Entergy

Entergy Nuclear Operations, Inc.
Pilgrim Station
600 Rocky Hill Road
Plymouth, MA 02360

Stephen J. Bethay
Director, Nuclear Assessment

June 29, 2006

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

SUBJECT: Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
Docket No. 50-293
License No. DPR-35

Pilgrim Fourth Ten-Year In-service Testing (IST) Program, IST Relief Request PR-03, Rev. 3

LETTER NUMBER: 2.06.008

REFERENCES:

1. NRC Letter, Pilgrim Nuclear Power Station-Entergy Relief Request PR-03, High Pressure Coolant Injection Pump (TAC NO. MB8773) dated August 29, 2005
2. Entergy Letter No. 2.05.012, Pilgrim Fourth Ten-Year In-service Testing (IST) Program, IST Relief Request PR-03, dated February 24, 2005

Dear Sir or Madam:

By this letter Entergy submits the HPCI Pump Relief Request PR-03, Revision 3 for NRC approval to continue for the remaining duration of the IST interval the alternative testing previously approved by the NRC in Reference 1. The PR-03 Rev. 3 includes updated information based on the results of NRC approved alternative comprehensive test and additional information concerning the alternative testing.

Entergy submitted Relief Request, PR-03, Rev. 2 by Reference 2 for the fourth IST interval and NRC approved the alternative testing for use until August 29, 2008. The fourth IST interval began on December 7, 2002 and ends on December 6, 2012.

The scope of this relief applies to ASME OMa-1996, ISTB 5.2.3, Comprehensive Test for HPCI pumps and includes confirmation of operational readiness of HPCI pumps based on the NRC approved alternative comprehensive test results and historical pump test data.

Pursuant to 10 CFR 50.55 a(a)(3)(i), Entergy proposes to continue to use the alternative testing to comply with ISTB 5.2.3. The proposed alternative provides an acceptable level of quality and safety because it verifies the operational readiness of the as-built configuration of the HPCI pump, and the historical data has shown no signs of degradation in the HPCI pump.

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Pilgrim intends to continue to perform the alternative comprehensive HPCI surveillance test as approved for the remaining duration of the Fourth IST interval.

This letter contains no new commitments.

If you have any questions or require additional information, please contact Mr. Bryan Ford, Licensing Manager, at (508) 830-8403.

Sincerely,

Stephen J. Bethay

Stephen J. Bethay

WGL/dm

Attachment: HPCI Pump Relief Request, PR-03, Revision 3 (86 pages)

cc: Mr. James J. Shea, Project Manager
Office of Nuclear Reactor Regulation
Mail Stop: 0-8B-1
U.S. Nuclear Regulatory Commission
1 White Flint North
11555 Rockville Pike
Rockville, MD 20852

U.S. Nuclear Regulatory Commission
Region 1
475 Allendale Road
King of Prussia, PA 19406

Senior Resident Inspector
Pilgrim Nuclear Power Station

ATTACHMENT

HPCI Pump Relief Request, PR-03, Revision 3, (8 pages)

Enclosure 1 to PR-03, Rev. 3 (11 pages)
Enclosure 2 to PR-03, Rev. 3 (66 pages)

(Total 86 pages)

PUMP RELIEF REQUEST PR-03, Revision 3

PUMP: P-205 (Main/Booster)

SYSTEM: High Pressure Coolant Injection (HPCI)

CLASS: 2

FUNCTION: Provides emergency core cooling subsequent to a small break LOCA.

TEST REQUIREMENTS:

ASME OM Code OMa-1996, ISTB 5.2.3, Comprehensive Test

ISTB 5.2.3(d): Vibration (displacement or velocity) shall be determined and compared with corresponding reference values. Vibration measurements are to be broad band (unfiltered). If velocity measurements are used, they shall be peak. If displacement amplitudes are used, they shall be peak-to-peak.

ISTB 5.2.3(e): All deviations from the reference values shall be compared with the ranges of Tables ISTB 5.2.1-1 and ISTB 5.2.3-1 and corrective action taken as specified in paragraph ISTB 6.2. The vibration measurements shall be compared to the relative and absolute criteria shown in the Alert and Required Action Ranges of Table ISTB 5.2.1-1. For example, if vibration exceeds either 6 V_r or 0.7 in./sec, the pump is in the Required Action Range.

RELIEF REQUESTED:

Relief is requested from the ASME OMa-1996, ISTB 5.2.3(d) required method of determining the vibration velocity (V_v) overall value for surveillance test use and for establishing reference values for the HPCI Main pump inboard (turbine side) bearing horizontal point (P3H) and the Main pump outboard (gearbox side) bearing horizontal point (P4H). PNPS proposes that the vibration occurring at the discrete frequency component that is at exactly 4x Booster pump RPM not be included as part of the vibration spectrum vector summing process to obtain the Main pump overall value for these points during comprehensive pump testing. This method is equivalent to extracting the discrete frequency component that is at exactly 4x Booster pump RPM from the broad band vibration spectrum. Since ISTB 5.2.3(d) requires broad band vibration measurements, NRC approved alternative testing is required to demonstrate the operational readiness of the HPCI pump taking into account the as-built configuration of the HPCI pump as specified in ISTB 4.3(g) and associated footnote.

Pilgrim requests relief from the Code requirements of paragraph ISTB 5.2.3(e) for the HPCI Main and Booster Pumps specifically from the vibration velocity (V_v) acceptance criteria specified in Table ISTB 5.2.1-1 for all Main pump and Booster pump vibration points except for the Booster pump outboard horizontal axial vibration point (P8A). Pilgrim proposes to expand the Acceptable Range identified in Table ISTB 5.2.1-1, for pump Quarterly and Biennial Comprehensive vibration monitoring.

BASIS FOR RELIEF:

Relief from the referenced Code requirements is based on the determination that the proposed alternative testing would provide an acceptable level of quality and safety in accordance with 10 CFR 50.55 a(a)(3)(i), as evidenced by the results of recent pump tests performed in November 2005 and February 2006, and historical vibration test data.

Historic testing and analysis performed on the HPCI System by PNPS (and the pump manufacturer) have consistently revealed characteristic pump vibration levels that exceed the acceptance criteria stated in Table ISTB 5.2.1-1. High vibration appears on the Main pump bearing housings at approximately 2x RPM in the horizontal direction, which is caused by Booster pump excitation (at 4x RPM of the booster pump). Under normal circumstances at 4000 rpm, the vibration amplitude at the Main pump bearings in the horizontal direction exceeds the OM Code absolute vibration Required Action Range of > 0.7 in./sec. Additionally, under the same conditions, all of the remaining HPCI Main and Booster pump vibration monitoring points, except for two, typically exceed the OM Code absolute acceptable range upper value of 0.325 in./sec.

The vibration characteristics of the HPCI pump are predominantly a function of the pump design and should be identified as such rather than attributed to pump degradation. The high vibration has been present to the same order of magnitude since the pump was new. Although existing vibration levels of the HPCI pump are higher than the acceptance criteria provided in Table ISTB 5.2.1-1, they reflect the unique operating characteristics of the HPCI pump design configuration. There are no major vibrational concerns that would result in pump degradation or would prevent the HPCI pump from performing its design safety function for an extended period of operation.

The purpose of the Code required testing is to demonstrate the operational readiness of the HPCI pump by monitoring pump vibrations for degradation and taking corrective actions when those vibration levels exceed the Code specified values. The Code specifies in ISTB 4.3(g) footnote that the reference vibration measurements should be representative of the pump and that the measured vibration will not prevent the pump from fulfilling its function. Accordingly, Pilgrim is proposing an alternative testing to demonstrate the operational readiness by taking into consideration the vibration measurements representative of the as-built configuration of the HPCI pump.

<u>Alternate Testing to the ASME OMa-1996 Code</u>:

Pilgrim proposes alternative testing as follows.

1. The alternative testing proposes to remove the 4x Booster pump RPM frequency component (discrete peak) from the vibration spectrum of the Main pump since its amplitude is not related to the physical condition or rotating dynamics of the Main pump rotor or bearing system. The Main pump vibration spectrum, with this single 4x Booster pump RPM frequency component removed, has been shown to be stable and more useful for monitoring actual pump condition. When this vibration frequency component at 4x Booster pump RPM is subtracted from the Main pump vibration spectrum the remaining vibration, which is attributed to the Main pump, is below the OM Code Required Action Range. This corrected vibration level provides a more representative measurement of the pump condition to be used for trending.

2. All other discrete vibration peaks observed at the Main pump horizontal vibration points will be evaluated during each pump vibration test, and will have an Acceptable Range upper limit of 1.05 V_r and an Alert Range upper limit 1.3 V_r. The reviews of the frequency spectrum data ensure that any significant change in the vibration signature will be noted regardless of whether the severity causes the overall level to exceed its criteria. For example, if the overall vibration level is acceptable but the 1x RPM component has increased to greater than 1.3 times the reference value overall level (Vr), then the pump will be placed in the vibration Required Action Range (>0.7in./sec).

3. PNPS will increase the ASME OMa-1996, ISTB 5.2.3 required frequency for vibration monitoring (that is part of the comprehensive testing) from once/2 years to once/year. The Code required comprehensive test for flow rates would continue to be once/2 years. Given that the HPCI vibration will normally exceed the OM Code limiting Alert Range of >0.325 in./sec, the once/year frequency will be doubled to twice/year. The twice/year frequency will be the commitment frequency. However, the normal PNPS practice will be to monitor vibration in the same manner during each of the Quarterly Group B Hydraulic Tests, whenever practicable. Thus, vibration monitoring will be performed up to 8 times in two years as part of the Group B Hydraulic Tests; instead of once/2 years as part of the Comprehensive pump tests.

4. As normal practice, Pilgrim will continue to monitor vibration of HPCI pump during each of the Quarterly Group B Hydraulic Tests in the same manner as required by the OM Code. The preventive maintenance (PM) procedure will also typically be performed, which provides for vibration monitoring of specific pumps for preventive maintenance and balancing, and includes vibration monitoring and trending of the HPCI pump to detect and monitor changes in equipment conditions. As shown in the HPCI pump configuration figure, vibration monitoring is performed at locations required by the OM Code and at additional locations within the scope of the PM procedure (perpendicular to the shaft in the horizontal and vertical positions at each bearing locations and at axial direction to the shaft). Vibration monitoring is thereby routinely performed for the Main pump, Booster pump, Speed Reduction Gearbox, and Steam Turbine. Using the vibration data collected at these points, an accurate diagnosis is made by analyzing the vibration spectrum and planned maintenance is determined to prevent failures. Thus, HPCI pump vibration monitoring will be performed up to 8 times in 2 years as part of Group B Hydraulic Tests and preventive or corrective maintenance will be implemented as necessary to prevent failures. Enclosures 1 and 2 provide HPCI pump vibration spectrum at locations required by the OM Code procedure.

5. Pilgrim will continue current HPCI pump and turbine monitoring and maintenance activities, with changes as conditions warrant, as follows:

   - Quarterly pump and valve operability tests will be performed to ensure the HPCI pump and turbine function for the intended safety function.

   - Quarterly lubrication oil sampling and periodic laboratory analysis as appropriate for the pressure-fed bearings on the Turbine, Main pump, and Gear Reducer and once/cycle (2 years) sampling and analysis for the non-pressure fed Booster pump will be performed. Lubrication oil analysis currently performed includes viscosity, acidity, residue, water content, metals by A.E. spectrometry, and ferrogram readings. This type of monitoring will detect degradation of the turbine or pump bearings due to accelerated wear, fretting, surface fatigue, or oil contamination.

