



Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

February 8, 1993

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Document Control Desk

Subject: Byron Units 1 and 2,
NRC Docket Numbers 50-454 and 50-455

Reference: NRC SER issued January 31, 1992 on Byron Station
Inservice Testing (IST) Program for Valves Revision 10c and
Byron Inservice Testing Program for Pumps Revision 9a.

Dear Dr. Murley:

Attached for your review and transmittal is Revision 9b of the IST Program for Pumps which includes a revision to Relief Request PR-7.

On January 31, 1992 an NRC SER was issued on the Byron Station Inservice Testing Program for Valves Revision 10c and Byron Inservice Testing Program for Pumps Revision 9a. Contained in this SER were four open items. Three of these items were given conditional approval pending further action by Byron Station and one required additional information. These items consisted of Relief Request PR-1 involving the use of ANSI/ASME OMB-1989, Part 6 (OM-6) vibration limits, Relief Request PR-7 involving vibration limits on the Essential Service Water Make-Up Pumps, VR-2 involving the check valves in the Sodium Hydroxide additive portion of the Containment Spray System, VR-18 involving full flow and backflow testing of several Emergency Core Cooling System check valves, and VR-19 involving the backflow testing frequency and methodology for the Auxiliary Feedwater Pump Discharge Check Valves.

Byron Station wishes to address these issues as follows.

Condition:

Relief Request PR-1 was approved on the condition that "the licensee complies with all of the OM-6 vibration measurement requirements".

Response:

Byron Station is in full compliance with the vibration measurement requirements of OM-6 with the exception of the Essential Service Water Makeup Pumps OSX02PA & B which are addressed in Relief Request PR-7.

Condition:

Relief Request PR-7 was approved on the condition that "the licensee obtains vendor's concurrence of the proposed ranges and complies with all other OM-6 vibration measurement requirements".

Response:

Relief Request PR-7 has been revised to contain vendor recommended vibration limits and to include a letter containing vendor concurrence with the proposed vibration limits for the Essential Service Water Make-Up pumps. Relief Request PR-7 is otherwise in full compliance with the vibration measurement requirements of OM-6.

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February 8, 1993

Condition:

Relief Request VR-2 was approved on the condition that "the licensee should actively investigate the use of non-intrusive diagnostic techniques to demonstrate that these valves exercise open during flow testing".

Response:

Relief Request VR-2 has been revised by Braidwood Station to include non-intrusive diagnostic techniques. Braidwood Station has submitted this revision for NRC review and approval. In an effort to conserve time by eliminating the need for two independent program reviews for Byron and Braidwood Stations, Byron Station requests an extension to allow the Byron revision of VR-2 to be submitted after NRC issuance of the Braidwood SER on this issue.

Request for Additional Information:

Relief Request VR-18 was denied due to insufficient detail.

Response:

Relief request VR-18 has been reorganized to include the requested additional information and was resubmitted for NRC evaluation and approval in March of 1992. Byron Station is currently awaiting an NRC SER on this submittal.

Condition:

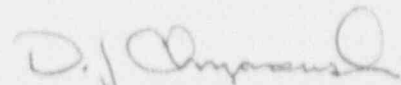
Relief Request VR-19 was approved on the condition that "the licensee should investigate the use of non-intrusive diagnostic techniques to demonstrate that these valves will close upon cessation or reversal of flow".

Response:

Relief Request VR-19 has been revised by Braidwood Station to include non-intrusive diagnostic techniques. Braidwood Station has submitted this revision for NRC review and approval. In an effort to conserve time by eliminating the need for two independent program reviews for Byron and Braidwood Stations, Byron Station requests an extension to allow the Byron revision of VR-19 to be submitted after NRC issuance of the Braidwood SER on this issue.

Please refer any questions or comments to this office.

Sincerely,



David J. Chrzanowski
Nuclear Licensing Administrator

Attachment: Relief Request, PR-7, Rev. 9b

cc: A. B. Davis, Regional Administrator - RIII
J. Hickman, Project Manager-NRR/PDIII-2
H. Peterson, Senior Resident Inspector (Byron)

RELIEF REQUEST NO. PR-7

1. PUMP NUMBER: OSX02PA, B pumps
2. NUMBER OF ITEMS: 2 pumps.
3. ASME CODE CLASS: 2 & 3
4. ASME CODE, SECTION XI REQUIREMENTS: ANSI/ASME OMB-1989, Part 6 states:
 "If deviations fall within the alert range of Table 3, the frequency of testing specified in paragraph 5.1 shall be doubled until the cause of the deviation is determined and the condition corrected. If deviations fall within the required action range of Table 3, the pump shall be declared inoperable until the cause of the deviation has been determined and the condition corrected.

When a test shows deviations outside the acceptable range of Table 3, the instruments involved may be recalibrated and the test rerun."

TABLE 3

Pump Type	Pump Speed	Test Parameter	Acceptable Range	Alert Range	Required Action Range
Centrifugal and vertical line shaft (Note (2))	<600 rpm	V_v or V_h	$\leq 2.5 V$	> 2.5 V, to 6 V, or > 10.5 mils	> 6 V, or > 22 mils
Centrifugal and vertical line shaft (Note (2))	≥ 600 rpm	V_v or V_h	$\leq 2.5 V$	> 2.5 V, to 6 V, or > 0.325 in./sec	> 6 V, or > 0.70 in./sec
Reciprocating		V_v or V_h	$\leq 2.5 V$	> 2.5 V, to 6 V,	> 6 V,

5. BAIS FOR RELIEF: The Essential Service Water Pumps OSX02PA & B are of a very unique design (see Fig. 1). The pump is attached to a horizontal diesel driver via a right angle gear drive, and the gear drive is located approximately 39 feet above the pump. This configuration assures pump operability during the design basis flooding of the Rock River. As would be expected, this extreme configuration results in vibration characteristics which are different from pumps of a more conventional design. The vibration levels for these pumps are consistently higher than the commonly expected values. These pumps exhibited higher than usual vibration levels at the time of their installation (approximately 0.4 - 0.45 in/sec for the gear box and approximately 0.20 - 0.25 in/sec for the pump), at which time they were verified by the vendor to be operating properly, and have continued to display high vibration levels throughout their service life.

RELIEF REQUEST NO. PR-7

6. ALTERNATE TESTING: Also characteristic of these pumps is the fact that the gear box vibration levels are consistently higher than the pump vibration levels. We propose that, in order to properly monitor this uniquely designed pump, separate acceptance ranges be used for the gear box and the pump. The vibration levels for the pump, though consistently higher than those for conventional pumps, display no significant upward trend over a period of approximately six years. This is significant evidence that these vibration levels are characteristic of this unique design and do not indicate pump degradation. However, we propose that tighter acceptance criteria be used for the pump than for the gear box in order to detect any degradation that may occur in the future. Based on performance data, Byron Station proposes that the following ranges be utilized to monitor vibration levels for OSX02PA & B (where V = the vibration amplitude [in inches per second] and Vr = the reference vibration amplitude [in inches per second] established when the pump was known to be operating acceptably):

OSX02PA & B Location (in/sec)	Acceptance Range (in/sec)	Alert Range (in/sec)	Required Action Range (in/sec)
Pump Shaft	$V \leq 2.5V_r$ and $V \leq 0.325$	$2.5V_r < V \leq 6.0V_r$ or $0.325 < V \leq 0.700$	$V > 6.0V_r$ or $V > 0.700$
Gearbox	$V \leq 2.5V_r$ and $V \leq 0.560$	$2.5V_r < V \leq 6.0V_r$ or $0.560 < V \leq 0.900$	$V > 6.0V_r$ or $V > 0.900$

Additionally, although it is obvious that this pump has unusual characteristics and understandably high vibration levels, we plan to maintain conservatism in our maintenance practices and replace the gear assembly when parts are available to re-verify that the high vibration levels are characteristic of this pump design.

7. JUSTIFICATION: A review of past performance parameters for the SX Make-up pumps has been completed. Attached are graphs of flowrate and vibration data over the last 2.5 years of operation. Prior to 1989, only the maximum peak vibration values were recorded without indication of orientation. Since 1989, all the individual peak vibration values at each location were recorded with associated orientation, therefore, the prior data cannot be directly compared to recent data. From the attached plots (see attachments A and B) and tables (see table 1 and 2) it can be seen that the vibration fluctuates dramatically but showed no overall upward trend over a 2.5 year period.

RELIEF REQUEST NO. PR-7

7. JUSTIFICATION:(cont)

Also, Commonwealth Edison System Material Analysis Department (SMAD) measured vibration levels at the points shown in figure 2 and compared the results to available data on vibration amplitudes for similar gear drive arrangements throughout the company. These were diesel driven fire pump units at Braidwood, Zion, and Dresden stations. Regardless of vendor, these four units all exhibited high vibration amplitudes on the gear drive consistent with the elevated vibration levels recorded on the SX Make-up pumps at Byron Station (see figure 3).

The OM-6 limit on the alert range for vibration is either 2.5 times the reference value or 0.325 (whichever is less) and the code limit on the required action range is 6.0 times the reference value or 0.700 (whichever is less). Based on vendor evaluation (see Attachment C) an alert value of 0.560 was selected and based on engineering judgement, a required action value of 0.900 was selected. These are conservative limits in comparison to the OM-6 limits. OM-6 limits allow an increase of 140% between the alert limit and the required action limit (for 2.5 times reference to 6.0 times reference) or an increase of 115% (for the 0.325 to 0.700). The alert limit being proposed here is 0.560 and the required action limit is 0.900. These proposed limits allow only 61% increase from alert to required action. This is a much more conservative increase than the OM-6 requirement.

By using acceptance ranges which are reflective of the intrinsic characteristics of the pump, performance can be monitored more effectively and unnecessary and excessive testing of properly functioning equipment can be avoided.

8. APPLICABLE TIME PERIOD: This relief is requested quarterly, during each inservice pump test, during the first inspection interval.

9. APPROVAL STATUS:

- a. November '90: SX Make-up Pump vibration limit relief request moved from RELIEF REQUEST NO. PR-1 to RELIEF REQUEST NO. PR-7 for clarification.
- b. March '91: Additional information plus separate Pump Shaft and Gearbox limits proposed based on NRC request for additional information.
- c. August '91: Additional information on operating history and elevated vibration levels on similar pumps added based on NRC request for additional information. Relief pending per Approve¹ from the NRC is required PRIOR to use of this relief request. Expedited review and approval is requested.
- d. January '93: Vendor recommendation incorporated.

