J1C77 (R7-92)

FORM 101.1	REVISION 14

CERTIFICATION OF ENGINEERING CALCULATION

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

LE CALCULATION: Oconee-Keowee Underground Path Analysis Using Cyme

LCULATION NUMBER: OSC-5952

RIGINALLY CONSISTING OF:

GES: i, ii, 1 THROUGH 92

OTAL ATTACHMENTS: 3* TOTAL MICROFICHE ATTACHMENTS: N/A

OTAL VOLUMES: 1 TYPE I CALCULATION/ANALYSIS? YES [x] NO [ ]

TYPE I REVIEW FREQUENCY: 3 y

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

RIGINATED BY: Sokha Chhak *Sokha Chhak* DATE 5/23/95

HECKED BY: Tim Griffin *D. I. Griffin* DATE 5/23/95

PRROVED BY: J. E. Stoner, Jr. *J. E. Stoner, Jr.* DATE 5/25/95

SS O TECHNICAL SERVICES DIVISION ______ DATE ______

ECEIVED BY TECHNICAL SERVICES DIVISION ______ DATE ______

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

CALCULATION PAGES (VOL)			ATTACHMENTS (VOL)			VOLUMES		ORIG	CHKD	APPR	ISSUE DATE
REVISED	DELETED	ADDED	REVISED	DELETED	ADDED	DELETED	ADDED	DATE	DATE	DATE	REC'D DATE

Attachment 3: 2 sets of disks (original & backup), 1 disk each

4.0 CONCLUSION

Based on the results of various cases (see Section 6.0) being analyzed, it can be concluded that the Keowee units and the underground circuits are viable emergency sources for Oconee. 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, for even more conservatism, the setting of the 4KV motor overcurrent relays should be reviewed to determine if the setting can be increased to allow longer motor starting times.

5.0 METHOD OF ANALYSIS

The transient analysis of the Keowee unit providing power to the Oconee auxiliaries via the underground path is performed using the Cyme program and the Keowee model as shown in Reference 2.

The following Cyme program modules were used. For subsequent revisions of this calculation, if a new validated 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 UNDERGROUND PATH SIMULATION

This calculation examines the capability of the Keowee unit to supply power to Oconee via the underground path. The plant condition for this study is LOCA/ LOOP at Unit 1 and LOOP at Units 2 & 3. Several cases were examined and their detailed descriptions including a summary table are given as follows:

1. Cases 1H and 1L

These two cases simulate a Keowee underground unit supplying Oconee Unit 1 LOCA and Units 2&3 LOOP loads under the following conditions:

a. Keowee unit is running at steady state (no load) at t=0 and lake net heads are 140' for Case 1H and 113' for Case 1L.

b. Keowee unit accepts loads of all three Oconee units at t=11sec. Because the Keowee unit is assumed to be already in a steady state, load acceptance can be simulated sooner than t=11sec. without affecting the results. In this calculation t=60cy is used to reduce the computer-run time.

c. Inrush from CT4 has subsided after 11 seconds.

In reality the two Oconee LOOP units will not be connected to Keowee simultaneously with the LOCA unit. Cases 1H and 1L are being examined because they envelop the three-unit LOOP case.

2. Cases 2H and 2L

These two cases simulate a Keowee underground unit supplying Oconee Unit 1 LOCA and Units 2&3 LOOP under the following conditions:

a. Keowee unit is running at steady state (no loads) at t=0 and lake net heads are 140' for Case 2H and 113' for Case 2L.

b. Keowee unit accepts Oconee Unit 1 LOCA loads at t=11 sec., and Oconee Units 2&3 LOOP loads at t=31sec. Because the Keowee unit is assumed to be already in a steady state, the first event can be simulated sooner than t=11sec. without affecting the results. In this calculation, t=60cy is used for the first event and t=1260cy for the second event to reduce the computer-run time.

c. Inrush from CT4 has subsided after 11 seconds.

d. The starting of one CBP is included with the LOCA unit.

3. Cases 3H and 3L

These two cases simulate a Keowee underground unit supplying Oconee Unit 1 LOCA under the following conditions:

a. Keowee unit is running at steady state (no load) at t=0 and lake net heads are 140' for Case 3H and 113' for Case 3L.

b. Keowee unit accepts Oconee Unit 1 LOCA loads at t=11sec. Because the Keowee unit is assumed to be already in a steady state, this event can be simulated sooner than t=11sec. without affecting the results. In this calculation t=60cy is used to reduce the computer-run time.

c. Voltage regulator for the Keowee unit fails prior to accepting loads.

d. The starting of one CBP motor is included with the LOCA unit.

4. Cases 4H and 4L

These two cases simulate a Keowee underground unit supplying Oconee Unit 1 LOCA under the following conditions:

a. Keowee unit supplies 75 MW of generation at t=0 and lake net heads are 140' for Case 4H and 113' for Case 4L.

b. Keowee unit rejects 75 MW of loads at t=60cy.

c. Keowee unit is accepting Oconee Unit 1 LOCA & 1 CBP when the system frequency has slowed down to 1.10 pu. Based on the results of Reference 3 (p.91), this time is t=952cy for Case 4H and t=1190cy for Case 4L. CT4 inrush is included for this scenario.

d. Keowee accepts Units 2 and 3 LOOP nine seconds after accepting the LOCA unit, at t=1492cy for Case 4H and t=1730cy for Case 4L. This time is selected because under a certain lake and load condition, it may take up to 22 seconds following a load rejection for the system frequency to slow down to 1.10 pu. Under this condition, the LOCA unit would be energized at 22 seconds followed by the LOOP units at 31 seconds, resulting in a nine-second separation between the two sequences.

5. Cases 5H and 5L

These cases are very similar to cases 4H and 4L and simulate a condition when one of the Oconee LOOP units, due to some logic failures, starts simultaneously with the LOCA unit.

a. Keowee unit supplies 75 MW of generation at t=0. The lake net heads are 140' for Case 5H and 113' for Case 5L.

b. Keowee unit rejects 75 MW of loads at t=60cy.

c. Keowee unit is accepting Oconee Unit 1 LOCA & 1 CBP and Unit 2 LOOP when the system frequency has slowed down to 1.10 pu. Based on the results of Reference 3 (p.91), this time is t=952cy for Case 5H and t=1190cy for Case 5L. CT4 inrush is included for this scenario.

d. Keowee accepts Unit 3 LOOP nine seconds after accepting Units 1 and 2 loads, at t=1492cy for Case 5H and t=1730cy for Case 5L. This time is selected because under a certain lake and load condition, it may take up to 22 seconds following a load rejection for the system frequency to slow down to 1.10 pu. Under this condition, Units 1 and 2 loads would be energized at 22 seconds followed by Unit 3 at 31 seconds, resulting in a nine-second separation between the two sequences.

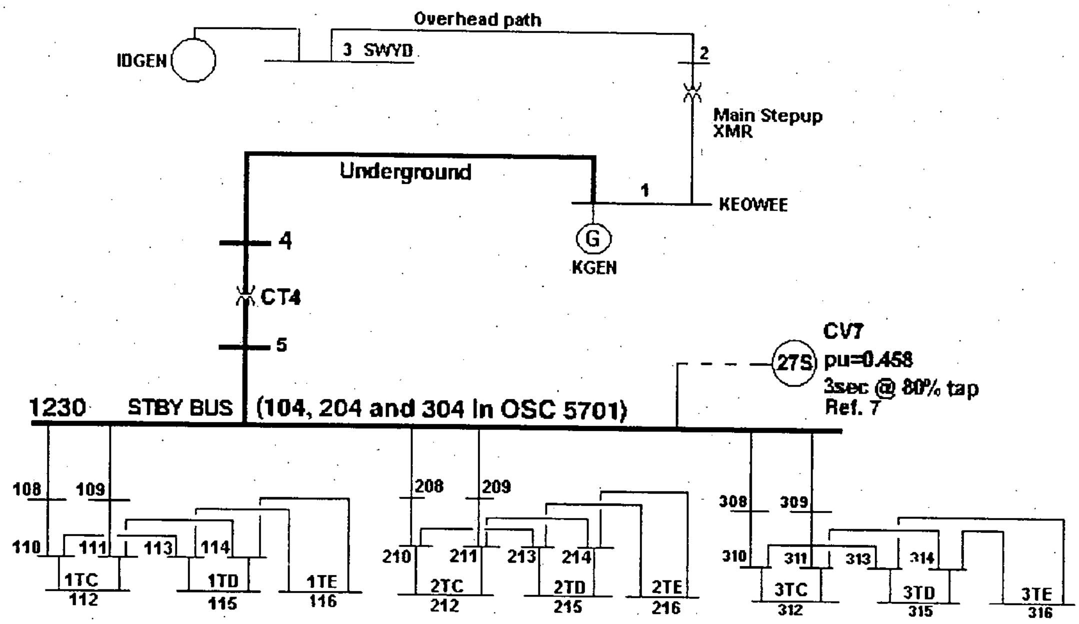
Summary of Cases Being Examined (nh: net head, SST: steady state)

Cases	Description	PL Files	SF Files	SO files
Case 1H	nh=140', t=0 SST, t=60cy 3-unit start	UH00L123	UH00L123	ONUGP00
Case 1L	nh=113', t=0 SST, t=60cy 3-unit start	UL00L123	UL00L123	ONUGP00
Case 2H	nh=140', t=0 SST t=60cy U1* t=1260cy U2 and U3	UH00L1	UH00L1	ONUGP00
Case 2L	nh=113', t=0 SST t=60cy U1* t=1260cy U2 and U3	UL00L1	UL00L1	ONUGP00
Case 3H	nh=140', t=0 SST, t=60cy U1* and voltage regulator failed	UH00L1RF	UH00L1RF	ONUGP00
Case 3L	nh=113', t=0 SST, t=60cy U1* and voltage regulator failed	UL00L1RF	UL00L1RF	ONUGP00
Case 4H	nh=140', t=60cy 75MW rejection, t=952cy U1*, Freq=1.10 pu t=1492cy U2 and U3	UH75L1	UH75L1	ONUGP75
Case 4L	nh=113', t=60cy 75MW rejection, t=1190cy U1*, Freq=1.10 pu t=1730cy U2 and U3	UL75L1	UL75L1	ONUGP75
Case 5H	nh=140', t=60cy 75MW rejection, t=952cy U1*+U2, Freq=1.10 pu t=1492cy U3	UH75L12	UH75L12	ONUGP75
Case 5L	nh=113', t=60cy 75MW rejection, t=1190cy U1*+U2, Freq=1.10 pu t=1730cy U3	UL75L12	UL75L12	ONUGP75

Note: U1*= Oconee Unit 1 LOCA loads + 1 CBP
U2= Oconee Unit 2 LOOP loads
U3= Oconee Unit 3 LOOP loads

6.1 SINGLE LINE AND LOADS

Since Oconee loads are the same whether they are fed via the overhead or the underground path, the single line diagrams for both circuits are very similar. Circuit connection from Keowee to 4 KV switchgears is shown in the diagram below. Beyond the 4KV gears, use single line diagrams shown in Reference 3, p16-19.



Bus 5-1230: Same as Bus 2-3 in Ref. 4, p65 & 68; use NSB4-3 from Ref. 2, p5 with length=32/1000.

6.2 CYME MODEL

6.2.1 Components :

In addition to the components already listed in References 2 (p4-6) and 3 (p6-8), the following components are needed to build a network file for this calculation. Default values provided by Cyme for zero sequence impedances are not used in this calculation and have not been verified.

1. Cables, (ONKWUG),
2. Transformer (CT4)

LINE or CABLE DATA

ID Tag	ONKWUG	KV level	15.00
Type		Size	500MCM
Length	1.00	Ampacity	
R1 (set 1)	0.0508*	R0 (set 1)	
X1	0.1858*	X0	
B1		B0	
R1 (set 2)		R0 (set 2)	

* Per Reference 4, p68

FIXED TAP XMR DATA

ID Tag	CT4*	Nominal MVA	12.00
Prim. KV	13.20	Sec KV	4.16
Pos. seq. Z	0.0668	Pos Seq X/R	17.40
Zero Seq. Z		Zero Seq X/R	
Prim Conn	D	Sec Conn	Yg
Max Loading	20.00	Tap %	100
Rg 1		Rg 2	

* Per Reference 4, p77; Reference 6, p2.

6.2.2 Network File : ONUGP00.NET

This network can be developed by modifying the network file (ONOHP00.NET) from Reference 3 (p9) as follows:

1. Use Cymbase to create ONUGP00.NET based on ONOHP00.NET

2. Delete the following transformers and branches:

   CT1, CT2 and CT3
   101-103, 102-104, 103-105, 103-15, 105-106, 105-107, 15-16, and 15-17
   201-203, 202-204, 203-205, 203-25, 205-206, 205-207, 25-26, and 25-27
   301-303, 302-304, 303-305, 303-35, 305-306, 305-307, 35-36, and 35-37

3. Add underground circuit (ONKWUG) between Buses 1 and 4

4. Add transformer (CT4) between Buses 4 and 5

5. Add 32 ft of 4KV-3000A bus (NSB4-3) between Bus 5 and Bus 1230

6. Change the number for Buses 104, 204 and 304 to 1230

6.2.3 Network File - Load Flow Format : ONUGP00.NND

See Cyme manual

6.2.4 Load Flow Result Files : ONUGP00.SO and ONUGP75.SO

See Cyme manual on how to convert ONUGP00.NND to ONUGP00.SO. To obtain a load flow file where the Keowee generator is generating to the grid, simply use Cymflow and modify ONUGP00.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 file was created this way: ONUGP75.SO for use in simulating a 75 MW load rejection.

6.2.5 Motor Files :

See Reference 3, p9.

6.2.6 User Defined Models :

User defined models used in this calculation are:

a) K140.TXT and K113.TXT : governor models; see Reference 3, p10.

b) KWE1.TXT and KWE2.TXT: regulator models; see Appendix B

6.2.7 Stability Control Files :

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

6.3 CYME PC FILES

Diskettes containing all PC files (except plot files: *.PL) are included in Attachment 3. To obtain *.PL files, re-run Cymstab. The PC files are zipped into OC5952_0.zip using Pkzip as follows:

PKZIP -& A:\OC5952_0.ZIP C:\CYONUG*.*

To recover the original PC files, unzip OC5952_0.zip from the diskettes to a hard drive using Pkunzip as follows:

PKUNZIP A:\OC5952_0.ZIP C:\CYONUG\

Directory and sub-directory names are used as examples only.

7.0 RESULTS OF THE SIMULATION

Results shown in Tables 7a, 7b, and 7c were read directly from screen plots. Hard copies of some selected plots are included in Appendix C and Attachment 1. The results are then compared with the following criteria to determine the operability of the Oconee auxiliary power system.

1.0 At 4KV level, voltages on Switchgear 1TD (Bus 115) are compared against the setting of the 27S relay to determine the effects of transient voltages on the relay operation. Actually, the 27S relay are connected to the standby bus, not SWGR 1TD. However, using the voltage on SWGR 1TD will provide a conservative evaluation. Per Reference 7, the 27S relays are set to pickup at 55V or 0.458pu with a time delay of 3sec @ 80% tap.

2.0 At 600V and lower, voltage at MCC XS1, XS2 and XS3 are compared with pick up and drop out voltage of contactors to determine the effects of transient voltages on contactor operations. Tests performed by GTE Sylvania (Att. 2) indicated that the pick-up and drop-out voltages are 65% and 50.2%, respectively for Size 1 contactors, and 70.2% and 40.2% for Size 5. Based on these values, a more general criteria that would cover size 1 through size 5 contactors can be derived as follows: pick-up = 71% and drop-out = 51%. In the following tables, the "ND" nomenclature means "contactors do not drop out"

3.0 For starting motors, their starting currents are compared against the setting of their associated overcurrent relays to determine the effects of transient voltage on motor operations. Although the starting currents do not remain constant (maximum value) throughout the starting period, the evaluation is based on a constant (maximum) value of the starting currents. Therefore, when the relay trip time is equal to the motor starting time as indicated in some instances in the following tables, the relay will not trip. For setting and curves of applicable overcurrent relays see Reference 3 (Attachment 5).

The following examples show how to interpret data in Tables 7a, 7b and 7c:

- V115 min, Tcy (.422@61): minimum voltage at Bus 115 is 0.422 pu at t=61cy.
- N @application (1.00@60): load applied at t=60cy and the frequency is 1.00 pu.
- N min @ Tcy (.947@380): minimum frequency is 0.947 pu at t=380cy.
- Below 0.95 for Tcy (for 153cy): the frequency dips below 0.95 but recovers to above this value within 153cy.
- Irbs 117 for Ts (4.72 for 174cy): maximum starting current for Motor 117 is 4.72 pu and the starting time for this motor is 174cy.
- Irl, Tt (2.42, 180cy@3.0): motor starting current is 2.42 times relay tap; the associated relay curve shows that at 3 times the tap, the relay will trip in 180cy.
- Ib=30.77, Irlp=60: motor base current is 30.77A and the relay tap is 60A.

Table 7a

VARIABLES	Case 1L / UL00L123.PL		Case 2L / UL00L1.PL	
	All Units @ 60cy		U1* @ 60cy	U2&3 @ 1260cy
V115 min , Tcy = 0.80 , Tcy = 0.90 , Tcy = 0.95 , Tcy 27S relay tripped?	.422 @ 61 .800 @ 246 .901 @ 272 .951 @ 286 Not tripped		.591 @ 61 .801 @ 141 .903 @ 217 .950 @ 268 Not tripped	.578 @ 1270 .800 @ 1310 .902 @ 1420 .951 @ 1430 Not tripped
N max @ Tcy N= 1.10 @ Tcy	n/a		n/a	n/a
N @application N min @ Tcy Below 0.95 for Tcy	1.000 @ 60 .9470 @ 380 for 153cy		1.00 @ 60 .966 @ 364 n/a	.989 @ 1260 .965 @ 1540 n/a
Irbs 117 for Ts Irl, Tt Ib=30.77, Irlp=60	4.72 for 174cy 2.42, 180cy@3.0 Not tripped		5.21 for 132cy 2.67, 180cy@3.0 Not tripped	Running
Ilps 118 for Ts Irl, Tt Ib=72.59, Irlp=120	4.29 for 121cy 2.60, 120cy@3.0 Not tripped		4.88 for 87cy 2.95, 120cy@3.0 Not tripped	Running
Ihpi 119, Ts Irl, Tt Ib=72.31, Irlp=120	6.19 for 206cy 3.73,300cy+@4.5 Not tripped		7.07 for 162cy 4.26,300cy+@4.5 Not tripped	Running
Ilpi 120, Ts Irl, Tt Ib=50.24, Irlp=90	3.49 for 127cy 1.95,150cy+@2.0 Not tripped		4.02 for 88cy 2.24,120cy+@2.5 Not tripped	Running
Irbf 121, Ts Irl, Tt Ib=118.8, Irlp=220	3.63 for 286cy 1.96, 480cy@2.5 Not tripped		3.72 for 249cy 2.00, 480@2.5 Not tripped	Running
Irbf 159, Ts Irl, Tt Ib=118.8, Irlp=220	3.60 for 303cy 1.94, 480cy@2.5 Not tripped		3.60 for 268cy 1.94, 480cy@2.5 Not tripped	Running
Iefw 155, Ts Irl, Tt Ib=72.17, Irlp=100	4.87 for 244cy 3.51, 300cy@4.0 Not tripped		5.03 for 204cy 3.63, 300cy@4.0 Not tripped	Running
V158-6/1XS3 min = 0.75, Tcy = 0.85, Tcy	.366 @ 61 .754 @ 256 .851 @ 280		.513 @ 61 .751 @ 150 .850 @ 256	.558 @ 1270 (ND) .751 @ 1300 .850 @ 1410
V162-2/1XS3 min = 0.75, Tcy = 0.85, Tcy	.367 @ 61 .751 @ 251 .851 @ 276		.513 @ 61 .751 @ 145 .852 @ 221	.568 @ 1270 (ND) .751 @ 1290 .850 @ 1390

V212 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	.425 @ 61 .800 @ 245 .900 @ 271 .951 @ 285		n/a	.575 @ 1270 .800 @ 1310 .902 @ 1420 .952 @ 1430
V312 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	.425 @ 61 .800 @ 245 .900 @ 271 .951 @ 285		n/a	.575 @ 1270 .800 @ 1310 .902 @ 1420 .952 @ 1430
V1 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	.800 @ 63 ... .900 @ 79 .950 @ 111		.859 @ 62 ... .900 @ 74 .951 @ 86	.866 @ 1260 ... .931 @ 1280 .952 @ 1280
Ilps 218, Ts Irl, Tt Ib=72.59, Irlp=120	4.31 for 120 cy 2.61, 120cy@3.0 Not tripped		n/a	5.08 for 80cy 3.07, 90cy+@3.5 Not tripped
Ihpi 219, Ts Irl, Tt Ib=72.31, Irlp=120	6.19 for 206cy 3.73,300cy+@4.5 Not tripped		n/a	7.22 for 160cy 4.35,300cy+@4.5 Not tripped
Iefw 237, Ts Irl, Tt Ib=72.17, Irlp=100	4.54 for 222 cy 3.28, 300@4.0 Not tripped		n/a	5.11 for 170cy 3.69, 300cy@4.0 Not tripped
Irbf 221, Ts Irl, Tt Ib=118.8, Irlp=220	3.62 for 284 cy 1.95, 480cy@2.5 Not tripped		n/a	3.76 for 240cy 2.03, 480cy@2.5 Not tripped
V258-6/2XS3 min = 0.75, Tcy = 0.85, Tcy	.424 @ 61 .751 @ 181 .852 @ 260		n/a	.574 @ 1270 .752 @ 1290 .850 @ 1380
V262-2/2XS3 min = 0.75, Tcy = 0.85, Tcy	.434 @ 61 .754 @ 177 .854 @ 257		n/a	.588 @ 1270 .752 @ 1280 .850 @ 1340
V358-6/3XS3 min = 0.75, Tcy = 0.85, Tcy	.414 @ 61 .750 @ 182 .855 @ 261		n/a	.562 @ 1270 .752 @ 1290 .850 @ 1390
V362-2/3XS3 min = 0.75, Tcy = 0.85, Tcy	.421 @ 61 .754 @ 178 .851 @ 257		n/a	.571 @ 1270 .750 @ 1290 .851 @ 1340

<u>Table 7b</u>

VARIABLES	Case 3L / UL00L1RF.PL		Case 4L / UL75L1.PL	
	U1* rf @ 60 cy	n/a	U1* @ 1190cy	U2&3 @ 1730cy
V115 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy 27S relay tripped?	.595 @ 75 .800 @ 282 .900 @ 466 .951 @ 502 Not tripped		.500 @ 1190 .800 @ 1290 .902 @ 1380 .950 @ 1430 Not tripped	.584 @ 1740 .801 @ 1770 .901 @ 1890 .953 @ 1910 Not tripped
N max, Tcy N= 1.10, Tcy	n/a		1.36 @ 587 1.10 @ 1190	n/a
N @application N min, Tcy Below 0.95 for Tcy	1.00 @ 60 .970 @ 399 ...		1.10 @ 1190 .980 @ 1540 ...	.997 @ 1730 ... ...
Irbs 117, Ts Irl, Tt Ib=30.77, Irlp=60	4.55 for 185cy 2.33, 210cy@2.5 Not tripped		5.18 for 160cy 2.66, 180cy@3.0 Not tripped	Running
Ilps 118, Ts Irl, Tt Ib=72.59, Irlp=120	4.52 for 116cy 2.73, 120cy@3.0 Not tripped		4.86 for 110cy 2.93, 120cy@3.0 Not tripped	Running
Ihpi 119, Ts Irl, Tt Ib=72.31, Irlp=120	6.62 for 226cy 3.99,300cy+@4.5 Not tripped		7.02 for 190cy 4.23,300cy+@4.5 Not tripped	Running
Ilpi 120, Ts Irl, Tt Ib=50.24, Irlp=90	3.77 for 128cy 2.10, 150cy@2.1 Not tripped		4.01 for 120cy 2.23,120cy+@2.5 Not tripped	Running
Irbf 121, Ts Irl, Tt Ib=118.8, Irlp=220	3.25 for 325cy 1.76, 480cy@2.5 Not tripped		3.66 for 280cy 1.97, 480cy@2.5 Not tripped	Running
Irbf 159, Ts Irl, Tt Ib=118.8, Irlp=220	3.13 for 348cy 1.69, 480cy@2.5 Not tripped		3.58 for 300cy 1.93, 480cy@2.5 Not tripped	Running
Iefw 155, Ts Irl, Tt Ib=72.17, Irlp=100	4.66 for 303cy 3.36, 390cy@3.5 Not tripped		5.02 for 240cy 3.62, 300cy@4.0 Not tripped	Running
V158-6/1XS3 min = 0.75, Tcy = 0.85, Tcy	.520 @ 61 .750 @ 307 .851 @ 406		.430 @ 1190 .750 @ 1310 .850 @ 1410	.564 @ 1740 (ND) .750 @ 1760 .851 @ 1880
V162-2/1XS3 min = 0.75, Tcy = 0.85, Tcy	.520 @ 61 .750 @ 286 .850 @ 396		.430 @ 1190 .750 @ 1300 .851 @ 1380	.573 @ 1740 (ND) .750 @ 1760 .850 @ 1850
V212 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	n/a		n/a	.581 @ 1740 .801 @ 1770 .901 @ 1890 .954 @ 1910

V312 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	n/a		n/a	.582 @ 1740 .800 @ 1770 .901 @ 1890 .954 @ 1910
V1 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	.840 @ 157 ... .900 @ 361 .951 @ 509		.775 @ 1190 .858 @ 1200 .901 @ 1200 .951 @ 1210	.881 @ 1730 .... .901 @ 1740 .952 @ 1750
Ilps 218, Ts Irl, Tt Ib=72.59, Irlp=120	n/a		n/a	5.13 for 80cy 3.10, 90cy+@3.5 Not tripped
Ihpi 219, Ts Irl, Tt Ib=72.31, Irlp=120	n/a		n/a	7.30 for 160cy 4.40, 300cy+@4.5 Not tripped
Iefw 237, Ts Irl, Tt Ib=72.17, Irlp=100	n/a		n/a	5.16 for 180cy 3.72, 300cy@4.0 Not tripped
Irbf 221, Ts Irl, Tt Ib=118.8, Irlp=220	n/a		n/a	3.79 for 250cy 2.04, 480cy@2.5 Not tripped
V258-6/2XS3 min = 0.75, Tcy = 0.85, Tcy	n/a		n/a	.580 @ 1740 .750 @ 1750 .850 @ 1820
V262-2/2XS3 min = 0.75, Tcy = 0.85, Tcy	n/a		n/a	.594 @ 1740 .750 @ 1750 .850 @ 1810
V358-6/3XS3 min = 0.75, Tcy = 0.85, Tcy	n/a		n/a	.568 @ 1740 .752 @ 1760 .850 @ 1840
V362-2/3XS3 min = 0.75, Tcy = 0.85, Tcy	n/a		n/a	.578 @ 1740 .751 @ 1750 .852 @ 1810

Table 7c

VARIABLES	Case 5L / UL75L12.PL		Case 5H / UH75L12.PL	
	U1*,U2@1190cy	U3 @ 1730cy	U1*,U2@952cy	U3 @ 1492cy
V115 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy 27S relay tripped?	.406 @ 1190 .801 @ 1380 .900 @ 1420 .950 @ 1480 Not tripped	.737 @ 1740 .821 @ 1750 .900 @ 1790 .950 @ 1870 Not tripped	.406 @ 955 .800 @ 1130 .901 @ 1170 .951 @ 1220 Not tripped	.733 @ 1500 .816 @ 1510 .900 @ 1550 .950 @ 1640 Not tripped
N max, Tcy N= 1.10, Tcy	1.36 @ 587 1.10 @ 1190	n/a	1.32 @ 496 1.10 @ 952	n/a
N @application N min, Tcy Below 0.95 for Tcy	1.10 @ 1190 .967 @1560 n/a	.986 @ 1730 n/a n/a	1.10 @ 952 .950 @ 1260 n/a	.999 @ 1490 n/a n/a
Irbs 117, Ts Irl, Tt Ib=30.77, Irlp=60	4.80 for 190cy 2.46, 210cy@ 2.5 Not tripped	Running	4.82 for 178cy 2.47, 210cy@2.5 Not tripped	Running
Ilps 118, Ts Irl, Tt Ib=72.59, Irlp=120	4.43 for 130cy 2.68, 135cy[1] Not tripped	Running	4.43 for 128cy 2.68, 135cy[1] Not tripped	Running
Ihpi 119, Ts Irl, Tt Ib=72.31, Irlp=120	6.33 for 230cy 3.81,300cy+@4.5 Not tripped	Running	6.32 for 208cy 3.81,300cy+@4.5 Not tripped	Running
Ilpi 120, Ts Irl, Tt Ib=50.24, Irlp=90	3.63 for 150cy 2.03, 150cy@2.1 Not tripped	Running	3.62 for 138cy 2.03, 150cy@2.1 Not tripped	Running
Irbf 121, Ts Irl, Tt Ib=118.8, Irlp=220	3.50 for 310cy 1.89, 480cy@2.5 Not tripped	Running	3.53 for 298cy 1.91, 480cy@2.5 Not tripped	Running
Irbf 159, Ts Irl, Tt Ib=118.8, Irlp=220	3.46 for 330cy 1.87, 480cy@2.5 Not tripped	Running	3.48 for 318cy 1.88, 480cy@2.5 Not tripped	Running
Iefw 155, Ts Irl, Tt Ib=72.17, Irlp=100	4.84 for 280cy 3.49, 300@4.0 Not tripped	Running	4.83 for 248cy 3.49, 300@4.0 Not tripped	Running
V158-6/1XS3 min = 0.75, Tcy = 0.85, Tcy	.350 @ 1190 .751 @ 1400 .853 @ 1460	.715 @ 1740 (ND) .802 @ 1750 .856 @ 1760	.349 @ 954 .752 @ 1150 .850 @ 1200	.710 @1500 (ND) .787 @ 1510 .851 @ 1520
V162-2/1XS3 min = 0.75, Tcy = 0.85, Tcy	.350 @ 1190 .751 @ 1390 .851 @ 1430	.729 @ 1740 (ND) .808 @ 1750 .852 @ 1750	.350 @ 954 .750 @ 1140 .850 @ 1180	.724 @1500 (ND) .802 @ 1510 .851 @ 1520

[1] Interpolation between 120cy@3.0 and 144cy@2.5

V212 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	.410 @ 1190 .800 @ 1380 .900 @ 1420 .950 @ 1480	.737 @ 1740 .822 @ 1750 .900 @ 1790 .950 @ 1860	.409 @ 955 .800 @ 1120 .900 @ 1170 .950 @ 1210	.733 @ 1500 .817 @ 1510 .900 @ 1550 .950 @ 1640
V312 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	n/a	.732 @ 1740 .820 @ 1750 .901 @ 1790 .950 @ 1870	n/a	.728 @ 1500 .815 @ 1510 .901 @ 1560 .950 @ 1640
V1 min, Tcy = 0.80, Tcy = 0.90, Tcy = 0.95, Tcy	.746 @ 1190 .820 @ 1200 .904 @ 1210 .950 @ 1220	.929 @ 1740 ... ... .969 @ 1750	.745 @ 956 .818 @ 958 .901 @ 968 .950 @ 985	.931 @ 1500 ... ... .971 @ 1510
Ilps 218, Ts Irl, Tt Ib=72.59, Irlp=120	4.45 for 130cy 2.69,135cy (p.15) Not tripped	Running	4.45 for 128cy 2.69,135cy (p.15) Not tripped	Running
Ihpi 219, Ts Irl, Tt Ib=72.31, Irlp=120	6.37 for 220cy 3.84,300cy+@4.5 Not tripped	Running	6.36 for 208cy 3.84,300cy+@4.5 Not tripped	Running
Iefw 237, Ts Irl, Tt Ib=72.17, Irlp=100	4.55 for 240cy 3.28, 300cy@4.0 Not tripped	Running	4.61 for 228cy 3.33, 300cy@4.0 Not tripped	Running
Irbf 221, Ts Irl, Tt Ib=118.8, Irlp=220	3.49 for 310cy 1.88, 480cy@2.5 Not tripped	Running	3.53 for 288cy 1.91, 480cy@2.5 Not tripped	Running
V258-6/2XS3 min = 0.75, Tcy = 0.85, Tcy	.409 @ 1190 .750 @ 1320 .853 @ 1410	.736 @ 1740 (ND) .821 @ 1750 .850 @ 1750	.408 @ 955 .752 @ 1070 .851 @ 1150	.732 @ 1500 (ND) .816 @ 1510 .852 @ 1510
V262-2/2XS3 min = 0.75, Tcy = 0.85, Tcy	.418 @ 1190 .751 @ 1310 .850 @ 1400	.754 @ 1740 (ND) ... .856 @ 1750	.416 @ 955 .750 @ 1070 .850 @ 1150	.750 @ 1500 ... .852 @ 1510
V358-6/3XS3 min = 0.75, Tcy = 0.85, Tcy	n/a	.715 @ 1740 .802 @ 1750 .854 @ 1760	n/a	.711 @ 1500 .797 @ 1510 .850 @ 1520
V362-2/3XS3 min = 0.75, Tcy = 0.85, Tcy	n/a	.728 @ 1740 .816 @ 1750 .851 @ 1750	n/a	.724 @ 1500 .810 @ 1510 .853 @ 1520

APPENDIX A: STABILITY CONTROL FILES

Each of the following control files contains the same No. 4 cards. To reduce the amount of prints, all No. 4 cards are listed only in the first file. In the subsequent files, only a few No. 4 cards are listed to show where the rest of the No. 4 cards should be.