   - HPCI pump and Turbine lube oil system is serviced as-needed weekly. HPCI gland seal condenser hot well pump and motor bearings and HPCI auxiliary lube oil pump and motor bearings are serviced semiannually for lubrication.

   - HPCI Turbine/Main pump, Main pump/Reducer, and Reducer/Booster pump gear-type shaft couplings are cleaned, examined, and grease-lubricated every 2 years. These examinations detect excessive wear, fretting, heating, or fatigue due to any unusual loading conditions.

   Past monitoring and maintenance activities have shown no evidence or observations of degradation in the HPCI Turbine, Main pump, Gear Reducer, or Booster pump. The attached HPCI and Booster pump historical vibration spectrum (Attachment 4) supports this conclusion. Thus, the continuation of the above periodic monitoring and maintenance activities will ensure that the HPCI pump remains in a high level of operational readiness and that degradation of HPCI pump mechanical condition, reliability, or performance will be detected and corrected in a timely manner.

Technical Justification:

PNPS has conducted an evaluation of the HPCI pump vibration characteristics. An important conclusion of this evaluation is that the mechanical condition of the Main pump can be monitored satisfactorily by disregarding the single frequency component caused by the excitation at 4x Booster pump RPM. The four-vane impeller of the Booster pump generates the excitation force hydraulically. This small pressure pulsation force exists at the vane passing frequency (number of vanes times RPM) for all centrifugal pumps and is usually seen as a significant but not particularly troublesome component on the frequency spectrum for vibration measurements taken at the bearing housings. For the HPCI pump, this vane passing frequency is a problem because it coincides with a hydraulic standing wave resonance in the cross-over piping from the Booster pump to the Main pump when the machine is operating at the rated speed of 4000 RPM. There is an acoustic pressure standing wave pattern, at the 4x RPM frequency, whose wavelength in water is equal to an even fraction (1/4 or 1/2) of the dimensional length inside the cross-over pipe. This is the same principle on which an organ pipe generates a pure tone pneumatic pressure standing wave.

In addition, and exacerbating the vibration resonance condition, the Main pump pedestal experiences a horizontal structural primary rocking mode of the pump pedestal at this same frequency when the Main pump is operating at the rated speed of 4000 RPM. The vibration mode is the second fundamental rocking mode, which is a torsional or twisting mode where the two end bearings move 180 degrees out of phase horizontally. The result of these coincident acoustic and structural resonances is that the Main pump exhibits high vibration in the horizontal direction at the 4x Booster pump RPM frequency. This is solely due to the excitation from the Booster pump being amplified by the coincident resonances. This level of vibration at 4x Booster pump RPM would be seen on the Main pump bearing housings even if the Main pump was not actually running (which is not possible as both pumps are on the same drive train).

The resonant vibration condition at the 4000 RPM operating speed is not detrimental and will not prevent the HPCI pump from fulfilling its function. At the 134 Hz frequency of the resonant vibration on the Main pump, caused by the excitation at 4x Booster pump RPM, the actual displacement amplitude at 0.7 in/sec peak velocity amplitude is 0.0017 inches peak-to-peak. This displacement imposes negligible alternating stresses on the pump pedestal, housings, and connected piping. The peak-to-peak displacement is also less than the Main pump fluid film journal bearing clearances and would impose negligible loading to these bearings.

The purpose of the ASME OM Code for pump testing is to monitor pumps for degradation. The concept of vibration monitoring is to establish baseline values for vibration when the pump is known to be in good working condition, such as after a maintenance overhaul. From that reference point, trending is performed to monitor for degradation based on the ratio of subsequent vibration levels relative to the reference values. The OM Code also establishes absolute vibration level criteria for Alert (>0.325 in/sec) and Required Action (>0.7 in/sec). In doing so, it was recognized that absolute vibration level limits (as opposed to relative change or ratio limits) are not always quantitatively linked directly with pump physical condition and the following remarks are stated in the ASME OMa Code 1996:

> " Vibration measurements of pumps may be foundation, driver, and piping dependent. Therefore, if initial vibration readings are high and have no obvious relationship to the

pump, then vibration measurements should be taken at the driver, at the foundation, and on the piping and analyzed to ensure that the reference vibration measurements are representative of the pump and that the measured vibration levels will not prevent the pump from fulfilling its function. "

An important conclusion of the PNPS HPCI pump vibration evaluation is that the mechanical condition of the Main pump can be monitored satisfactorily by disregarding the single frequency component caused by the excitation at 4x Booster pump RPM. A single peak frequency component can be effectively isolated and deleted from a vibration spectrum using the mean-squared subtraction method, that is, the discrete component amplitude (in/sec peak) is squared and subtracted from the spectrum overall level squared, then the square root of that difference represents the overall vibration level that exists without the energy contributed by the deleted component. It has been found that when this method is used, the remaining vibration overall level is much more consistent, stable, and trendable.

This method of vibration level correction has been applied to historical spectrums. The 4x Booster pump RPM component was taken out of the calculation for the main pump overall vibration level. This data shows that when the 4x Booster pump RPM component is deleted from the Main pump vibration, the level is below the Required Action Range (> 0.7 in./sec) but still within the Alert Range (> 0.325 in./sec). It was also shown that the potential effects from the dynamic alignment of pump shaft couplings (at 2X Main pump RPM) can still be monitored effectively.

The vibration spectra derived from the NRC approved alternative test conducted in November 2005 conforms to the historical vibration spectra documented since 1994. Enclosure 1 provides the November 2005 test results and Enclosure 2 provides the historical tests results. Since the observed vibration spectra have not changed, no degradation in the established operational readiness of the HPCI pump has taken place. Also, the alternative test verifies the operational readiness of the HPCI pump in its as-built configuration as stipulated by ISTB 4.3(g) with corresponding footnote.

Impact of Potential Modifications:

For the HPCI Main and Booster pumps, it has been determined that the vibration is foundation and piping dependent. To reduce the HPCI Main and Booster pump vibration down to levels that meet acceptable OM Code vibration criteria requires modifications to the HPCI pump, mounting components, foundation and/or cross-over (interconnecting) piping.

As suggested in a Byron Jackson Tech Note, this vibration may be improved by modifying the interconnecting piping and the Main pump mounting pedestal. The alternative modification changes the Booster pump impeller from four to five vanes to alter the forcing function of the standing wave resonance.

The proposed Byron Jackson modifications, other than replacing the Booster pump impeller, are generally very difficult to implement successfully. Altering the natural frequency of a large pump installation requires either considerable additions of stiffening components or substantial additions of mass. Often the results of such design changes are unsuccessful or unfavorable due to the variable speed operation requirements.

Modification of the HPCI Booster pump would require replacing the current four-vane impeller with an upgraded five-vane impeller. The impeller modification, although yielding predictable results, requires extensive work to the HPCI pump at a time when such a major rebuild of this pump is not otherwise necessary or desired. The expected result would be a modest decrease in the vibration caused on the Main pump at 4000 RPM, although the vibration would remain above the 0.325 inch/sec Alert Range criteria. A small decrease in hydraulic performance is also expected when changing from a four to five-vane impeller. The proposed major modification would cost approximately $500,000 without a compensating improvement in the pump vibration. Most HPCI pump vibration points would remain above the 0.325 in./sec Alert Criteria. Accordingly, the proposed modification would not achieve the underlying objective of performing the Code required testing without the need for Code relief.

PNPS has also concluded that none of the possible modifications that could be performed on the HPCI pump, mounting pedestal, or cross-over piping are necessary. This is primarily due to the nature of the HPCI pump service profile. The Byron Jackson Tech Note describes the following consideration in the Technical Discussion:

> " Pumping systems in which the vane passing pressure pulsations form standing waves in the attached piping are not unusual, especially if the pumps have a variable speed driver. Standing waves are highly dependent upon water temperature. Thus, measured vibration amplitudes often vary from test to test. "

The HPCI pump service is such that the pump runs for short periods of time at highly variable speeds. The pump inservice testing at PNPS is performed with the pump operating at or close to its rated speed (4000 RPM) and flow conditions (4250 GPM) that are unique to PNPS. For this particular pump configuration, this pump speed corresponds to the point where the acoustic resonant vibration is typically most pronounced. In actual service for high pressure coolant injection to the reactor, the pump will operate at the speed that the flow controller requires to maintain reactor water level. The flow rate of 4250 GPM is the maximum makeup flow rate for which the HPCI System was intended to be capable of maintaining reactor water level. This flow rate is far in excess of the decay heat makeup water requirements for the reactor in the isolated condition in the absence of a major leak. The pump speed required is also dependent on reactor pressure with the required speed decreasing along with reactor pressure.

The same general HPCI pump configuration is used at other plants but often with different pump impellers, rated speeds and plant design flow rates. For these plants the vibration characteristics at the inservice testing points are markedly different for that reason. The vibration monitoring performed (including a frequency spectral review) to date under the IST program and the PNPS Pump Vibration Monitoring Program has shown that there has not been degradation of these HPCI pump components.

Inservice Testing can be successfully performed for the PNPS HPCI pump using the methods proposed in this relief request, along with monitoring and maintenance activities currently in practice. Any significant degradation of the HPCI pump components will be readily identified using the vibration spectral analysis methods and other preventive monitoring activities described in this relief request. Therefore, Entergy believes that the proposed alternative testing and monitoring for the PNPS HPCI pump will provide an acceptable level of quality and safety in accordance with 10 CFR 50.55 a(a)(3)(i).

ALTERNATE TESTING:

To allow for practicable monitoring of vibration levels on the HPCI pump, alternate vibration acceptance criteria are necessary. A full spectrum review will be performed for all IST vibration points during each proposed comprehensive test, utilizing the following criteria.

The table below provides the acceptance criteria that are applied to the overall vibration level for the Main pump. The note explains that for the horizontal Main pump points, the discrete frequency component at 4x Booster pump RPM will be extracted from the overall value using the mean-squared subtraction. The two extracted discrete peaks (points P3H and P4H) will be evaluated separately, and will have an Acceptance Range upper limit of 1.05Vr and Alert Range upper limit of 1.3Vr (where Vr equals the vibration reference overall value).

The table boxes in ***bold italics*** have values that have been modified from the OM Code vibration criteria. The ***Alert vibration range of 1.5Vr to 6Vr*** (in lieu of the OM Code range of 2.5Vr to 6Vr) has been applied as the modified OM vibration criteria. The absolute limiting upper Alert Values (i.e. 0.375, 0.450, 0.500, 0.550, and 0.600) are based upon existing pump reference values, and fall between the values of 1.25Vr and 1.5Vr. All of the modified Alert Values have been compared to historical pump vibration data.

The Table row for P8A is in compliance with the OM Code vibration criteria, and has been placed into this relief request for information only.