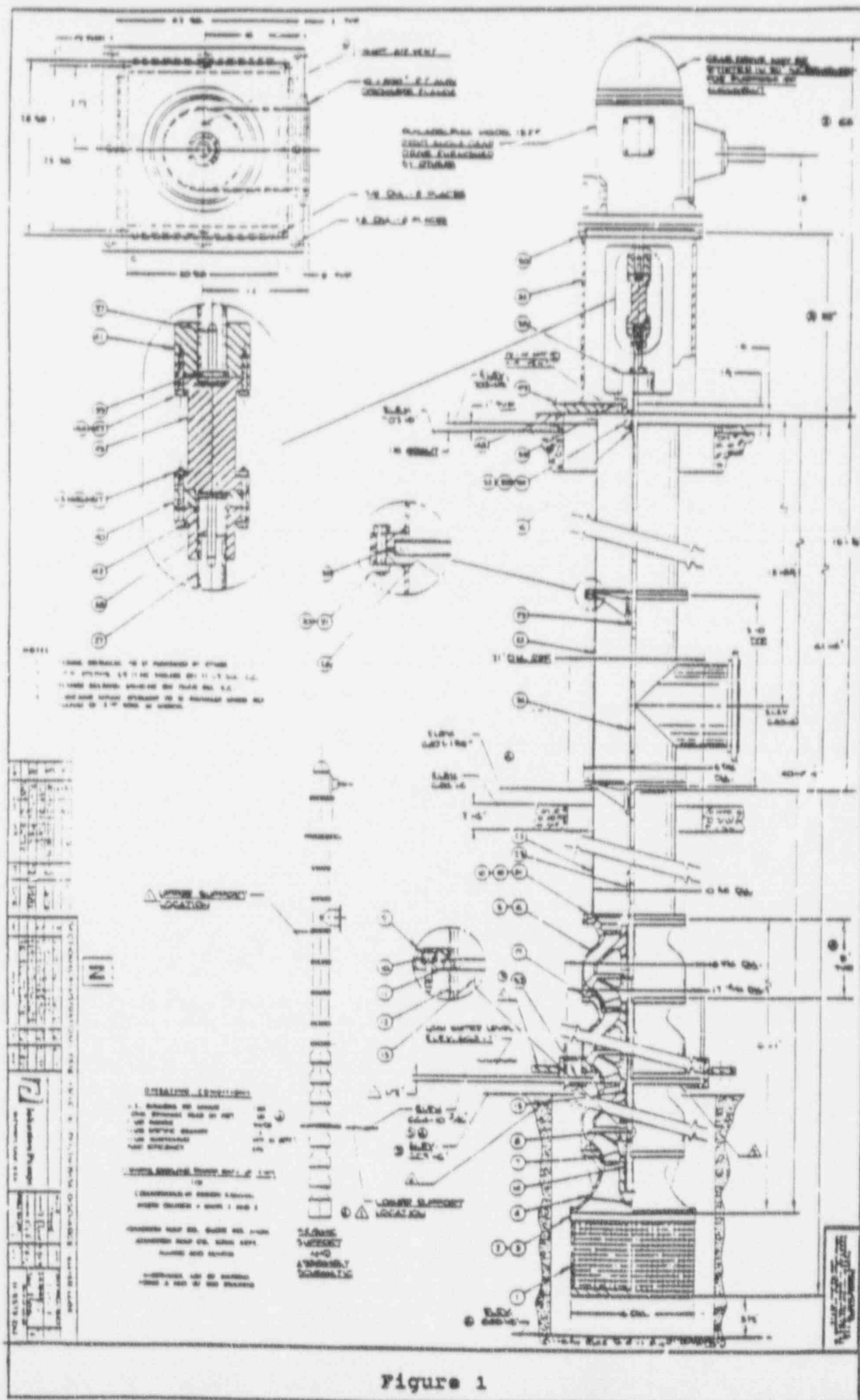


FIGURE 2

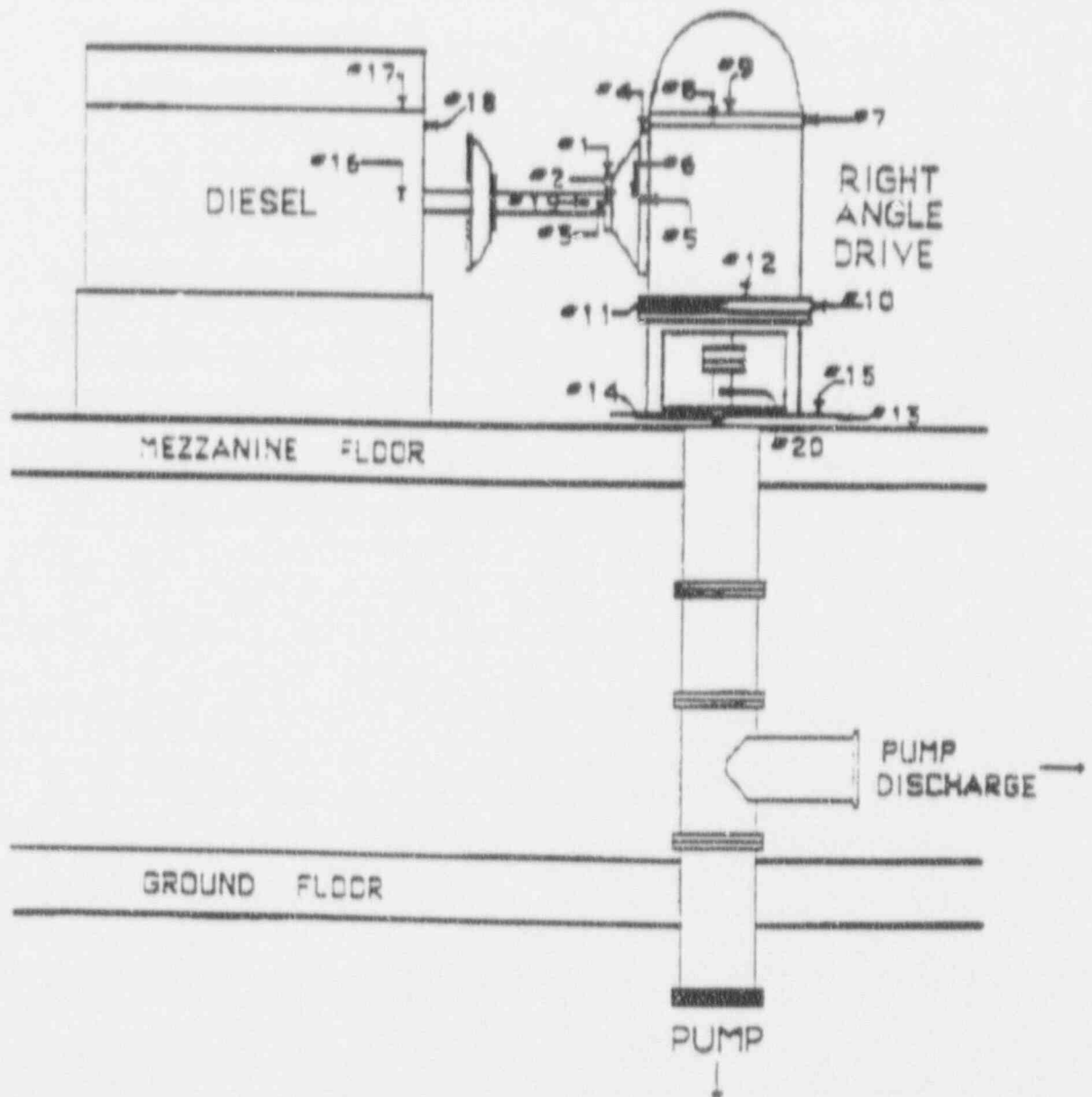
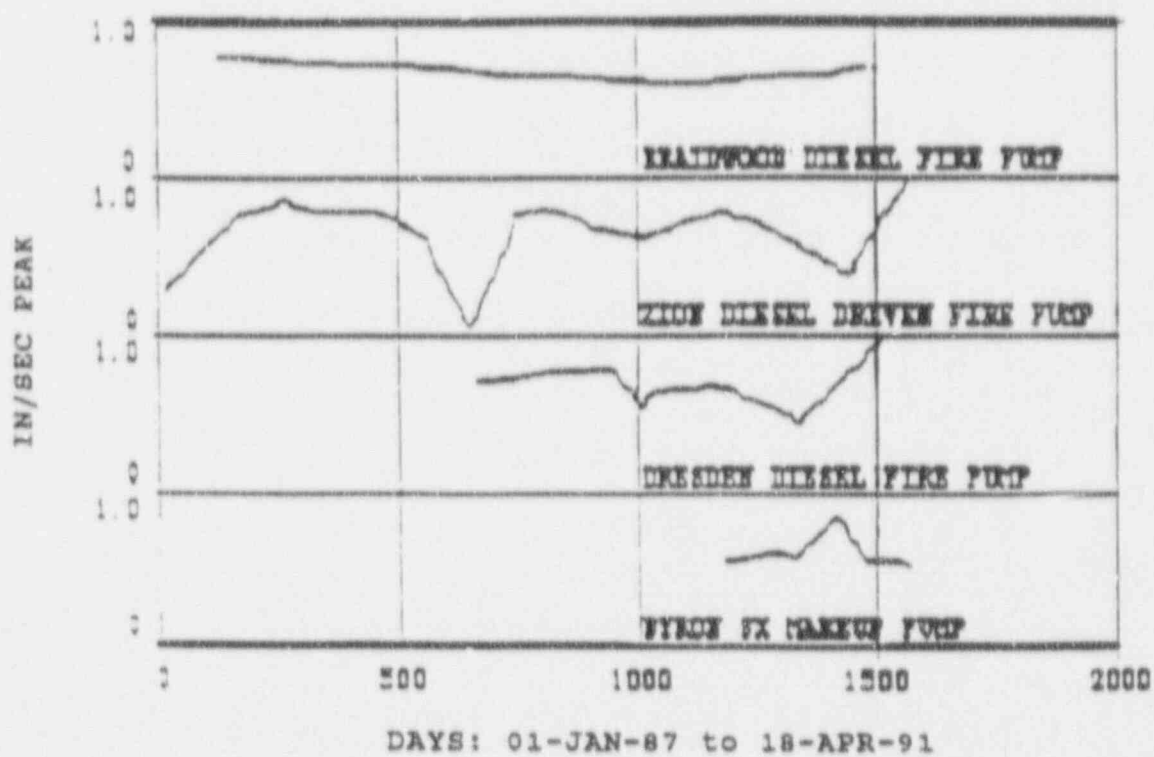


FIGURE 3



07/30/91

FOR INFORMATION ONLY

ATTACHMENT A
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OSX02PA

PUMP LINE SHAFT VIBRATION(VERT) (IN/SEC)