81UH00L123.SF:Keowee UGP,@0cy 0MWLR,@60cy U1+U2+U3, nh=140'

```
90        1  1  1  1  1  1  1  1  1  1
92    1
93   117   118   119   120   121   133   134
93   135   136   137   140   153   154   155   159   115
93   218   219   221   237   240   255
93   318   319   321   337   340   355
95   1
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
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
95 312
95 329
95 322
95 326
95 325
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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
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
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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
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
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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
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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
 .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
04 115           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:\cyonug\
00    1.
11KWE1.TXT      1111111C:\cyonug\
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.
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	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	75.	
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

81UL00L123.SF:Keowee UGP,@0cy 0MWLR,@60cy U1+U2+U3, nh=113'

```
90        1  1  1  1  1  1  1  1  1  1
92    1
93   117   118   119   120   121   133   134
93   135   136   137   140   153   154   155   159   115
93   218   219   221   237   240   255
93   318   319   321   337   340   355
95   1
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
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
95 312
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
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:\cyonug\
00    1.
11KWE1.TXT      1111111C:\cyonug\
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.
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	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	75.	
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

81UH00L1.SF:Keowee UGP,@0cy SST, @60cy U1*, @1260cy U2&U3, nh=140'

90		1 1	1 1	1 1	1 1	1 1				
92	1									
93	117	118	119	120	121	133	134			
93	135	136	137	140	153	154	155	159	115	
93	218	219	221	237	240	255				
93	318	319	321	337	340	355				
95	1									

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
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
95 312
95 329
95 322
95 326
95 325
95 327
95 315
95 338
95 339
95 341
95 342

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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
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 ...
   ...
   ...
11K140.TXT      1111111C:\cyonug\
00    1.
11KWE1.TXT      1111111C:\cyonug\
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.
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   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
31 75.
36 128            3.54
36 152            1.06
36 131            5.31
36 151            5.31
36 132            3.54
31 1260.
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   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	1275.	
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

81UL00L1.SF:Keowee UGP,@0cy 0MWLR, @60cy U1*, @1260cy U2&U3, nh=113'

90		1	1	1	1	1	1	1	1	1	1
92	1									
93	117	118	119	120	121	133	134			
93	135	136	137	140	153	154	155	159	115	
93	218	219	221	237	240	255				
93	318	319	321	337	340	355				

95 1
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
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
95 312
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
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:\cyonug\
00    1.
11KWE1.TXT      1111111C:\cyonug\
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.
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   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
31 75.
36 128              3.54
36 152              1.06
36 131              5.31
36 151              5.31
36 132              3.54
31 1260.
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    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	1275.	
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

81UH00L1RF.SF:Keowee UGP,@0cy 0MWLR, @60cy U1*, Regulator Failed, nh=140'

```
90         1  1  1  1  1  1  1  1  1  1
92     1
93   117   118   119   120   121   133   134
93   135   136   137   140   153   154   155   159   115
95   1
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. 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
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 ...
   ...
   ...
11K140.TXT       1111111C:\cyonug\
00     1.
11KWE2.TXT       1111111C:\cyonug\
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.
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	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	
31	75.	
36	128	3.54
36	152	1.06
36	131	5.31
36	151	5.31
36	132	3.54

81UL00L1RF.SF:Keowee UGP,@0cy 0MWLR, @60cy U1*, Regulator Failed, nh=113'

```
90        1  1  1  1  1  1  1  1  1  1
92    1
93   117   118   119   120   121   133   134
93   135   136   137   140   153   154   155   159   115
95   1
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. 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
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:\cyonug\
00    1.
11KWE2.TXT     1111111C:\cyonug\
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.
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	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	
31	75.	
36	128	3.54
36	152	1.06
36	131	5.31
36	151	5.31
36	132	3.54

81UH75L1.SF:Keowee UGP,@60cy 75MWLR, @952cy U1*, @1492cy U2&U3 nh=140'

90		1 1	1 1	1 1	1 1	1 1			
92	1	3							
93	117	118	119	120	121	133	134		
93	135	136	137	140	153	154	155	159	115
93	218	219	221	237	240	255			
93	318	319	321	337	340	355			
95	1								
95	3								
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								
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	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
00  0.49 0.142   3.2       0.477 0.155   1.2   1.0 0.235 0.035 0.035
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 ...
   ...
   ...
11K140.TXT     1111111C:\cyonug\
00    1.
11KWE1.TXT     1111111C:\cyonug\
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
31 952.
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 4               -42.48
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   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
31 957
36 4               42.48
31 967.
36 128              3.54
36 152              1.06
36 131              5.31
36 151              5.31
36 132              3.54
31 1492.
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	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	1507.	
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

81UL75L1.SF:Keowee UGP,@60cy 75MWLR, @1190cy U1*, @1730cy U2&U3 nh=113'

90	1	1	1	1	1	1	1	1	1	1
92	1	3								
93	117	118	119	120	121	133	134			
93	135	136	137	140	153	154	155	159	115	
93	218	219	221	237	240	255				
93	318	319	321	337	340	355				
95	1									
95	3									
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									
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	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
00  0.49 0.142   3.2        0.477 0.155   1.2   1.0 0.235 0.035 0.035
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:\cyonug\
00    1.
11KWE1.TXT      1111111C:\cyonug\
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
31 1190.
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 4                -42.48
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	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	
31	1195.	
36	4	42.48
31	1205.	
36	128	3.54
36	152	1.06
36	131	5.31
36	151	5.31
36	132	3.54
31	1730.	
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	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	1745.	
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

81UH75L12.SF:Keowee UGP,@60cy 75MWLR, @952cy U1*+U2, @1492cy U3 nh=140'

```
90        1  1  1  1  1  1  1  1  1  1
92    1     3
93  117   118   119   120   121   133   134
93  135   136   137   140   153   154   155   159   115
93  218   219   221   237   240   255
93  318   319   321   337   340   355
95    1
95    3
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
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  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
00  0.49 0.142   3.2       0.477 0.155   1.2   1.0 0.235 0.035 0.035
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 ...
   ...
   ...
11K140.TXT       1111111C:\cyonug\
00    1.
11KWE1.TXT       1111111C:\cyonug\
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
31 952.
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 4                  -42.48
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
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	
31	957.	
36	4	42.48
31	967.	
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
31	1492.	
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	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	1507.	
36	331	5.31
36	332	3.54
36	328	3.54
36	351	5.31
36	352	1.06

81UL75L12.SF:Keowee UGP,@60cy 75MWLR, @1190cy U1*+U2, @1730cy U3 nh=113'

```
90        1  1  1  1  1  1  1  1  1  1
92    1     3
93  117   118   119   120   121   133   134
93  135   136   137   140   153   154   155   159   115
93  218   219   221   237   240   255
93  318   319   321   337   340   355
95   1
95   3
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
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
95 312
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
00  0.49 0.142   3.2        0.477 0.155   1.2   1.0 0.235 0.035 0.035
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:\cyonug\
00    1.
11KWE1.TXT      1111111C:\cyonug\
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
31 1190.
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 4                  -42.48
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
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	
31	1195.	
36	4	42.48
31	1205.	
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
31	1730.	
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	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	1745.	
36	331	5.31
36	332	3.54
36	328	3.54
36	351	5.31
36	352	1.06

APPENDIX B: USER DEFINED MODELS

For this calculation the governor models are the same as the models used in Reference 3, p10. These models are K140.TXT and K113.TXT. For the exciter model, there are small modifications done to the original model KWEX.TXT shown in References 2, p23. The first modified version is KWE1.TXT which includes a statement to report the steady state value of field voltage EFD. The second modified version is KWE2.TXT which includes statements that make field voltage EFD constant and equal to the steady state value. This version is used to simulate a case where the regulator fails and the field voltage remains constant. The listings of all three exciter models are as follows:

1. KWEX.TXT

```
PST,IG,TR,VIMAX,VIMIN,TC,TB,KA,TA,VRMAX,VRMIN,KC,KF,TF
P,VVLR,1.06
P,KVL,120.0
P,TVL,0.05
P,KVF,1.0
P,IB,IBGEN(IG)
P,EFD0,EFD0(IG)
P,VT0,VT0(IB)
P,IFD0,EI0(IG)
P,UPPER0,VT0*VRMAX-KC*IFD0
P,LOWER0,VT0*VRMIN-KC*IFD0
P,VREF,VT0+EFD0/KA

TENS,VT,IB
FILT,VT,VT1,1.0,TR
+,VT1,VERR,1.0,1.0,VREF
=,VS,0.0
+,VERR,VS,VF,VI,1.0,1.0,-1.0,-1.0,0.0
LIM,VI,VIM,VIMIN,VIMAX
TR,VIM,VR1,1.0,TC,1.0,TB
TR,VR1,VRR,KA,0.0,1.0,TA
MIN,VRR,VOEL,VR
FREQ,FREQ,IB
FILT,FREQ,FT,1.0,0.08
/,VT,FT,FTT,1.0,1.0
+,FTT,VF,VLL,1.0,KVF,1.0,VVLR
TR,VLL,VOEL,KVL,0.0,1.0,TVL
DER,VR,VRD,KF,0.0
FILT,VRD,VF,1.0,TF
EIG,IFD,IG
+,UPPER,IFD,VT,1.0,KC,-VRMAX,0.0
+,LOWER,IFD,VT,1.0,KC,-VRMIN,0.0
LIM,VR,EFD,LOWER,UPPER,EFD0
EFD,EFD,IG,EFD0
RAPP,VERR,VR,VOEL,FT,FTT,UPPER,LOWER,VIM
```

2. KWE1.TXT

```
PST,IG,TR,VIMAX,VIMIN,TC,TB,KA,TA,VRMAX,VRMIN,KC,KF,TF
P,VVLR,1.06
P,KVL,120.0
P,TVL,0.05
P,KVF,1.0
P,IB,IBGEN(IG)
P,EFD0,EFD0(IG)
P,VT0,VT0(IB)
P,IFD0,EI0(IG)
P,UPPER0,VT0*VRMAX-KC*IFD0
P,LOWER0,VT0*VRMIN-KC*IFD0
P,VREF,VT0+EFD0/KA

TENS,VT,IB
FILT,VT,VT1,1.0,TR
+,VT1,VERR,1.0,1.0,VREF
=,VS,0.0
+,VERR,VS,VF,VI,1.0,1.0,-1.0,-1.0,0.0
LIM,VI,VIM,VIMIN,VIMAX
TR,VIM,VR1,1.0,TC,1.0,TB
TR,VR1,VRR,KA,0.0,1.0,TA
MIN,VRR,VOEL,VR
FREQ,FREQ,IB
FILT,FREQ,FT,1.0,0.08
/,VT,FT,FTT,1.0,1.0
+,FTT,VF,VLL,1.0,KVF,1.0,VVLR
TR,VLL,VOEL,KVL,0.0,1.0,TVL
DER,VR,VRD,KF,0.0
FILT,VRD,VF,1.0,TF
EIG,IFD,IG
+,UPPER,IFD,VT,1.0,KC,-VRMAX,0.0
+,LOWER,IFD,VT,1.0,KC,-VRMIN,0.0
LIM,VR,EFD,LOWER,UPPER,EFD0
EFD,EFD,IG,EFD0
RAPP,VERR,VR,EFD,VOEL,FT,FTT,UPPER,LOWER,VIM
```

3. KWE2.TXT

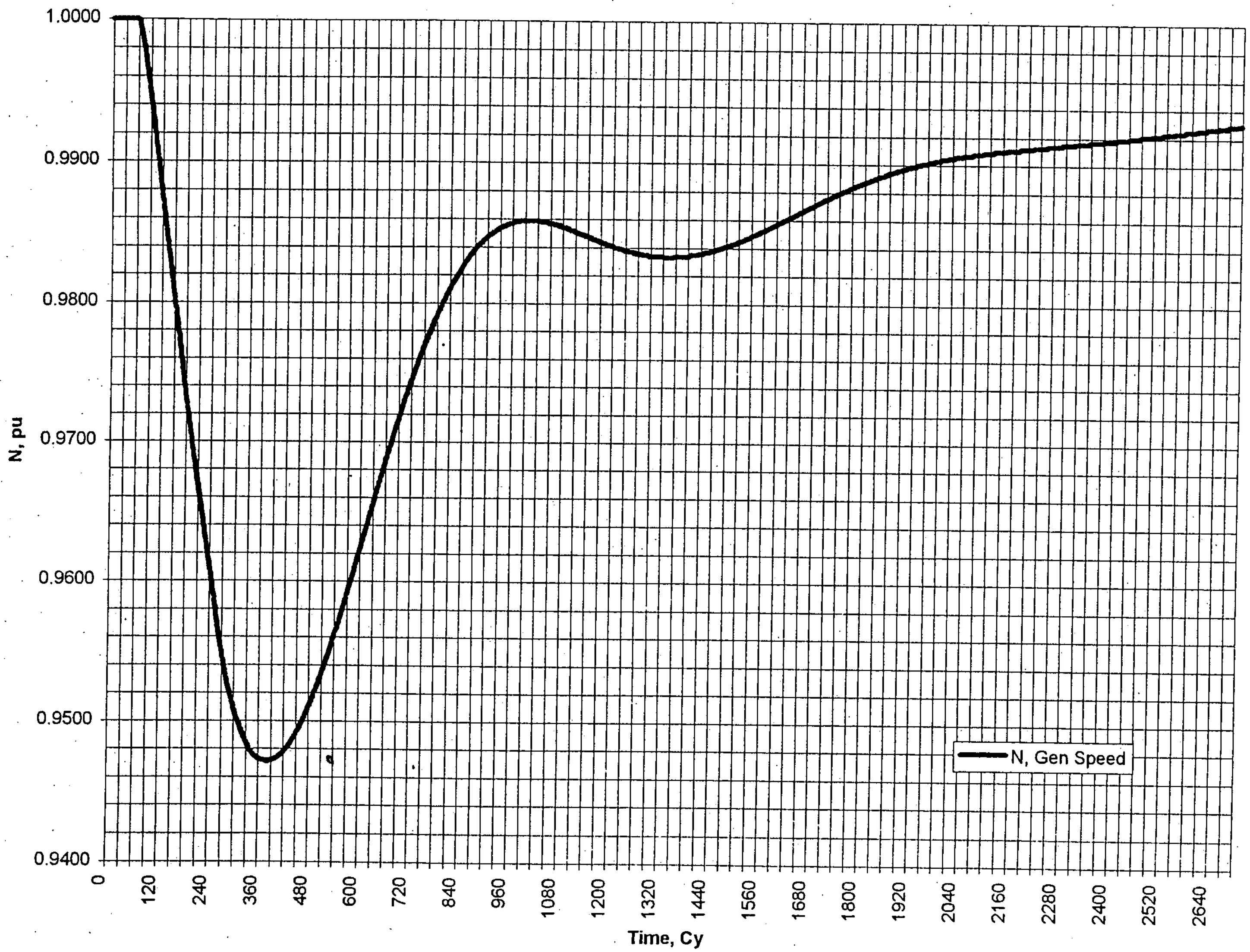
```
PST,IG,TR,VIMAX,VIMIN,TC,TB,KA,TA,VRMAX,VRMIN,KC,KF,TF
P,VVLR,1.06
P,KVL,120.0
P,TVL,0.05
P,KVF,1.0
P,IB,IBGEN(IG)
P,EFD0,EFD0(IG)
P,VT0,VT0(IB)
P,IFD0,EI0(IG)
P,UPPER0,VT0*VRMAX-KC*IFD0
P,LOWER0,VT0*VRMIN-KC*IFD0
P,VREF,VT0+EFD0/KA

TENS,VT,IB
FILT,VT,VT1,1.0,TR
+,VT1,VERR,1.0,1.0,VREF
=,VS,0.0
+,VERR,VS,VF,VI,1.0,1.0,-1.0,-1.0,0.0
LIM,VI,VIM,VIMIN,VIMAX
TR,VIM,VR1,1.0,TC,1.0,TB
TR,VR1,VRR,KA,0.0,1.0,TA
MIN,VRR,VOEL,VR
FREQ,FREQ,IB
FILT,FREQ,FT,1.0,0.08
/,VT,FT,FTT,1.0,1.0
+,FTT,VF,VLL,1.0,KVF,1.0,VVLR
TR,VLL,VOEL,KVL,0.0,1.0,TVL
DER,VR,VRD,KF,0.0
FILT,VRD,VF,1.0,TF
EIG,IFD,IG
+,UPPER,IFD,VT,1.0,KC,-VRMAX,0.0
+,LOWER,IFD,VT,1.0,KC,-VRMIN,0.0
LIM,VR,EFD,LOWER,UPPER,EFD0
=,X,1.1552
EFD,X,IG,EFD0
RAPP,VERR,VR,EFD,VOEL,FT,FTT,UPPER,LOWER,VIM
```

APPENDIX C : OUTPUT IN EXCEL CHART FORMAT

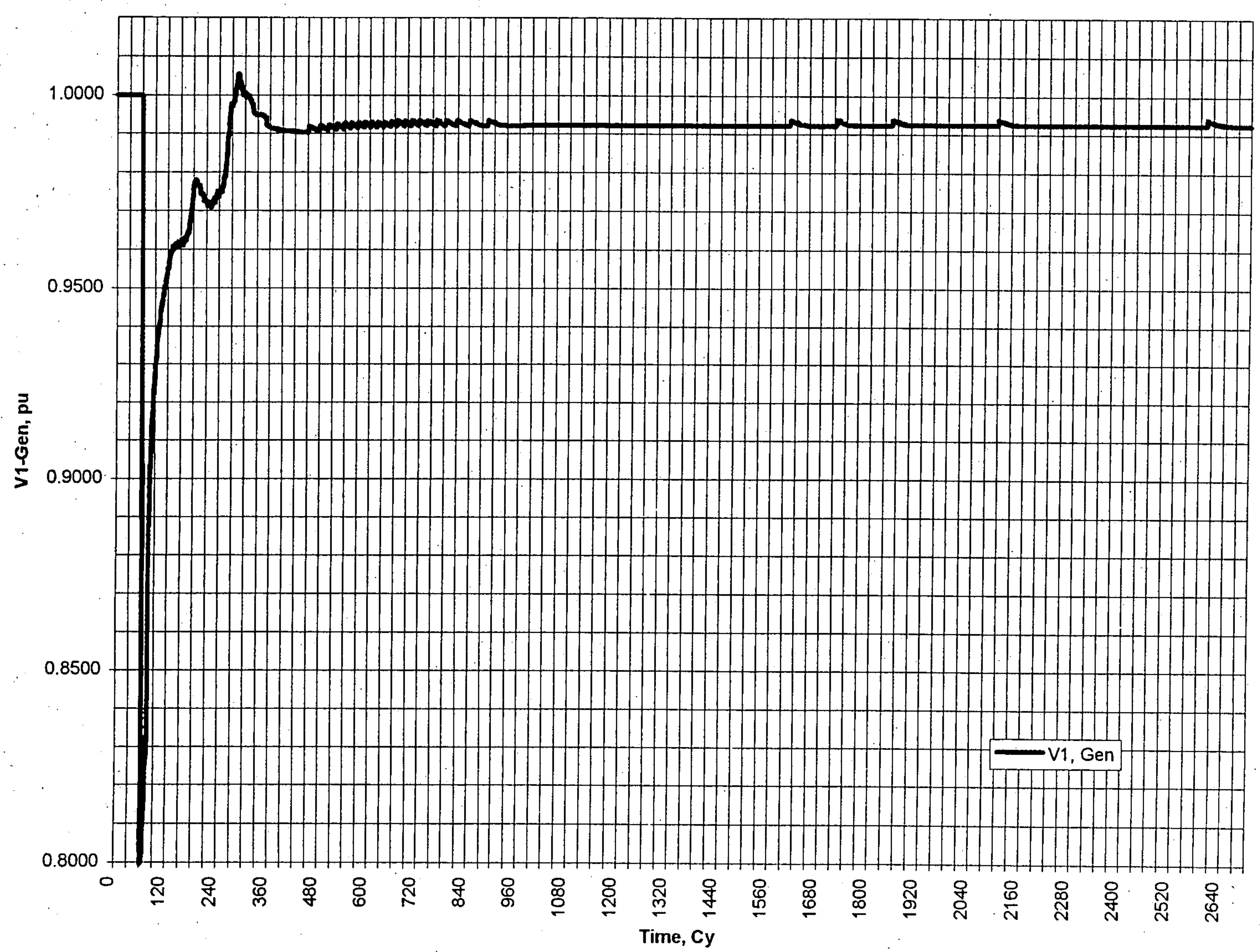
The following pages contain selected plots of the Cyme results given in Excel-chart format.