MAIN PUMP**

Test Parameter	Vibration Point	Acceptable Range	Alert Range	Required Action Range
V_v	Main pump** Horizontal Inboard (P3H)	***≤1.5 V_r but not > 0.550 in./sec***	***> 1.5 V_r to 6 V_r or > 0.550 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec
V_v	Main pump** Horizontal Outboard (P4H)	***≤1.5 V_r but not > 0.600 in./sec***	***> 1.5 V_r to 6 V_r or > 0.600 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec
V_v	Main pump Vertical Inboard (P3V)	***≤1.5 V_r but not > 0.450 in./sec***	***> 1.5 V_r to 6 V_r or > 0.450 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec
V_v	Main pump Vertical Outboard (P4V)	***≤1.5 V_r but not > 0.375 in./sec***	***> 1.5 V_r to 6 V_r or > 0.375 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec
V_v	Main pump Axial Inboard (P3A))	***≤1.5 V_r but not > 0.500 in./sec***	***> 1.5 V_r to 6 V_r or > 0.500 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec

**Note: For Main pump Horizontal vibration points P3H and P4H, a frequency spectrum analysis will be performed for each pump vibration operability test and the discrete peak at 4x Booster pump RPM will be extracted (using mean-squared subtraction method) from the vibration spectrum overall value. In addition, all other vibration spectrum discrete peaks (including the extracted discrete peak) will be evaluated during each test, and will have an Acceptable Range upper limit of 1.05 V_r and an Alert Range upper limit 1.3 V_r.

BOOSTER PUMP

Test Parameter	Vibration Point	Acceptable Range	Alert Range	Required Action Range
V_v	Booster pump Horizontal Inboard (P7H)	***≤1.5 V_r but not > 0.450 in./sec***	***> 1.5 V_r to 6 V_r or > 0.450 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec
V_v	Booster pump Horizontal Outboard (P8H)	***≤1.5 V_r but not > 0.500 in./sec***	***> 1.5 V_r to 6 V_r or > 0.500 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec
V_v	Booster pump Vertical Inboard (P7V)	***≤1.5 V_r but not > 0.400 in./sec***	***> 1.5 V_r to 6 V_r or > 0.400 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec
V_v	Booster pump Vertical Outboard (P8V)	***≤1.5 V_r but not > 0.500 in./sec***	***> 1.5 V_r to 6 V_r or > 0.500 to 0.70 in./sec***	> 6 V_r or > 0.70 in./sec
V_v	Booster pump Axial Outboard (P8A)	≤2.5 V_r but not > 0.325 in./sec	> 2.5 V_r to 6 V_r or > 0.325 to 0.70 in./sec	> 6 V_r or > 0.70 in./sec

DURATION OF PROPOSED ALTERNATIVE

The proposed alternative testing shall apply for the remainder of the 4th Inservice Testing Interval at Pilgrim.

REFERENCES

1. NRC Letter, Pilgrim Nuclear Power Station- Entergy Relief Request PR-03 High Pressure Coolant Injection Pump (TAC NO. MB8773), dated August 29, 2005

2. Entergy Letter No. 02.05.042, Response to NRC Request for Additional Information Related to Pilgrim In-service Testing (IST) Relief Request PR-03 (TAC NO. MB8773), dated May 24, 2005

3. Entergy Letter No. 02.05.012, Pilgrim Fourth Ten-year In-Service Testing Program, IST relief Request PR-03, dated February 24, 2005

ENCLOSURES

Enclosure 1: HPCI pump November 2005 Vibration Test Results (11 pages)

Enclosure 2: HPCI pump Configuration and Historical Vibration Test Results (66 pages)

ENCLOSURE 1

HPCI PUMP NOVEMBER 2005 VIBRATION TEST RESULTS
(11 pages)

(Pilgrim Seeks Relief for P3H and P4H Points.
Data for the remaining point is provided for information)

1. Relief Point P3H Data
2. Relief Point P4H Data
3. Point P3V Data
4. Point P3A Data
5. Point P4V Data
6. Point P7H Data
7. Point P7V Data
8. Point P8H Data
9. Point P8V Data
10. Point P8A Data

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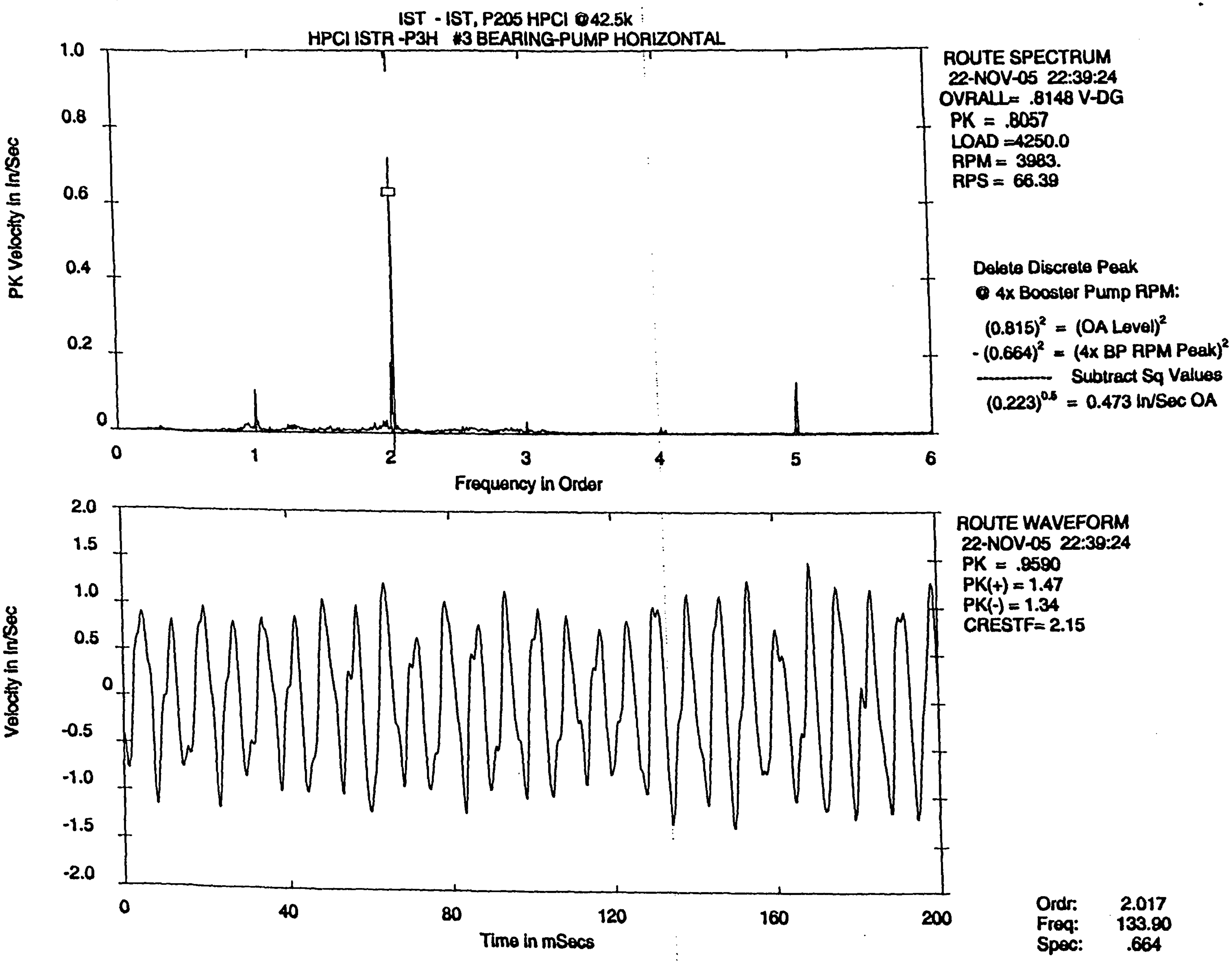
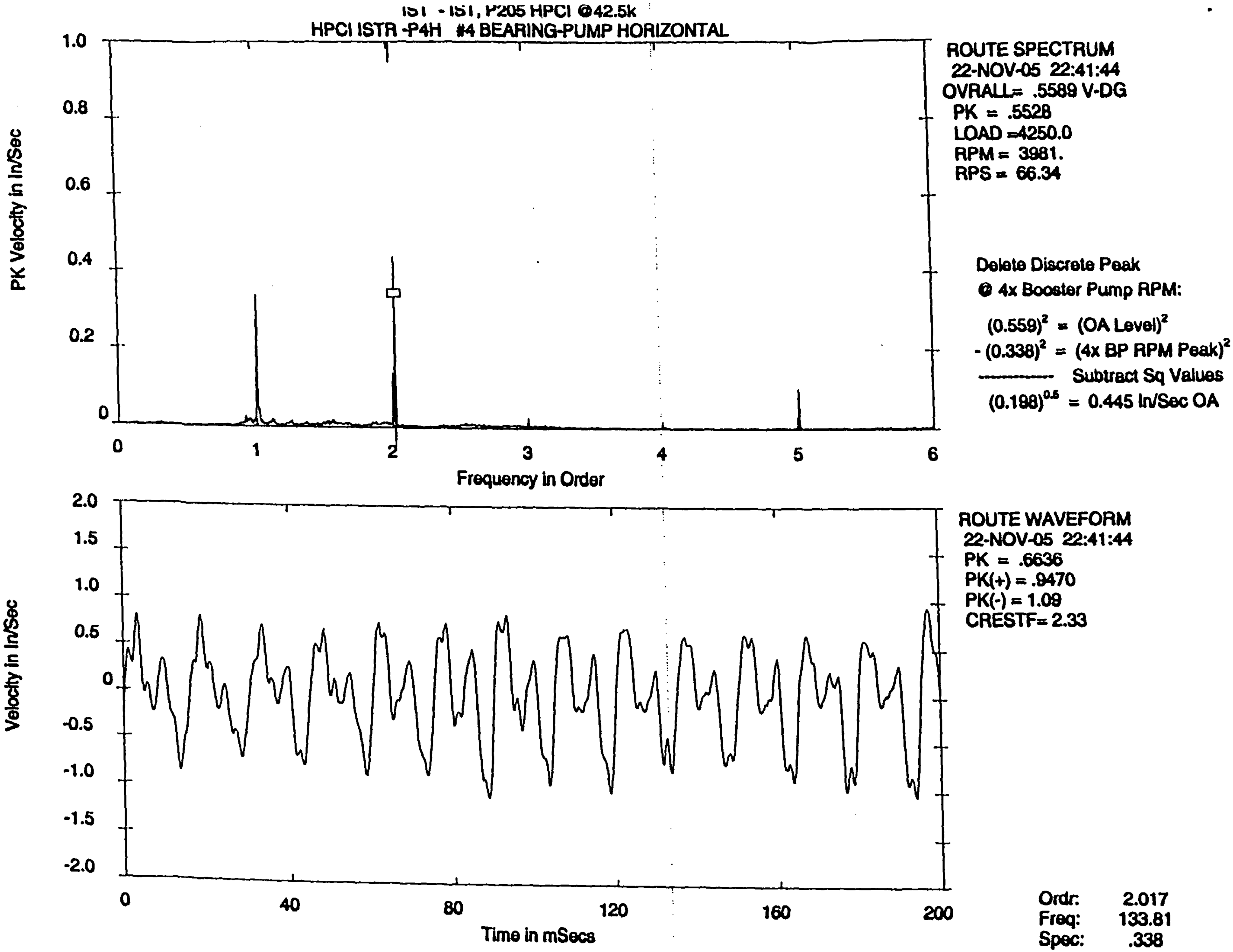
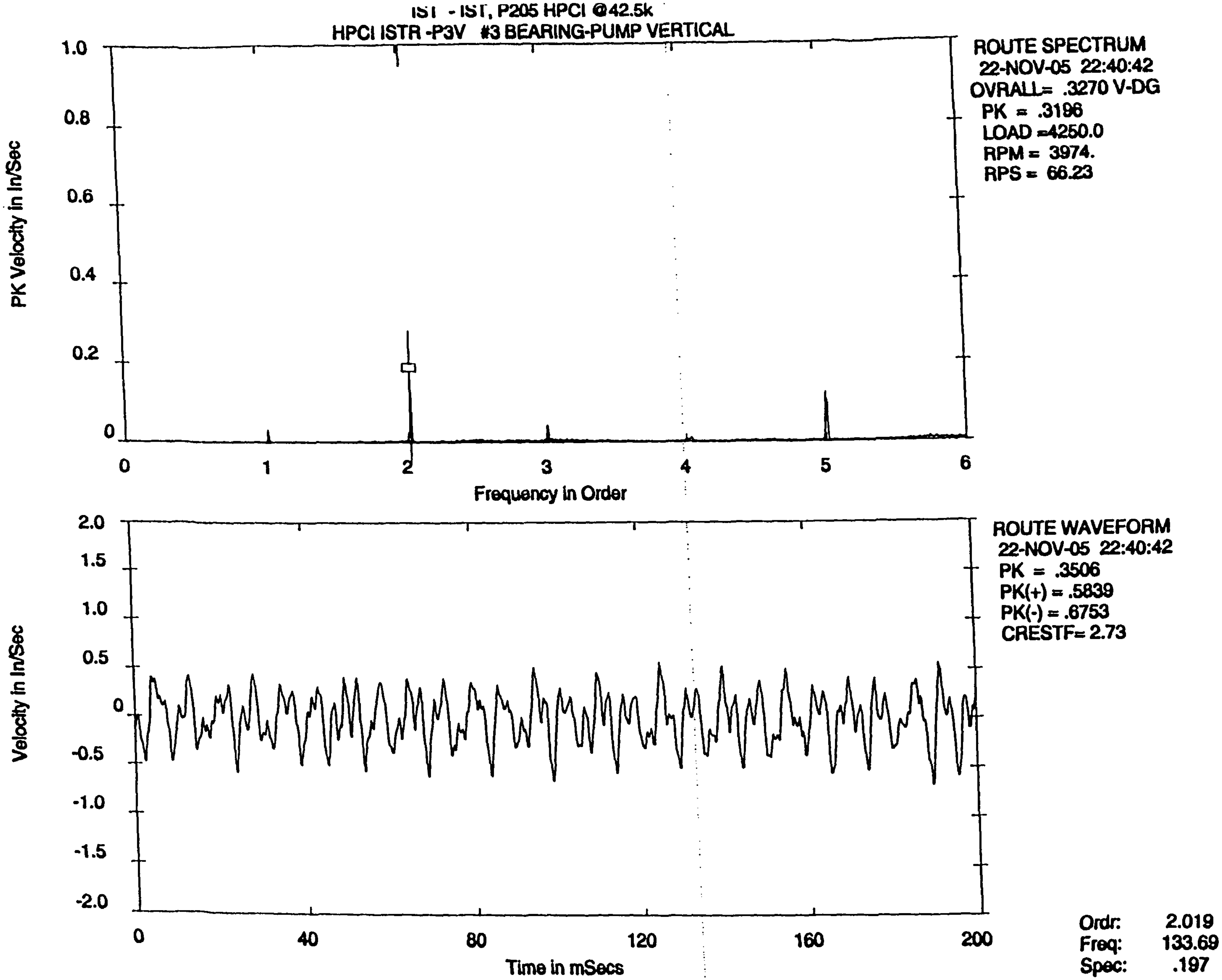
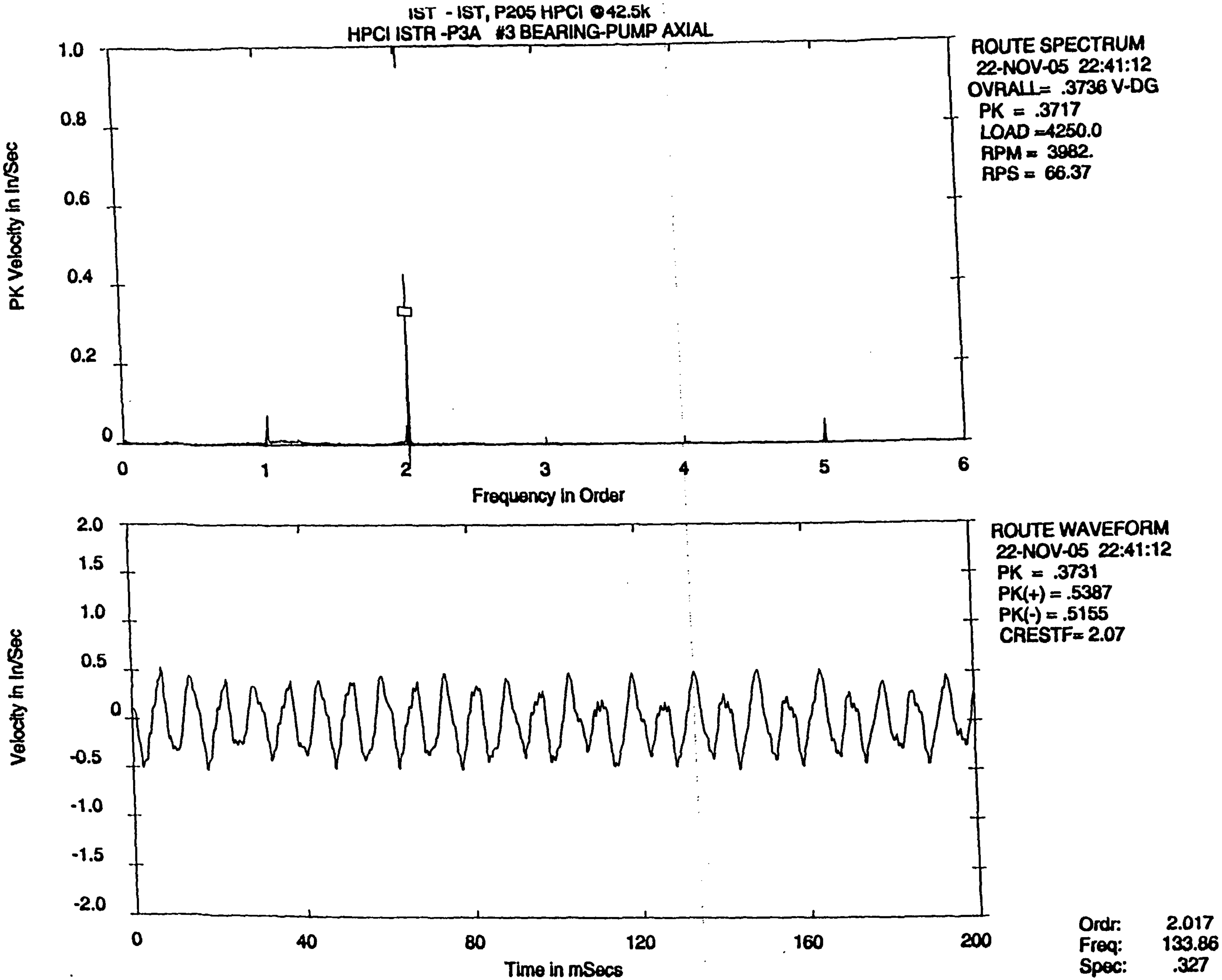