VPLSHV

900
875
850
825
800
775
750
725
700
675
650
625
600
575
550
525
500
475
450
425
400
375
350
325
300
275
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225
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175
150
125
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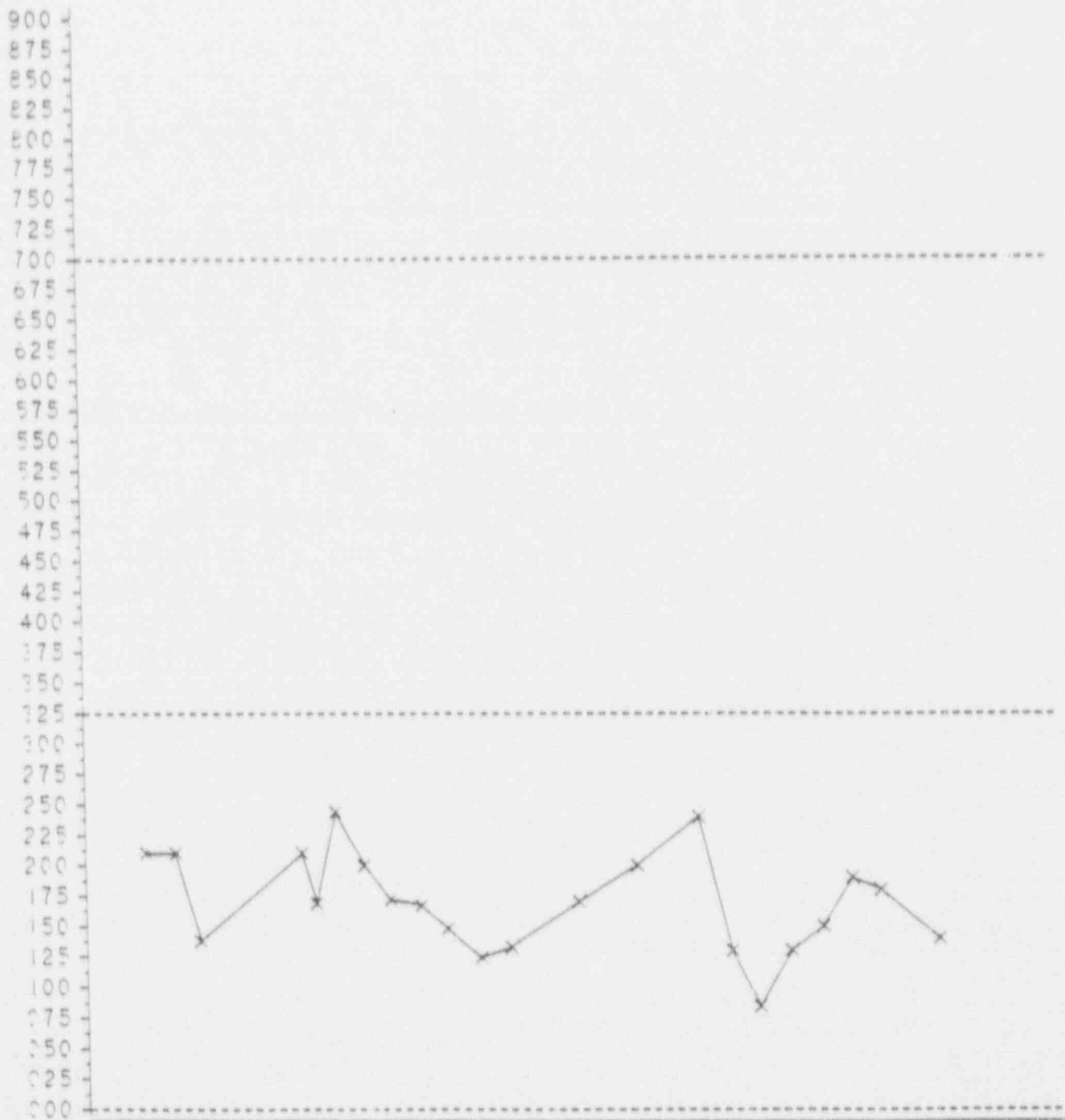
12/05/87

04/18/89

08/31/90

01/13/92

TESTDATE



07/30/91

FOR INFORMATION ONLY

ATTACHMENT A
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OSX02PA

PUMP LINE SHAFT VIBRATION(RAD N-S) (IN/SEC)

VPLSHN

900
875
850
825
800
775
750
725
700
675
650
625
600
575
550
525
500
475
450
425
400
375
350
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225
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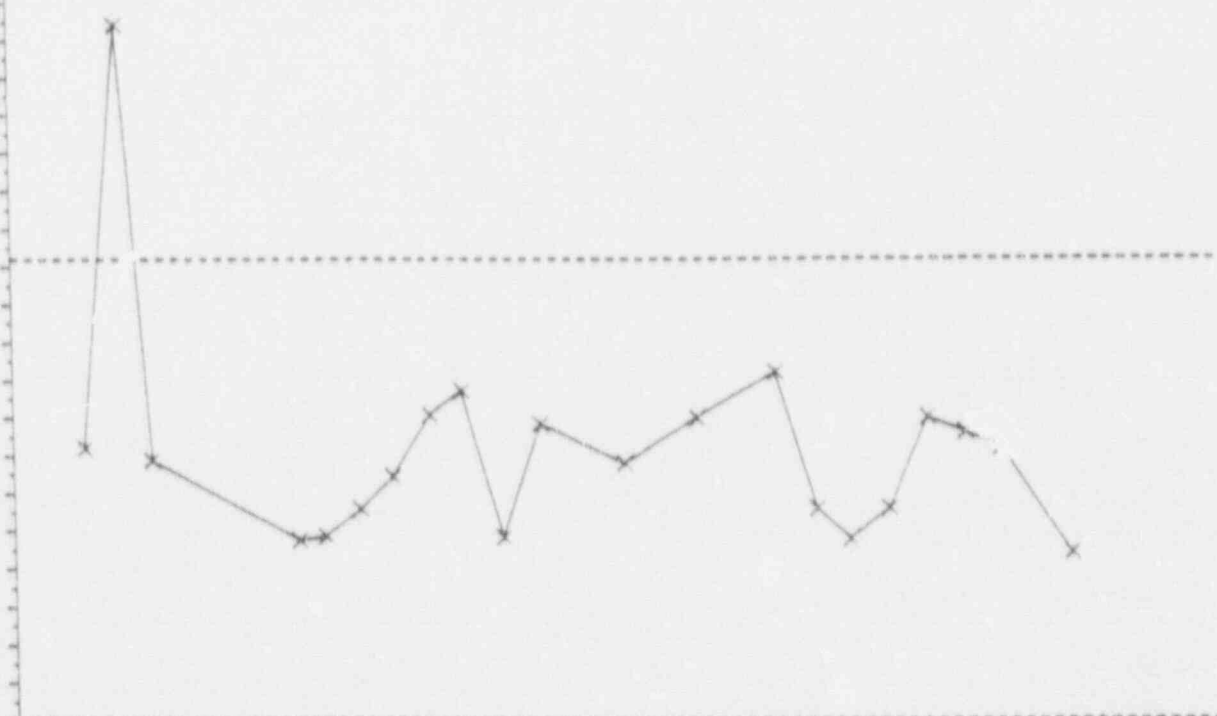
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04/18/89

08/31/90

01/13/92

TESTDATE



07/31/91

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FOR INFORMATION ONLY

0SX02PA

PUMP LINE SHAFT VIBRATION(RAD E-W) (IN/SEC)

VPLSHE

900
875
850
825
800
775
750
725
700
675
650
625
600
575
550
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500
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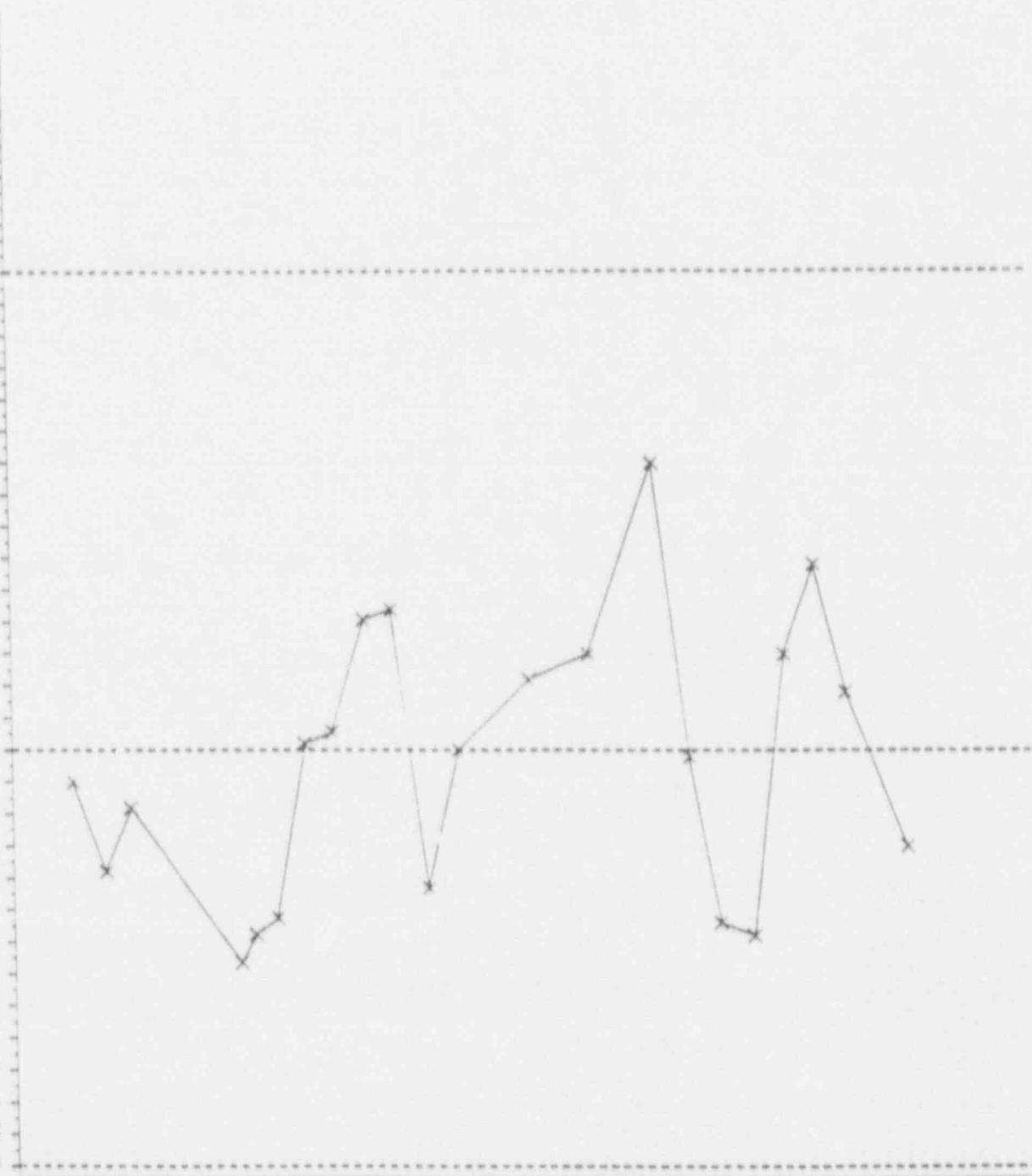
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08/31/90

01/13/92

TESTDATE



07/31/91

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FOR INFORMATION ONLY

OSX02PA

UPPER GEAR BOX VIBRATION(VERT) (IN/SEC)