Case 1L - UL00L123.XLS



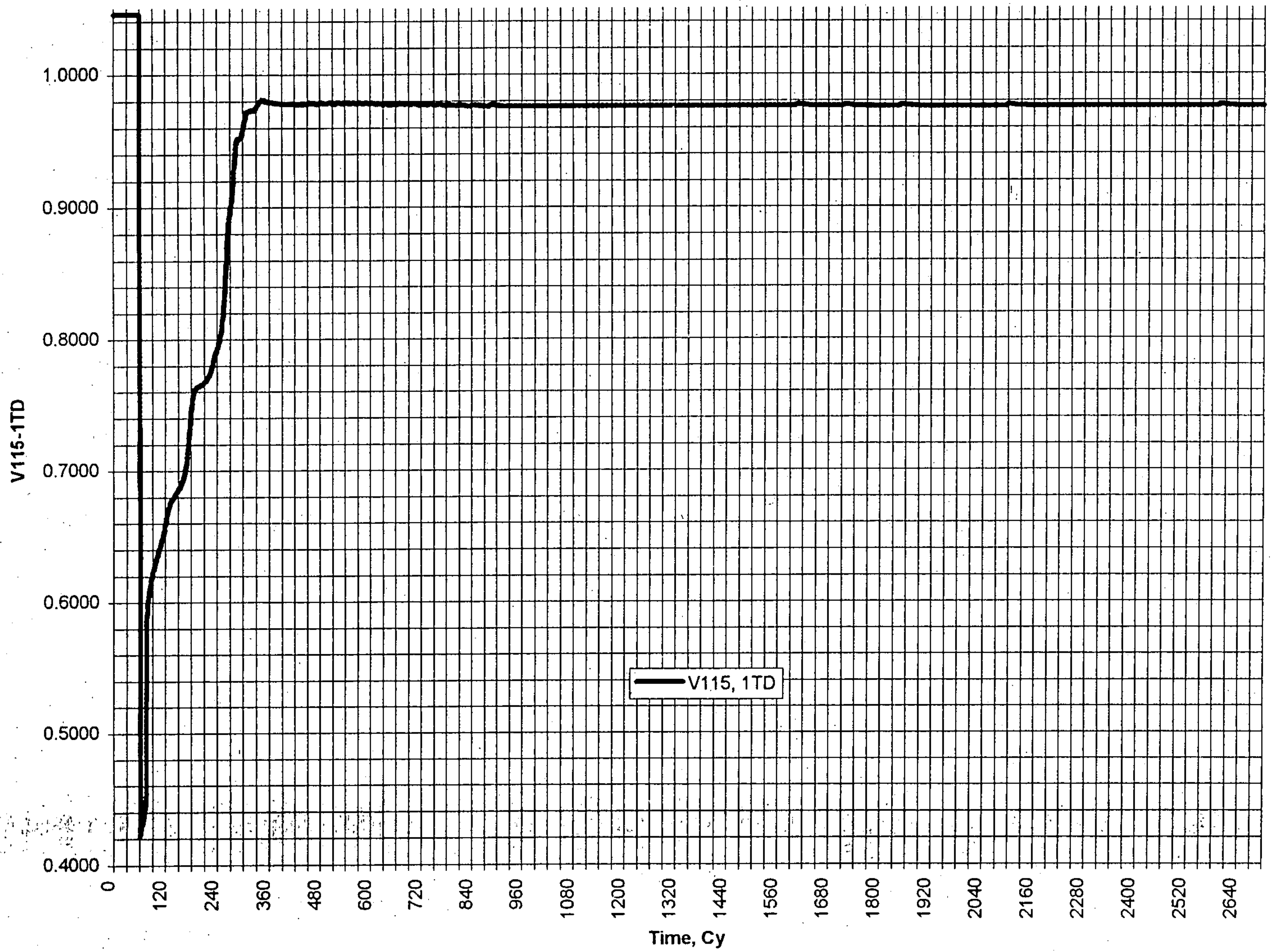
By: SC 5/22/95
Checked: DTG 5/23/95

Case 1L - UL00L123.XLS



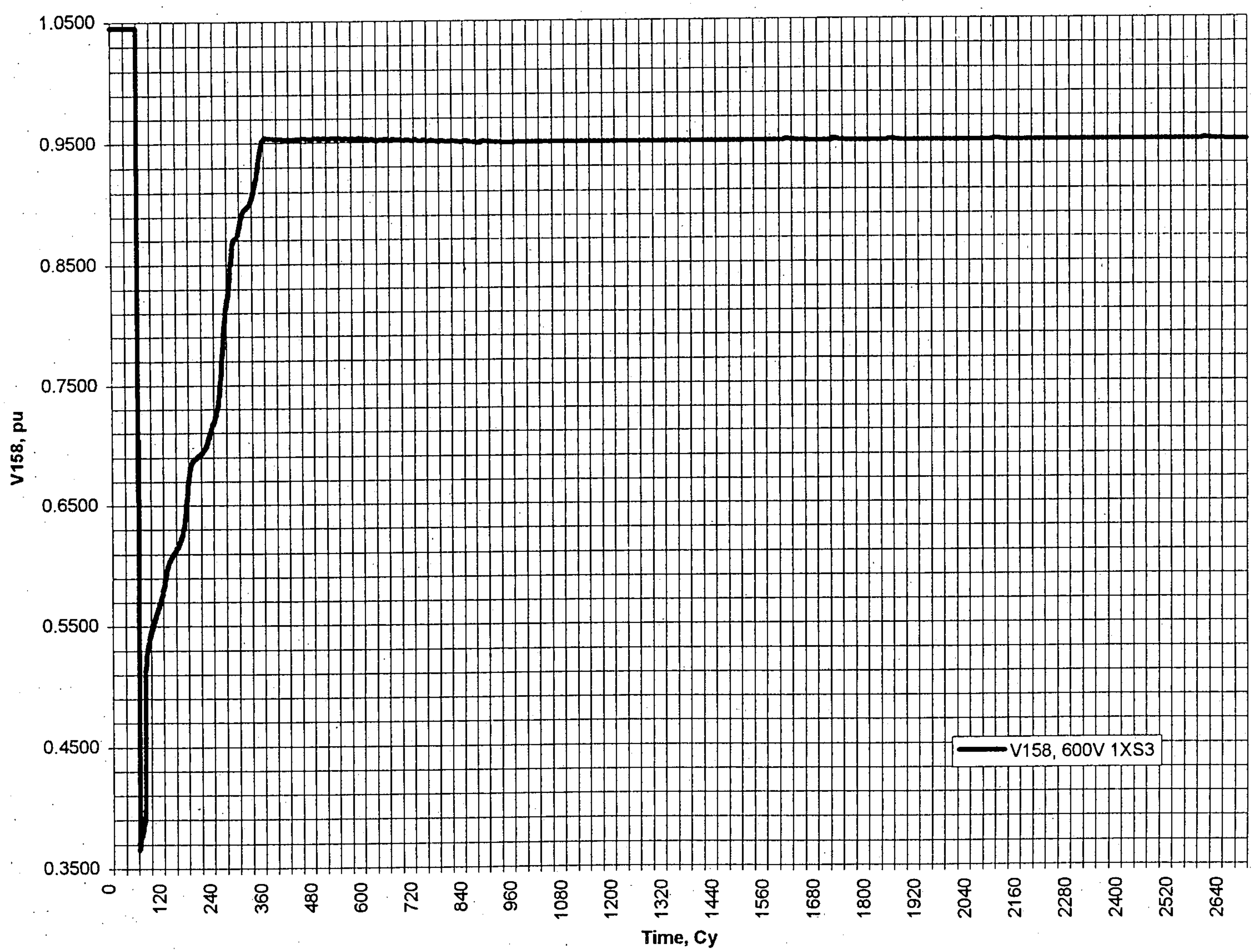
By: SC 5/22/95
Checked: DTG 5/23/95

Case 1L - UL00L123.XLS



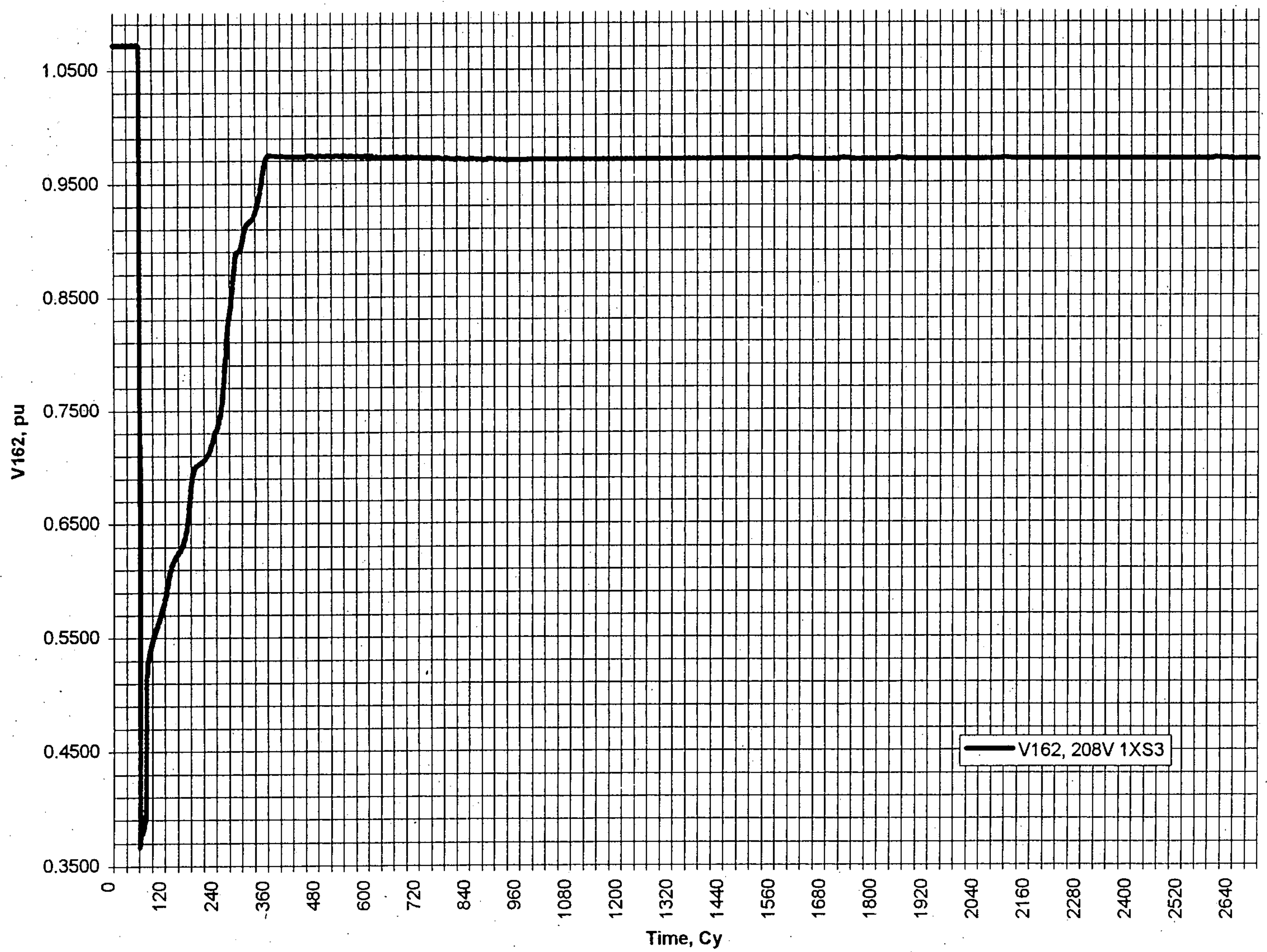
By: SC 5/22/95
Checked: DTG 5/23/95

Case 1L - UL00L123.XLS



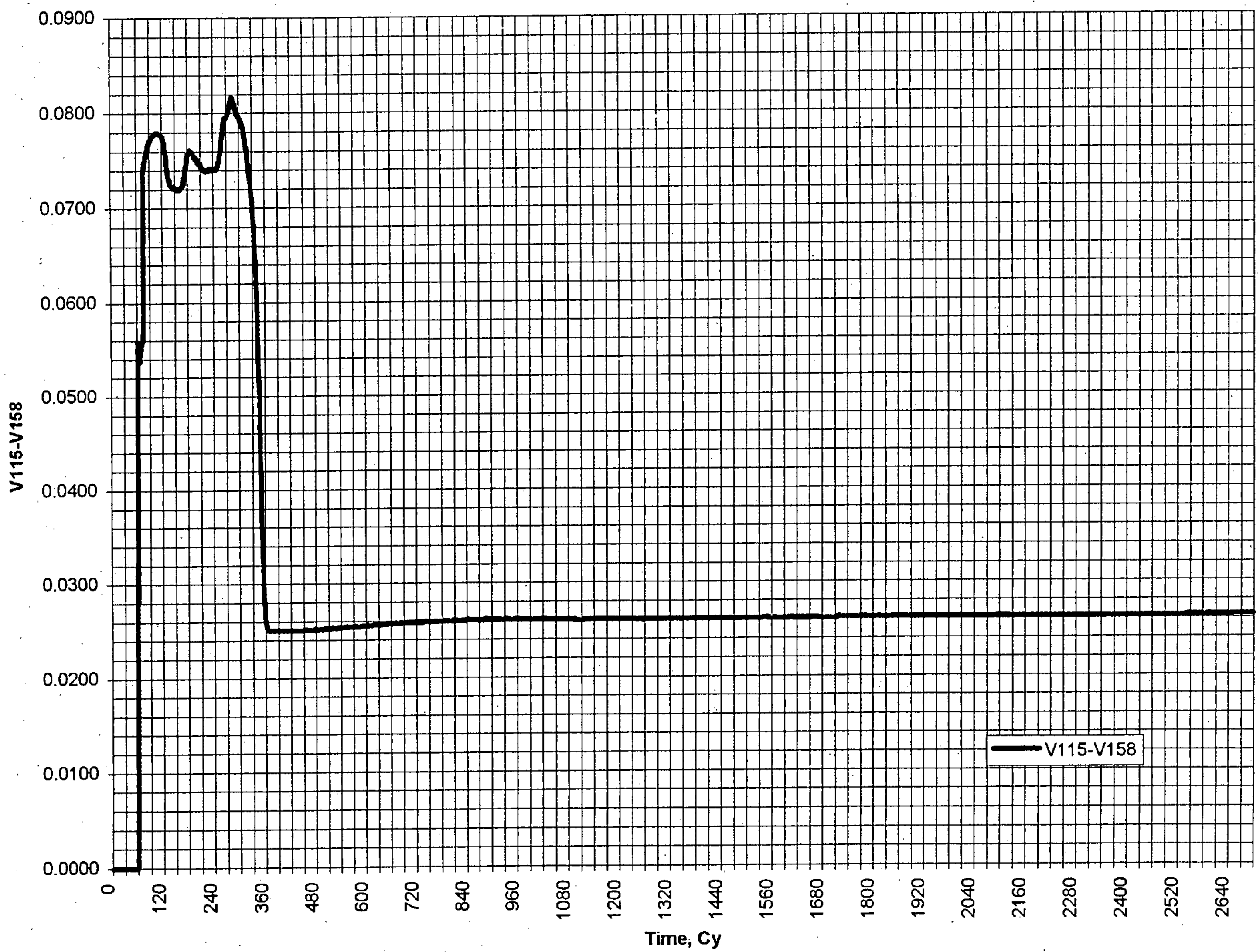
By: SC 5/22/95
Checked: DTG 5/23/95

Case 1L - UL00L123.XLS



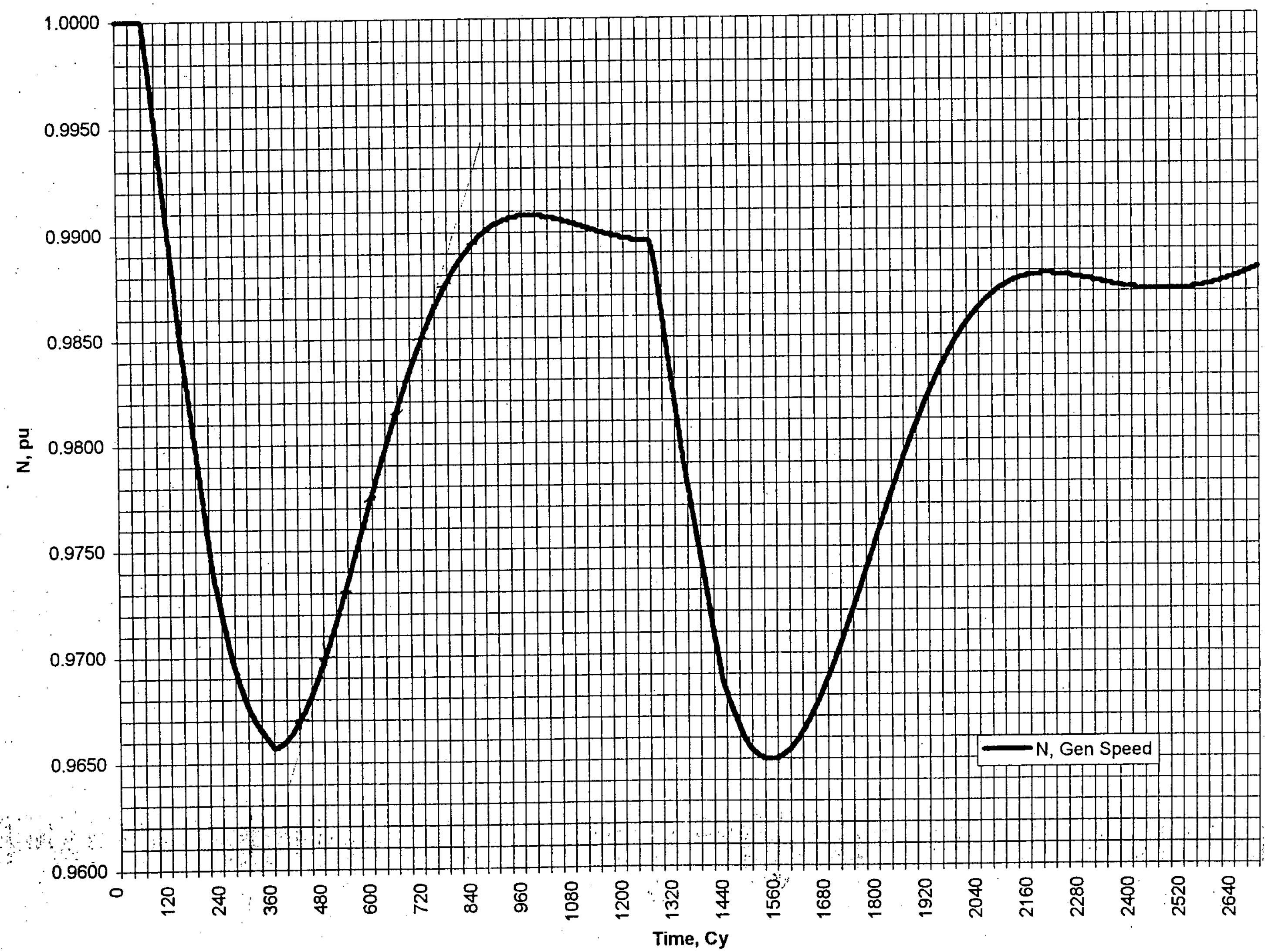
By: Sc 5/22/95
Checked: DTG 5/23/95

Case 1L - UL00L123.XLS

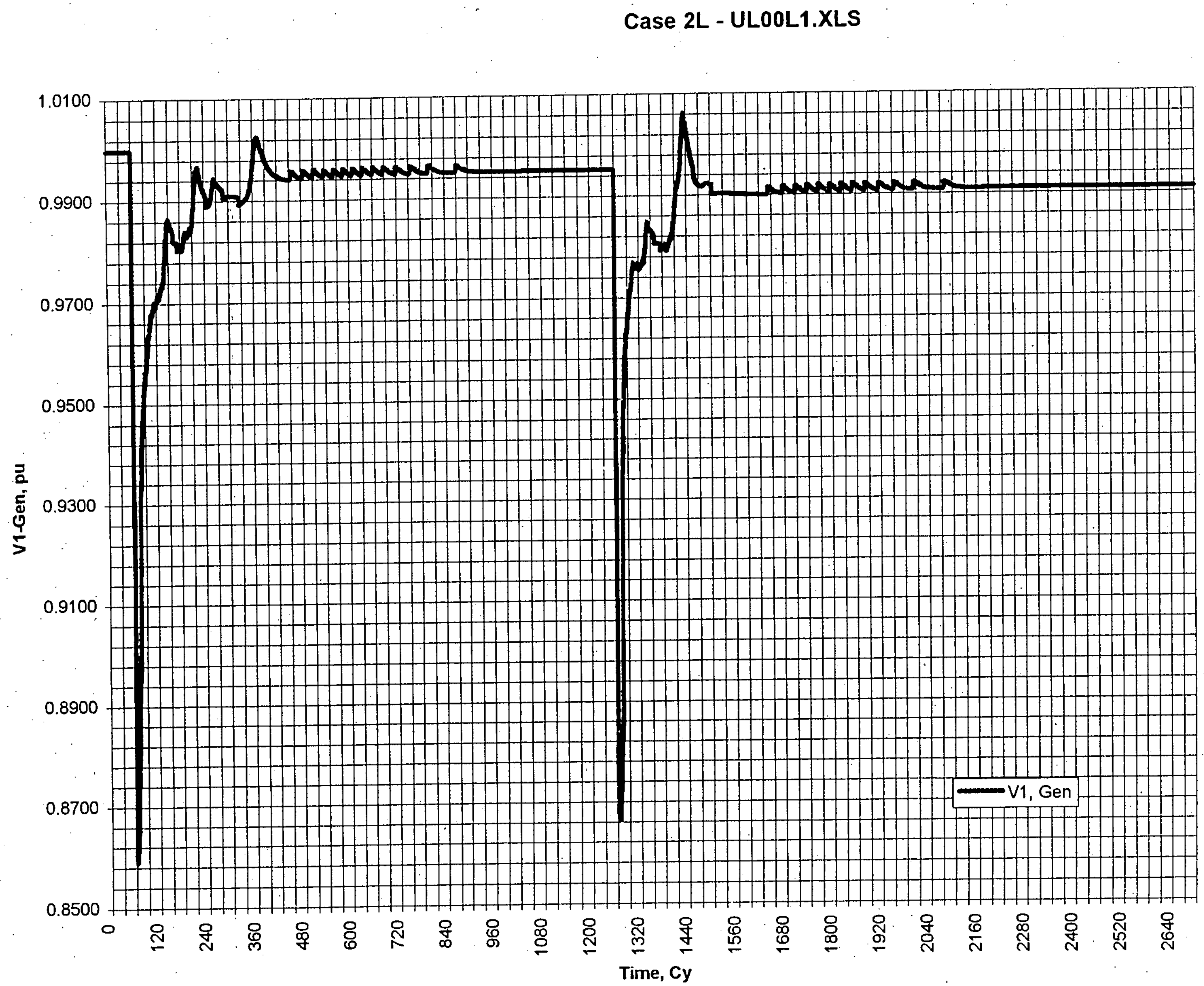


By: SC 5/22/95
Checked: DTG 5/23/95

Case 2L - UL00L1.XLS

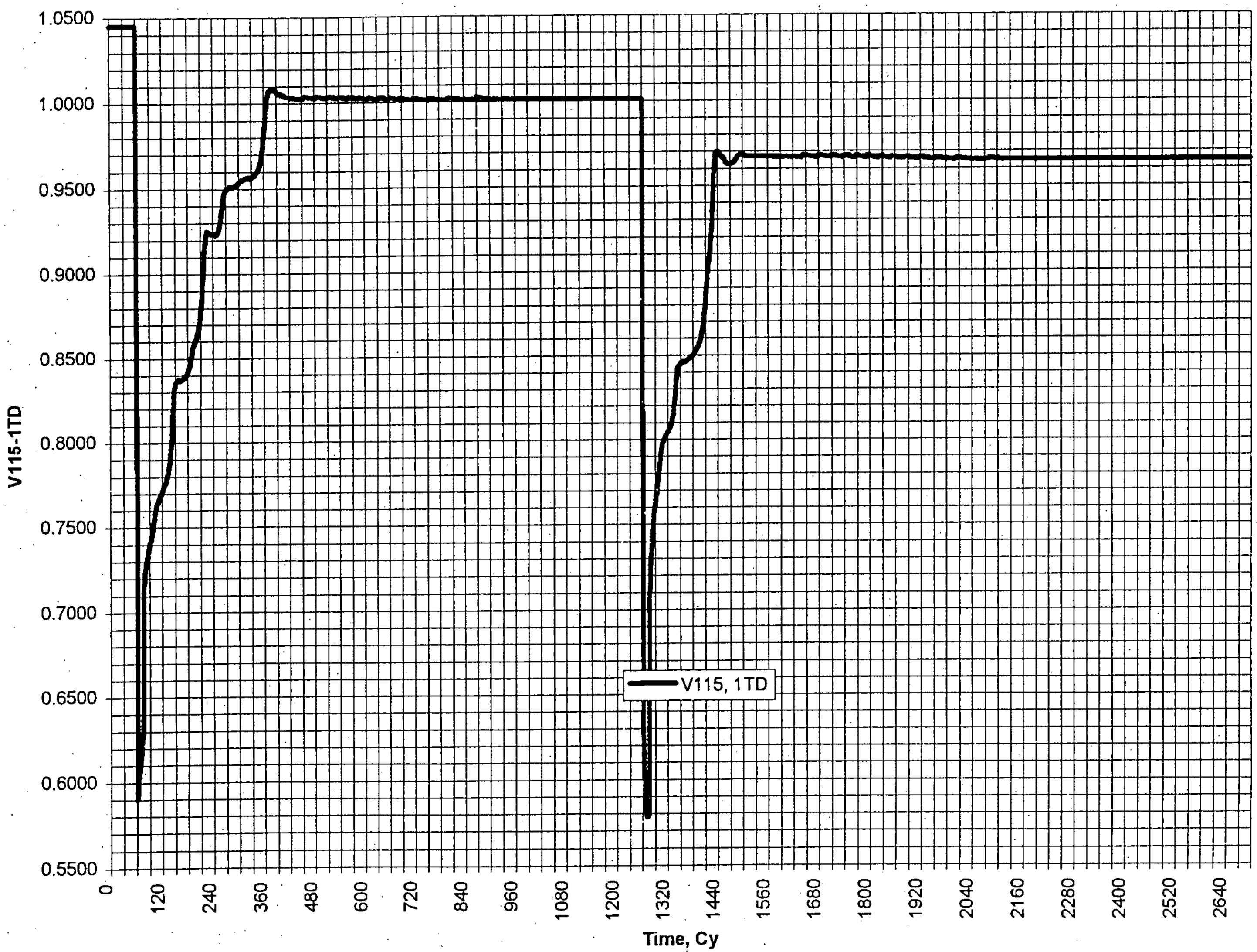


By: SC 5/22/95
Checked: DTG 5/23/95



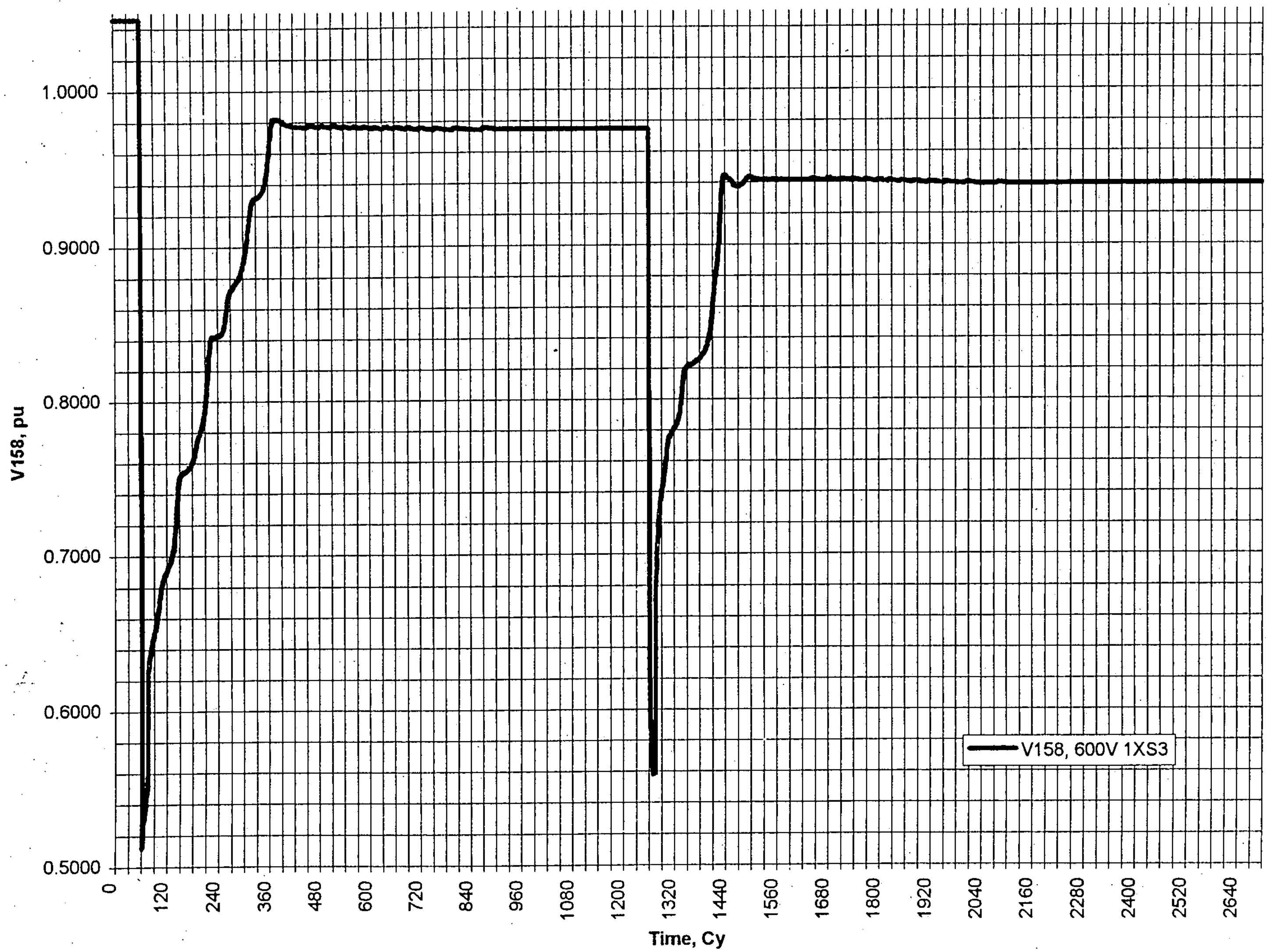
By: SC 5/22/95
Checked: DTG 5/23/95

Case 2L - UL00L1.XLS



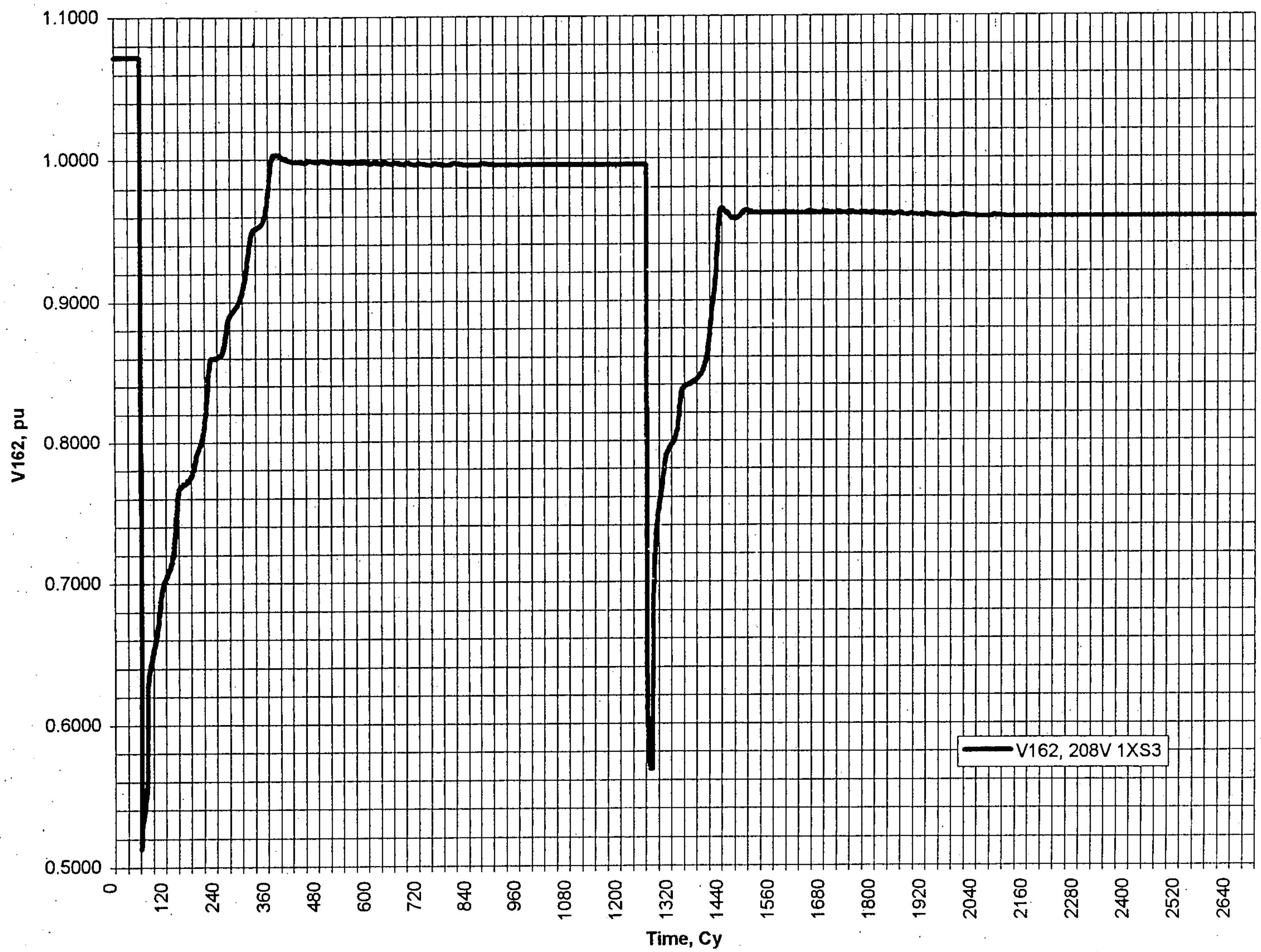
By: SC 5/22/95
Checked: PTG 5/23/95

Case 2L - UL00L1.XLS



By: SC 5/22/95
Checked: DTG 5/23/95

Case 2L - UL00L1.XLS



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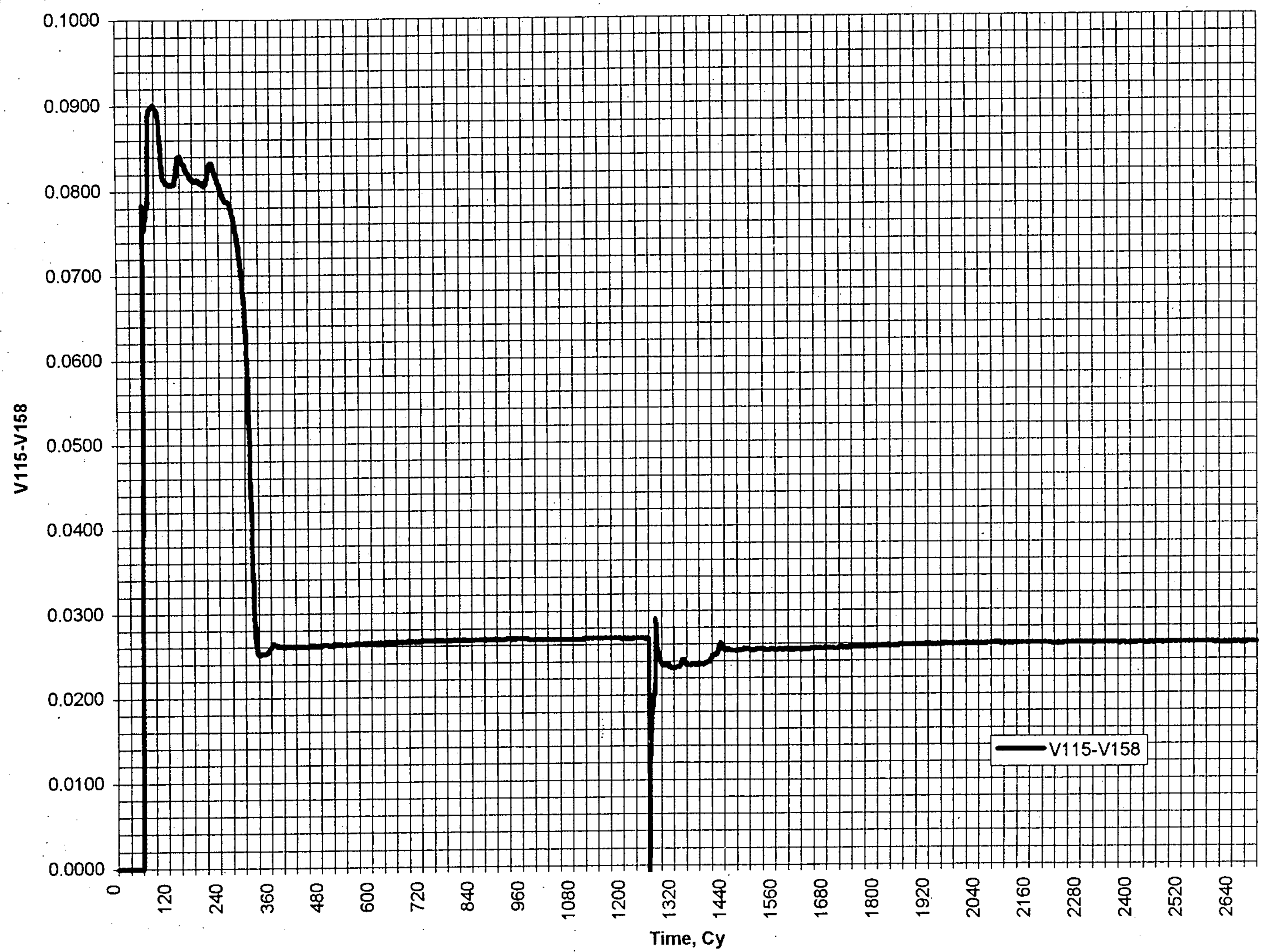
Case 2L - UL00L1.XLS