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P3H #3 BEARING-PUMP HORIZONTAL
PK Velocity in In/Sec
Frequency in Order
ROUTE SPECTRUM
22-NOV-05 22:39:24
OVRALL= .8148 V-DG
PK = .8057
LOAD =4250.0
RPM = 3983.
RPS = 66.39
Delete Discrete Peak
@ 4x Booster Pump RPM:
(0.815)² = (OA Level)²
- (0.664)² = (4x BP RPM Peak)²
Subtract Sq Values
(0.223)^0.5 = 0.473 In/Sec OA
Velocity in In/Sec
Time in mSecs
ROUTE WAVEFORM
22-NOV-05 22:39:24
PK = .9590
PK(+) = 1.47
PK(-) = 1.34
CRESTF= 2.15
Ordr: 2.017
Freq: 133.90
Spec: .664



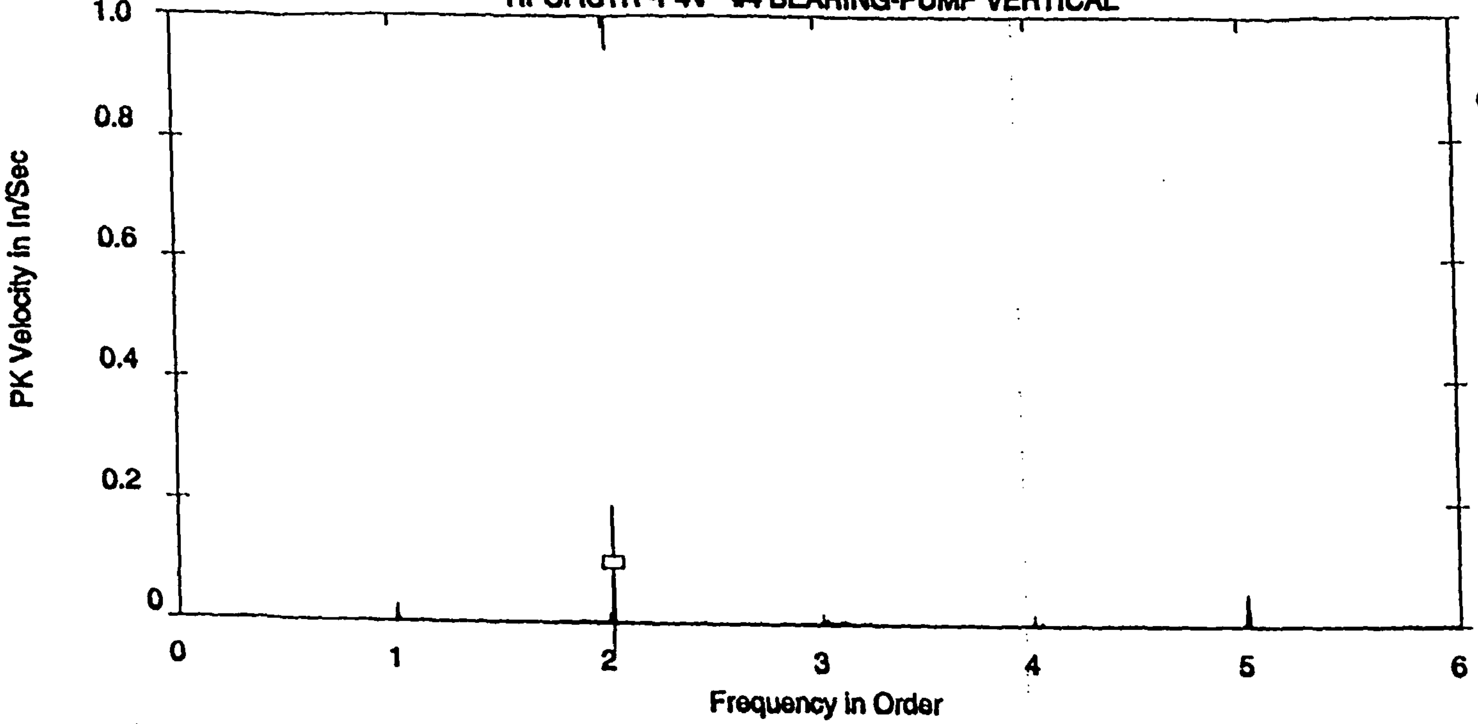
IST - IST, P205 HPCI @42.5k
HPCI ISTR -P4H #4 BEARING-PUMP HORIZONTAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
22-NOV-05 22:41:44
OVRALL= .5589 V-DG
PK = .5528
LOAD =4250.0
RPM = 3981.
RPS = 66.34
Delete Discrete Peak
@ 4x Booster Pump RPM:
(0.559)² = (OA Level)²
- (0.338)² = (4x BP RPM Peak)²
Subtract Sq Values
(0.198)^0.5 = 0.445 In/Sec OA
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
ROUTE WAVEFORM
22-NOV-05 22:41:44
PK = .6636
PK(+) = .9470
PK(-) = 1.09
CRESTF= 2.33
Ordr: 2.017
Freq: 133.81
Spec: .338