VUGBV

900
875
850
825
800
775
750
725
700
675
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625
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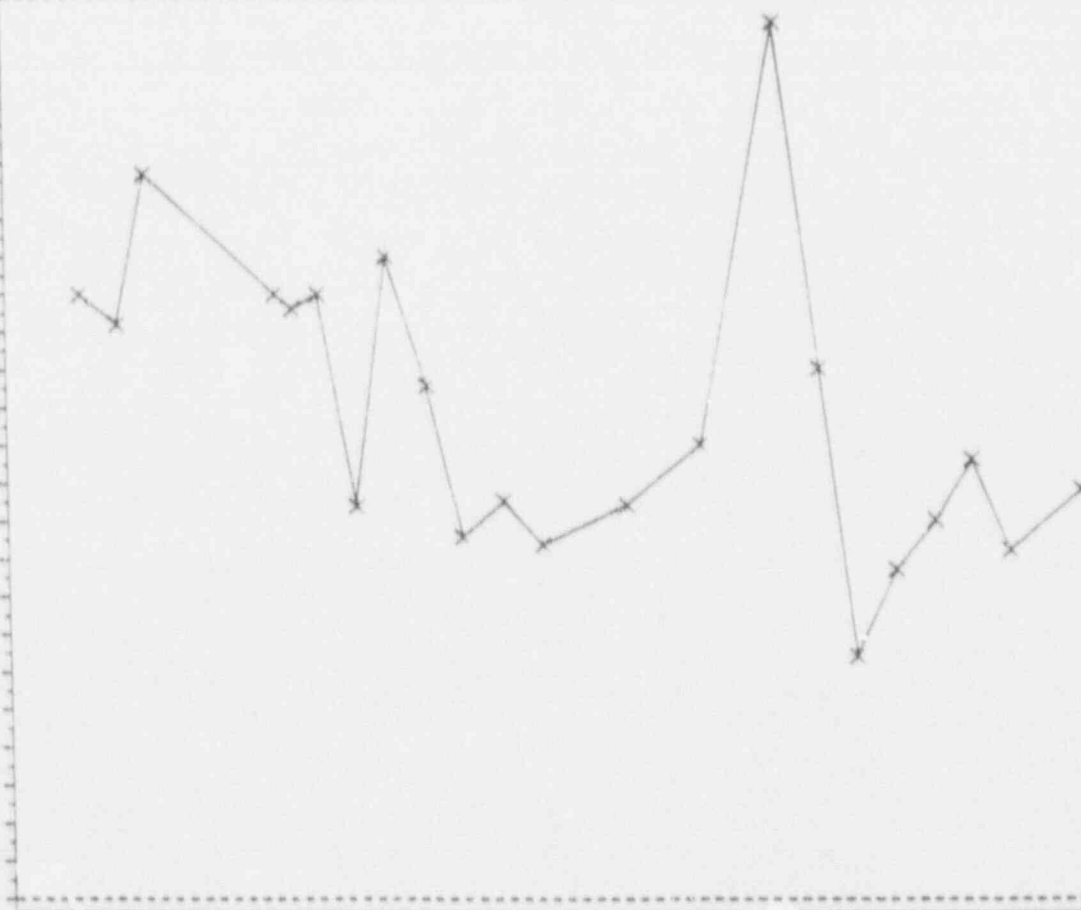
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TESTDATE



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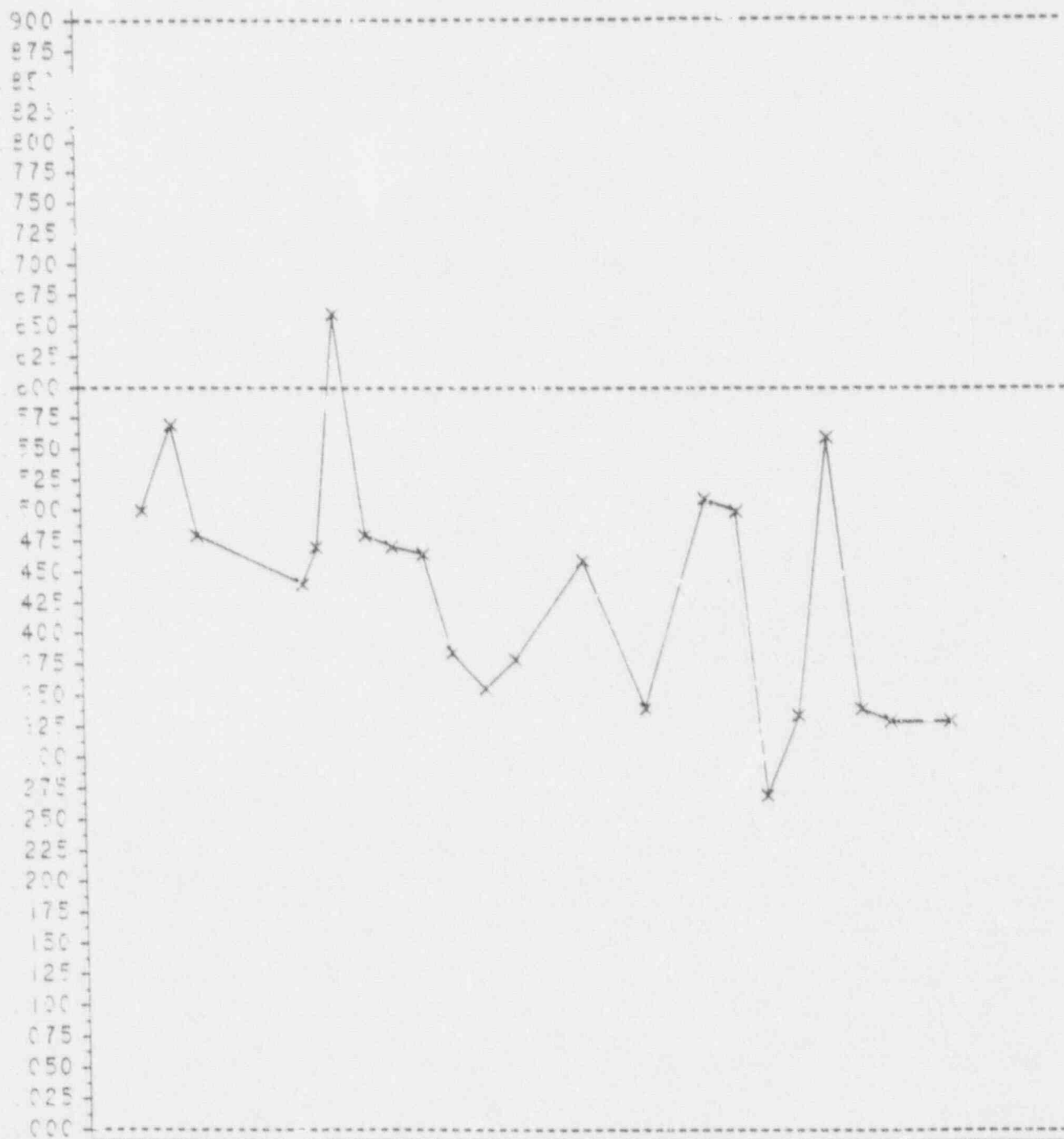
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FOR INFORMATION ONLY

OSX02PA

UPPER GEAR BOX VIBRATION(RAD N-S) (IN/SEC)

VUGBRN



12/03/87

04/18/89

08/31/90

01/13/92

TESTDATE

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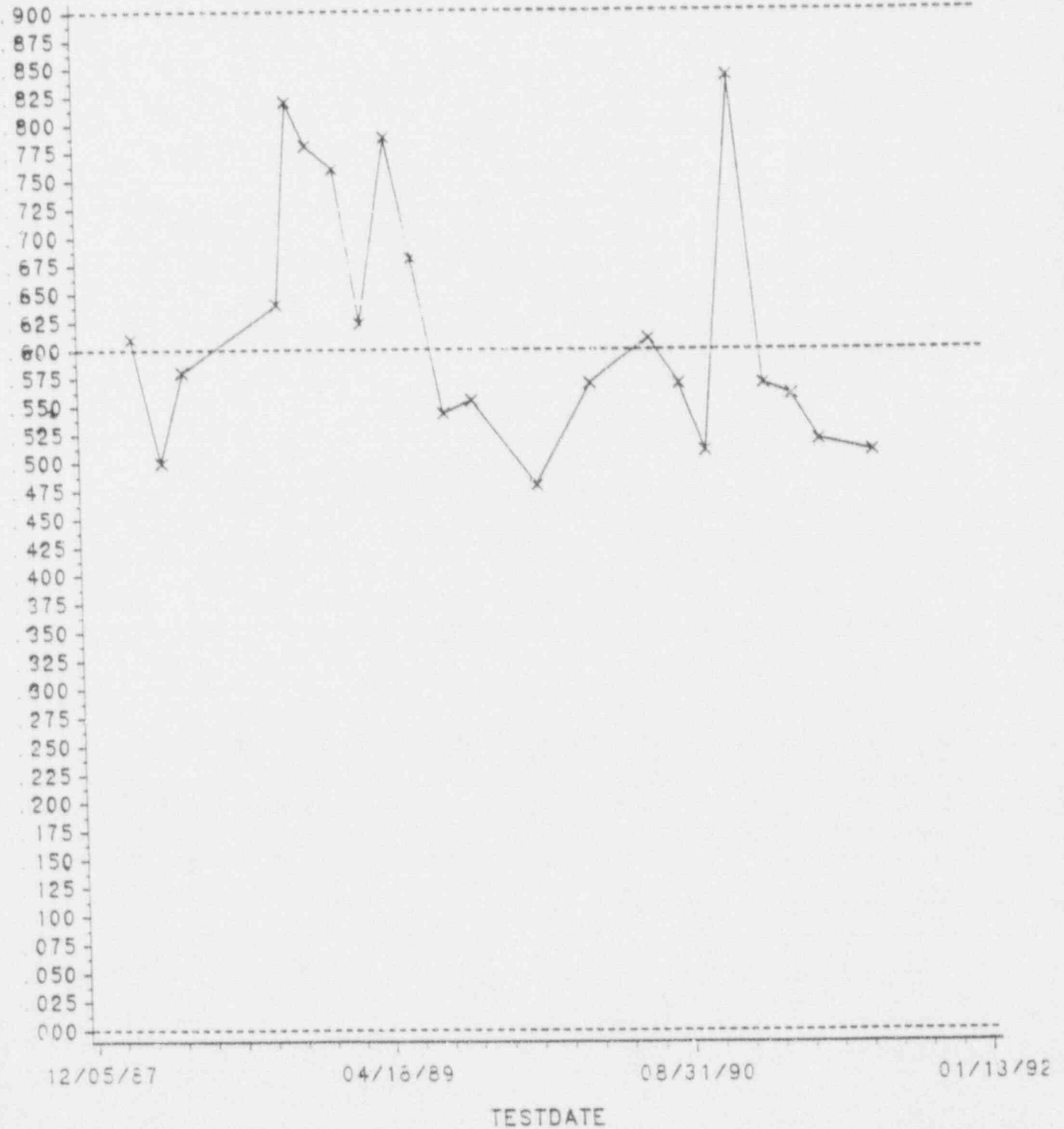
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0SX02PA

UPPER GEAR BOX VIBRATION(RAD E-W) (IN/SEC)

VUGBRE



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FOR INFORMATION ONLY

0SX02PA

LOWER GEAR BOX VIBRATION(VERT) (IN/SEC)