By: se 5/22/95
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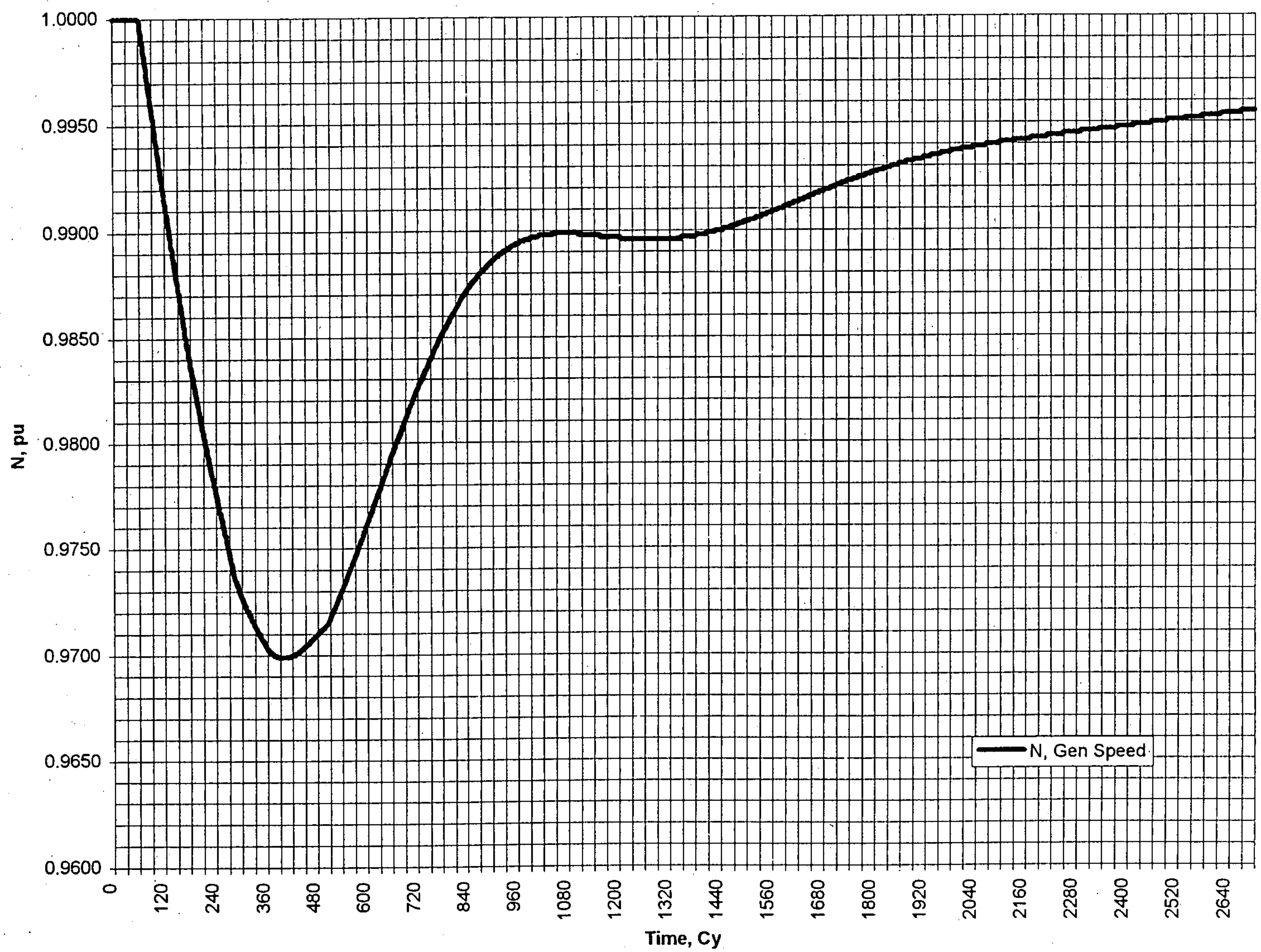
Case 3L - UL00L1RF.XLS



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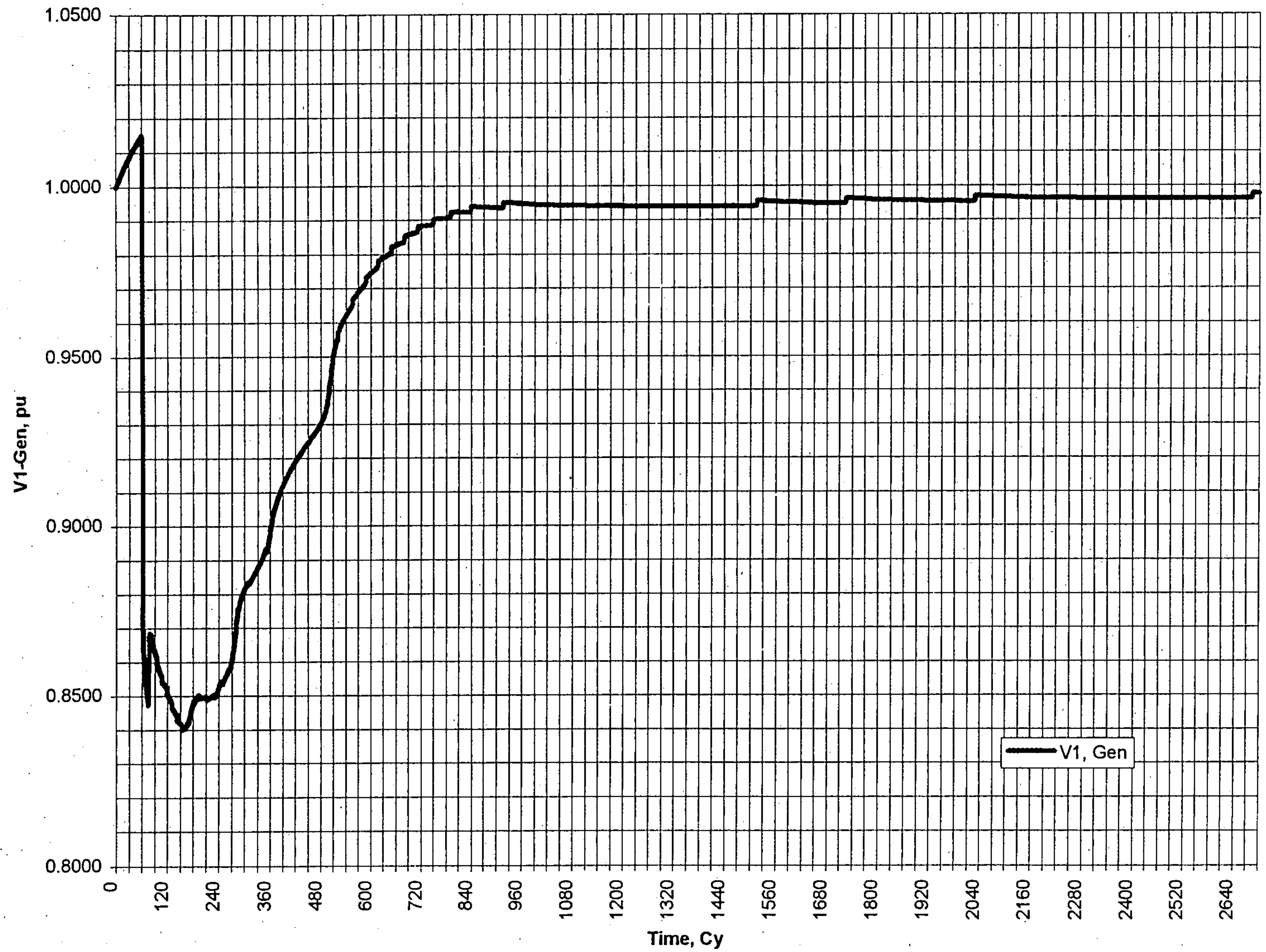
Case 3L - UL00L1RF.XLS



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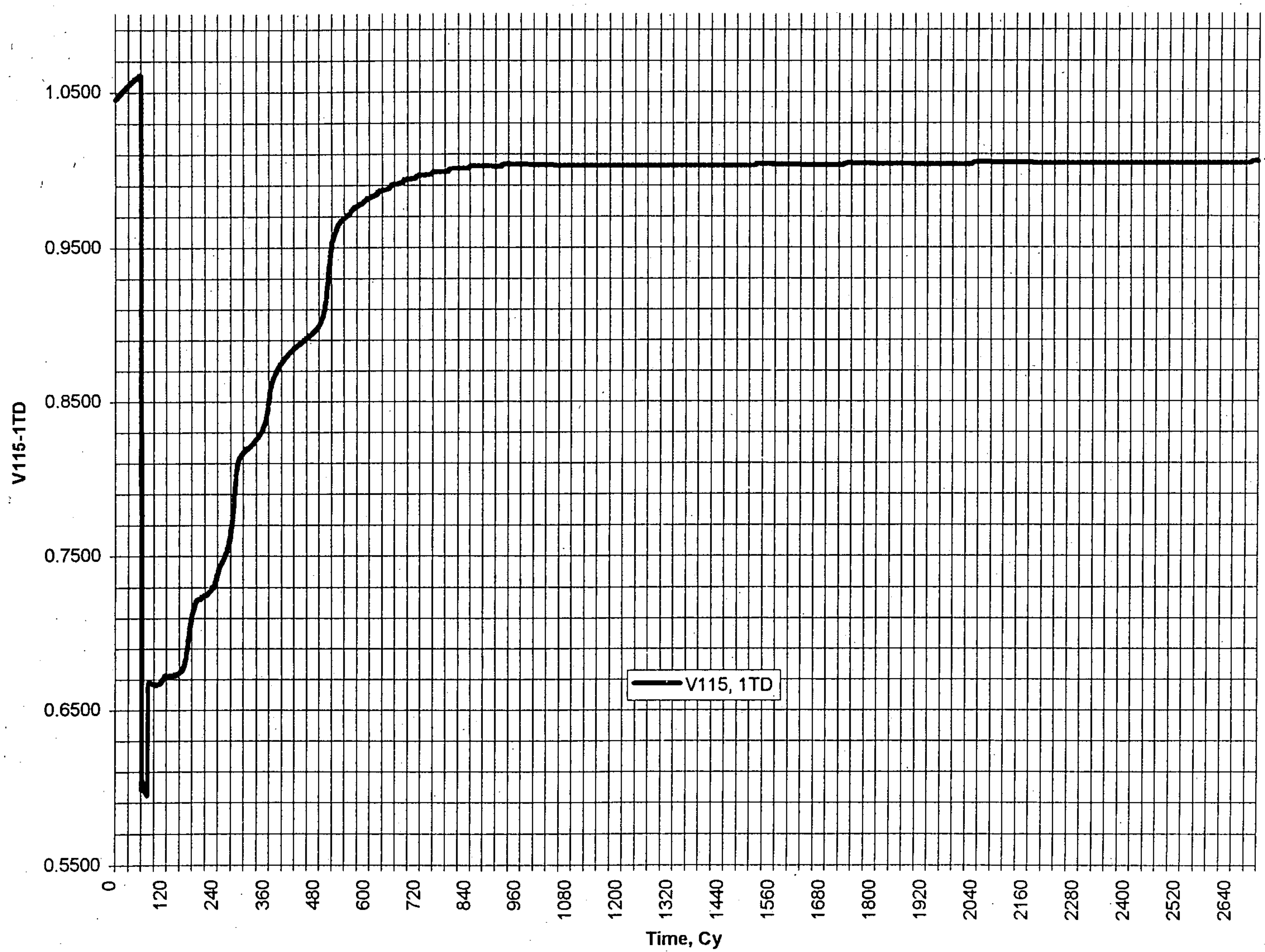
Case 3L - UL00L1RF.XLS



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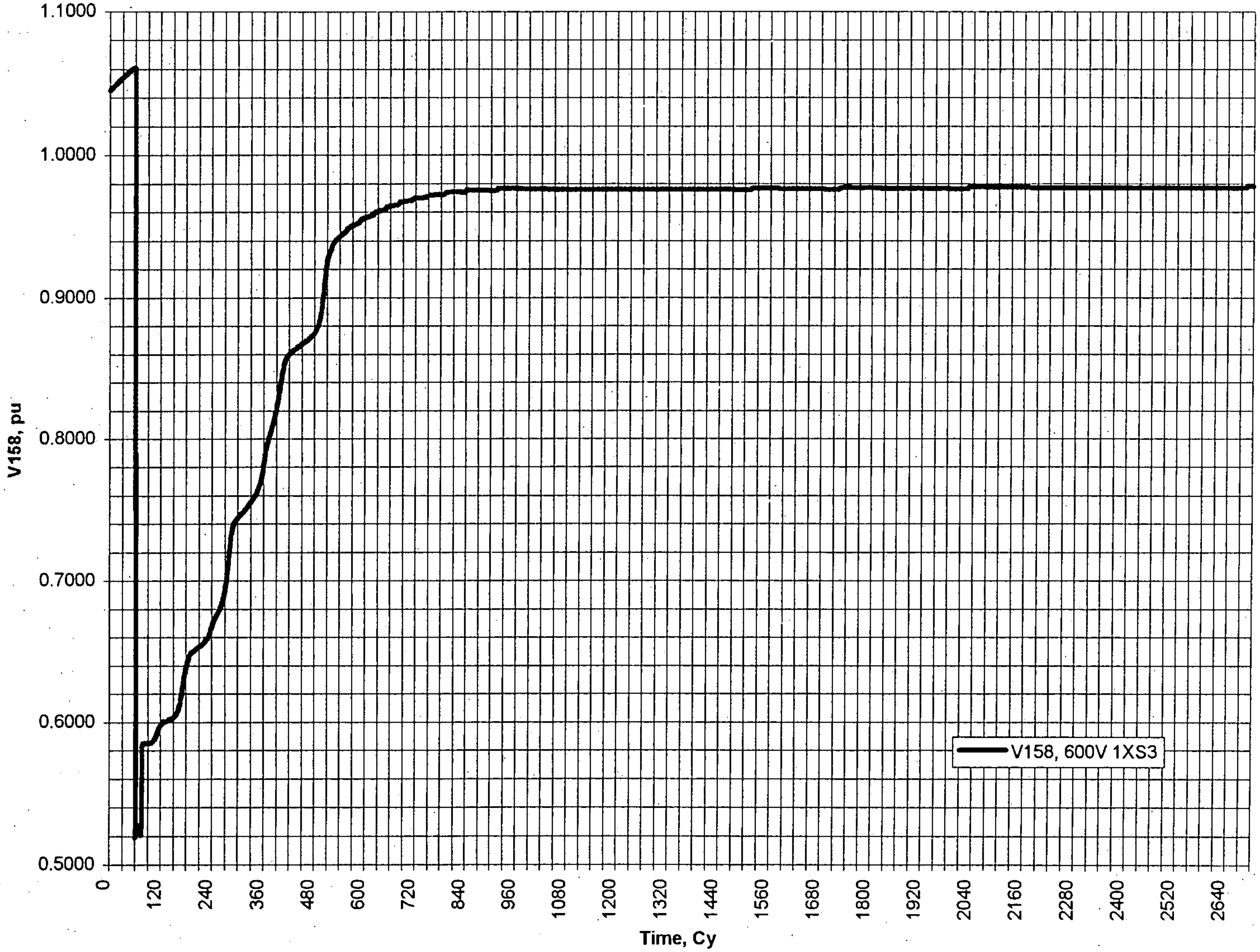
Case 3L - UL00L1RF.XLS



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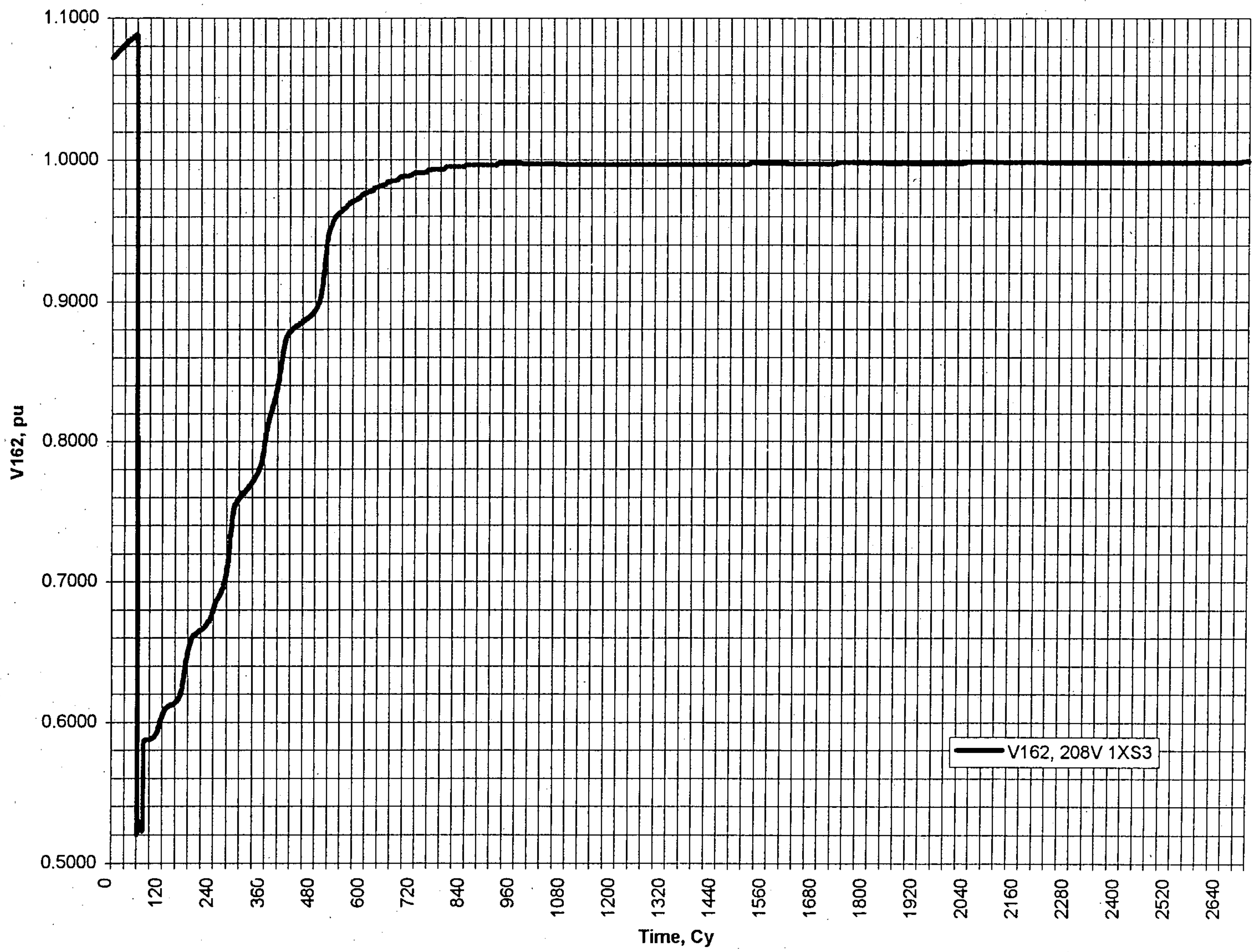
Case 3L - UL00L1RF.XLS



By: se 5/22/95
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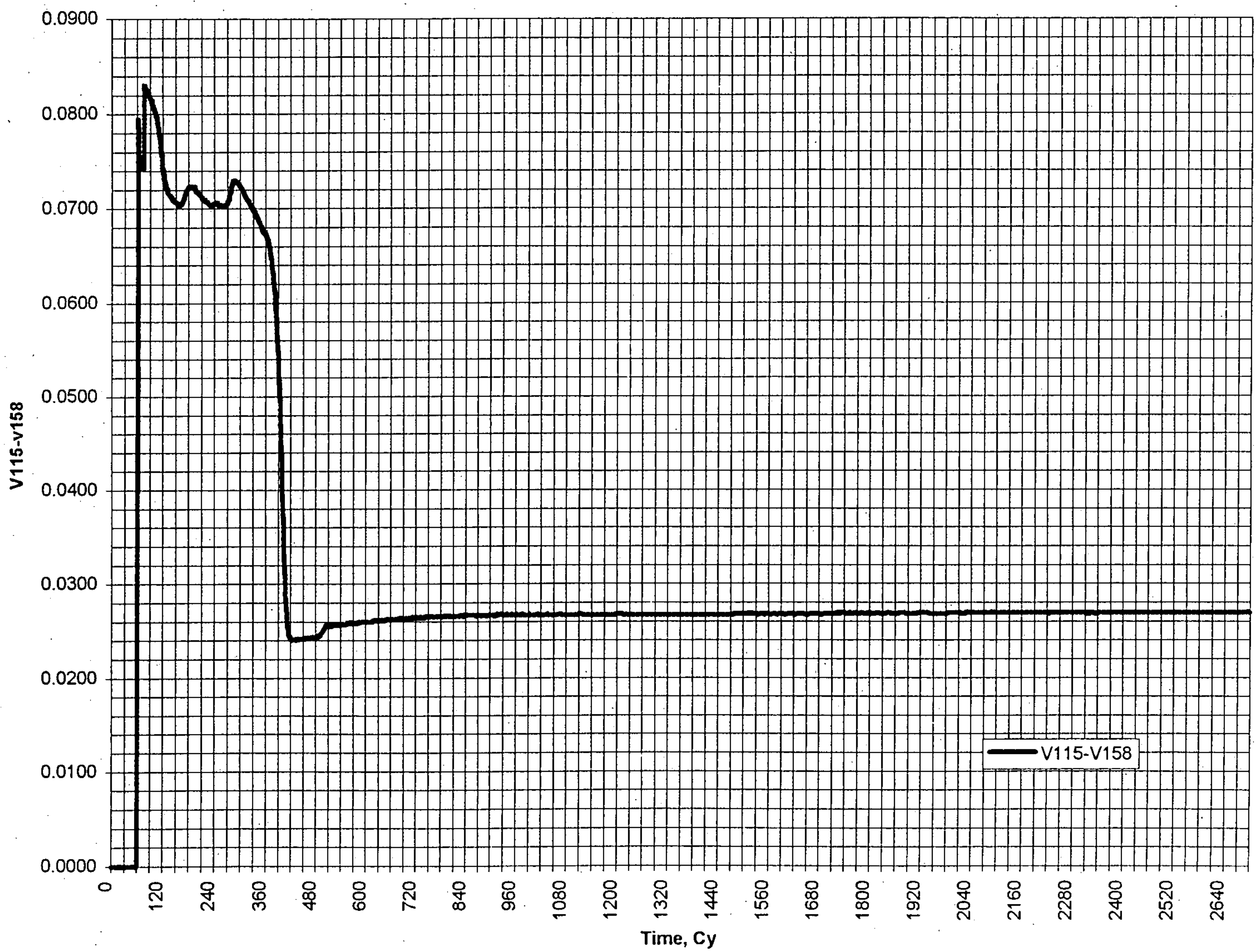
Case 3L - UL00L1RF.XLS



By: SC 5/22/95
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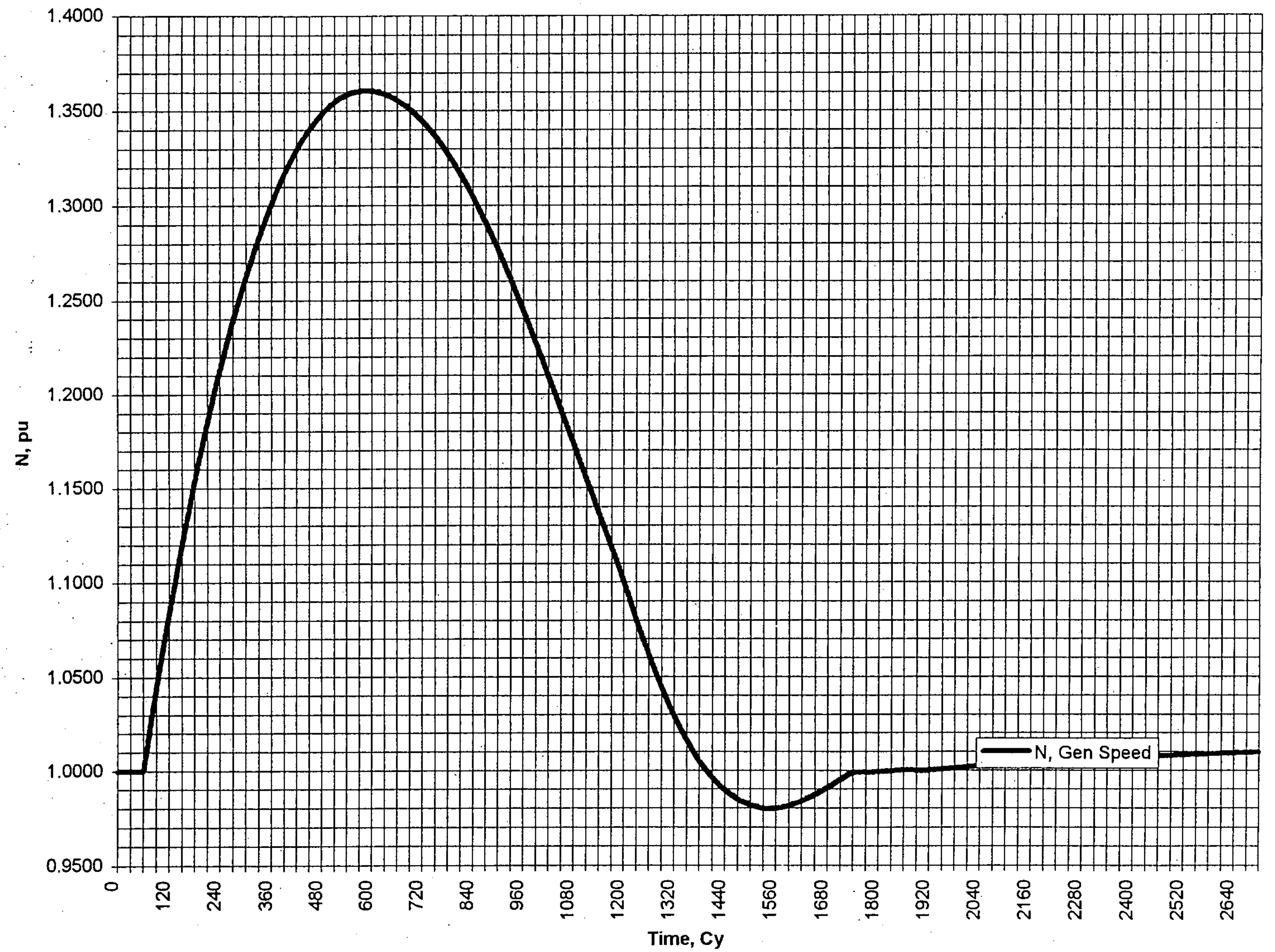
Case 4L - UL75L1.XLS

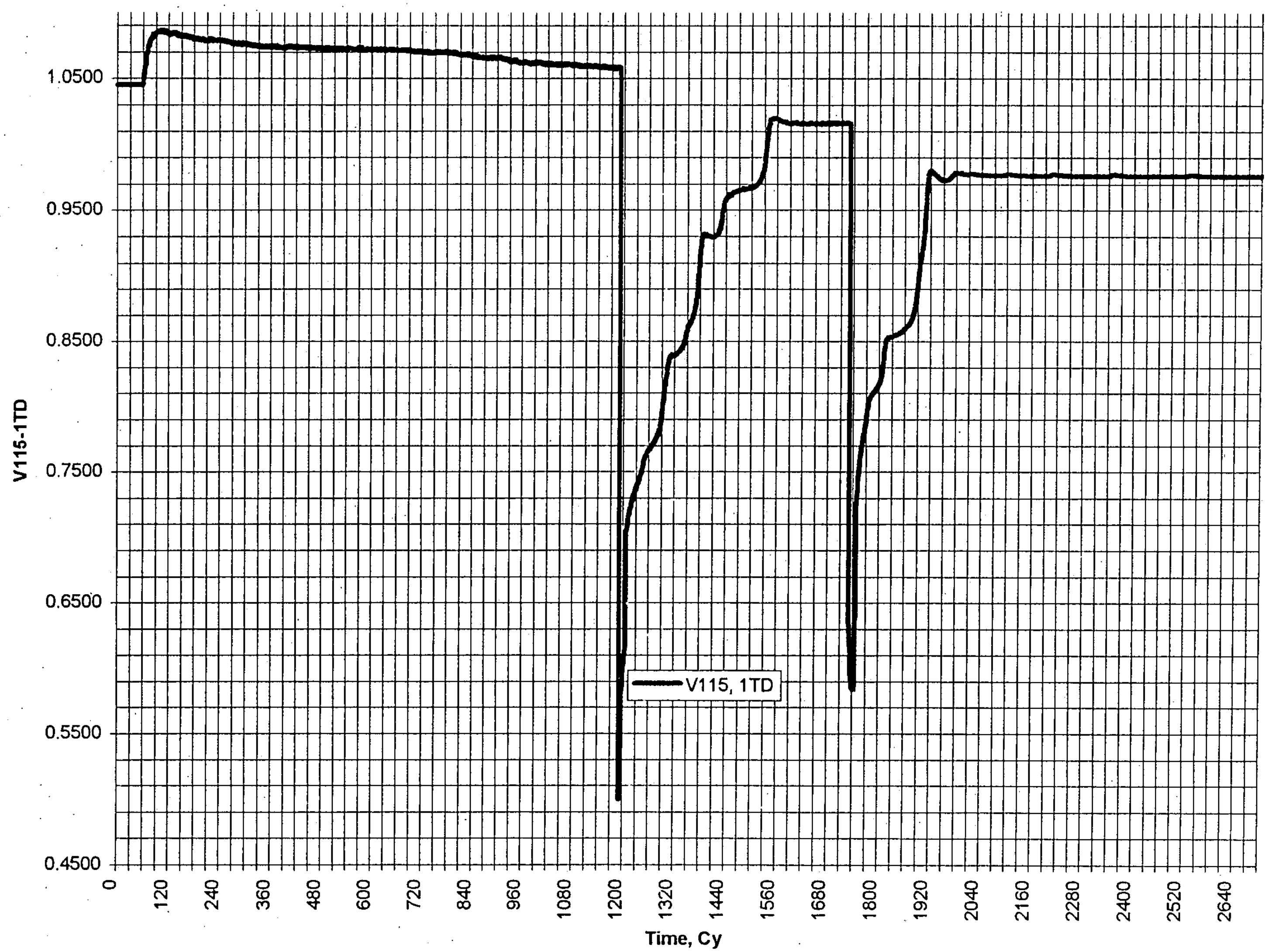


By: SE 5/22/95
Checked: DTG 5/23/95

Case 4L - UL75L1.XLS

By: SC 5/22/95
Checked: DTG 5/23/95

Case 4L - UL75L1.XLS



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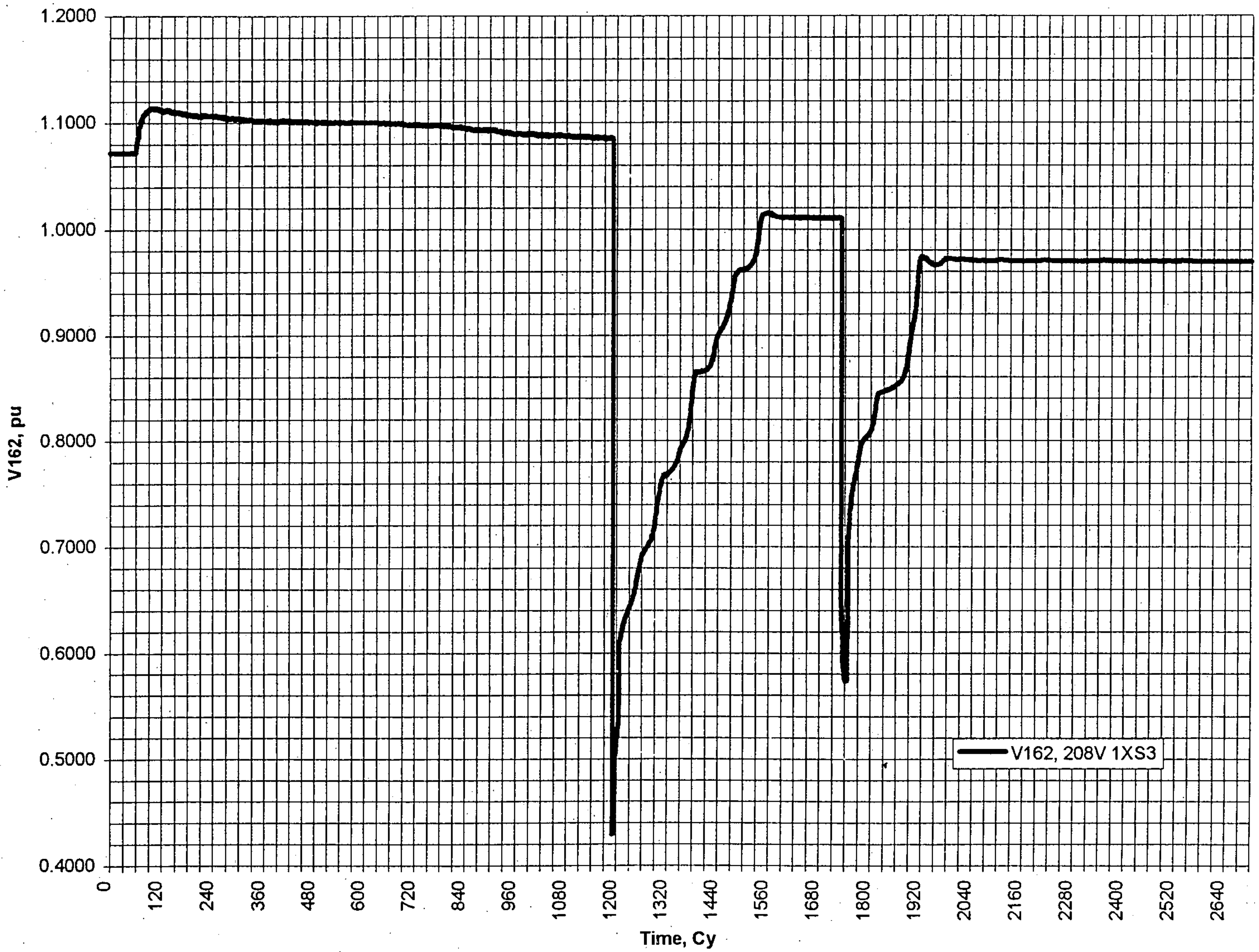
Case 4L - UL75L1.XLS