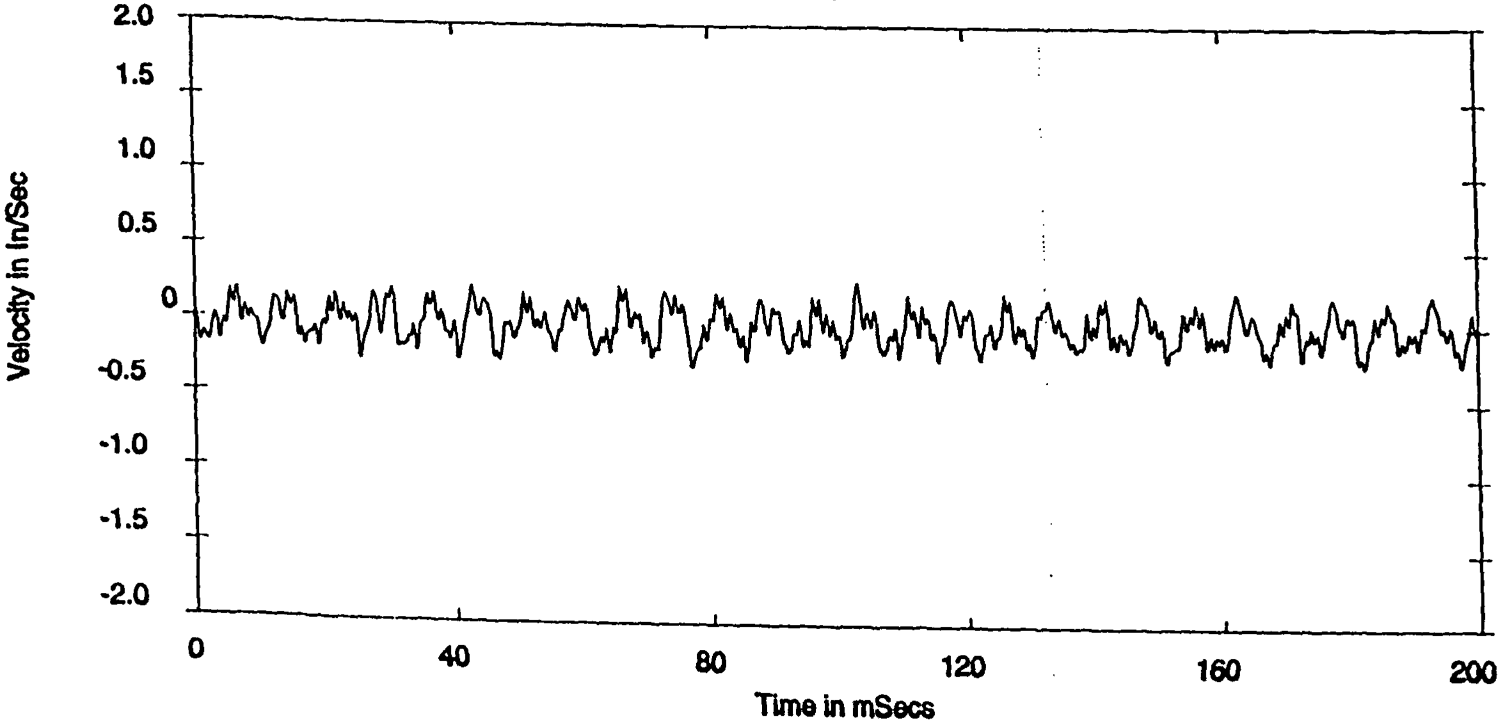
IST - IST, P205 HPCI @42.5k
HPCI ISTR -P3V #3 BEARING-PUMP VERTICAL
ROUTE SPECTRUM
22-NOV-05 22:40:42
OVRALL= .3270 V-DG
PK = .3196
LOAD =4250.0
RPM = 3974.
RPS = 66.23
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE WAVEFORM
22-NOV-05 22:40:42
PK = .3506
PK(+) = .5839
PK(-) = .6753
CRESTF= 2.73
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 2.019
Freq: 133.69
Spec: .197


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P3A #3 BEARING-PUMP AXIAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
22-NOV-05 22:41:12
OVRALL= .3736 V-DG
PK = .3717
LOAD =4250.0
RPM = 3982.
RPS = 66.37
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
ROUTE WAVEFORM
22-NOV-05 22:41:12
PK = .3731
PK(+) = .5387
PK(-) = .5155
CRESTF= 2.07
Ordr: 2.017
Freq: 133.86
Spec: .327

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P4V #4 BEARING-PUMP VERTICAL



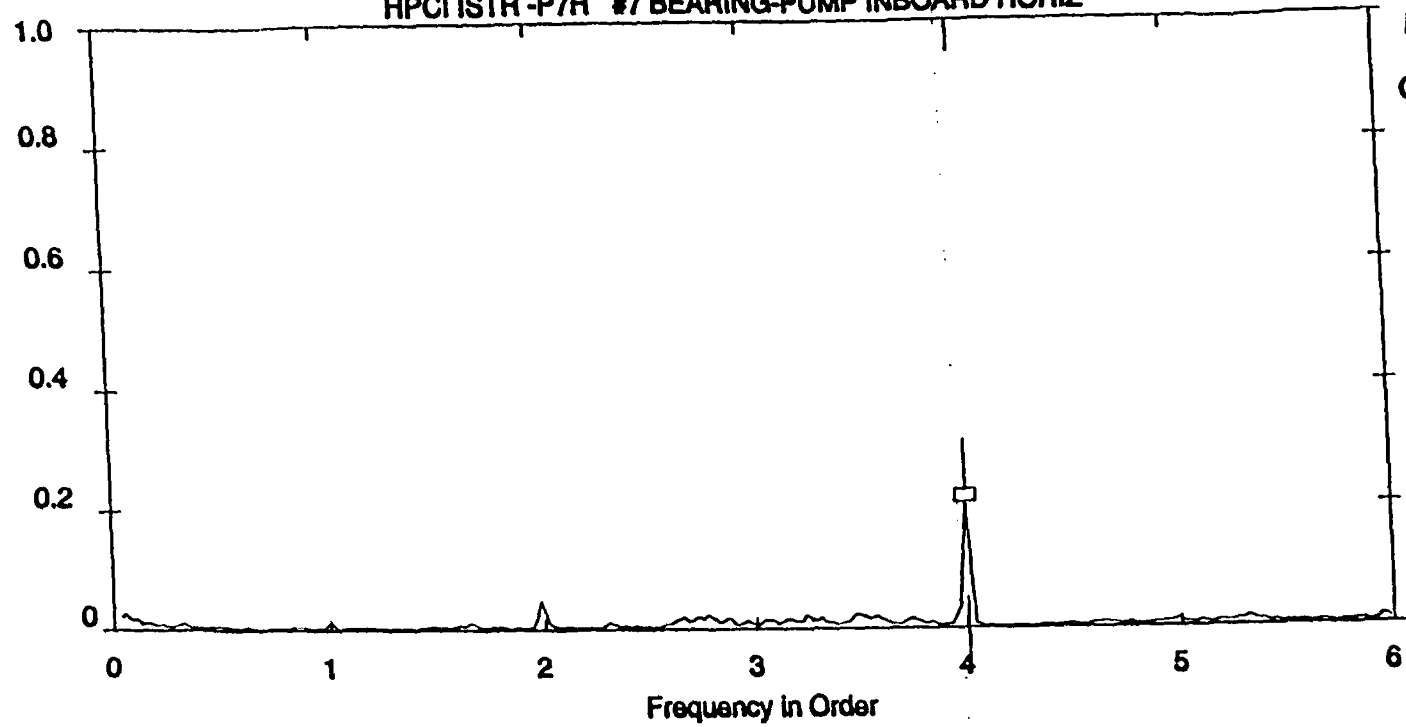
ROUTE SPECTRUM
22-NOV-05 22:42:30
OVRALL= .1547 V-DG
PK = .1429
LOAD =4250.0
RPM = 3983.
RPS = 66.39



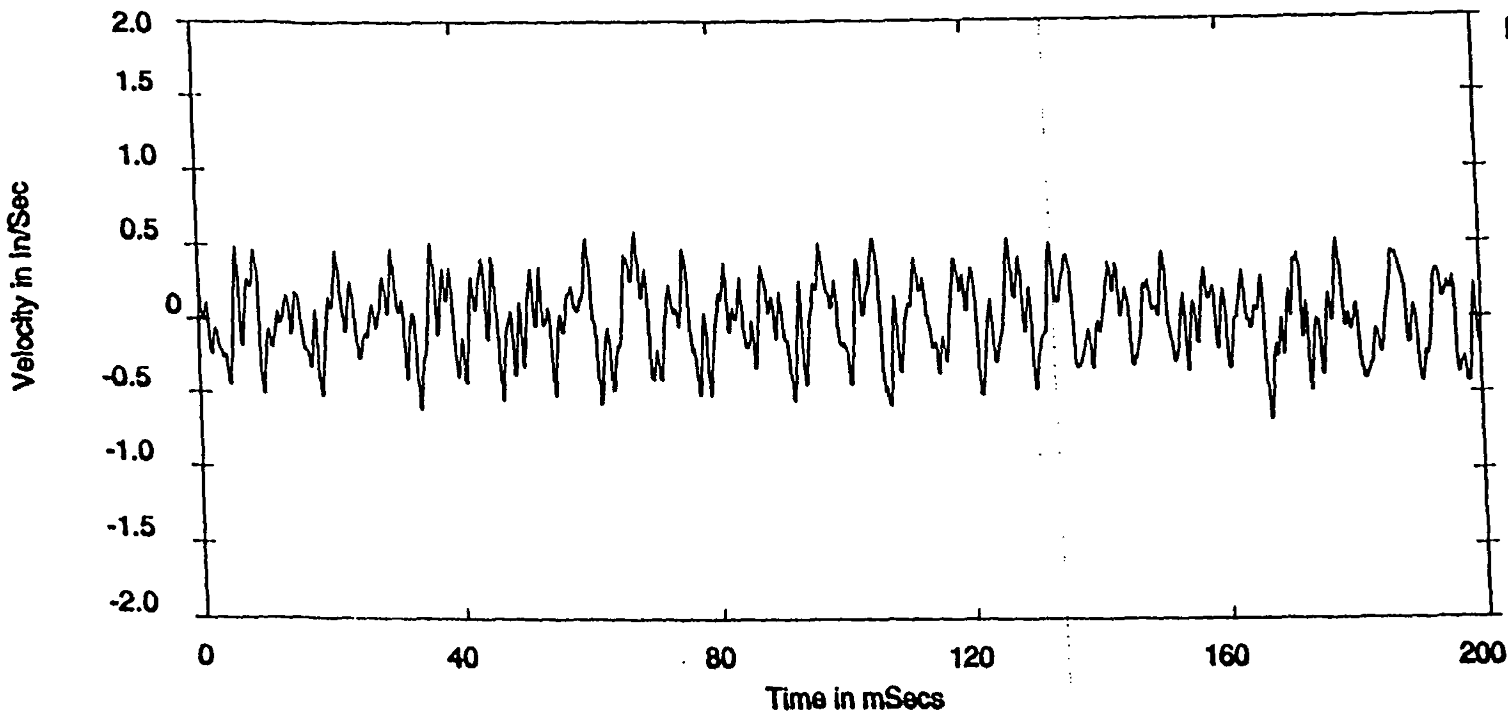
ROUTE WAVEFORM
22-NOV-05 22:42:30
PK = .1629
PK(+) = .2951
PK(-) = .2861
CRESTF= 2.61