VLGBV

900
875
850
825
800
775
750
725
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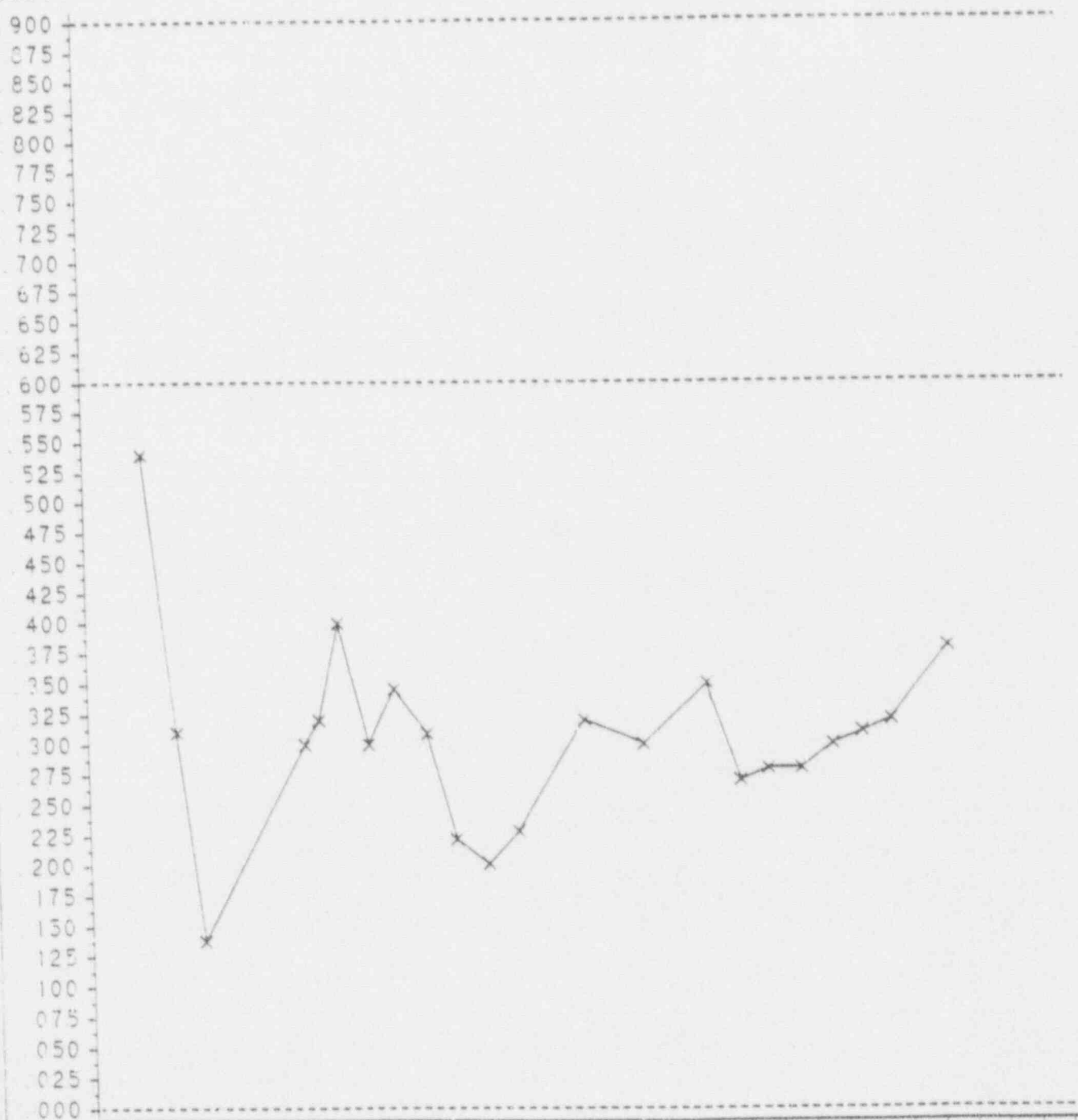
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TESTDATE



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FOR INFORMATION ONLY

OSX02PA

LOWER GEAR BOX VIBRATION(RAD N-S) (IN/SEC)

VLGBN

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01/13/92

TEST DATE



07/31/91

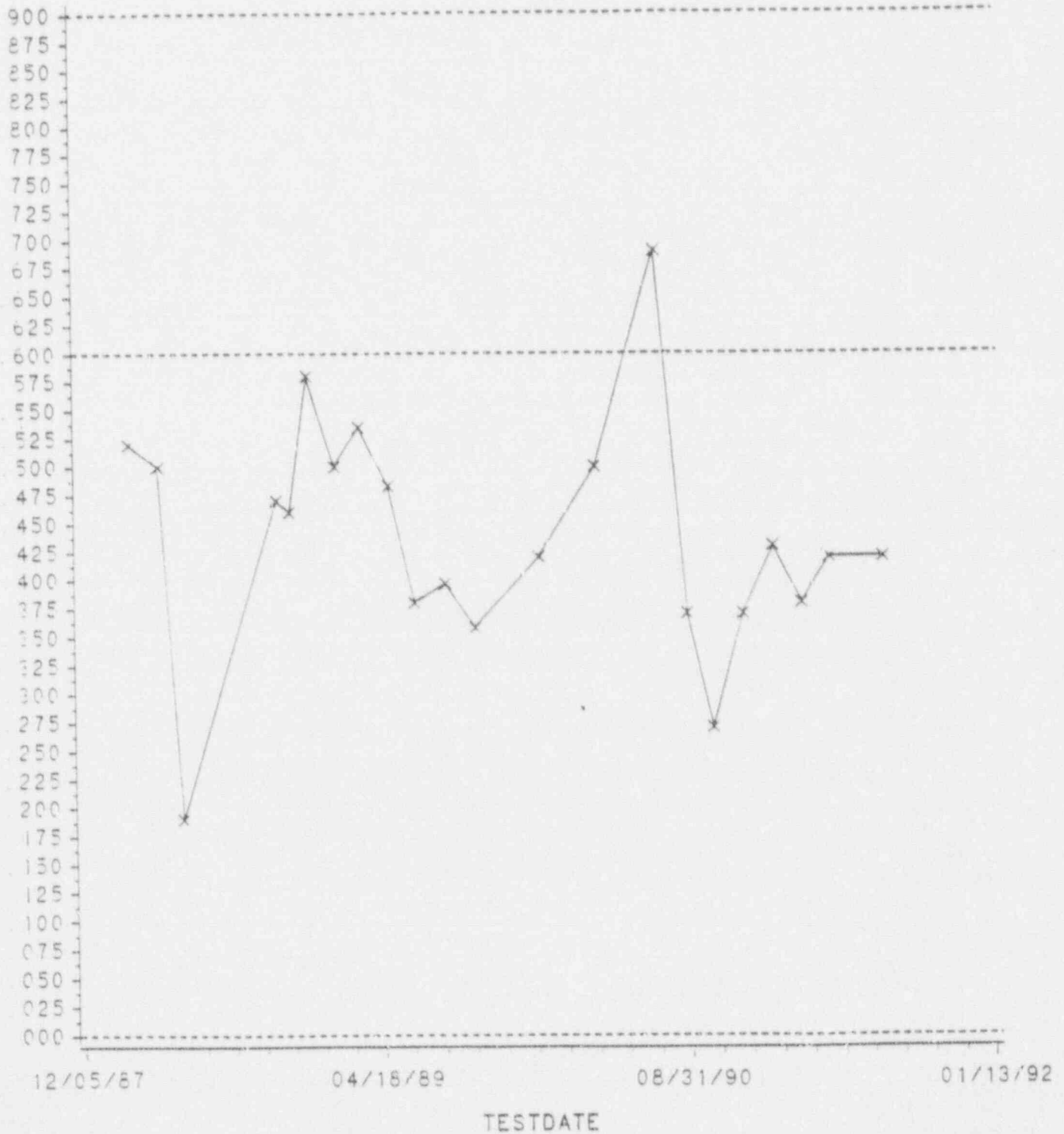
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FOR INFORMATION ONLY

OSX02PA

LOWER GEAR BOX VIBRATION(RAD E-W) (IN/SEC)

VLGBE



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FOR INFORMATION ONLY

0SX02PA

FLOW RATE (GPM)

FLRAT

1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
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1250
1200
1150
1100
1050
1000

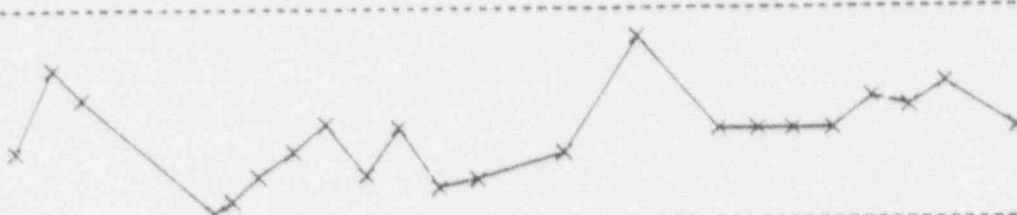
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TESTDATE



07/31/91

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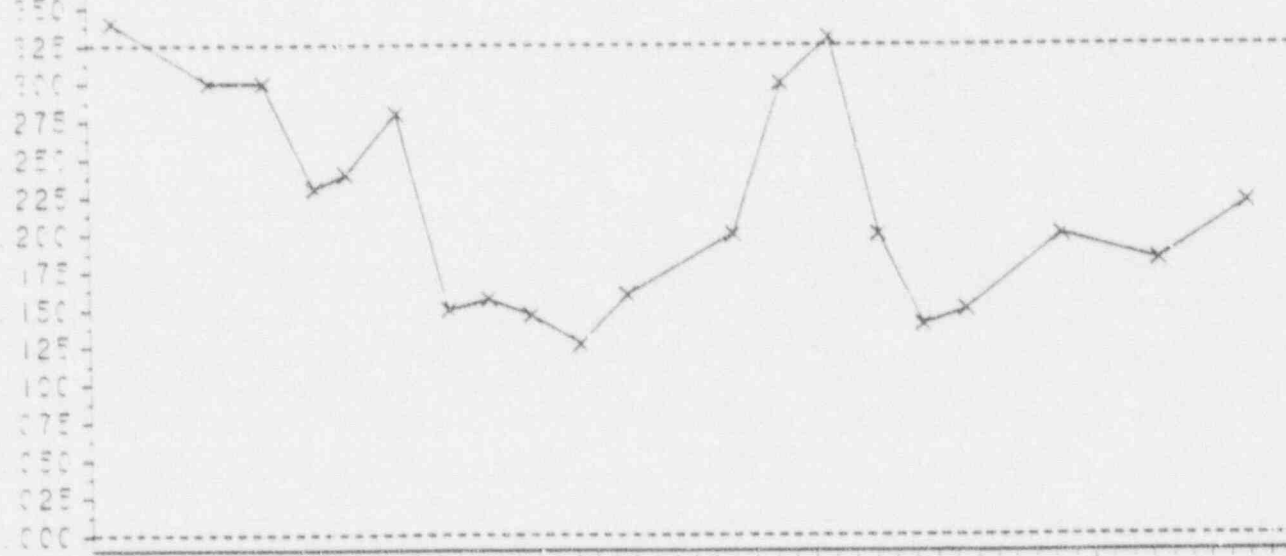
PUMP LINE SHAFT VIBRATION (VERT) (IN/SEC)

VPLSHV

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05/14/89 09/30/89 04/16/89 11/04/89 05/20/90 12/09/90 06/27/91