By: SC 5/22/95
Checked: DTF 5/23/95

Case 4L - UL75L1.XLS



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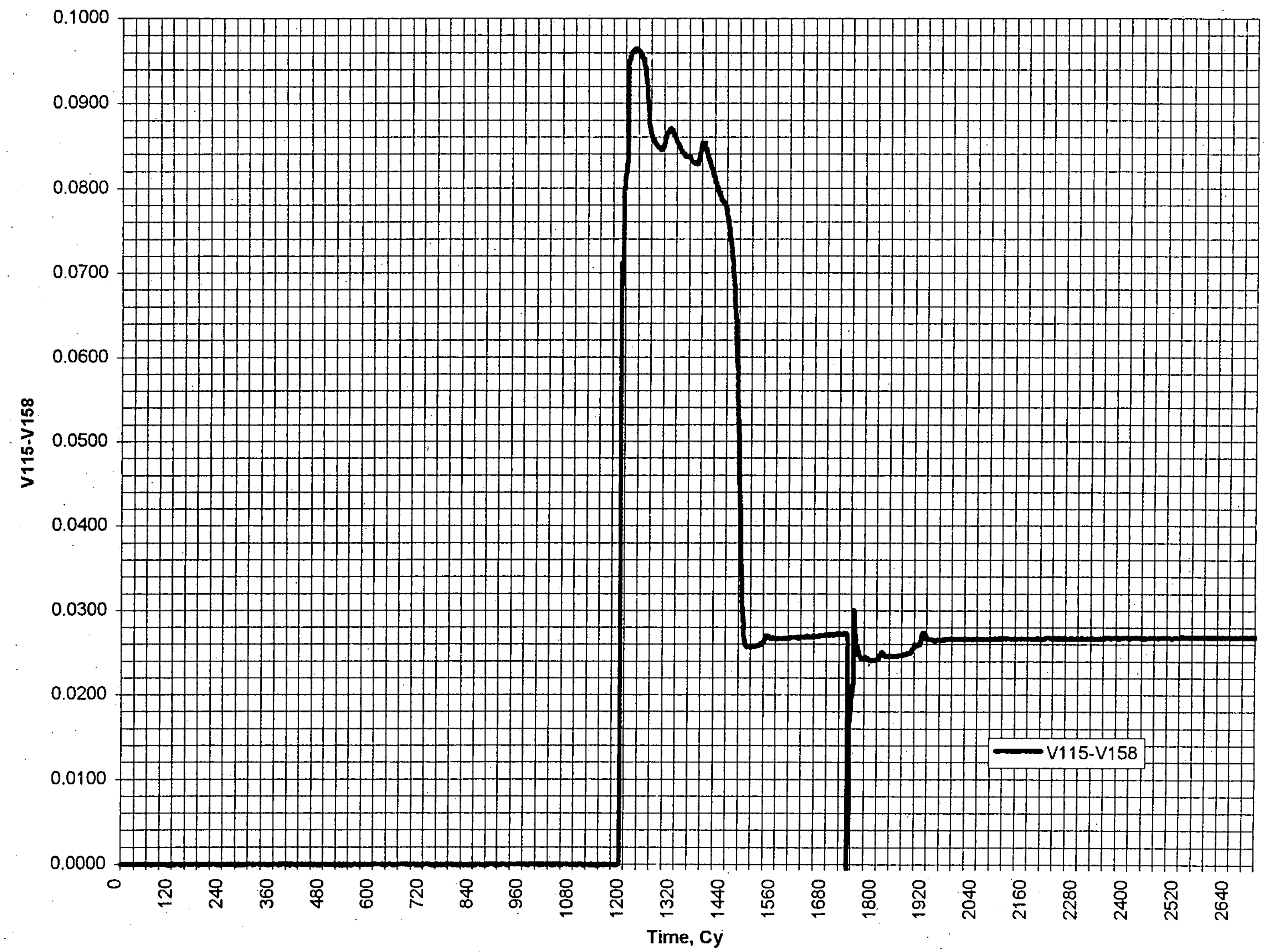

By: SC 5/22/95
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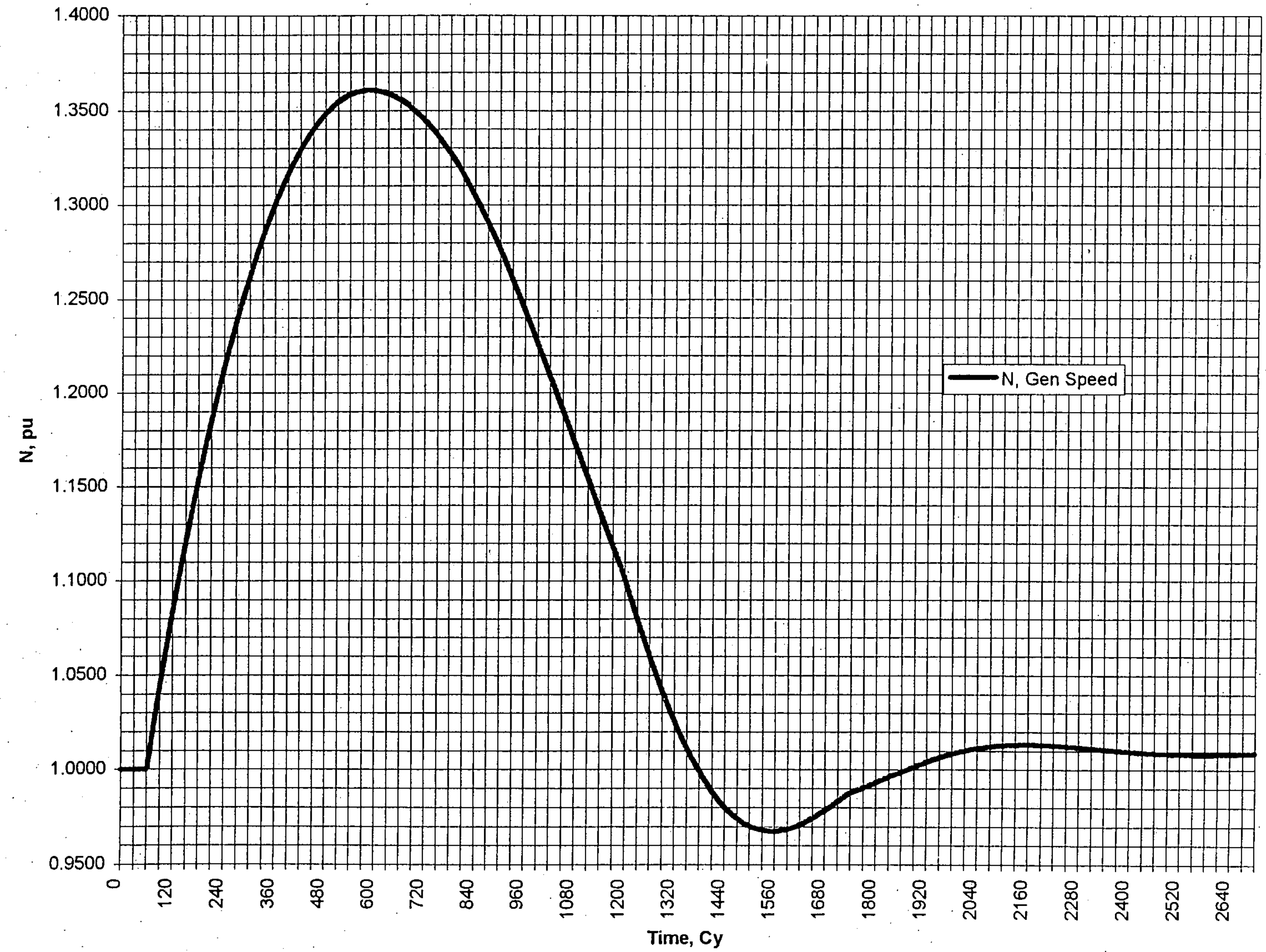
Case 5L - UL75L12.XLS



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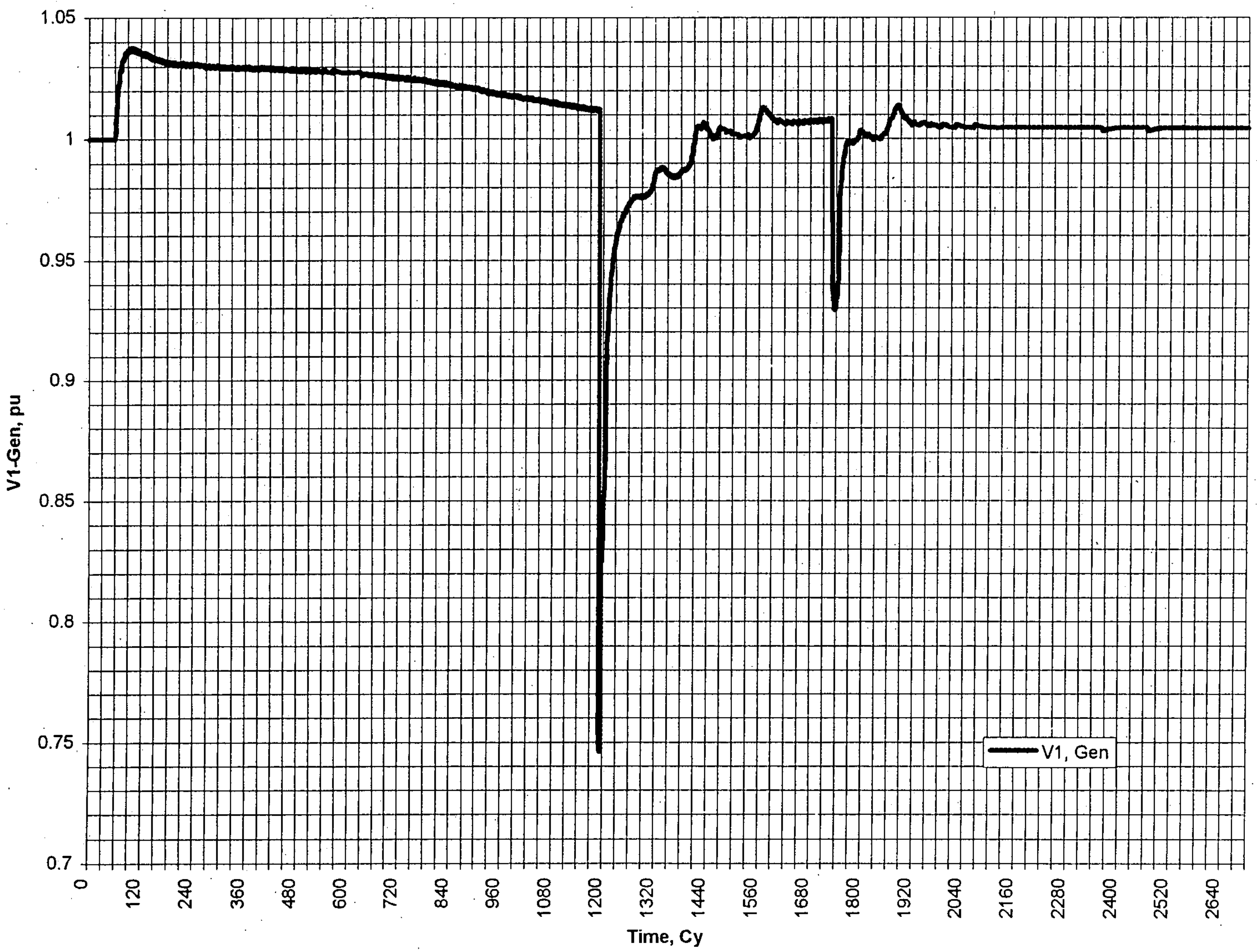
Case 5L - UL75L12.XLS

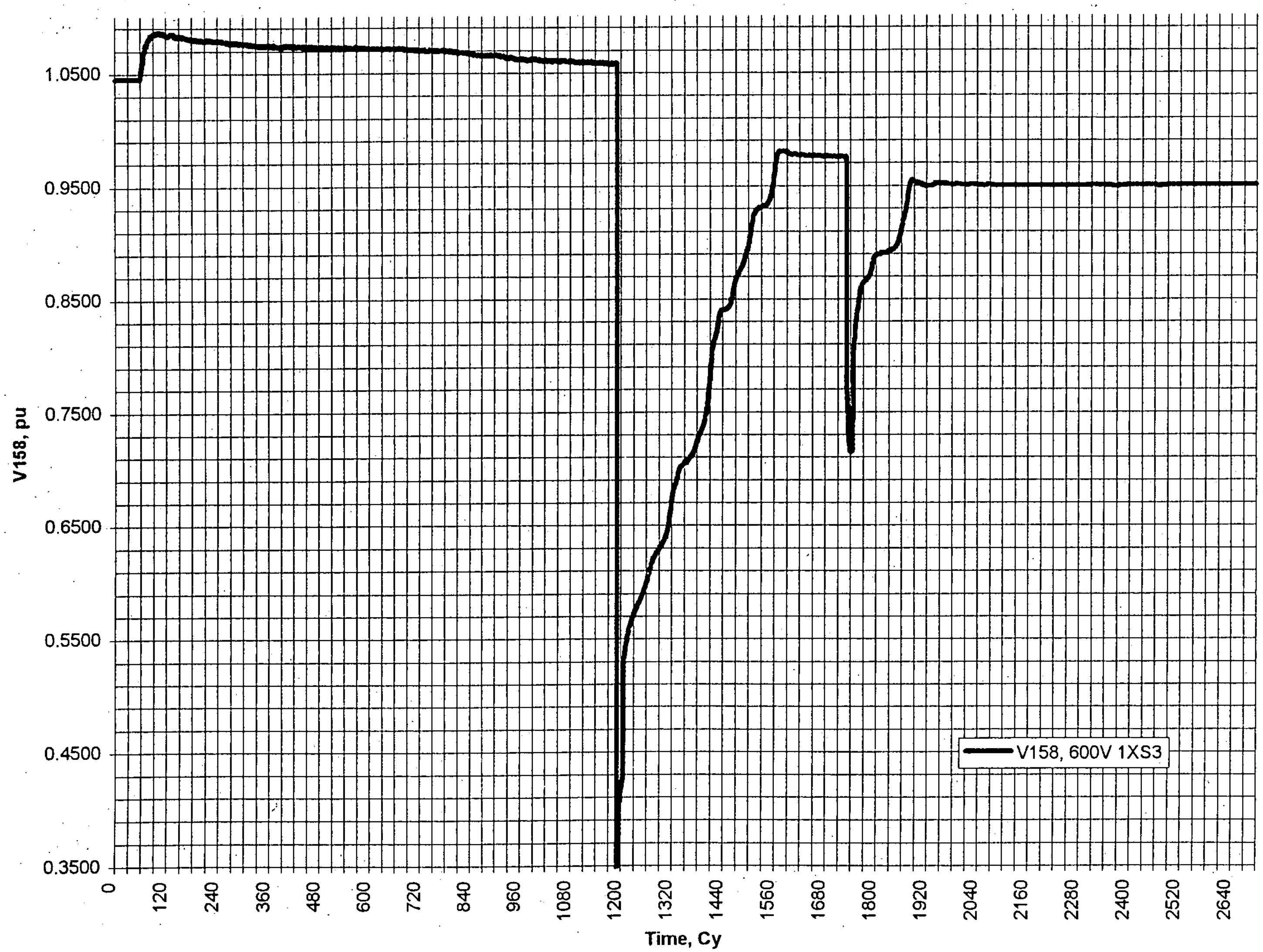


By: SC 5/22/95
Checked: DTG 5/23/95

Case 5L - UL75L12.XLS

By: SC 5/22/95
Checked: DTG 5/23/95

Case 5L - UL75L12.XLS



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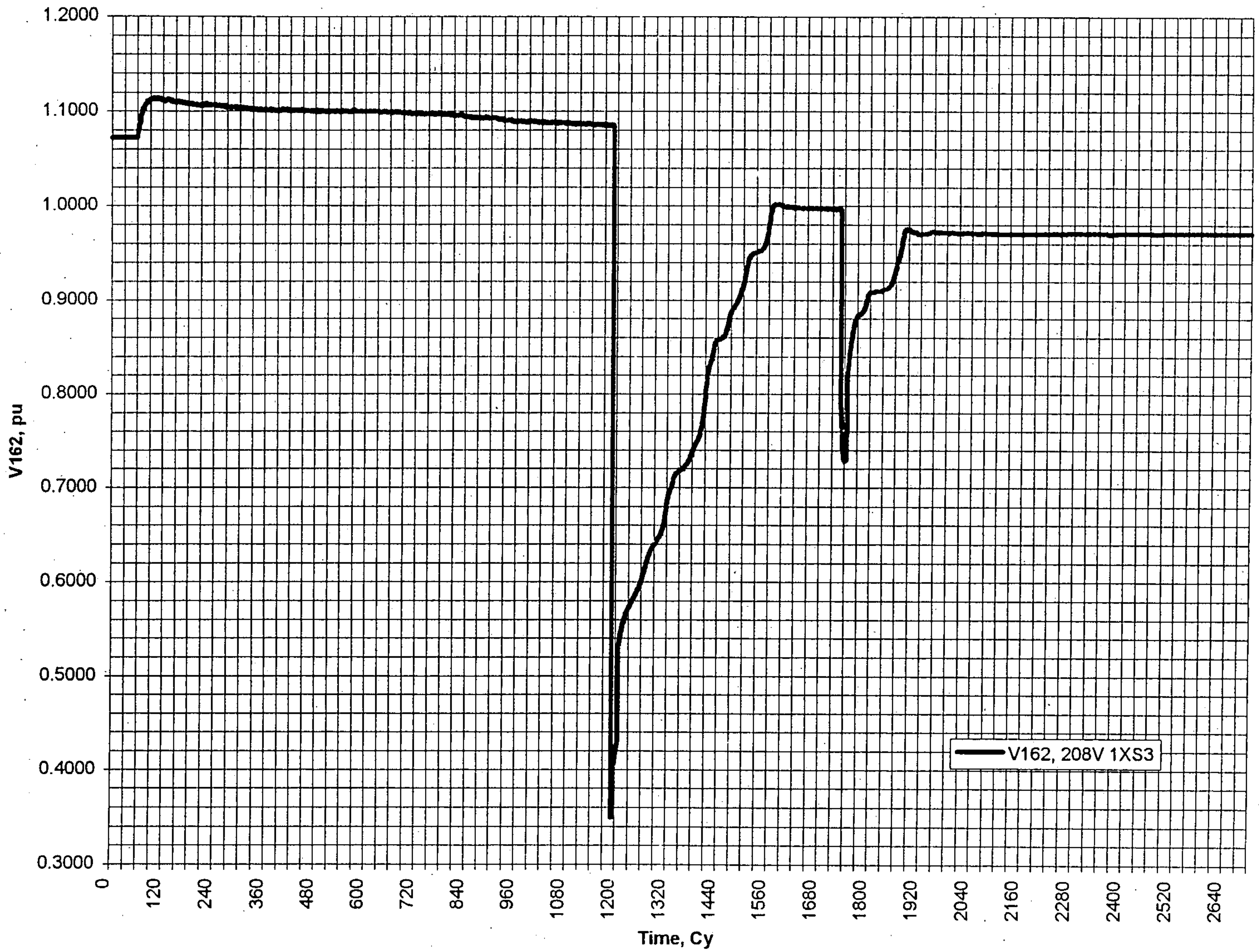
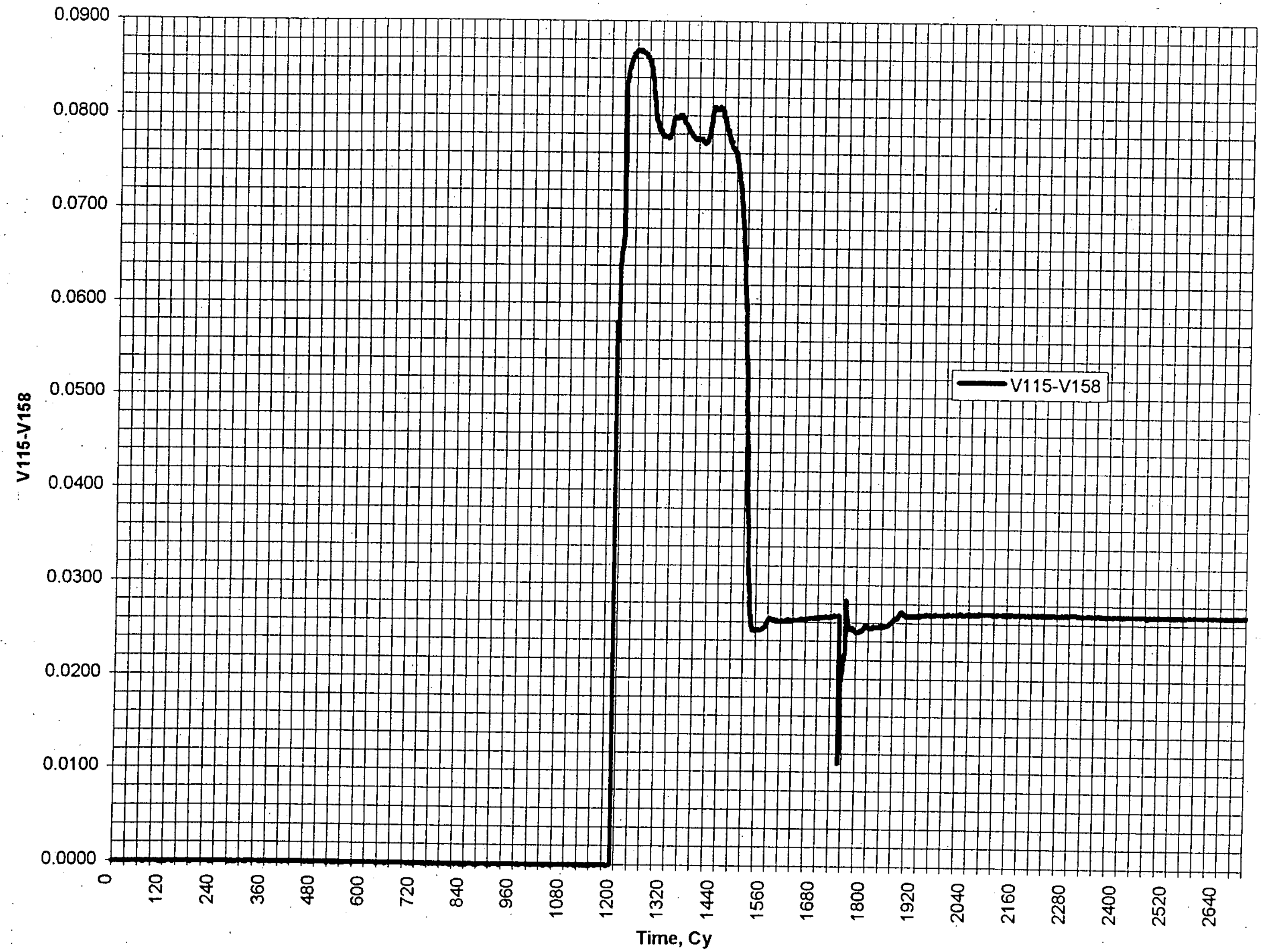
Checked: DTG 5/23/95