Ordr:	2.017
Freq:	133.93
Spec:	.103

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P7H #7 BEARING-PUMP INBOARD HORIZ

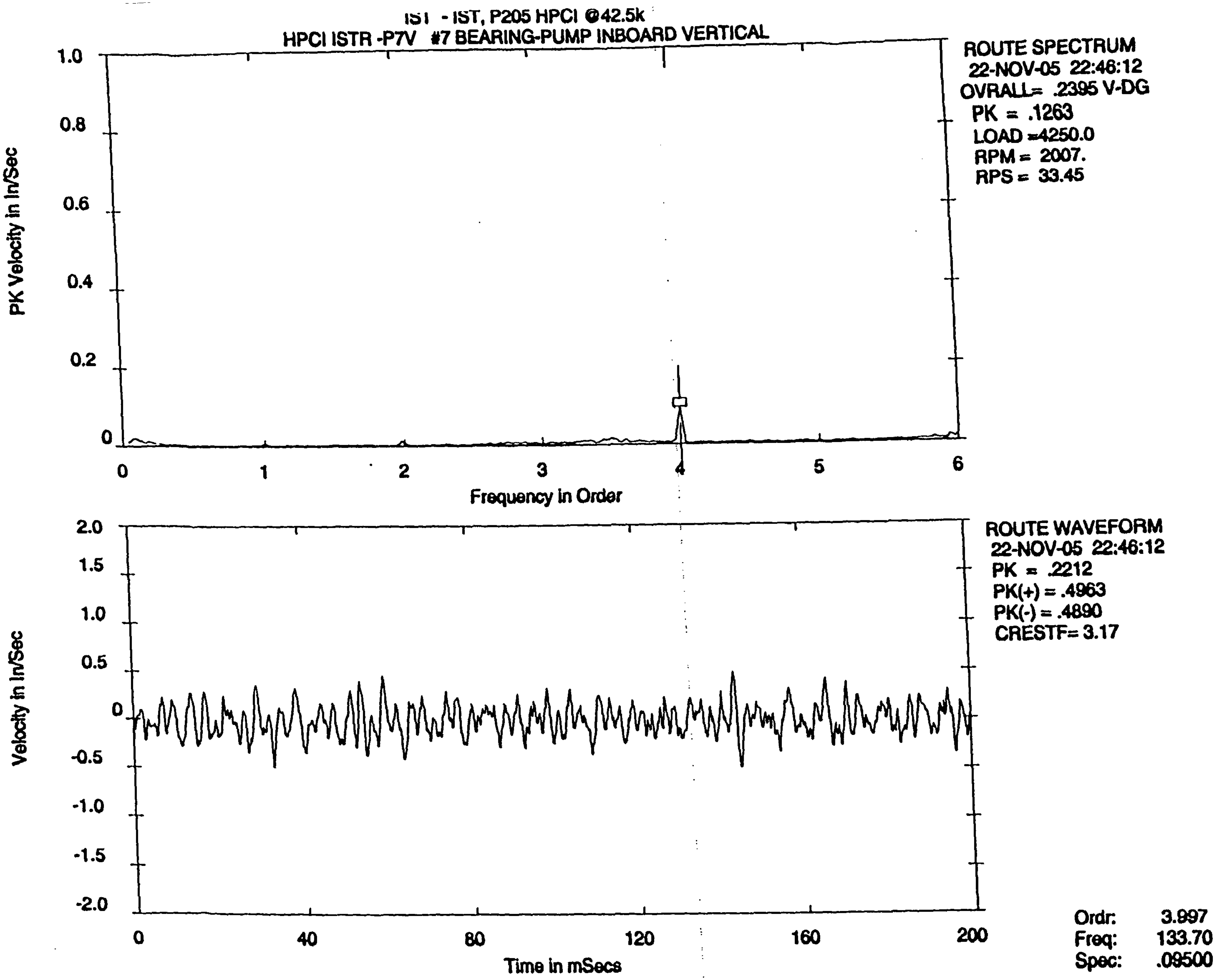


ROUTE SPECTRUM
22-NOV-05 22:45:44
OVRALL= .3329 V-DG
PK = .2524
LOAD =4250.0
RPM = 2005.
RPS = 33.42

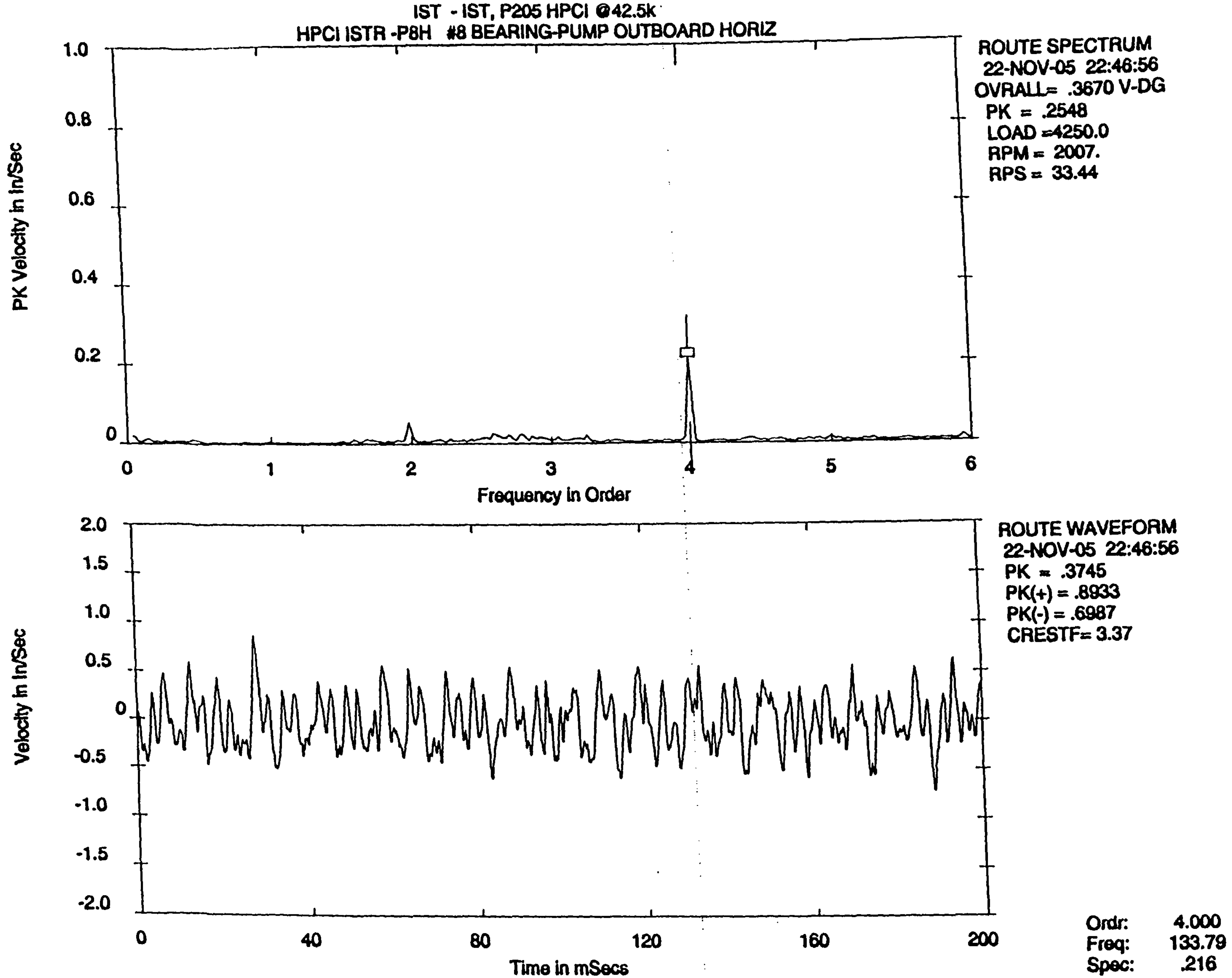


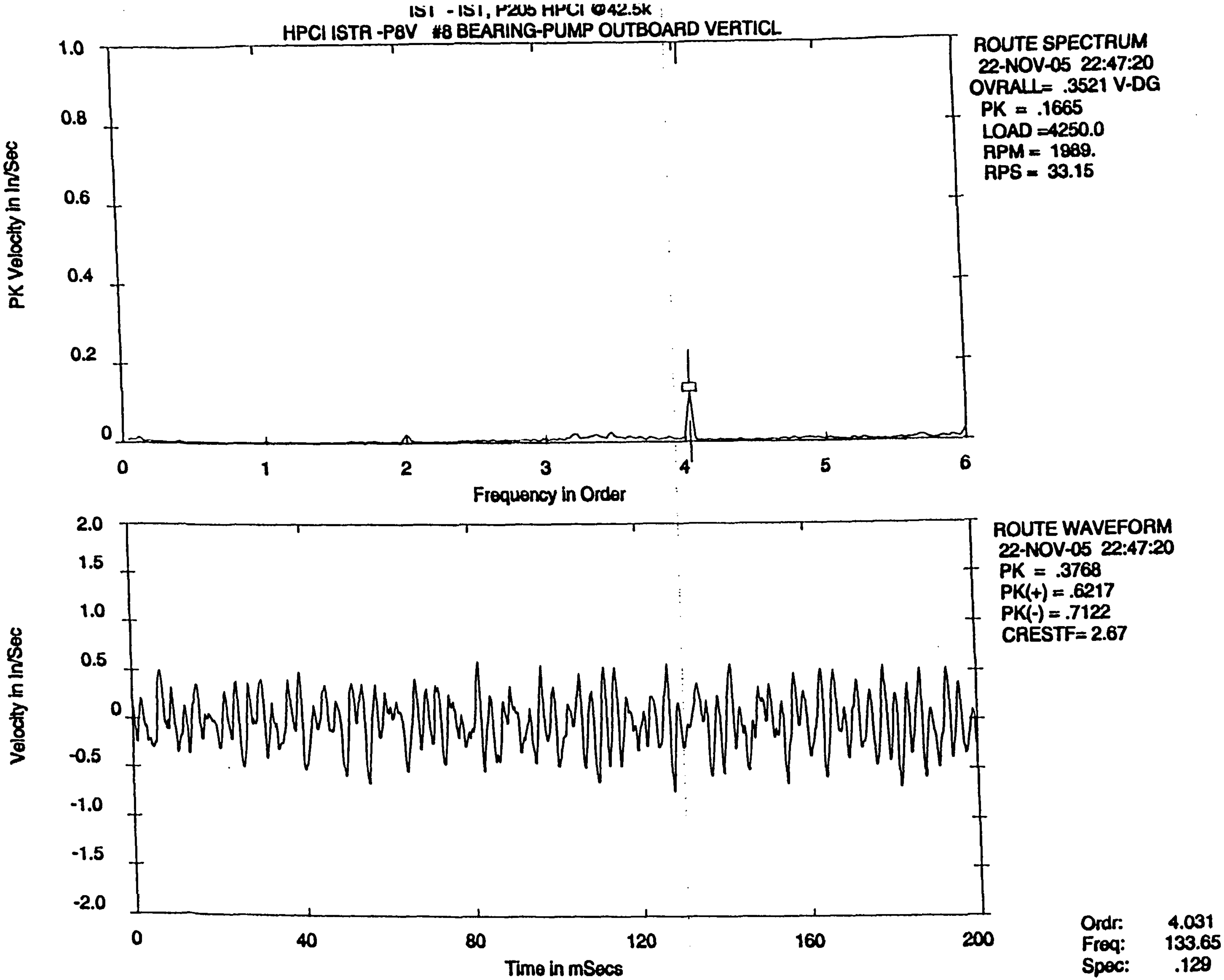
ROUTE WAVEFORM
22-NOV-05 22:45:44
PK = .3577
PK(+) = .5876
PK(-) = .6811
CRESTF= 2.69

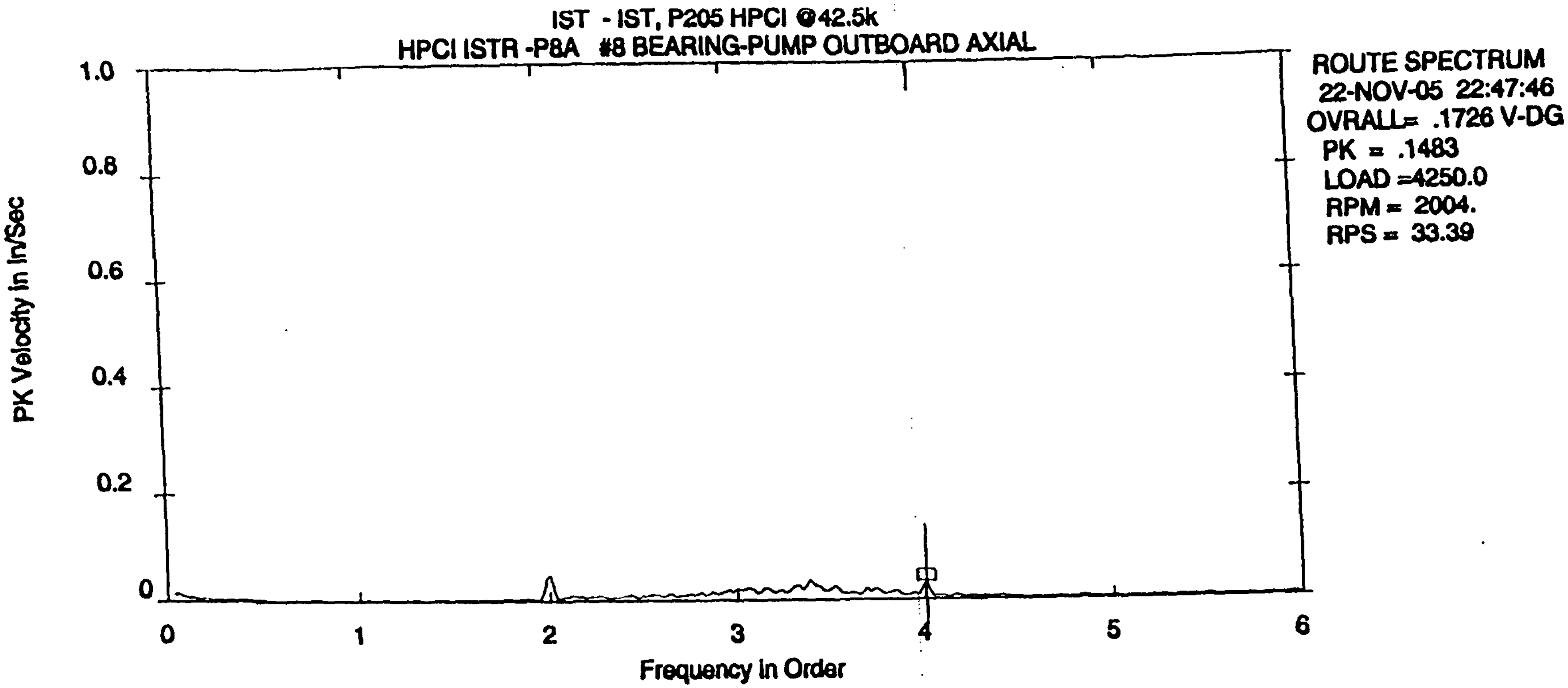
Ordr: 4.000
Freq: 133.67
Spec: .211

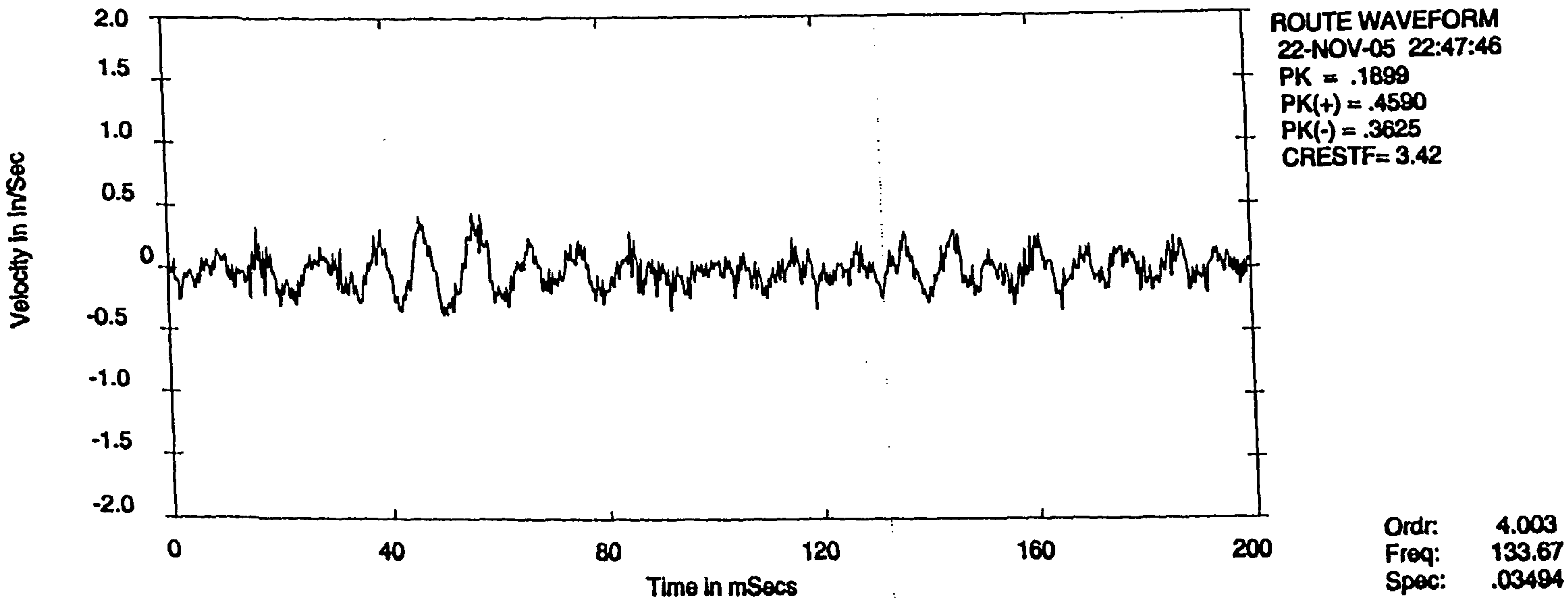


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P7V #7 BEARING-PUMP INBOARD VERTICAL
ROUTE SPECTRUM
22-NOV-05 22:46:12
OVRALL= .2395 V-DG
PK = .1263
LOAD =4250.0
RPM = 2007.
RPS = 33.45
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0 1 2 3 4 5 6
Frequency in Order
ROUTE WAVEFORM
22-NOV-05 22:46:12
PK = .2212
PK(+) = .4963
PK(-) = .4890
CRESTF= 3.17
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0 40 80 120 160 200
Time in mSecs
Ordr: 3.997
Freq: 133.70
Spec: .09500


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8H #8 BEARING-PUMP OUTBOARD HORIZ
ROUTE SPECTRUM
22-NOV-05 22:46:56
OVRALL= .3670 V-DG
PK = .2548
LOAD =4250.0
RPM = 2007.
RPS = 33.44
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE WAVEFORM
22-NOV-05 22:46:56
PK = .3745
PK(+) = .8933
PK(-) = .6987
CRESTF= 3.37
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 4.000
Freq: 133.79
Spec: .216


