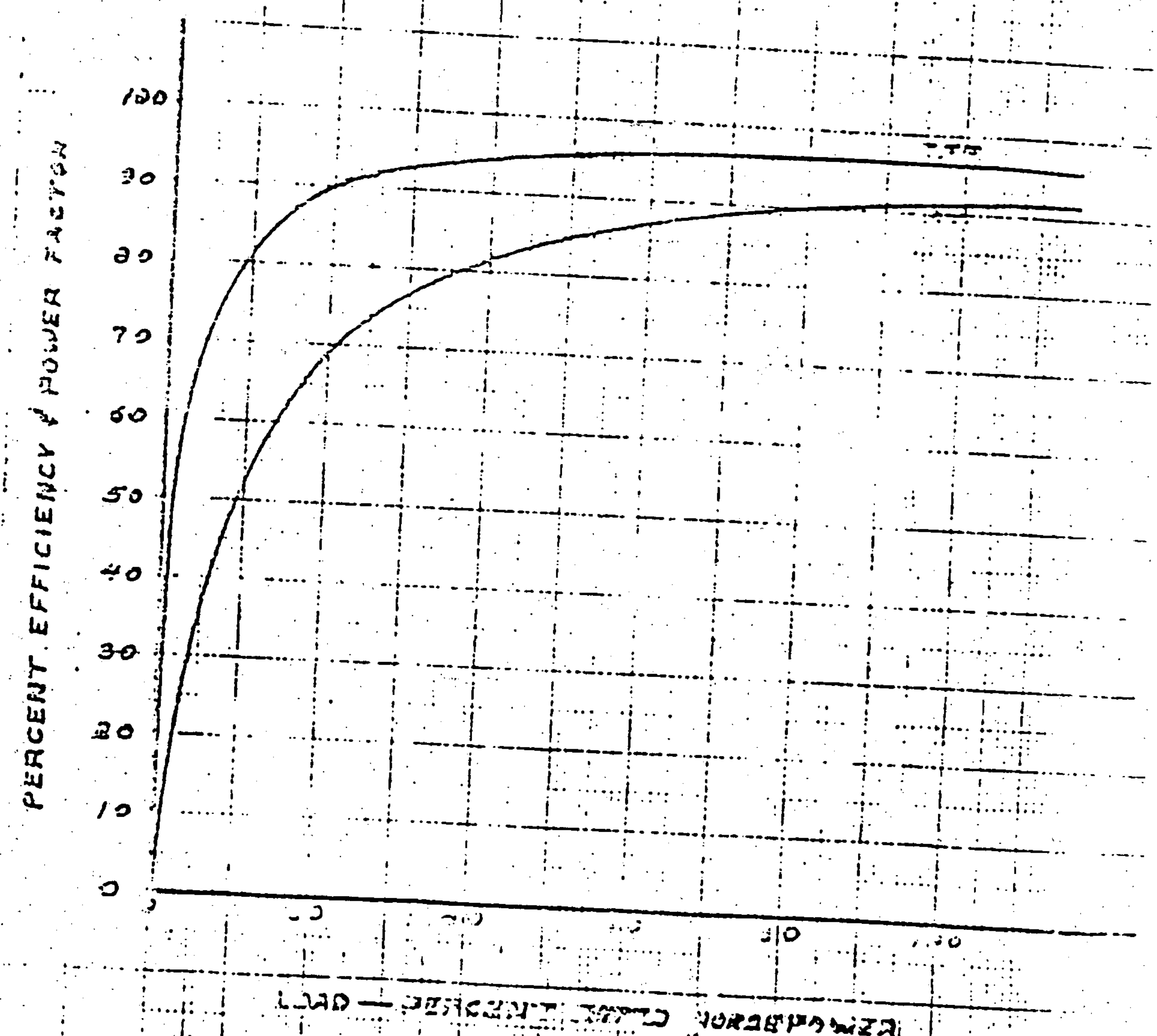


CURVE NO M-010265-2-A

CONDENSATE BOOSTER PUMP MOTOR

EFFICIENCY AND POWER FACTOR CURVES



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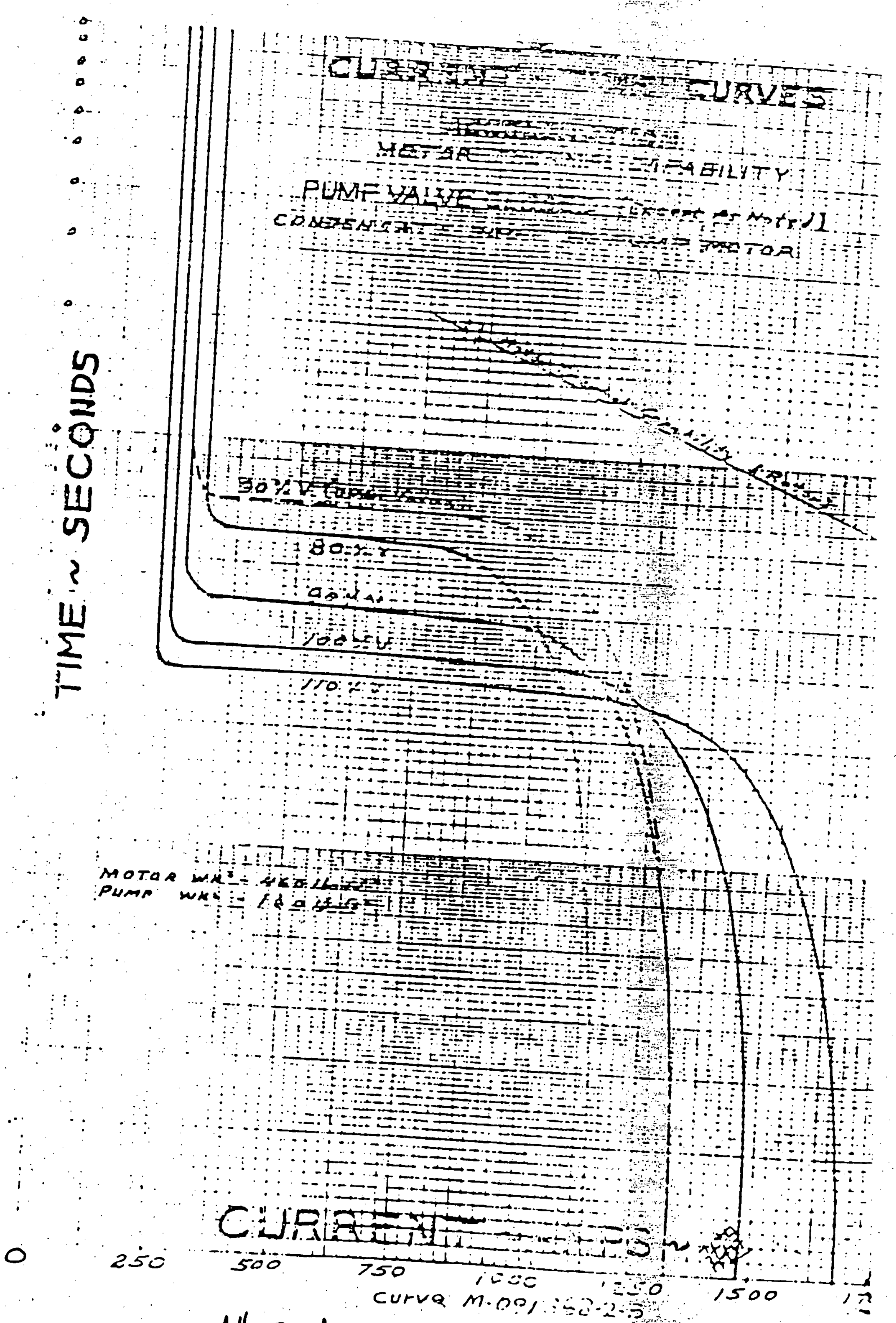
CURVE NO. M-NC114-

000015



Att. 3 of OSC 5701
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ATTACHMENT 4

ABB Information on the Effects fo Frequency on CV and CO Relays

OSC 5701

SC 5/12/94

AB 5/12/94