Case 5L - UL75L12.XLS



By: sc 5/22/95
Checked: DTG 5/23/95

Case 5L - UL75L12.XLS



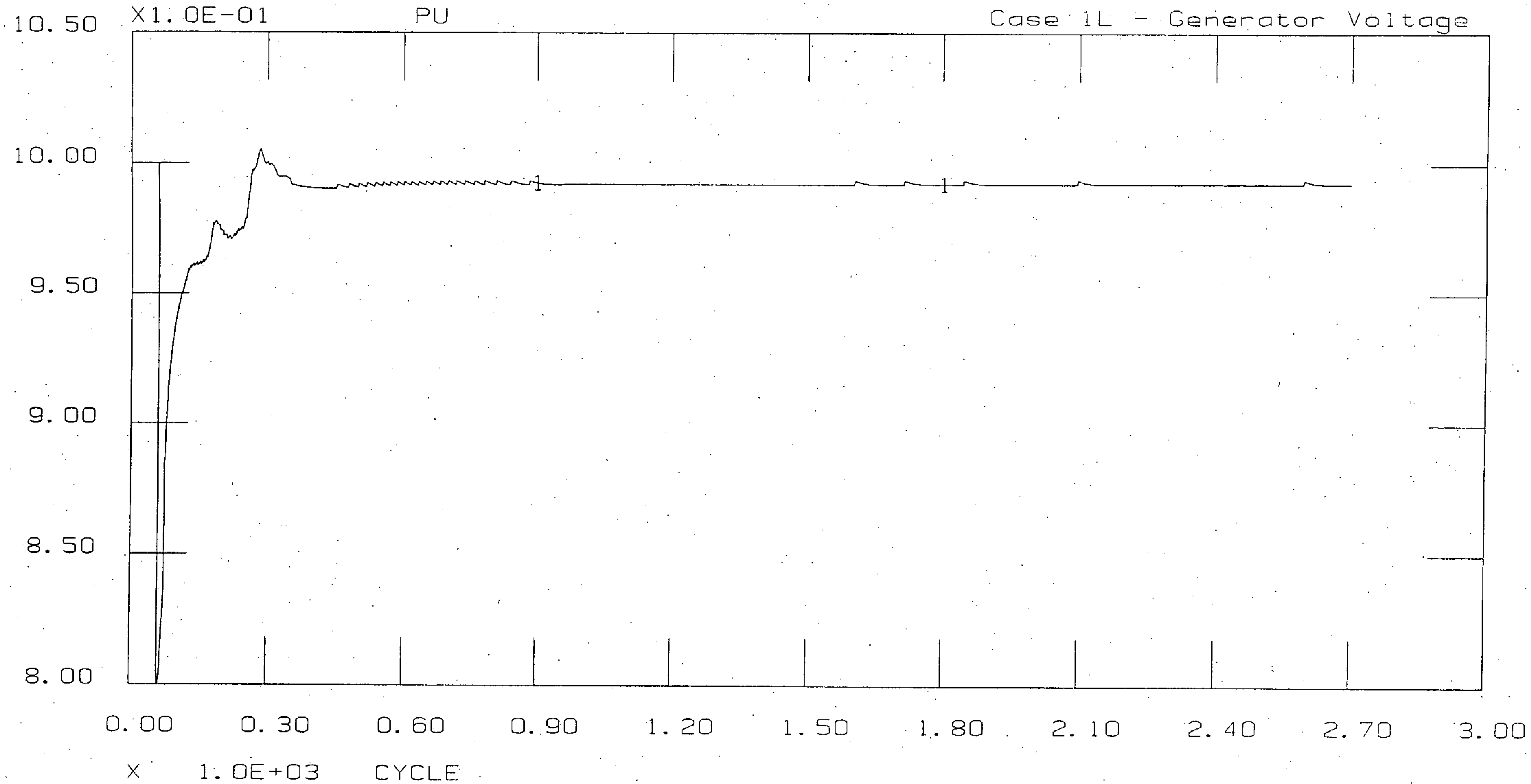
By: Sc 5/22/95
Checked: DTG 5/23/95

COVER SHEET

ATTACHMENT 1 of OSC 5952

This attachment contains 25 sheets of Cyme plots

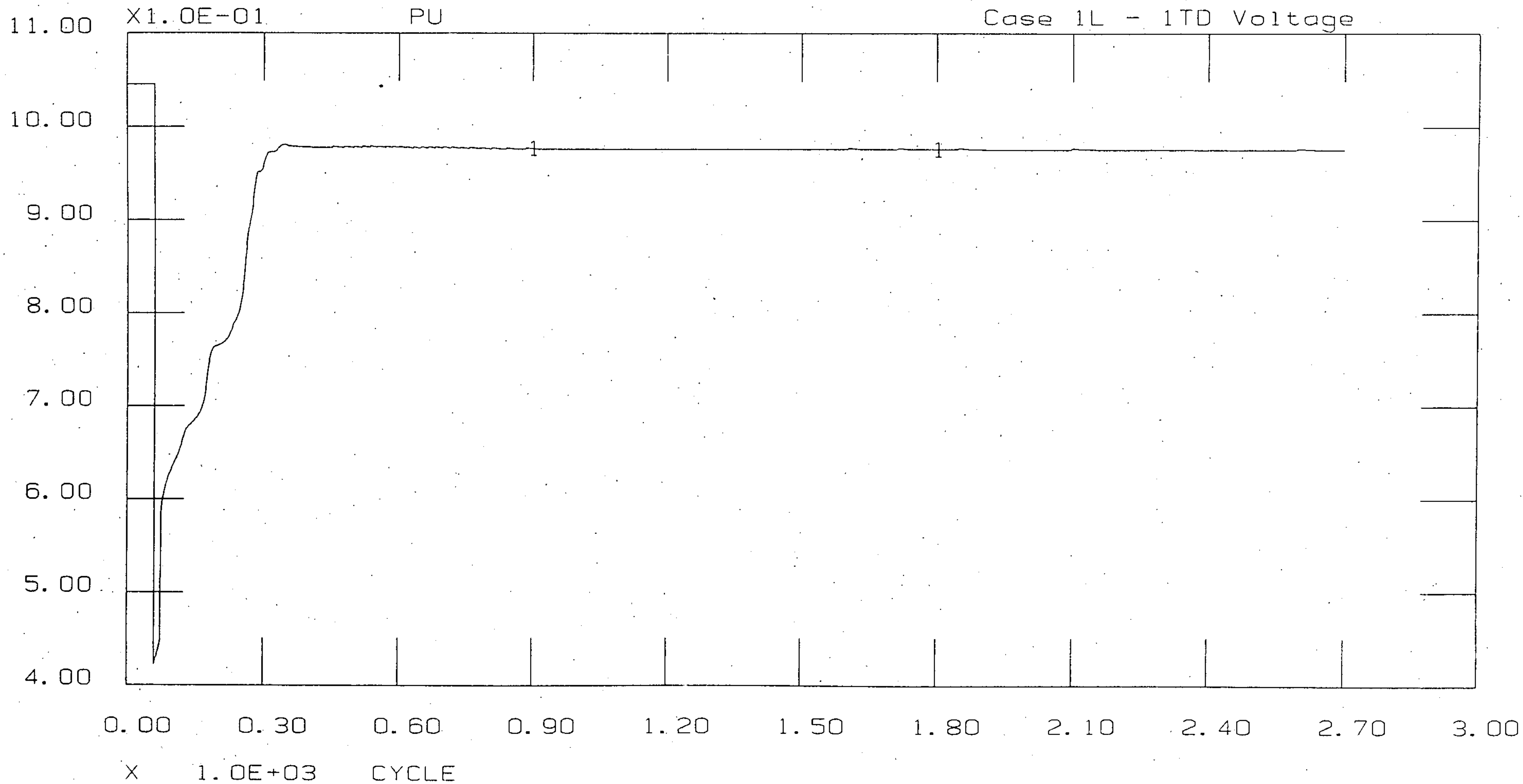
By: SE 4/20/95



1: BUS 1 VOLTAGE

Att. 1 of OSC 5952
Sh 1 of 25
SC 4/20/95

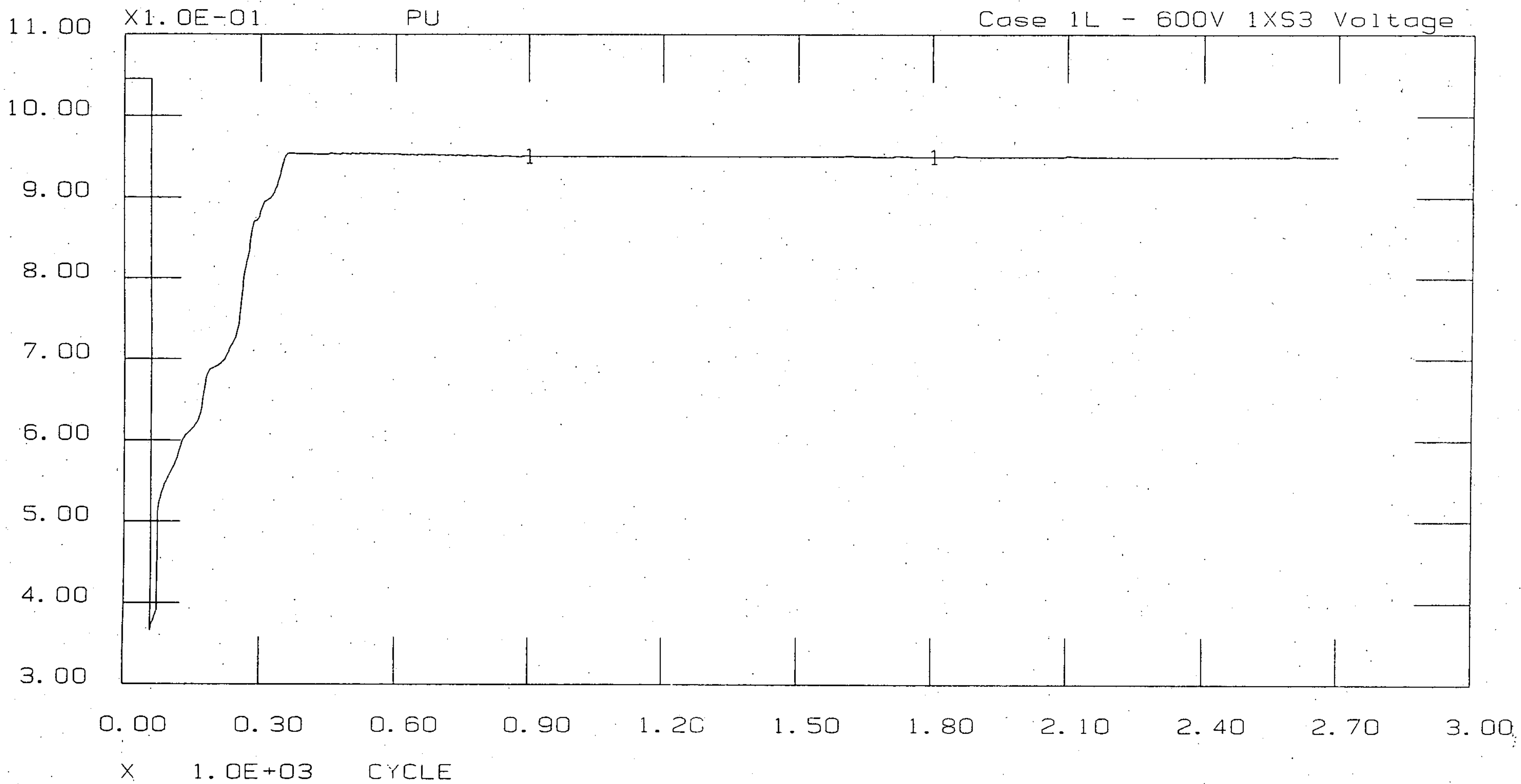
ULOOL123. SF: Keowee UGP. @0c OMWLR. @60cv



1: BUS 115 VOLTAGE

Att. 1 of OSC 5952
Sh. 2 of 25
SC 4/20/95

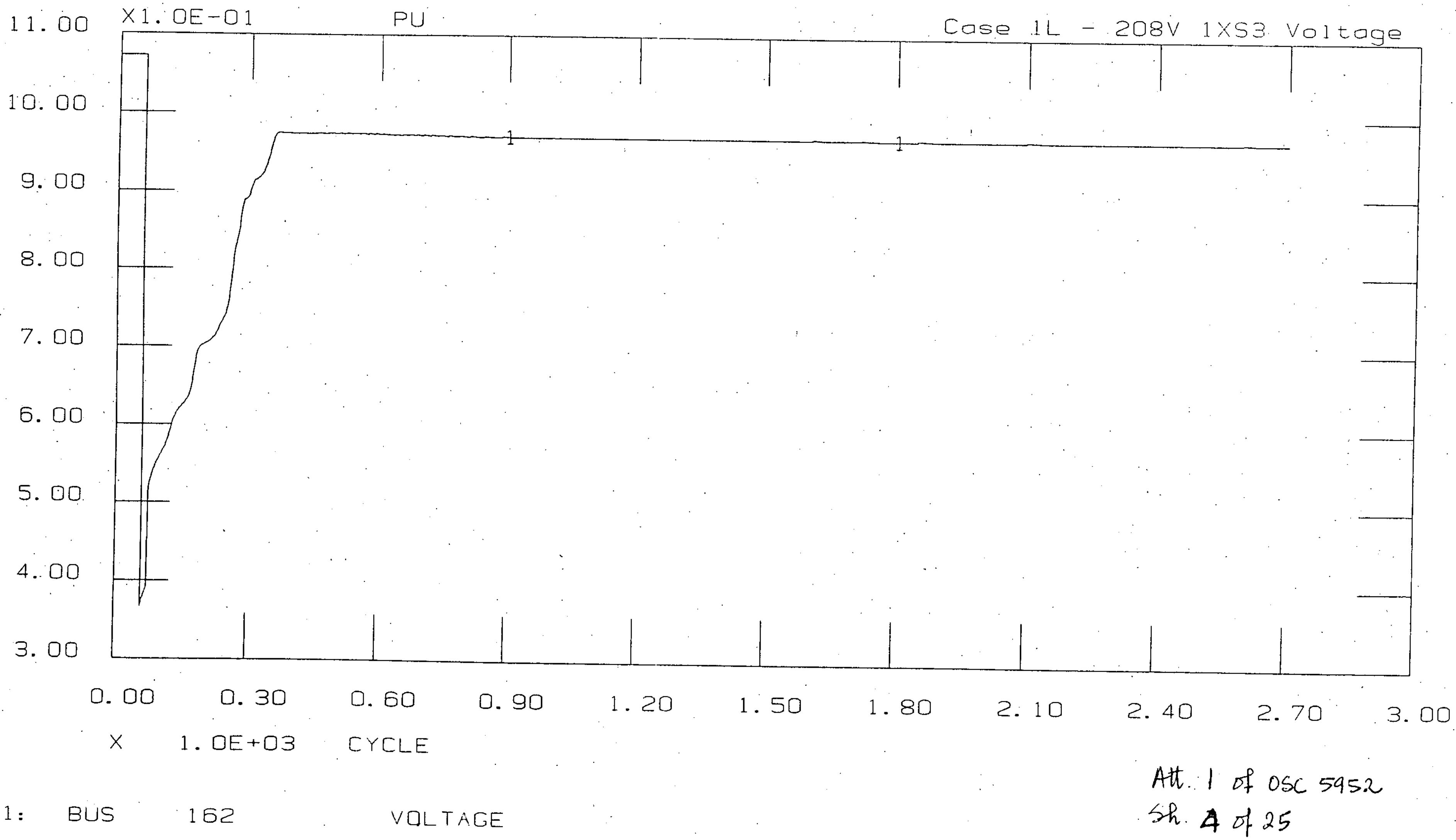
ULOOL123.SF: Keowee UGP. @0c. OMWLR. @60cv



1: BUS 158 VOLTAGE

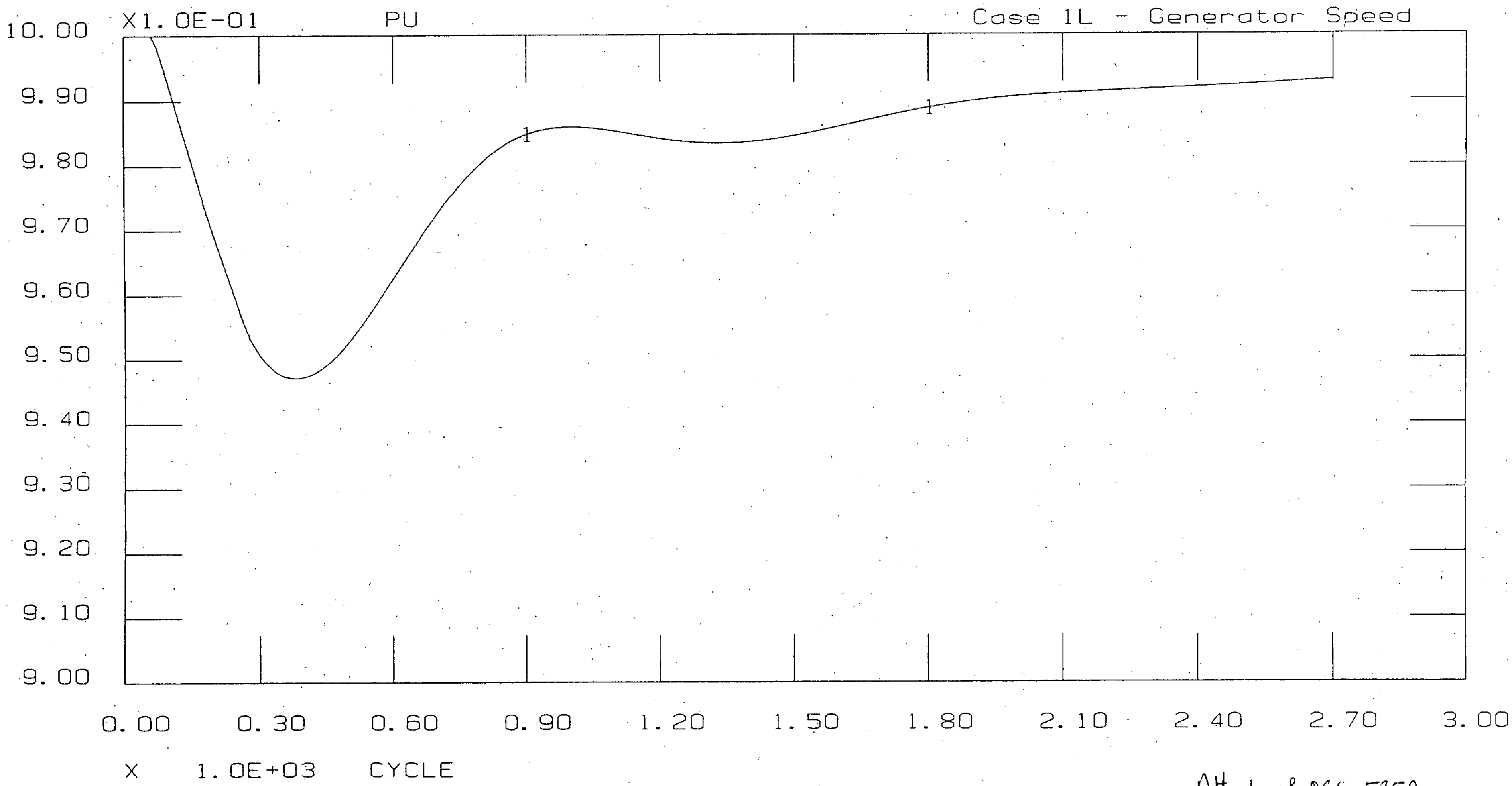
Att. 1 of OSC 5952
Sh. 3 of 25
SC 4/20/95

ULOOL123. SF: Keowee UGP. @Ocv OMWLR. @60cv



Att. 1 of OSC 5952
Sh. 4 of 25
SC 4/20/95

ULOOL123.SF: Keowee UGP. @0cv OMWLR. @60c



Att. 1 of OSC 5952
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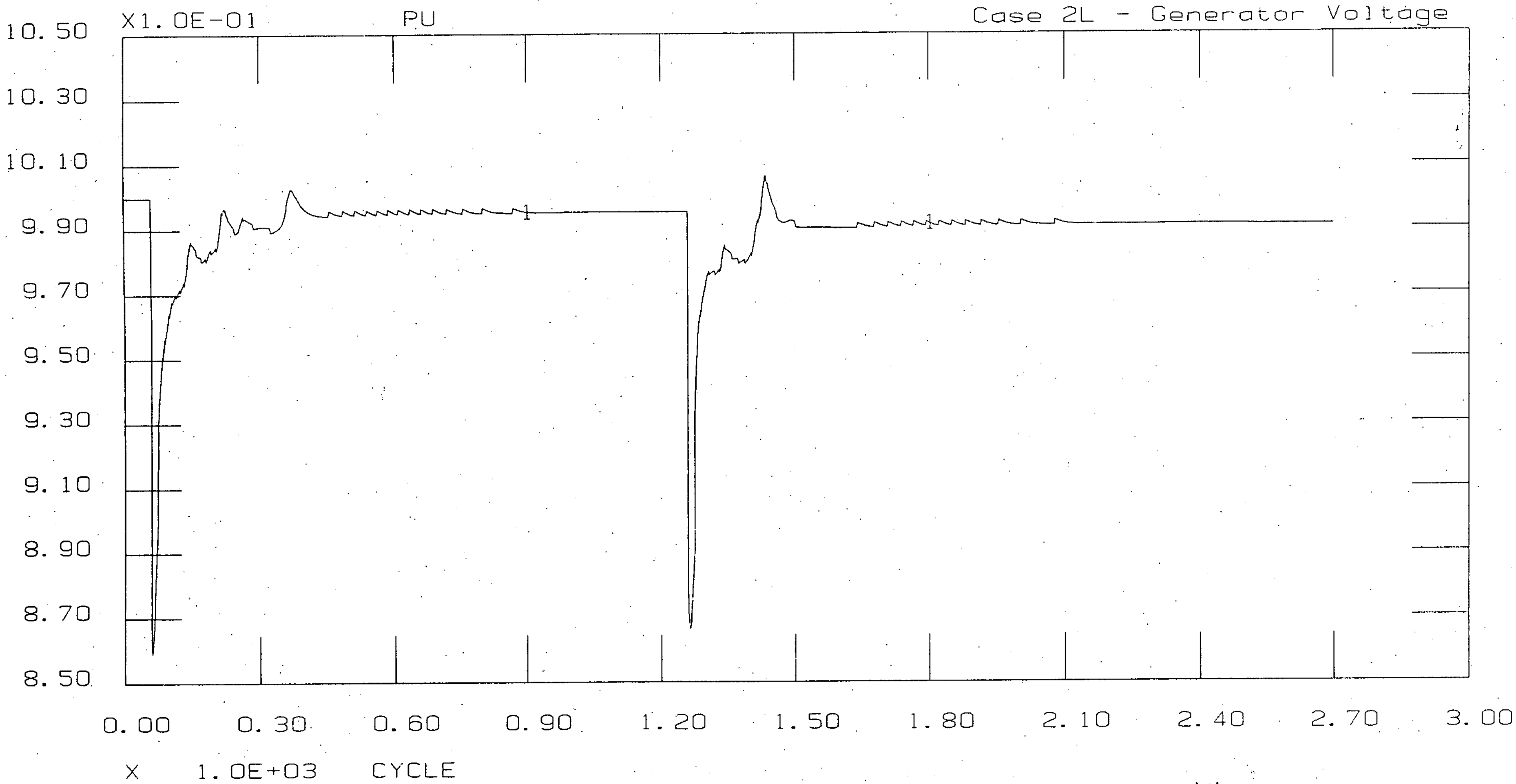
ULOOL123. SF: Keowee UGP. @0cv OMWLR. @60c



1: BUS 1 VOLTAGE

UL.OOL1. SF: Keowee UGP. @0cv OMWLR. @60c / U

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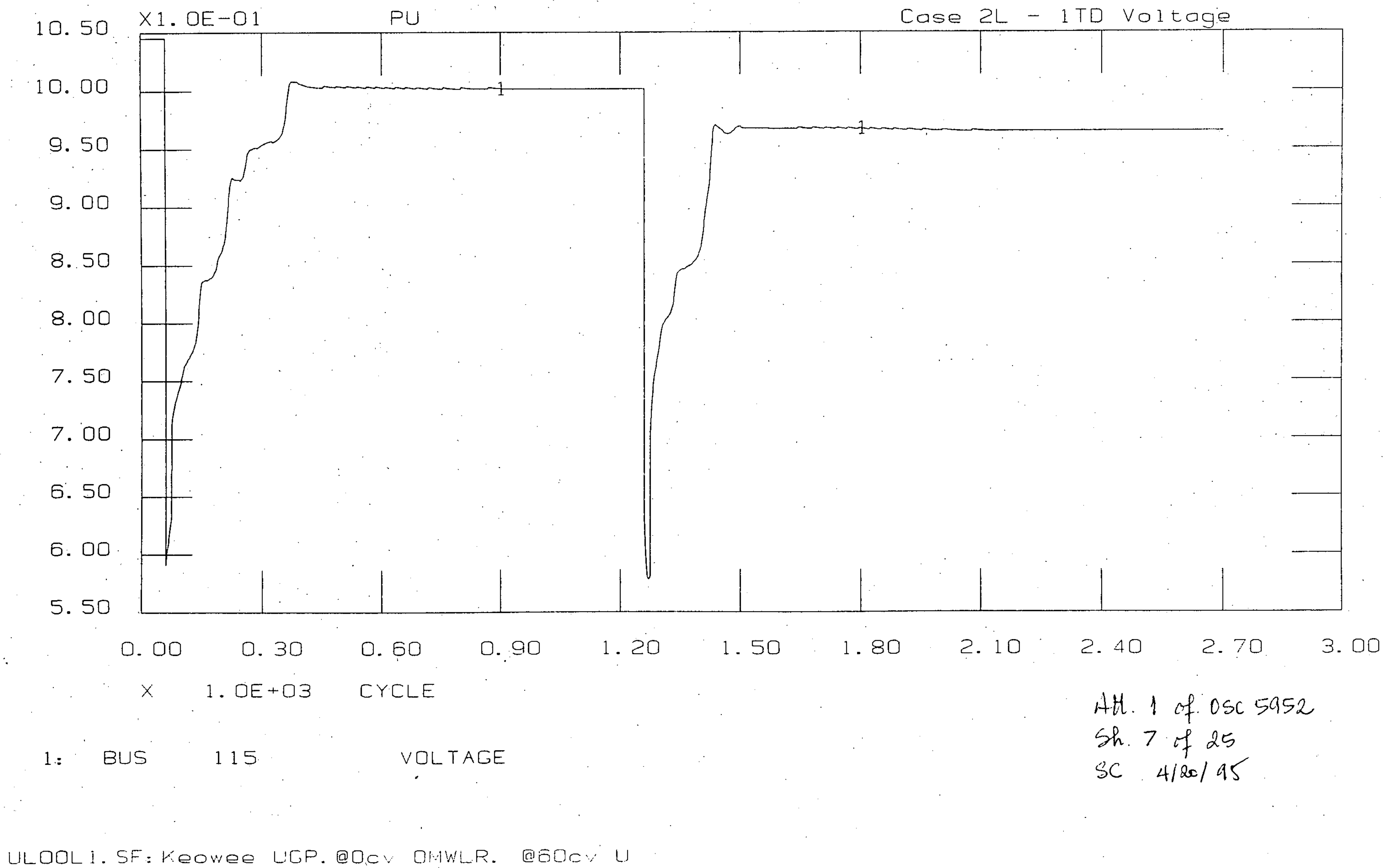

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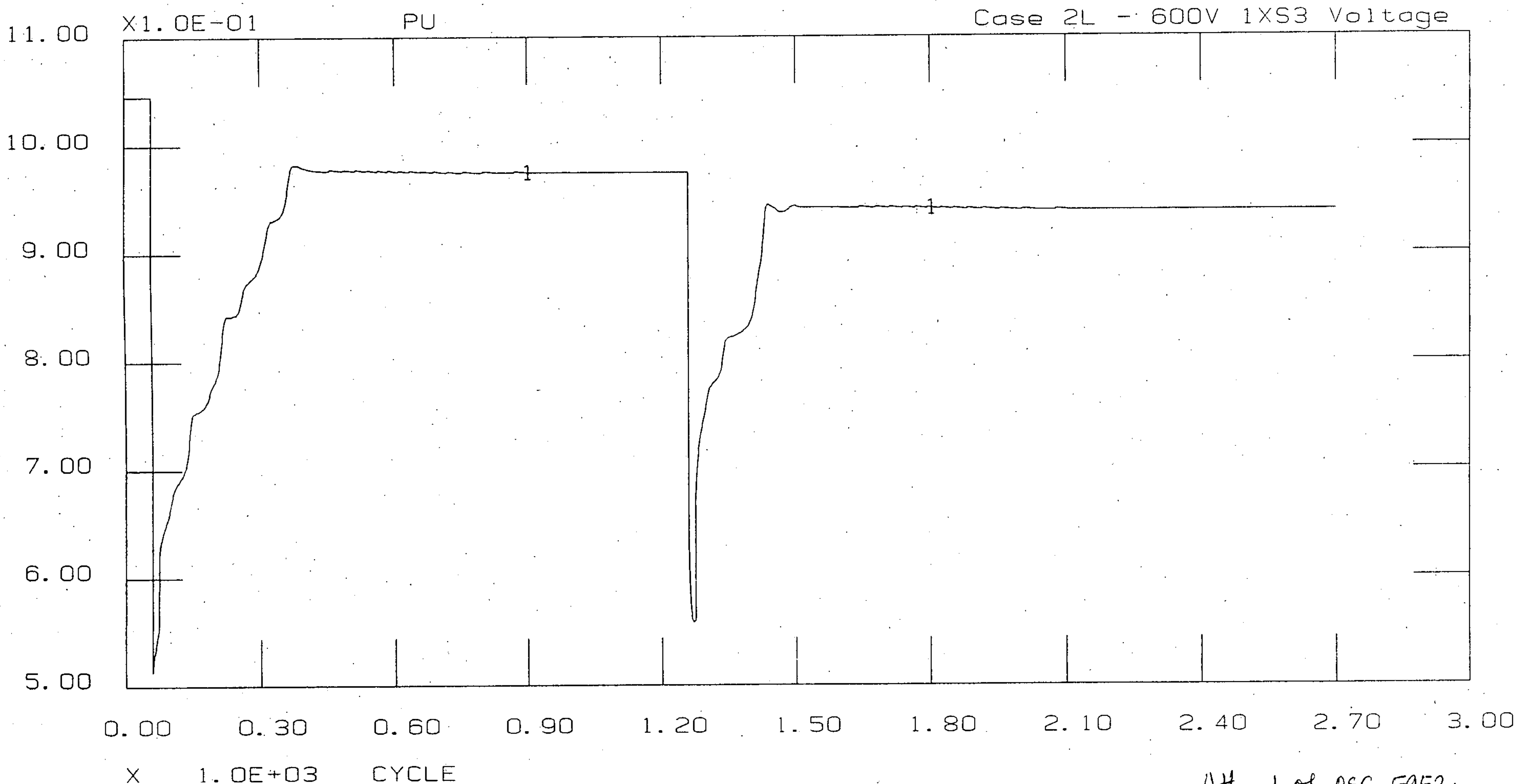

1: BUS 158 VOLTAGE

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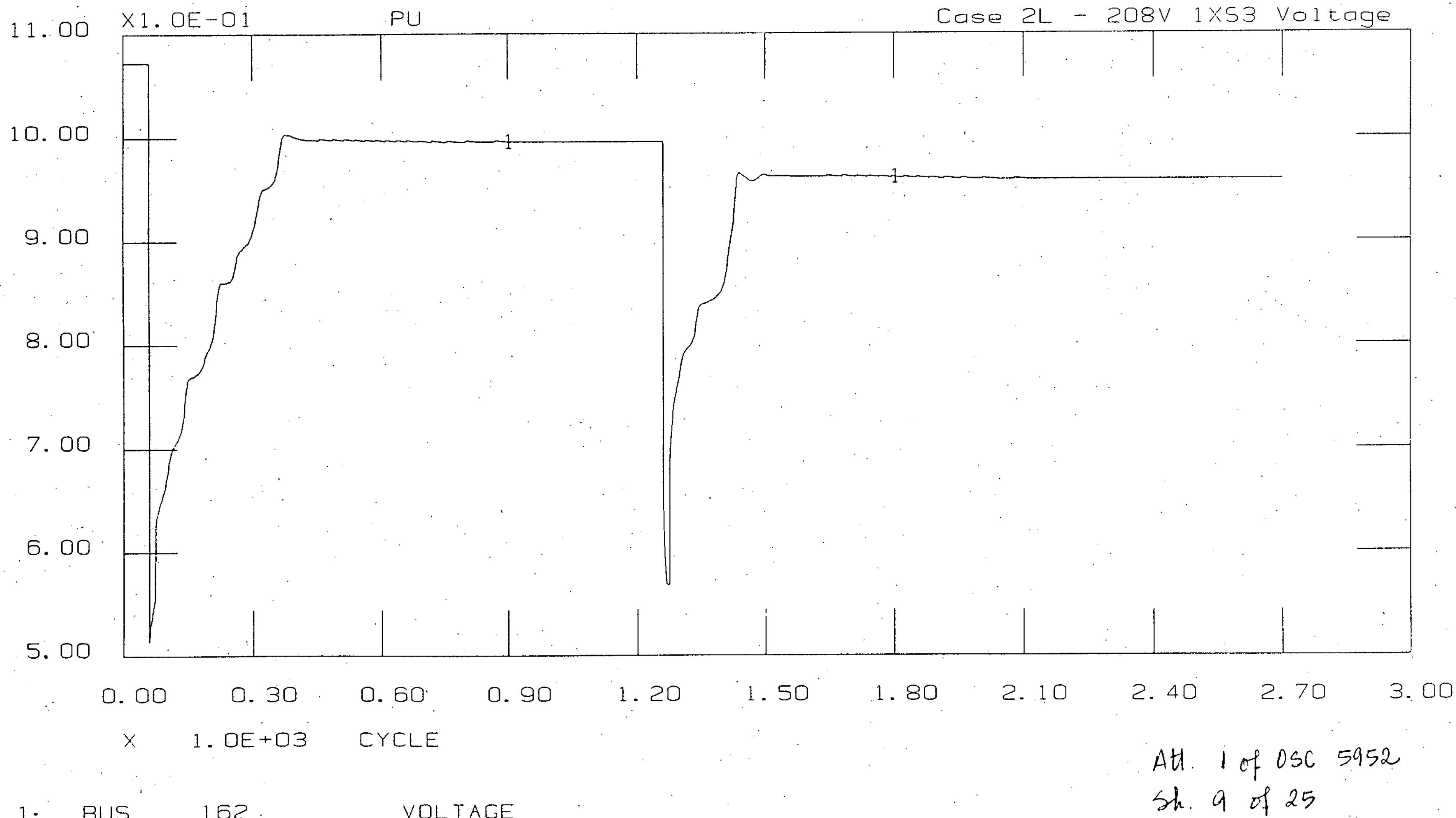
ULOOL1.SF: Keowee UGP. @0cv OMWLR. @60cv U