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8V #8 BEARING-PUMP OUTBOARD VERTICL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
22-NOV-05 22:47:20
OVRALL= .3521 V-DG
PK = .1665
LOAD =4250.0
RPM = 1989.
RPS = 33.15
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
ROUTE WAVEFORM
22-NOV-05 22:47:20
PK = .3768
PK(+) = .6217
PK(-) = .7122
CRESTF= 2.67
Ordr: 4.031
Freq: 133.65
Spec: .129


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8A #8 BEARING-PUMP OUTBOARD AXIAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
22-NOV-05 22:47:46
OVRALL= .1726 V-DG
PK = .1483
LOAD =4250.0
RPM = 2004.
RPS = 33.39


Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
ROUTE WAVEFORM
22-NOV-05 22:47:46
PK = .1899
PK(+) = .4590
PK(-) = .3625
CRESTF= 3.42
Ordr: 4.003
Freq: 133.67
Spec: .03494

ENCLOSURE 2

HPCI PUMP CONFIGURATION AND HISTORICAL VIBRATION TEST RESULTS
(Total 66 pages)

(Pilgrim seeks Relief for P3H and P4H Points. Data for the remaining point is provided for information)

HPCI Pump Layout

1. HPCI Pump Configuration
2. HPCI Pump Configuration
3. HPCI Pump Configuration
4. HPCI Pump Vibration Monitoring Program

Relief Point P3H Data

5. P3H HPCI Vibration Spectrum Data, Nov. 24, 2004
6. P3H HPCI Vibration Spectrum Data, Aug. 24, 2004
7. P3H HPCI Vibration Spectrum Data, Dec. 17, 1997
8. P3H HPCI Vibration Spectrum Data, May 06, 1996
9. P3H HPCI Vibration Spectrum Data, Nov. 20, 1995
10. P3H HPCI Vibration Spectrum Data, May 25, 1994