TESTDATE



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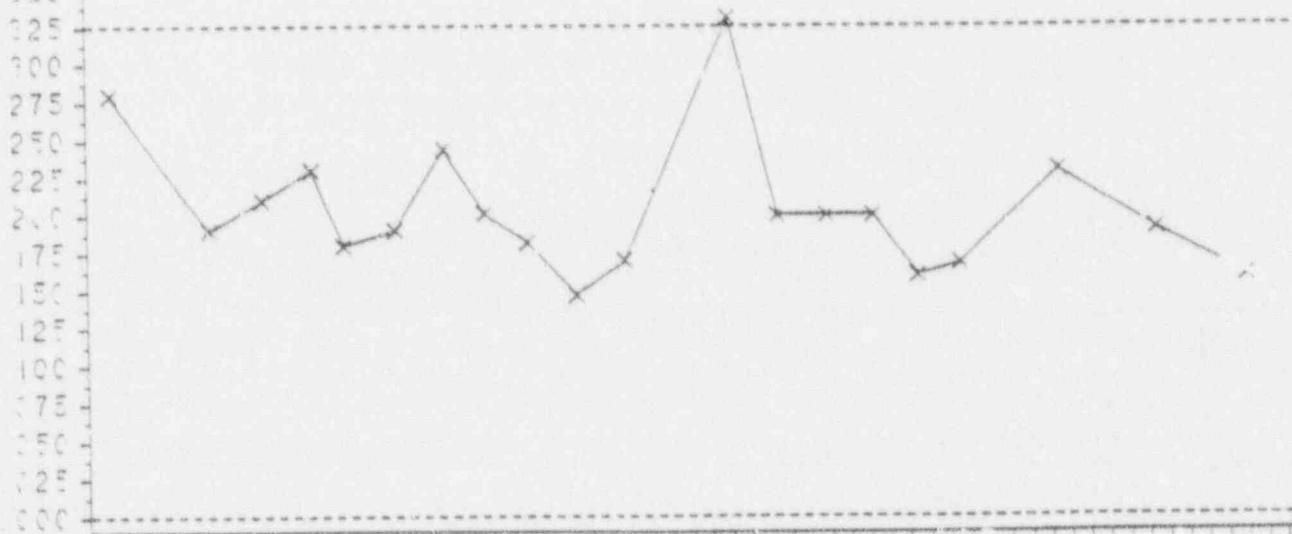
PUMP LINE SHAFT VIBRATION(RAD N-S) (IN/SEC)

VPLSHN

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TESTDATE



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FOR INFORMATION ONLY

OSX02PB

PUMP LINE SHAFT VIBRATION(RAD E-W) (IN/SEC)

VPLSHE

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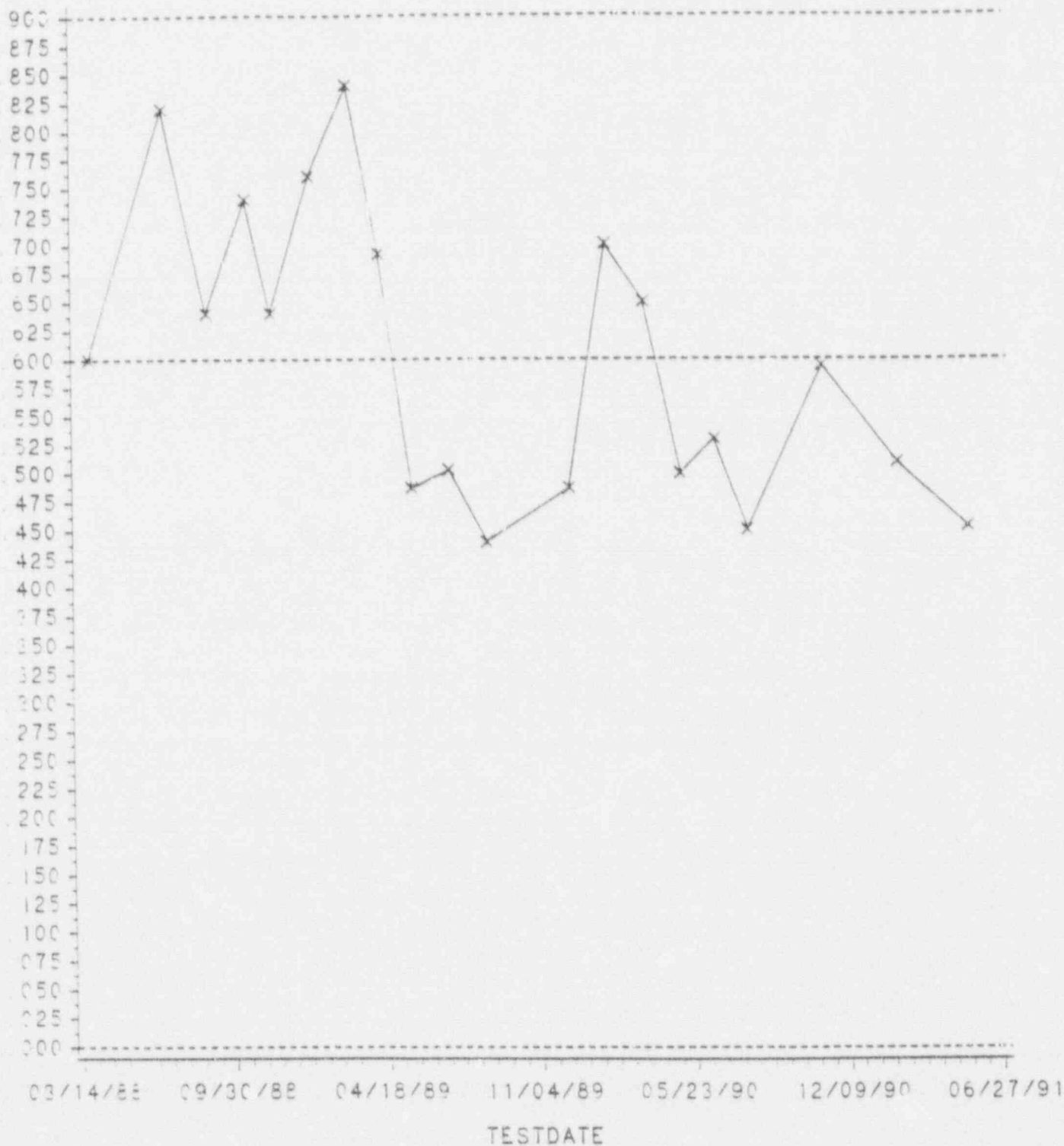
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0SX02PB

UPPER GEAR BOX VIBRATION(VERT) (IN/SEC)

VUGBV



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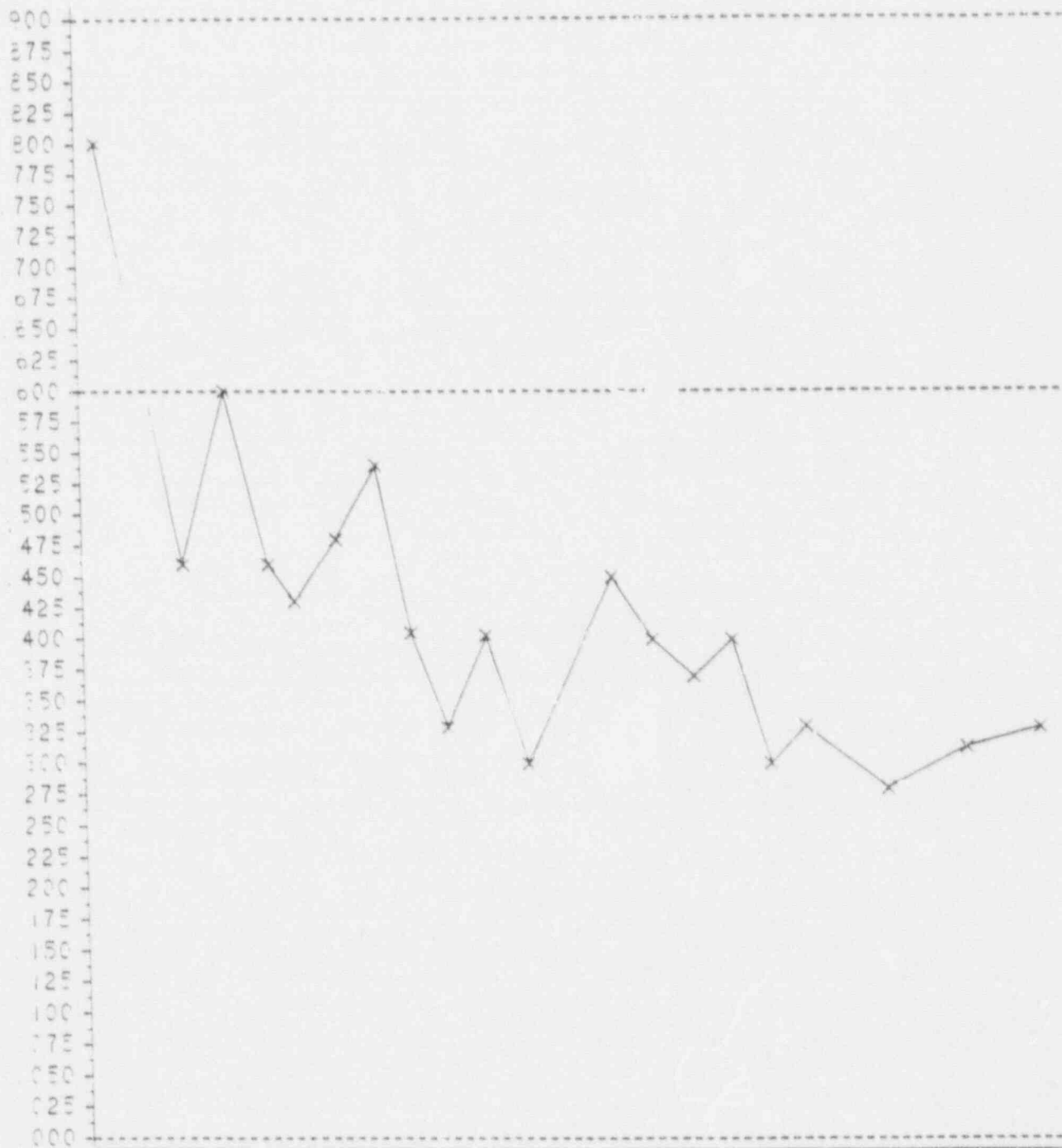
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FOR INFORMATION ONLY

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UPPER GEAR BOX VIBRATION(RAD N-S) (IN/SEC)