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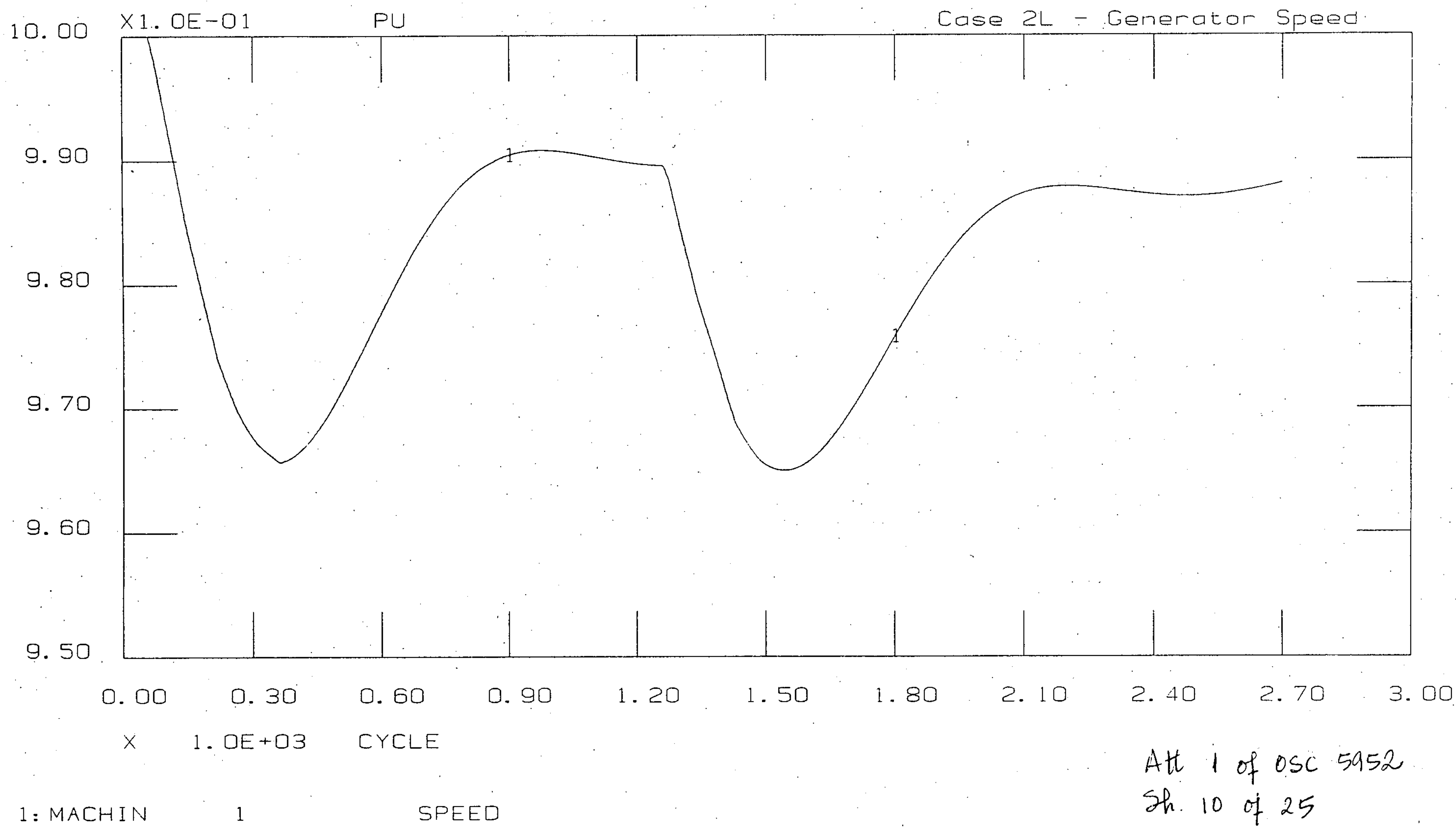
ULOOL1.SF: Keowee UGP. @0cv OHWLR. @60cv U



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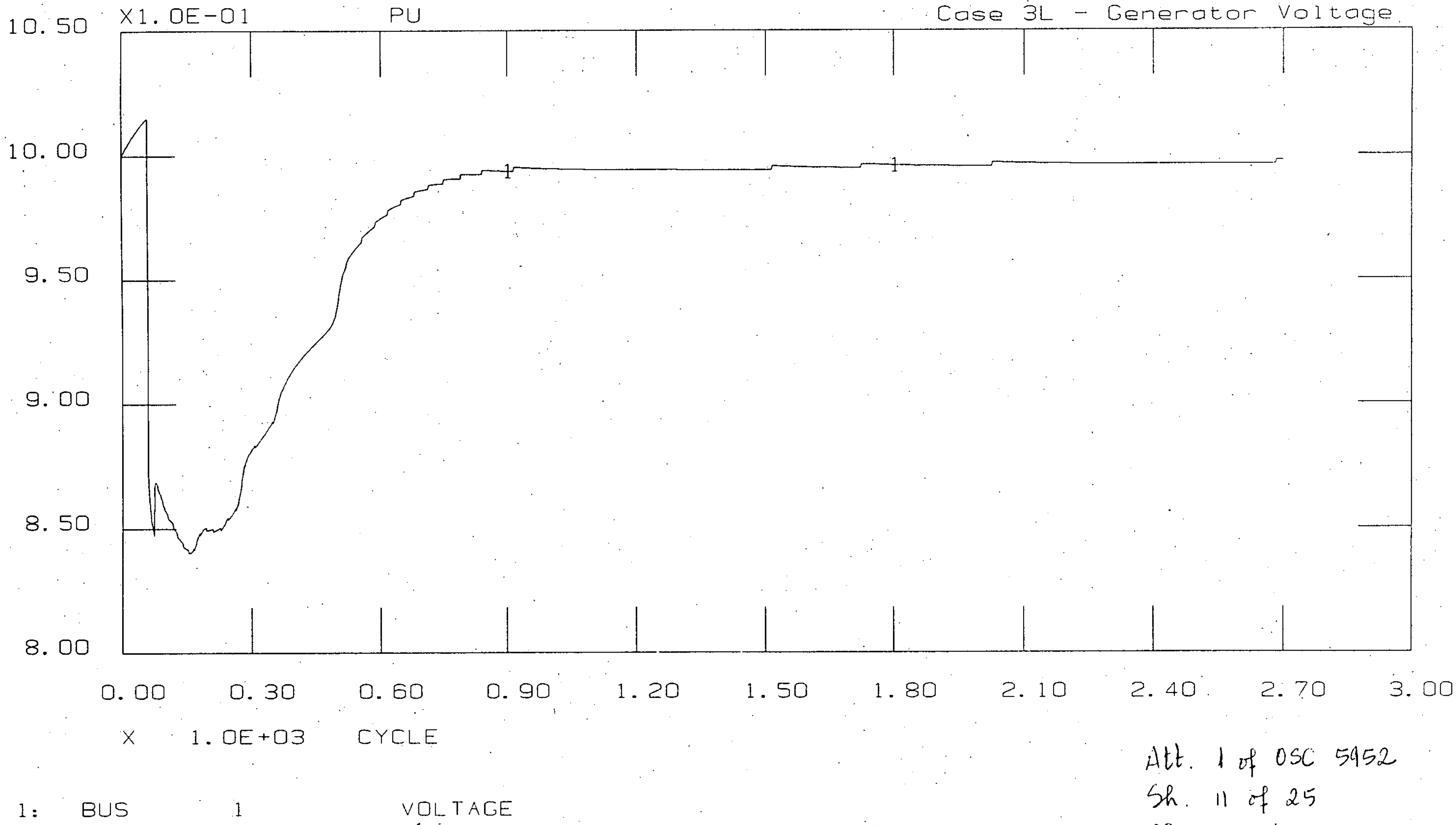
ULOOL1.SF: Keowee UGP.@0cv OMWLR. @60cv U



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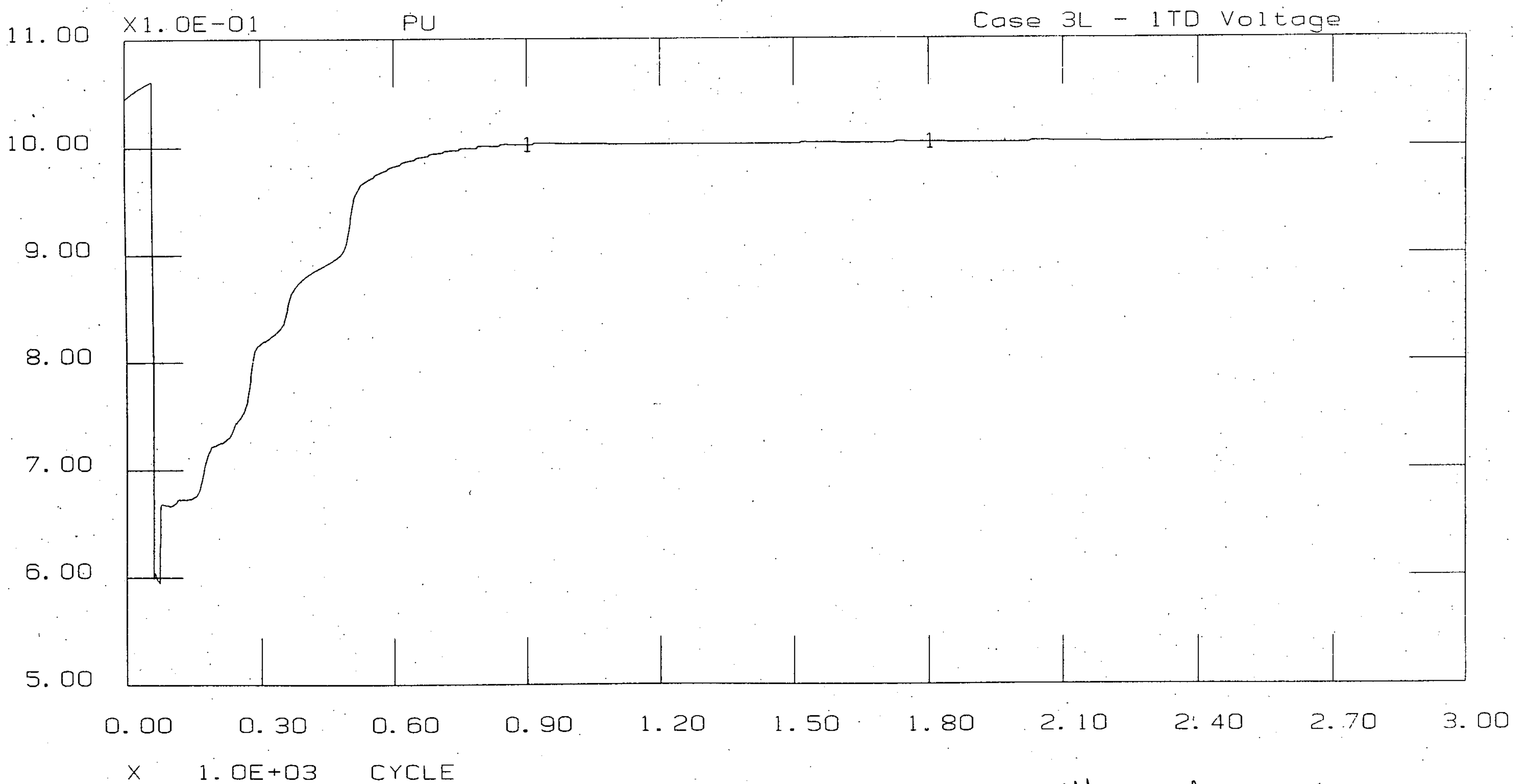
ULOOL1RF.SF: Keowee UGP.@0c. OHWLR. @60cv



1: BUS 115 VOLTAGE

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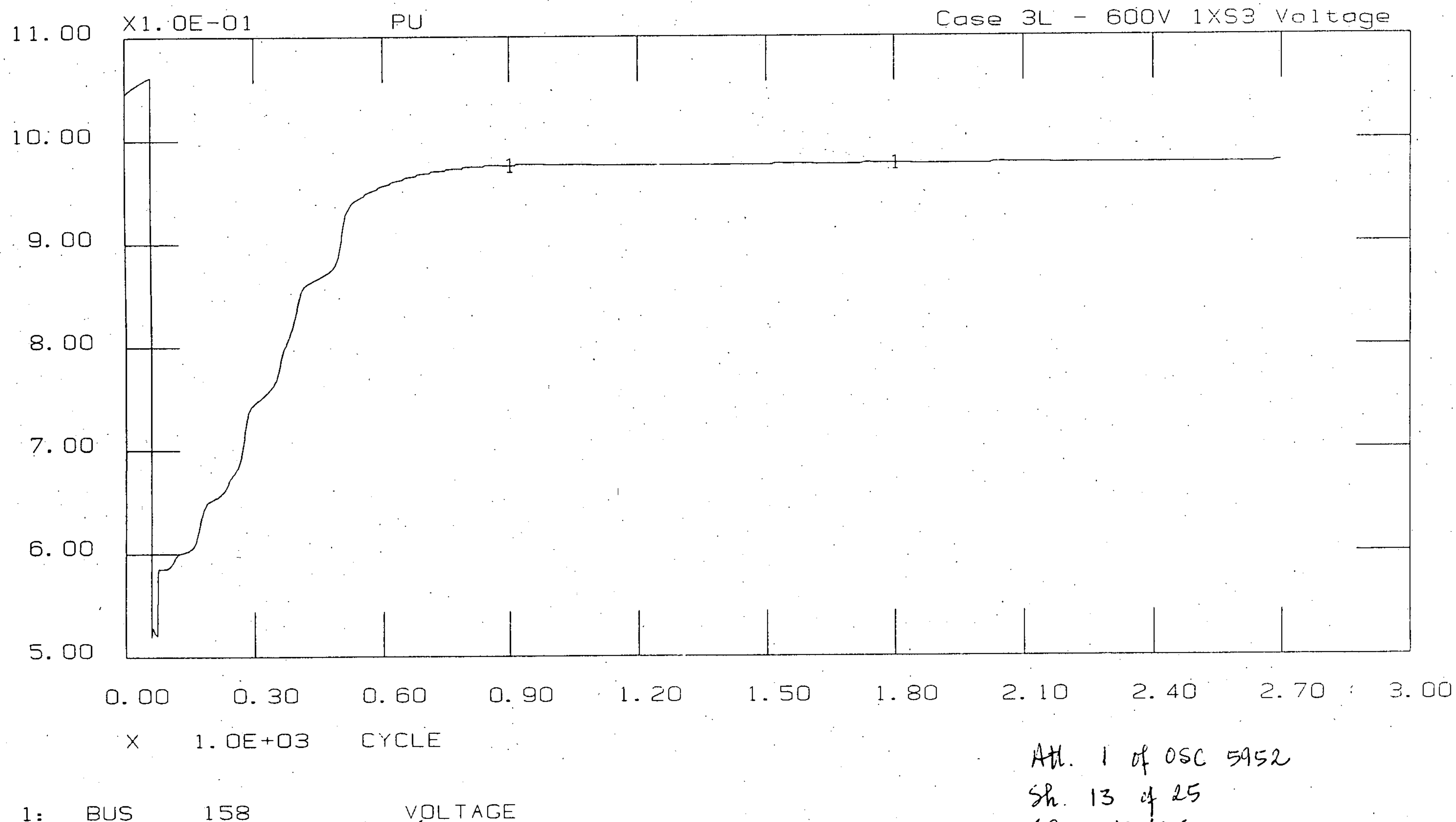
ULOOL1RF.SF: Keowee UGP. @0c / ONWLP. @60cv



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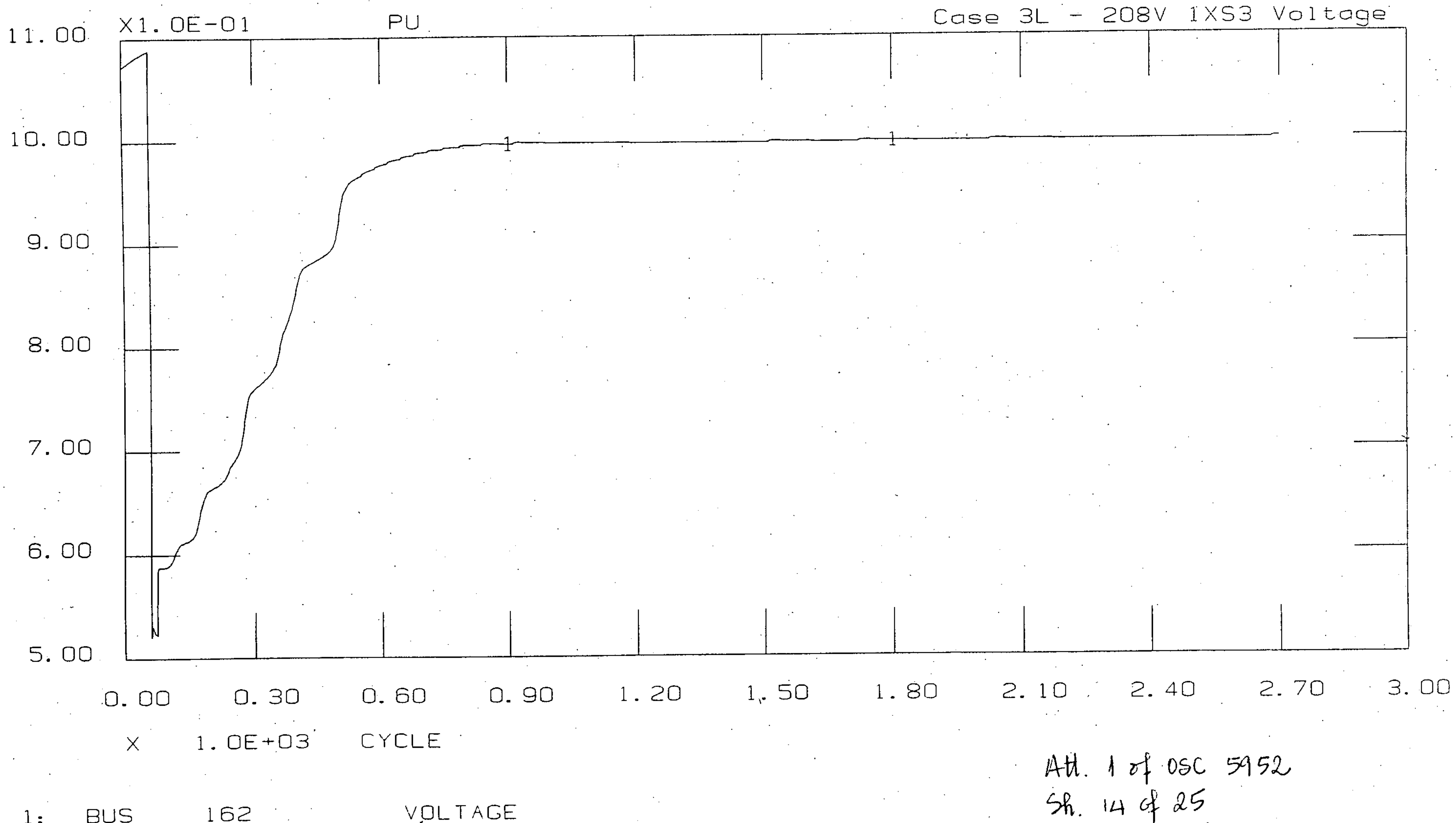
ULOOL1RF. SF: Keowee UGP. @0cv OMWLR. @60cv



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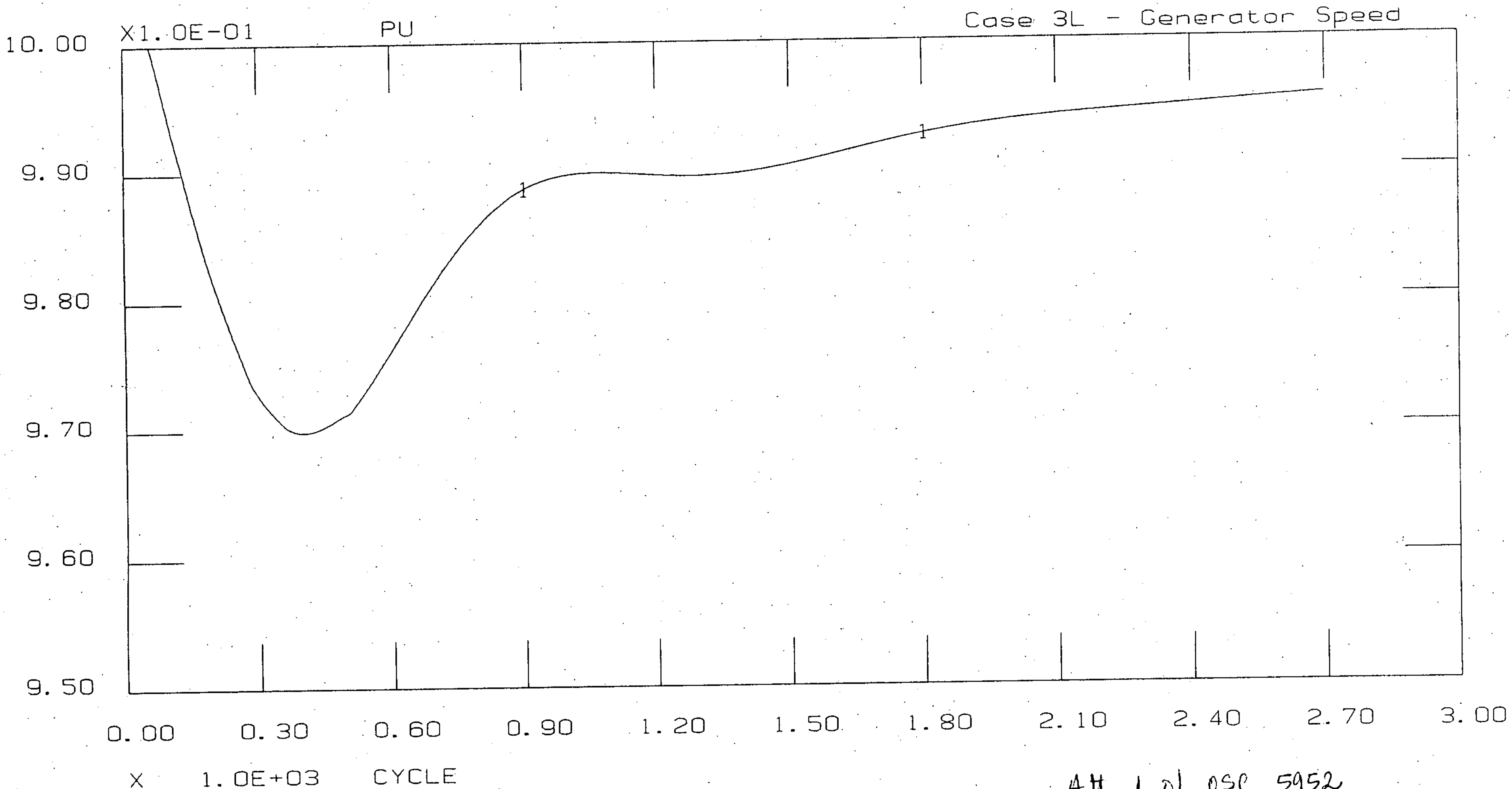
ULOOL1RF.SF: Keowee UCP.@0cv OMWLR. @60c



1: MACHIN 1 SPEED

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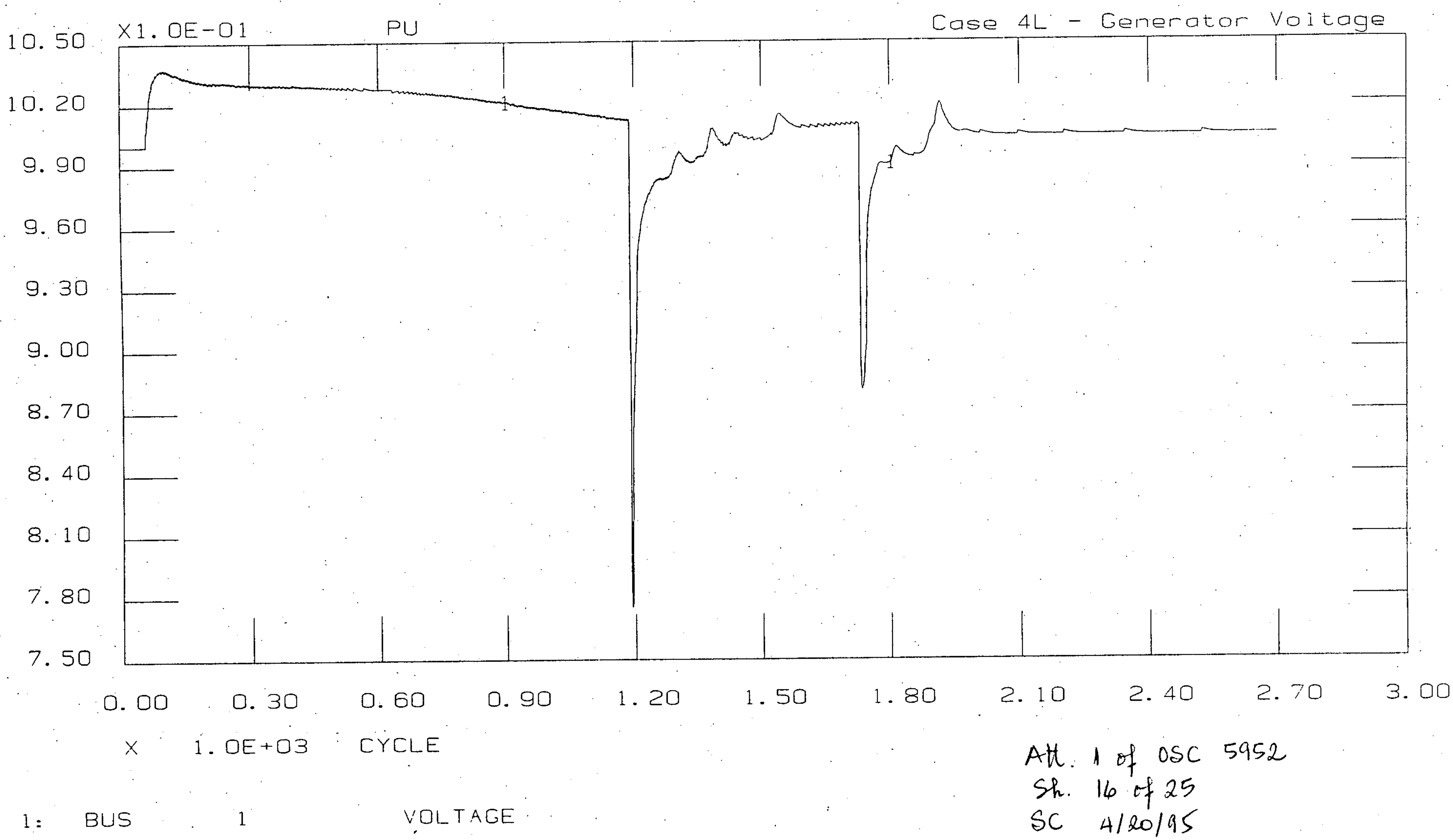
ULOOL1RF.SF: Keowee UGP. @0cv OMWLR. @60cv



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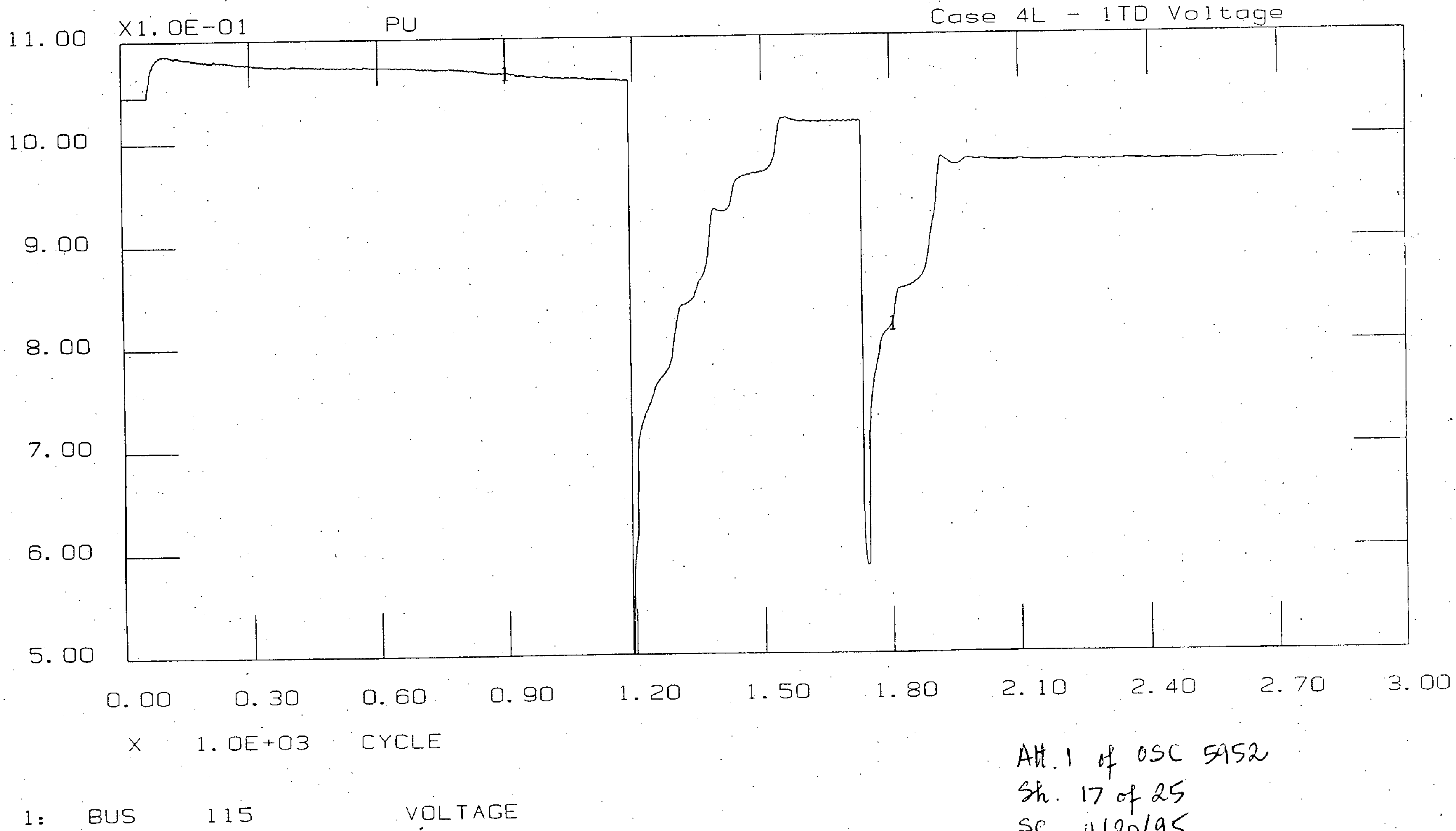
UL75L1. SF: Keowee UGP. @60cy 75MWLR. @1190



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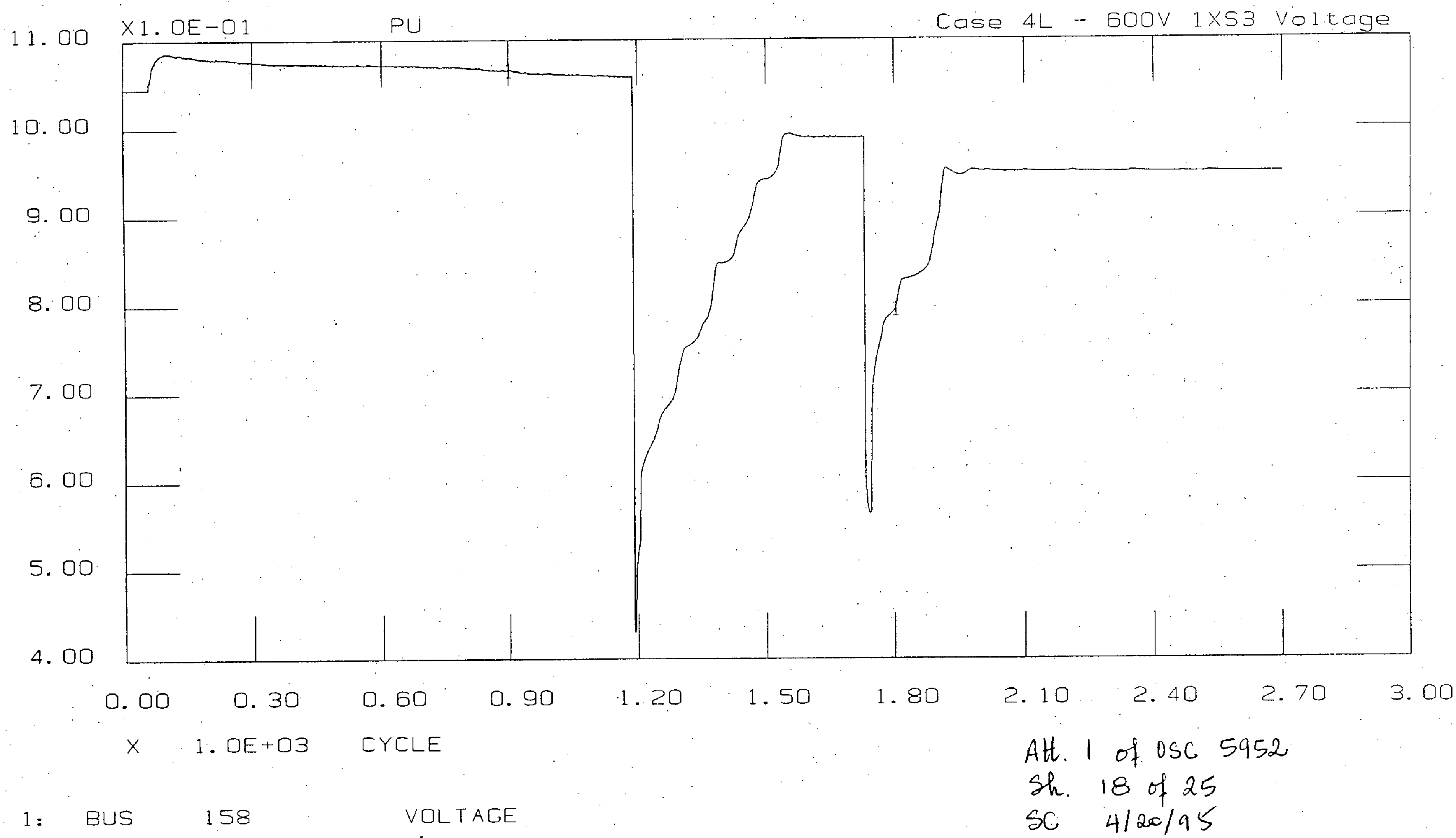
UL75L1. SF: Keowee UGP. @60c. 75MWLR. @1190



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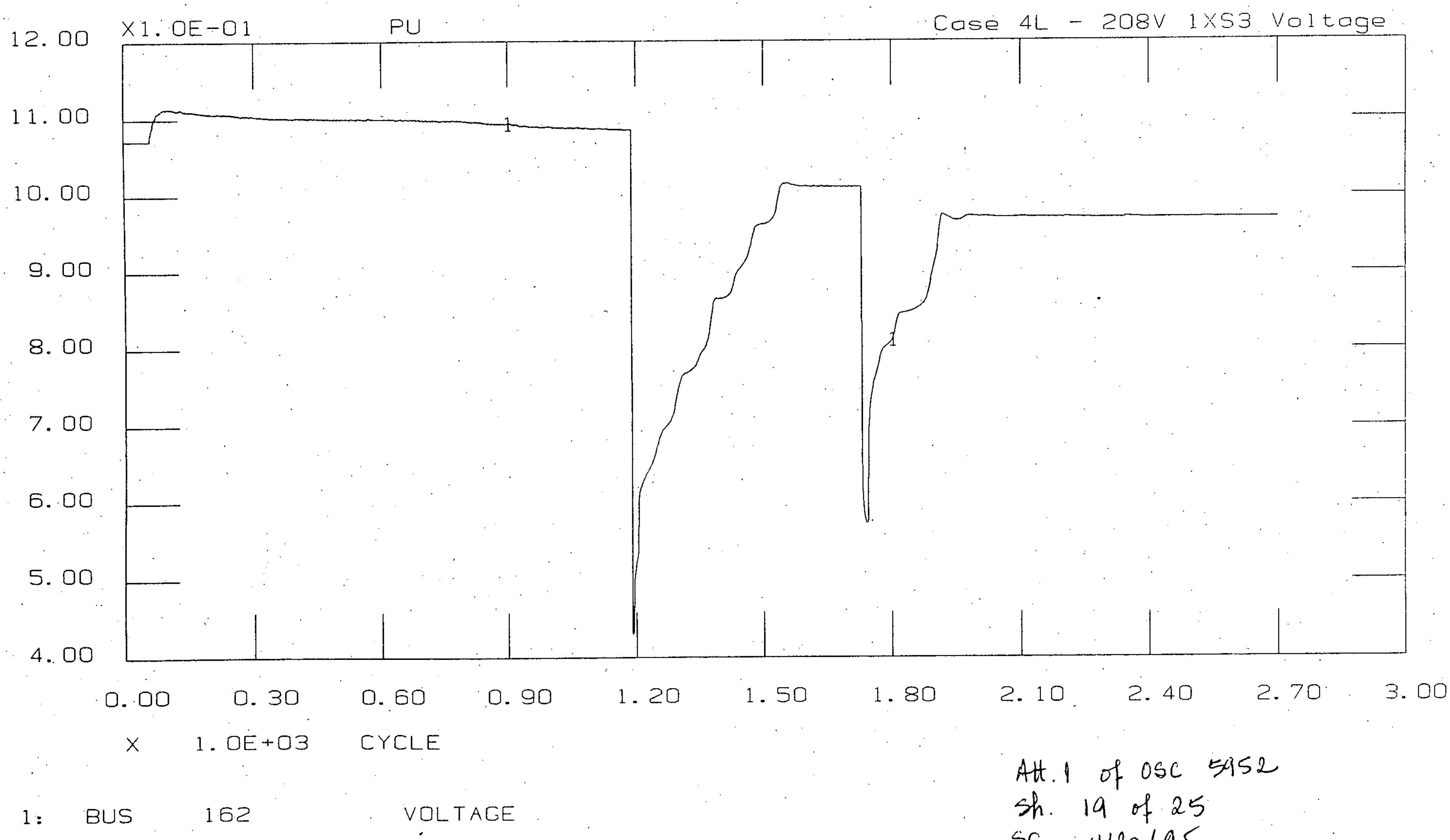
UL75L1. SF: Keowee UGP. @60cv 75MWLR. @1190



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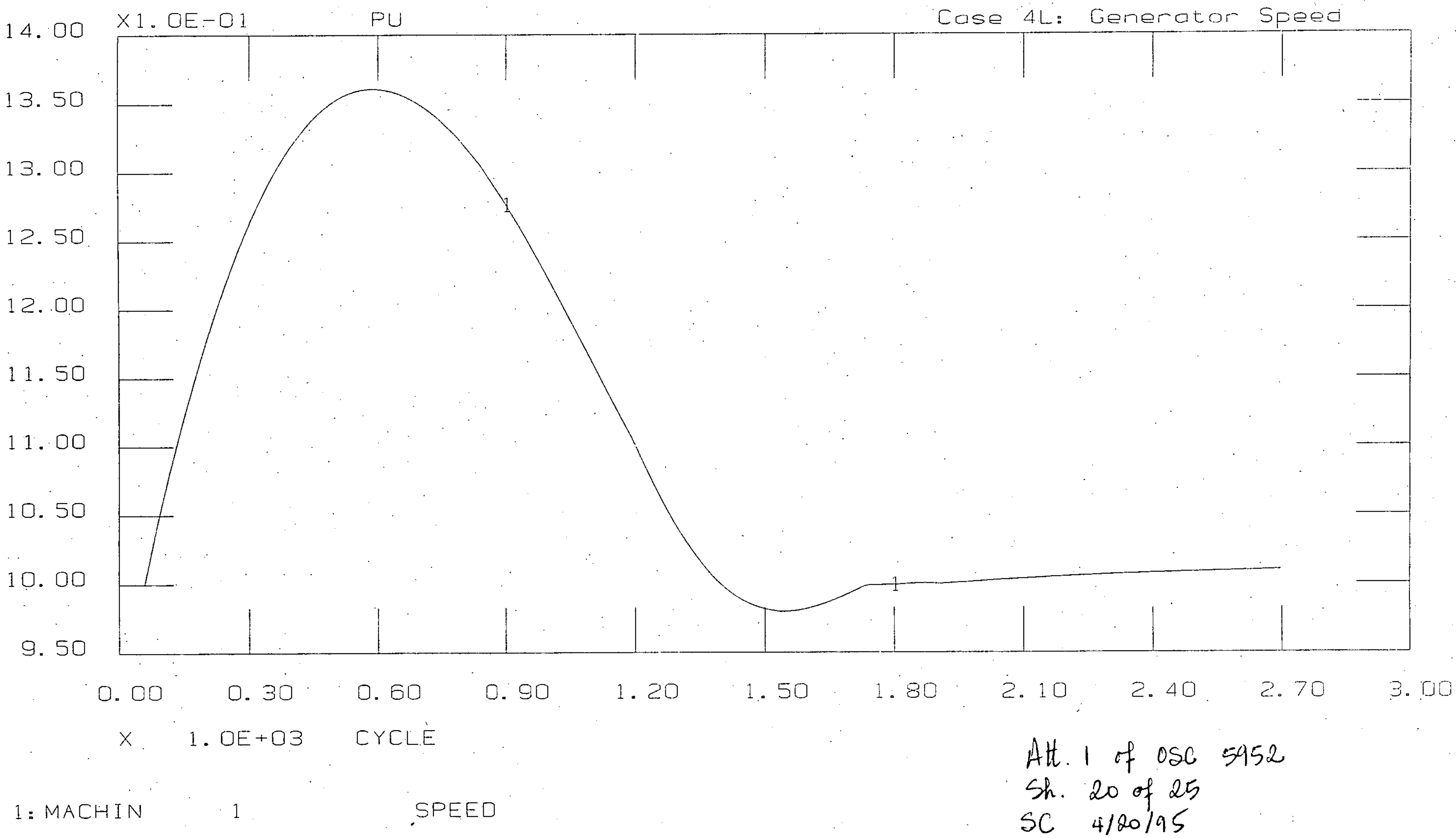
UL75L1.SF: Keowee UGP. @60cy 75MWLR. @1190



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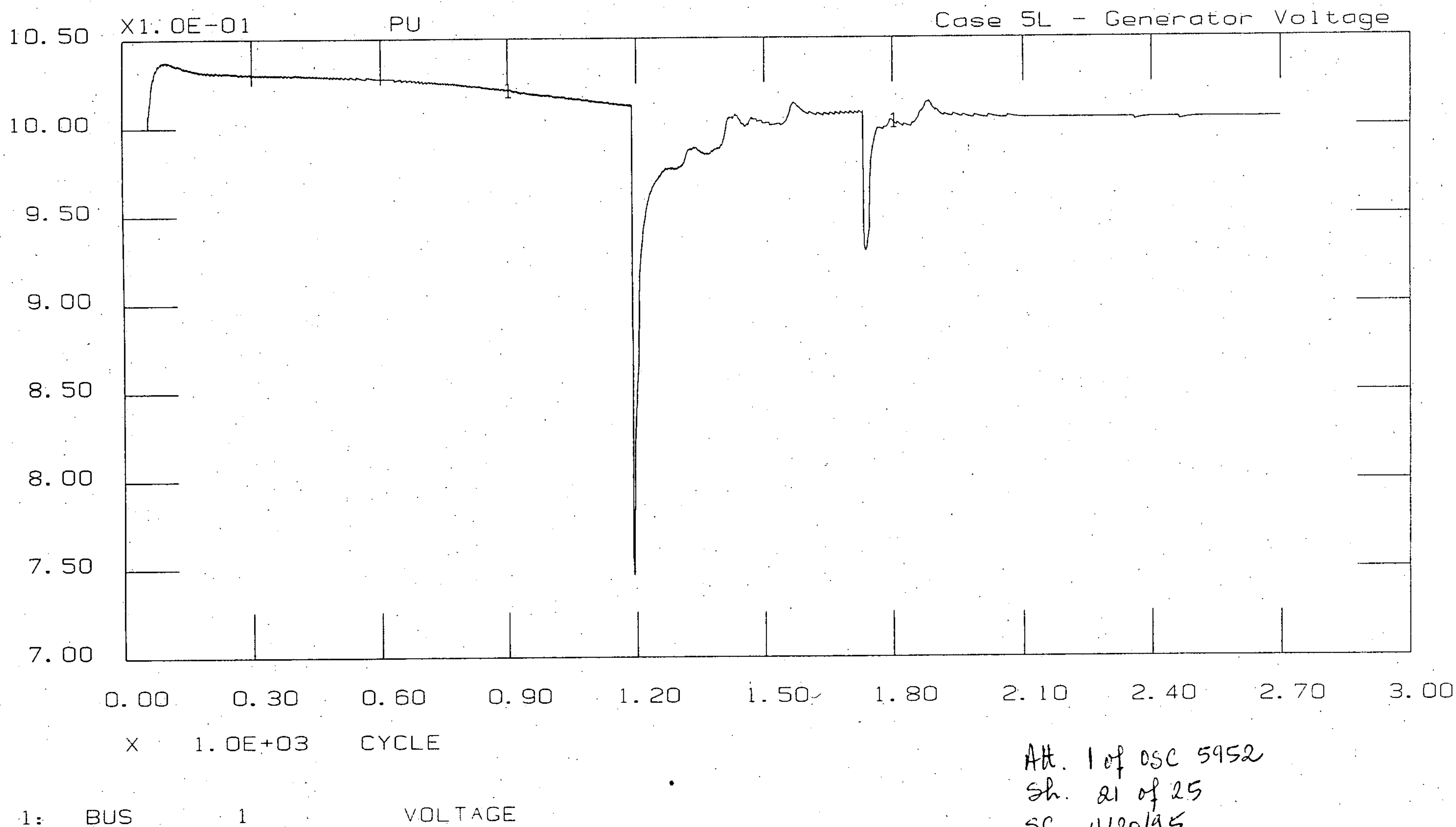
UL75L1. SF: Keowee UGP. @60cv 75MWLR. @1190



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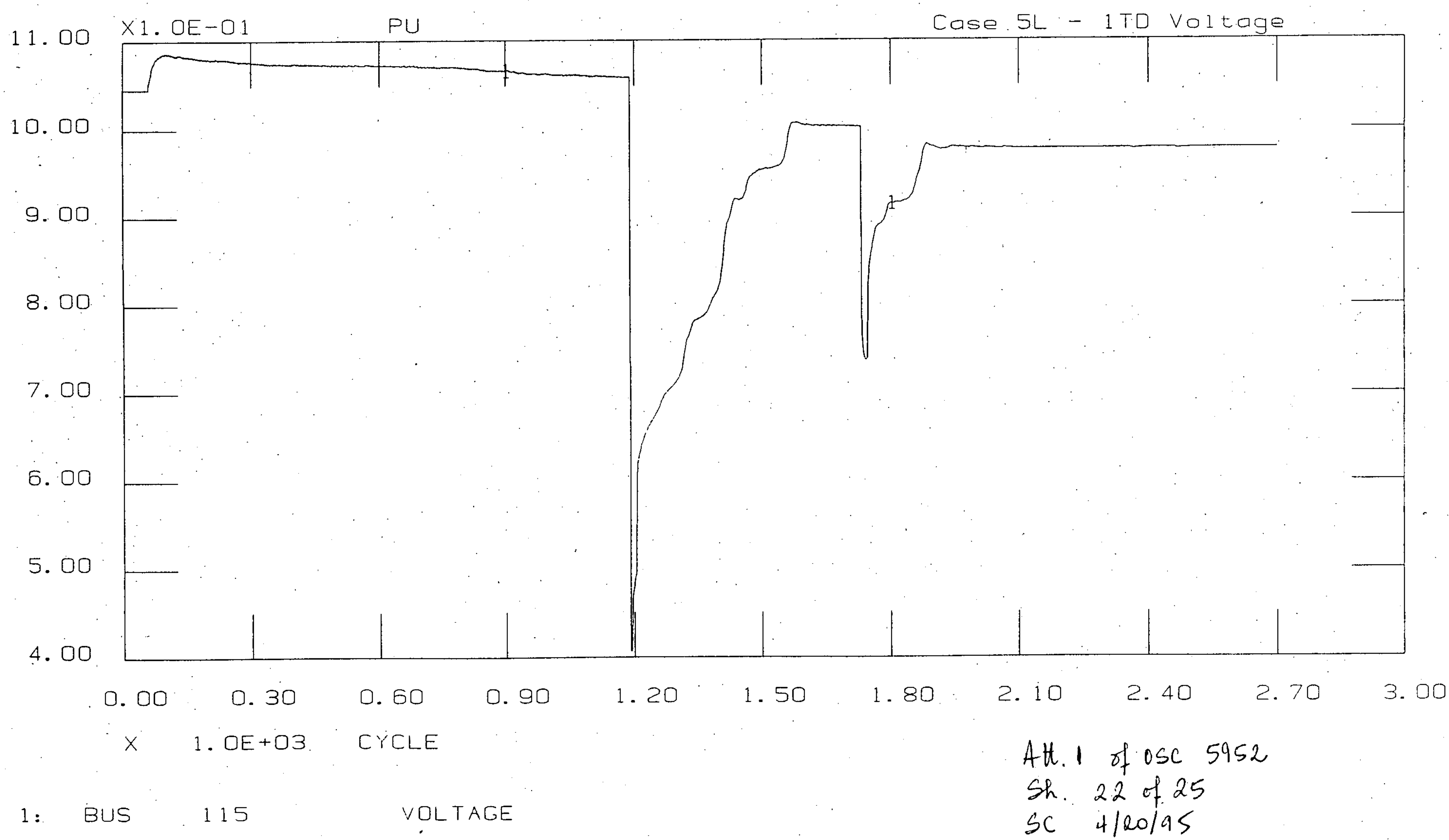
UL75L12.SF: Keowee UGP. @60c. 75MWLR. @119



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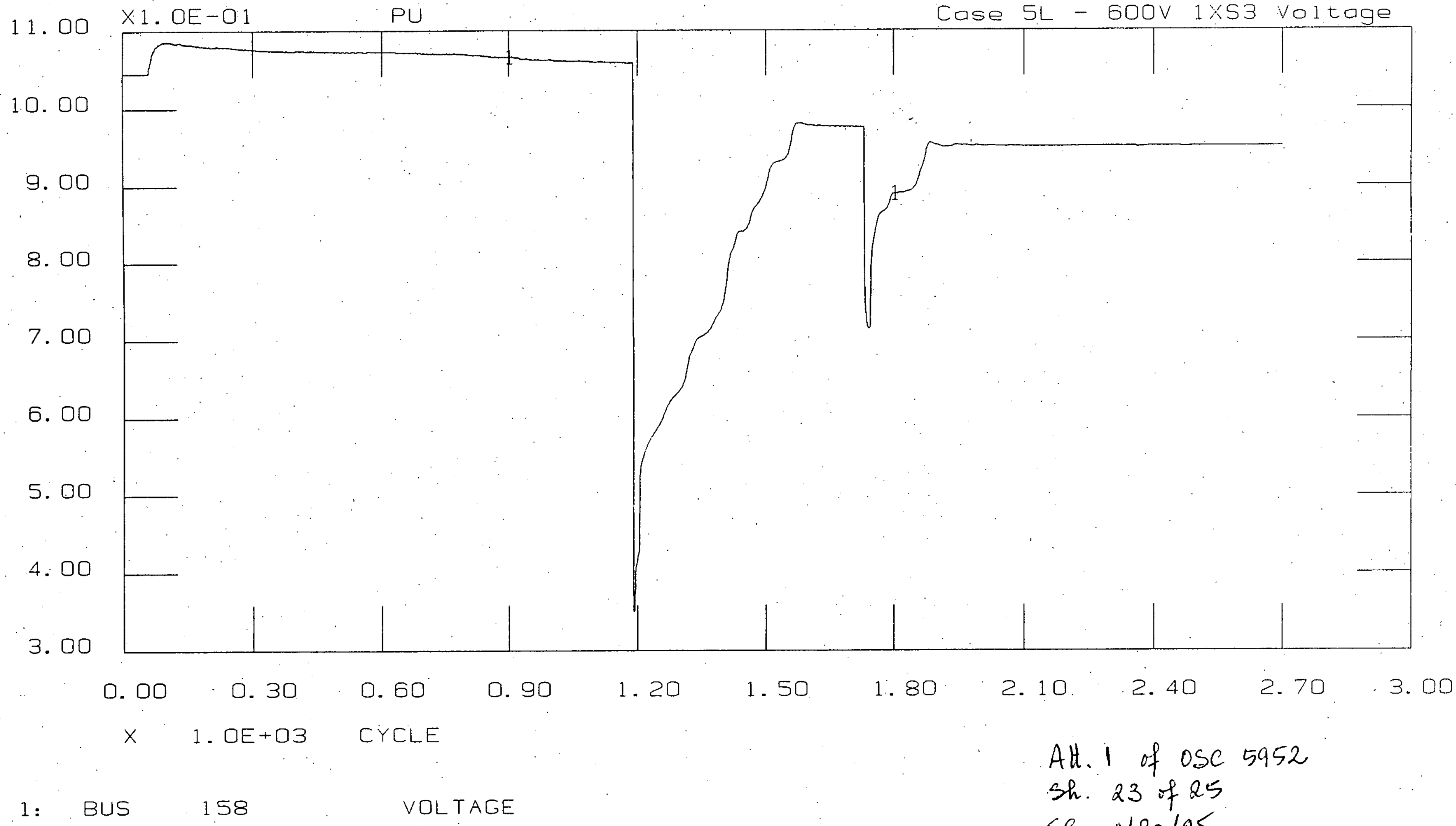
UL75L12. SF: Keowee UGP. @60cv 75MWLR. @119



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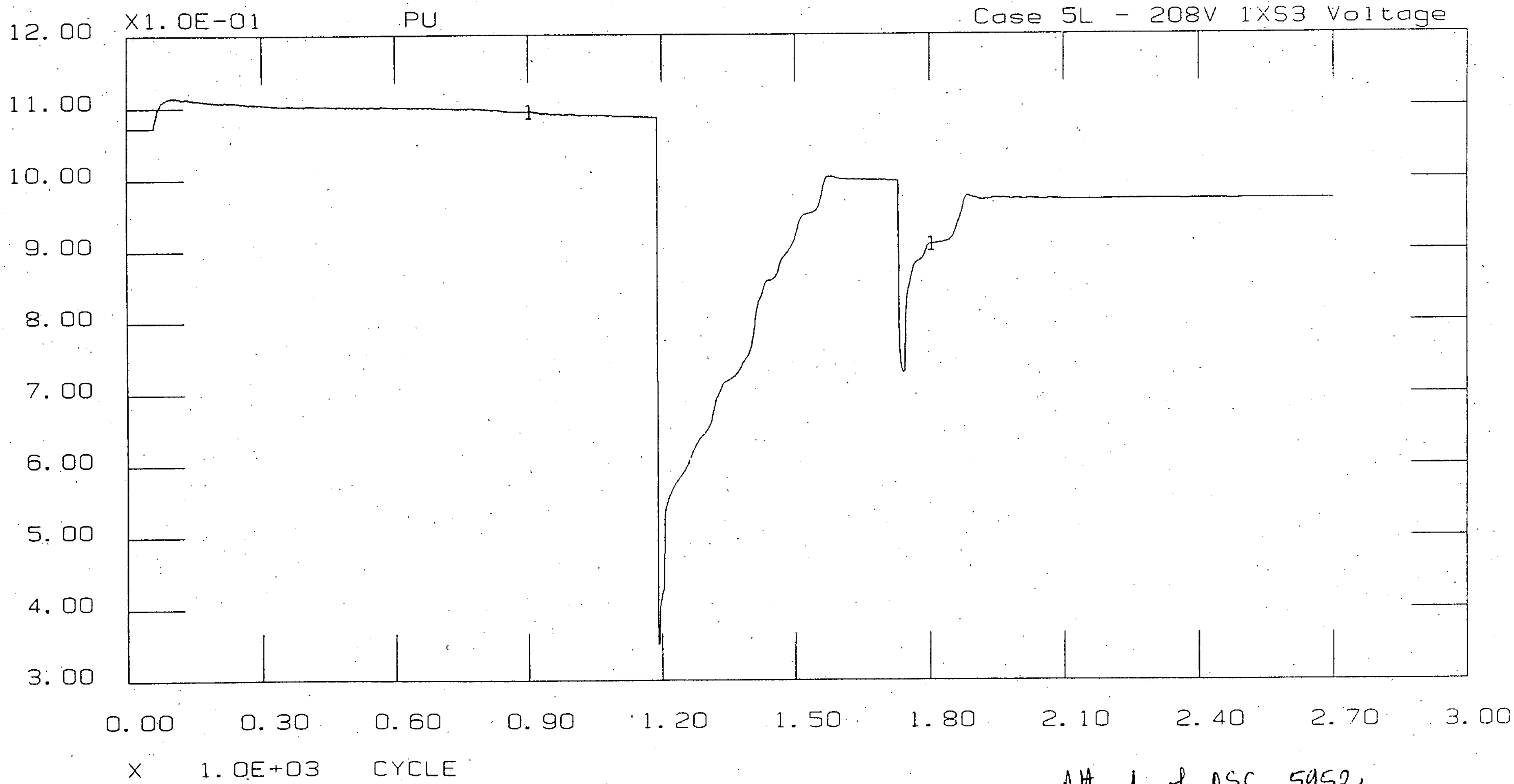
UL75L12. SF: Keowee UGP. @60cv 75MWLR. @119



1: BUS 162 VOLTAGE

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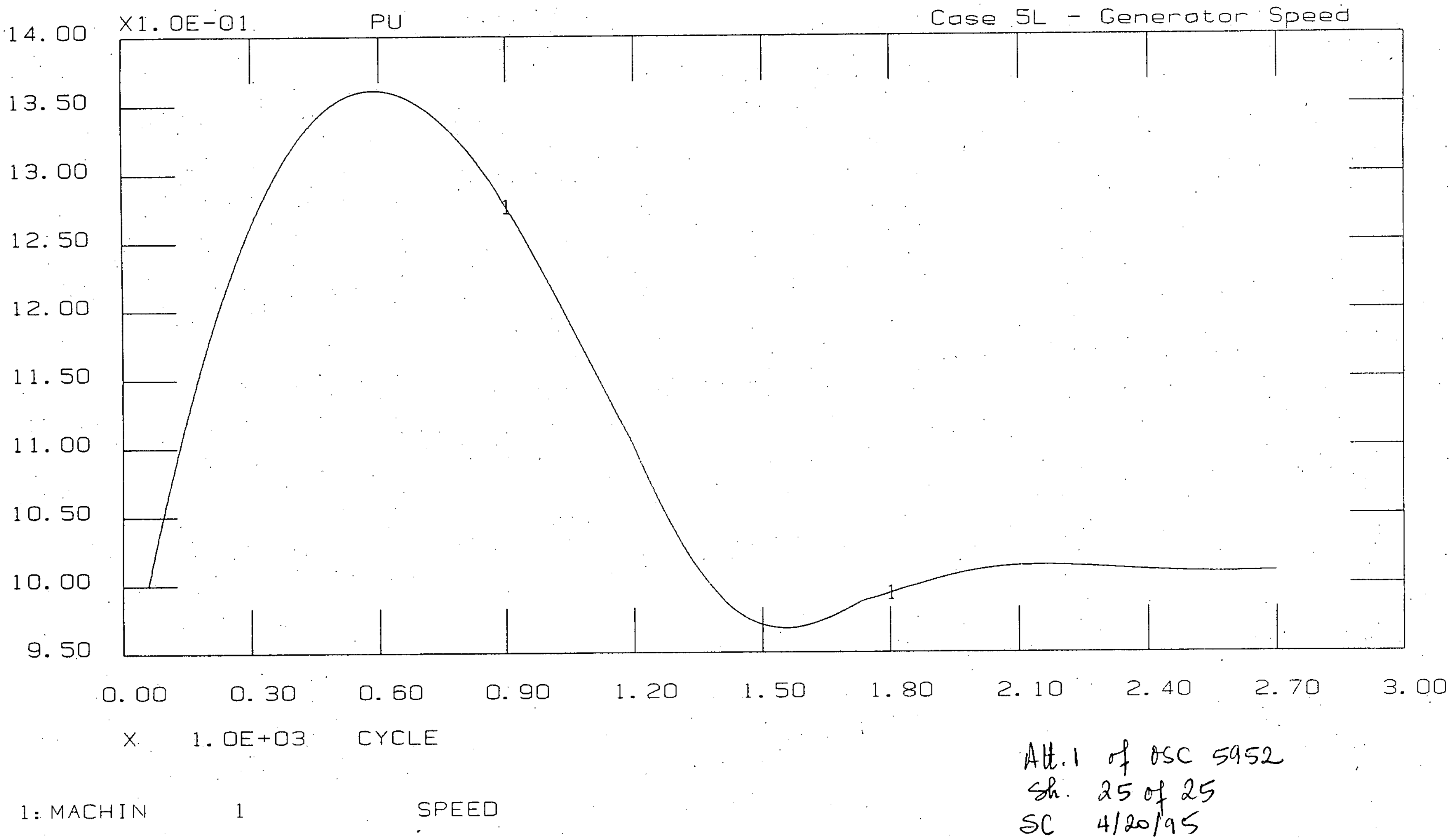
UL75L12. SF: Keowee UGP. @60cv 75MWLR. @119



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UL75L12. SF: Keowee UGP. @60cv 75MWLR. @119

COVER SHEET

ATTACHMENT 2 of OSC 5952

This attachment contains one sheet, a letter from GTE Sylvania.

By: SC 4/20/95

SYLVANIA Electrical Equipment

September 15, 1980

Duke Power Company
P.O. Box 33189
Charlotte, North Carolina 28242

Attention: Mr. Luis A. Lecaros,
Elect. Engr.

SUBJECT: Test Report

Dear Mr. Lecaros:

I am attaching, hereto, a copy of tests made on starters at our Lancaster, South Carolina plant on January 10, 1980.

The purpose of these tests was to get the pick-up and drop-out values of our starters.

The worst operating conditions a starter is subjected to is pick-up where the VA inrush is high and the energy required to pick-up the magnet and starter is high. As you can see from the attached results on the Size 1, the pick-up voltage was 65% and drop-out was 50.2%. For the size 5 TM, the pick-up was 70.2% and drop-out 40.2%.

Although this test did not include a continuous 4-hour running test, we operated the starters long enough to have hot coils.

The worst condition in a continuous run is with overvoltage. This causes the coil to draw higher currents which causes overheating. We are required by NEMA to run satisfactorily continuously at 110% voltage.

With undervoltage such as 80% as long as the starter picks-up and seals in the coil heating will be less than 100%.

Very truly yours,

GTE SYLVANIA

William J. Suk

William J. Suk

cc: [redacted]
Mr. Dick Schneider - GTE-Cleveland

Att. 2 of OSC 5952
Sheet 1 of 1
se 4/20/95

COVER SHEET

ATTACHMENT 3 of OSC 5952

This attachment contains 2 sets of diskettes (original & backup), one each.

By: SC 4/20/95