VUGBRN



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TESTDATE

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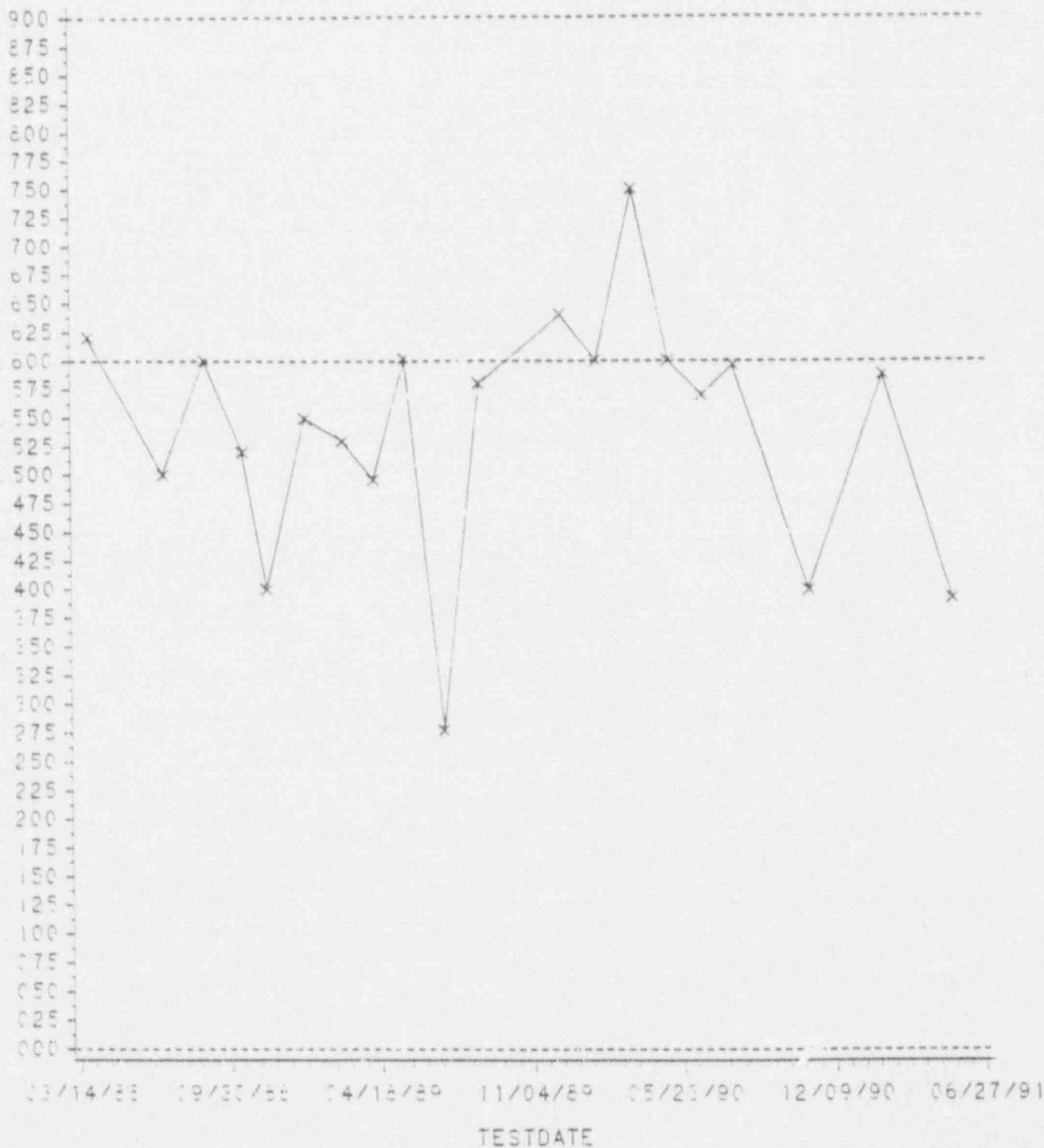
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OSX02PB

UPPER GEAR BOX VIBRATION(RAD E-W) (IN/SEC)

VUGBRE



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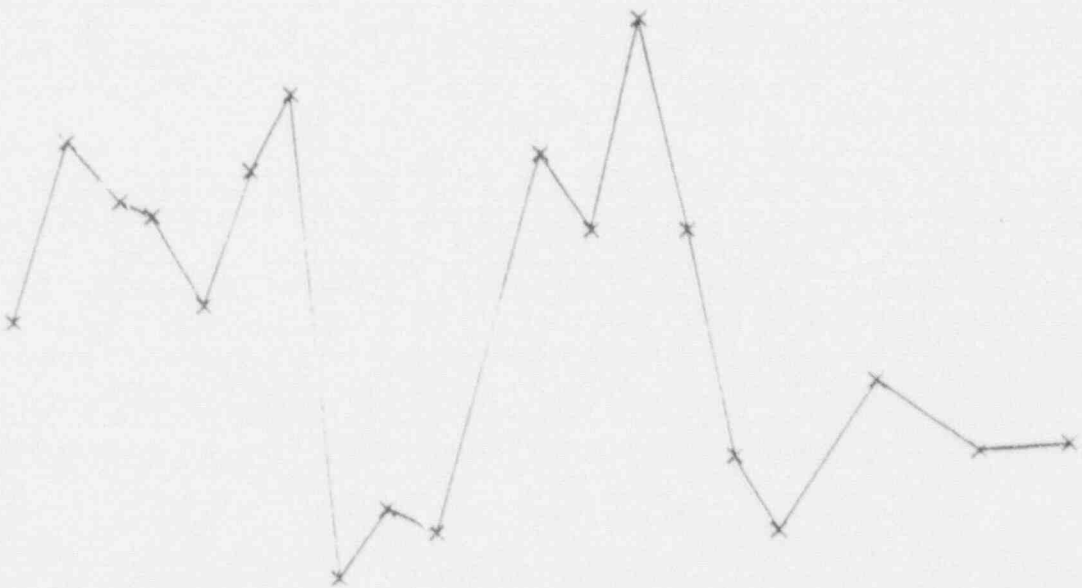
LOWER GEAR BOX VIBRATION(VERT) (IN/SEC)

VLGBV

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TESTDATE



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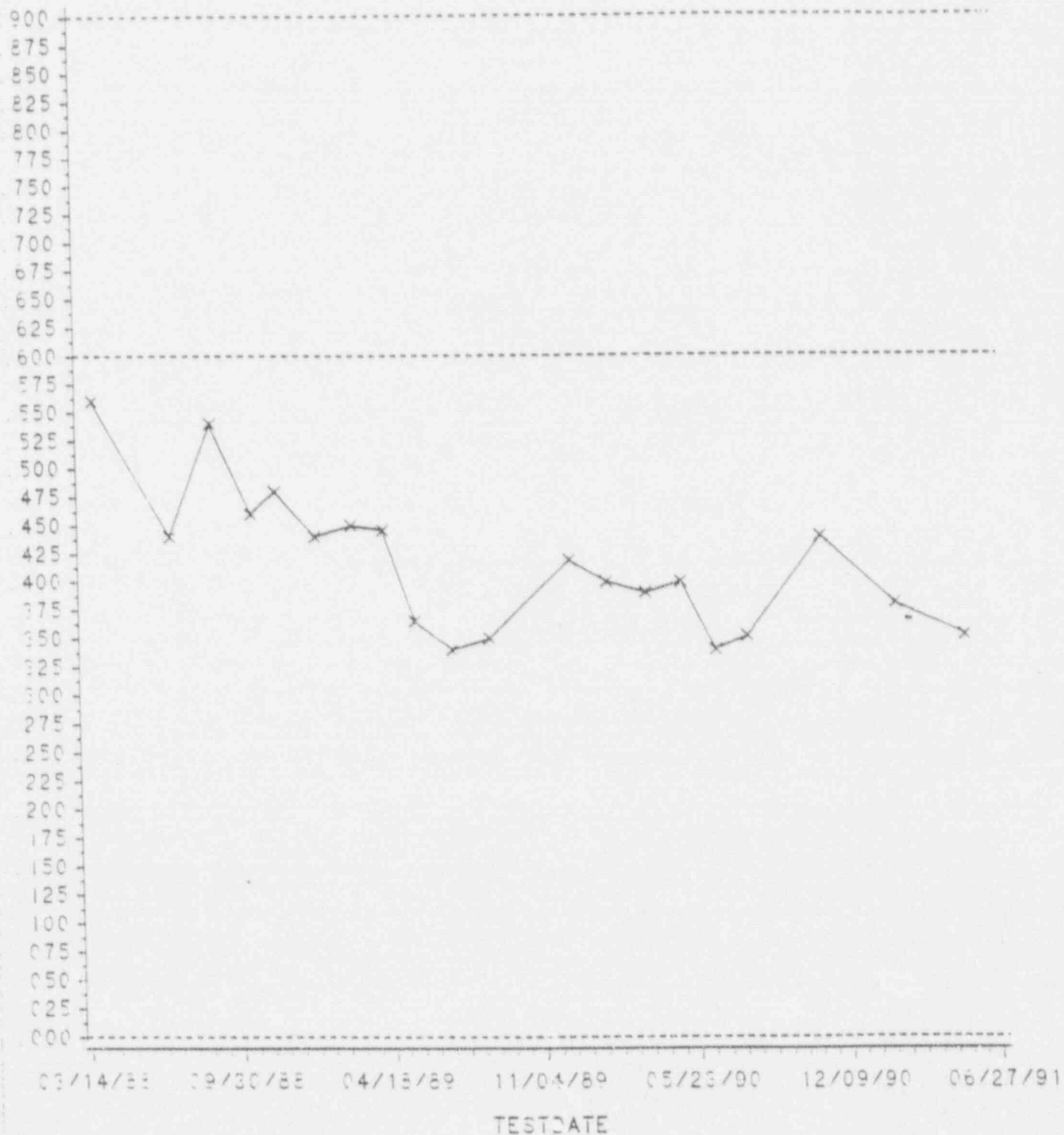
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OSX02PB

LOWER GEAR BOX VIBRATION(RAD N-S) (IN/SEC)

VLGBN



07/31/91

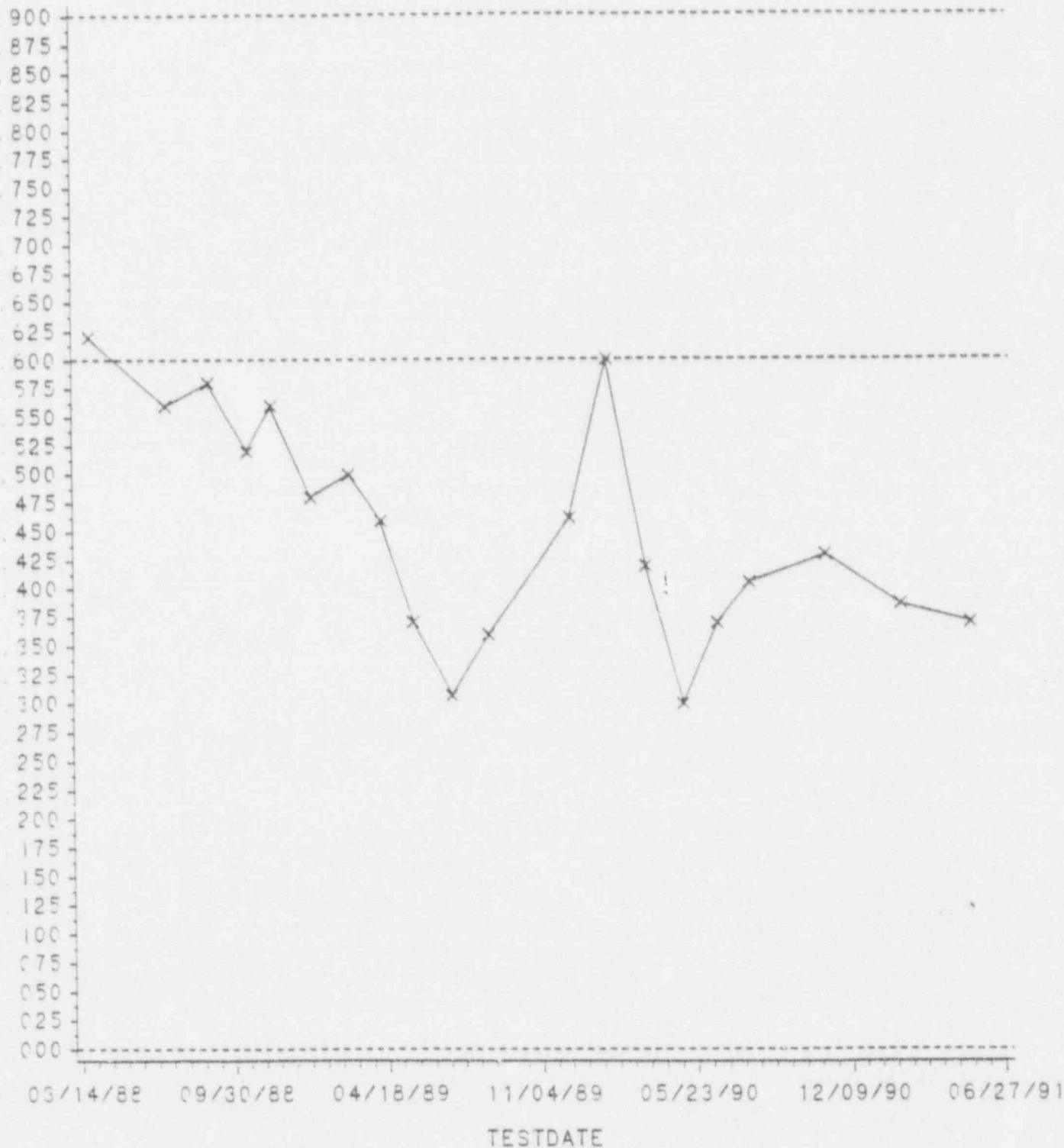
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LOWER GEAR BOX VIBRATION(RAD E-W) (IN/SEC)

VLGBE



07/31/91

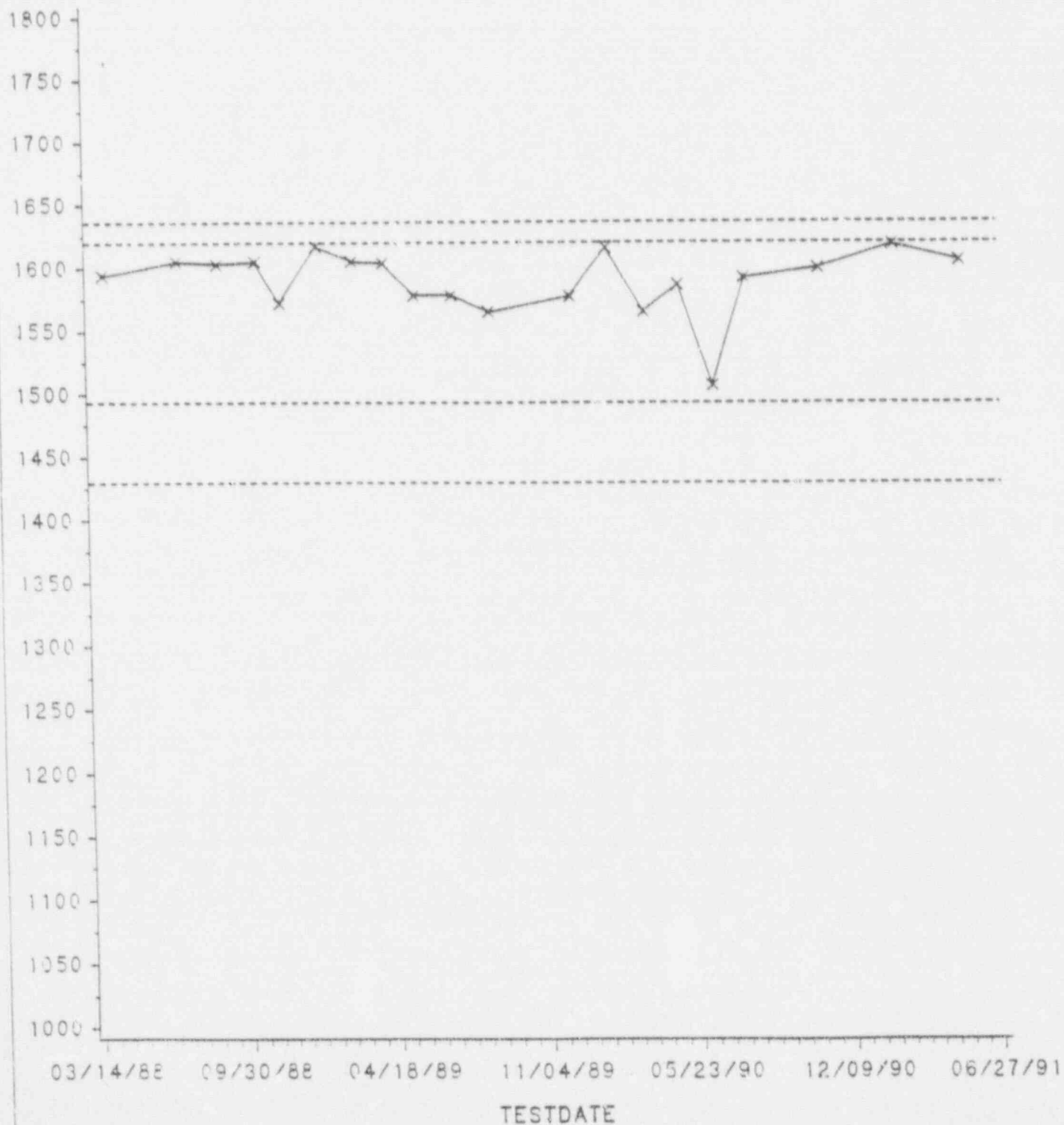
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0SX02PB

FLOW RATE (GPM)

FLRAT





STEWART & STEVENSON SERVICES, INC.

P.O. BOX 1637 • HOUSTON TEXAS 77251 • RT • (713) 923-2161
 ADMINISTRATION BLDG FAX (713) 923-8966 • PURCHASING DEPT FAX (713) 923-1186
 TELEX 984397 • TWX 510-250-6385

1-21-93
 TRANSMISSION DATE

RECIPROCATING ENGINE DIVISION

We are transmitting 1 pages (including cover letter). If transmission is incomplete, please call (713) 923-0317.

Please deliver to:

Page 1 of 1NAME Warren WagnerFROM Jim BellFIRM Commonwealth EdisonPHONE NO (713) 923-0337FAX NO (815) 234-5441 X2270FAX NO (713) 923-4917

REFERENCE: 8V71N Pump Unit
 W.O. N74410

Dear Mr. Wagner,

As per our telephone conversation Stewart & Stevenson's minimum standard for vibration peak to peak is 6 mils displacement at 1800 RPM horizontal and vertical. This corresponds to .56 inches per second velocity peak.

The existing .55 inches per second velocity peak corresponds to 5.8 mils displacement peak to peak which is within tolerance.

If you have any further questions, please get back with me.

Very truly yours,

James Bell
 James Bell

cc: Robert Mitcham

JB021.03 - 12340307M

TABLE 1

PUMP=05X02PA

TESTDATE	PUMP(V)	PUMP(N-S)	PUMP(E-W)	UPPR GRBX(V)	UPPR GRBX(N-S)	UPPR GRBX(E-W)	LWR GRBX(V)	LWR GRBX(N-S)	LWR GRBX(E-W)	FLOW RATE
02/24/88	210	180	300	400	500	610	540	540	520	1520
04/11/88	210	460	230	380	570	500	310	440	500	1569
05/18/88	136	172	280	480	480	580	138	350	190	1551
10/26/88	210	*	159	400	440	640	300	480	470	1484
11/17/88	169	119	181	390	470	820	320	460	460	1491
12/19/88	244	122	194	400	660	781	400	460	580	1605
02/02/89	200	140	330	260	480	760	300	440	500	1520
03/15/89	172	161	339	425	471	623	340	456	535	1537
05/03/89	167	202	427	339	465	788	309	475	483	1808
06/14/89	148	218	435	239	385	681	222	462	380	1534
08/03/89	124	121	217	263	356	543	201	430	397	1489
09/20/89	133	196	325	234	379	555	228	443	358	1504
01/03/90	170	170	380	260	460	480	320	450	420	1518
04/04/90	200	200	400	300	340	570	300	400	500	1688
07/11/90	240	230	550	580	510	610	350	520	690	1633
08/29/90	130	140	320	350	500	570	270	450	370	1633
10/10/90	084	120	190	160	270	510	280	310	270	1633
11/28/90	130	140	180	217	335	842	280	421	370	1633
01/17/91	150	200	400	250	560	570	300	450	430	1652
03/04/91	190	190	470	280	340	560	310	410	380	1646
04/18/91	180	180	370	230	330	520	320	420	420	1660
07/17/91	140	110	250	270	330	510	380	460	420	1633

* NO TEST DATA AVAILABLE FOR THESE POINTS DUE TO INCOMPATIBILITY OF PAST AND PRESENT RECORD KEEPING PRACTICES

TABLE 2

PUMP=05K0708

TESTDATE	PUMP(V)	PUMP(N-S)	PUMP(E-W)	UPPR GRBX(V)	UPPR GRBX(N-S)	UPPR GRBX(E-W)	LWR GRBX(V)	LWR GRBX(N-S)	LWR GRBX(E-W)	FLOW RATE
03/29/88	340	280	250	600	800	620	*	560	620	1594
07/06/88	300	190	200	820	460	500	340	440	560	1605
08/30/88	300	210	219	640	600	600	460	540	580	1603
10/20/88	230	230	170	740	460	520	420	460	520	1605
11/21/88	240	180	*	640	430	400	410	480	560	1572
01/11/89	280	180	180	760	480	550	350	440	480	1617
03/02/89	150	244	180	840	540	530	440	450	500	1605
04/12/89	157	201	181	692	405	496	491	446	459	1604
05/24/89	146	182	152	487	329	802	170	335	371	1578
07/12/89	127	147	148	503	403	277	216	340	307	1578
08/30/89	160	170	150	440	300	580	200	350	360	1565
12/14/89	200	331	203	487	450	640	451	419	462	1577
01/31/90	300	200	200	700	400	600	400	400	600	1616
03/21/90	330	200	250	650	370	750	540	390	420	1688
05/01/90	200	200	100	500	300	600	400	400	300	1588
06/20/90	140	160	130	530	300	570	250	340	370	1608
08/01/90	150	168	135	451	330	596	201	352	406	1692
11/07/90	200	230	180	594	280	400	300	440	430	1600
02/14/91	183	191	203	510	313	588	253	381	387	1618
05/18/91	221	160	146	454	329	393	257	353	371	1605

* NO TEST DATA AVAILABLE FOR THESE POINTS DUE TO INCOMPATIBILITY OF PAST AND PRESENT RECORD KEEPING PRACTICES