Relief Point P4H Data

11. P4H HPCI Vibration Spectrum Data, Nov. 24, 2004
12. P4H HPCI Vibration Spectrum Data, Aug. 24, 2004
13. P4H HPCI Vibration Spectrum Data, Dec. 17, 1997
14. P4H HPCI Vibration Spectrum Data, May 06, 1996
15. P4H HPCI Vibration Spectrum Data, Nov. 20, 1995
16. P4H HPCI Vibration Spectrum Data, May 25, 1994

Point P3V Data

17. P3V HPCI Vibration Spectrum Data, Nov. 24, 2004
18. P3V HPCI Vibration Spectrum Data, Aug. 24, 2004
19. P3V HPCI Vibration Spectrum Data, Dec. 17, 1997
20. P3V HPCI Vibration Spectrum Data, May 06, 1996
21. P3V HPCI Vibration Spectrum Data, Nov. 20, 1995
22. P3V HPCI Vibration Spectrum Data, May 25, 1994

Point P3A Data

23. P3A HPCI Vibration Spectrum Data, Nov. 24, 2004
24. P3A HPCI Vibration Spectrum Data, Aug. 24, 2004
25. P3A HPCI Vibration Spectrum Data, Dec. 17, 1997
26. P3A HPCI Vibration Spectrum Data, May 06, 1996
27. P3A HPCI Vibration Spectrum Data, Nov. 20, 1995
28. P3A HPCI Vibration Spectrum Data, May 25, 1994

Point P4V Data

29. P4V HPCI Vibration Spectrum Data, Nov. 24, 2004
30. P4V HPCI Vibration Spectrum Data, Aug. 24, 2004
31. P4V HPCI Vibration Spectrum Data, Dec. 17, 1997
32. P4V HPCI Vibration Spectrum Data, May 06, 1996
33. P4V HPCI Vibration Spectrum Data, Nov. 20, 1995
34. P4V HPCI Vibration Spectrum Data, May 25, 1994

Point P7H Data

35. P7H HPCI Vibration Spectrum Data, Nov. 24, 2004
36. P7H HPCI Vibration Spectrum Data, Aug. 24, 2004
37. P7H HPCI Vibration Spectrum Data, Dec. 17, 1997
38. P7H HPCI Vibration Spectrum Data, May 06, 1996
39. P7H HPCI Vibration Spectrum Data, Nov. 20, 1995
40. P7H HPCI Vibration Spectrum Data, May 25, 1994

Point P7V Data

41. P7V HPCI Vibration Spectrum Data, Nov. 24, 2004
42. P7V HPCI Vibration Spectrum Data, Aug. 24, 2004
43. P7V HPCI Vibration Spectrum Data, Dec. 17, 1997
44. P7V HPCI Vibration Spectrum Data, May 06, 1996
45. P7V HPCI Vibration Spectrum Data, Nov. 20, 1995
46. P7V HPCI Vibration Spectrum Data, May 25, 1994

Point P8H Data

47. P8H HPCI Vibration Spectrum Data, Nov. 24, 2004
48. P8H HPCI Vibration Spectrum Data, Aug. 24, 2004
49. P8H HPCI Vibration Spectrum Data, Dec. 17, 1997
50. P8H HPCI Vibration Spectrum Data, May 06, 1996
51. P8H HPCI Vibration Spectrum Data, Nov. 20, 1995
52. P8H HPCI Vibration Spectrum Data, May 25, 1994

Point P8V Data

53. P8V HPCI Vibration Spectrum Data, Nov. 24, 2004
54. P8V HPCI Vibration Spectrum Data, Aug. 24, 2004
55. P8V HPCI Vibration Spectrum Data, Dec. 17, 1997
56. P8V HPCI Vibration Spectrum Data, May 06, 1996
57. P8V HPCI Vibration Spectrum Data, Nov. 20, 1995
58. P8V HPCI Vibration Spectrum Data, May 25, 1994

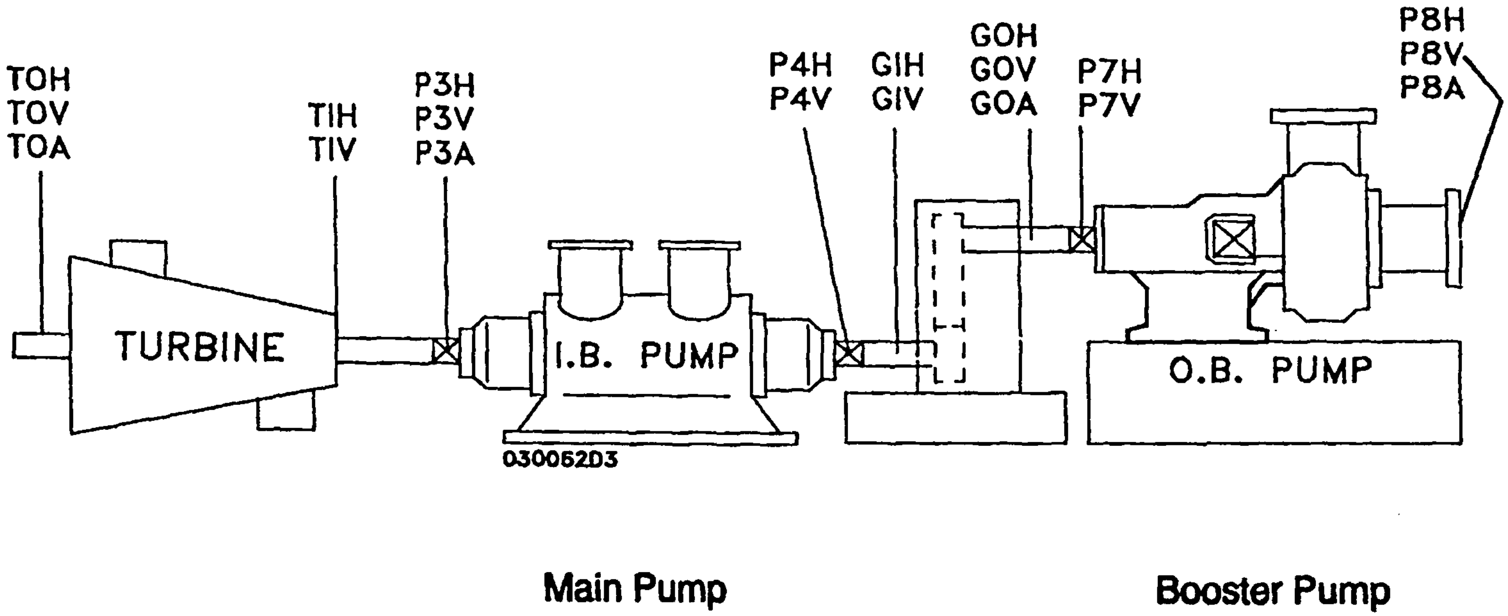
Point P8A Data

59. P8A HPCI Vibration Spectrum Data, Nov. 24, 2004
60. P8A HPCI Vibration Spectrum Data, Aug. 24, 2004
61. P8A HPCI Vibration Spectrum Data, Dec. 17, 1997
62. P8A HPCI Vibration Spectrum Data, July 31, 1996*
63. P8A HPCI Vibration Spectrum Data, Nov. 20, 1995
64. P8A HPCI Vibration Spectrum Data, May 25, 1994

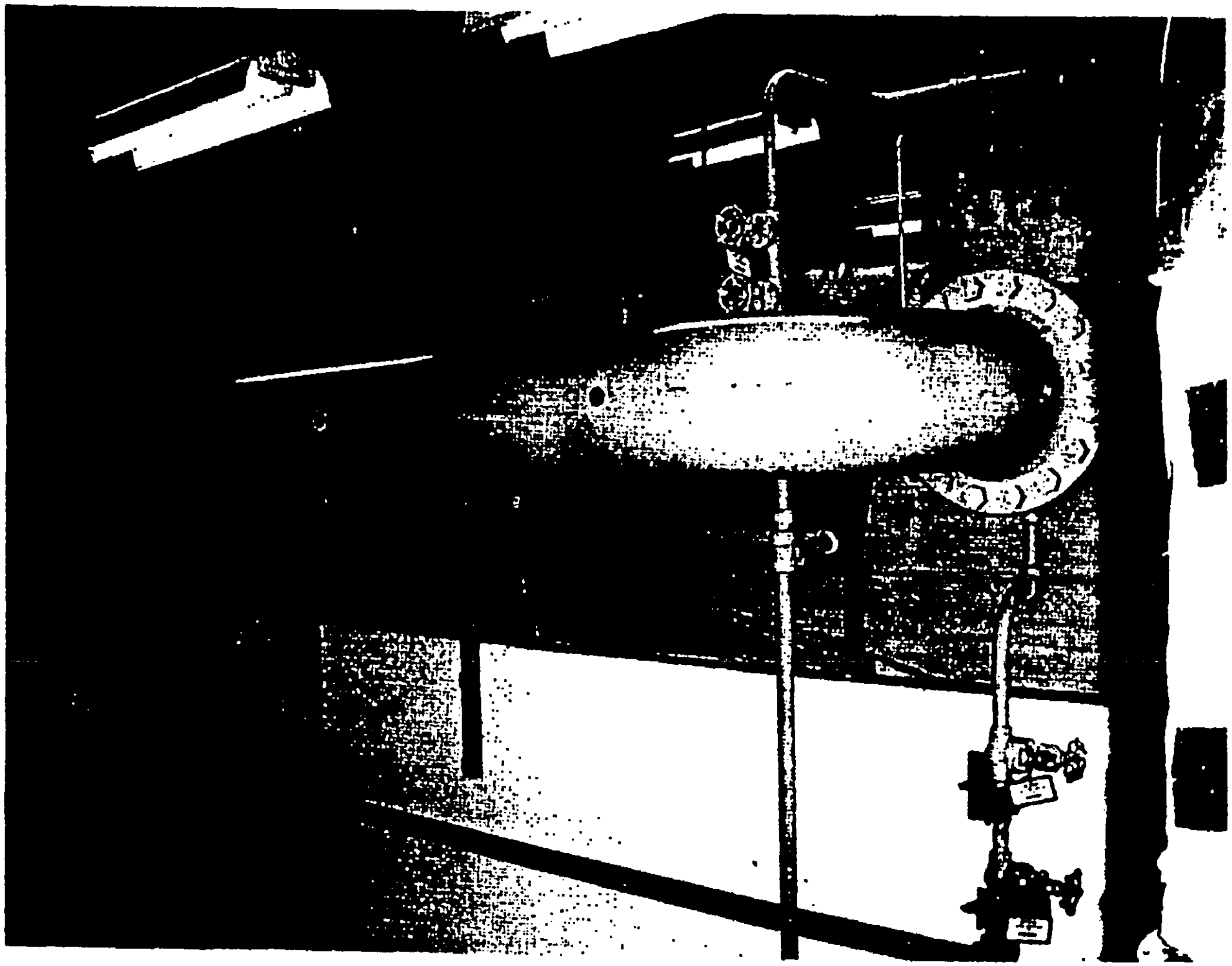
*July 31, 1996 data is submitted since May 06, 1996 data is not available for point P8A.

encl001.PDF

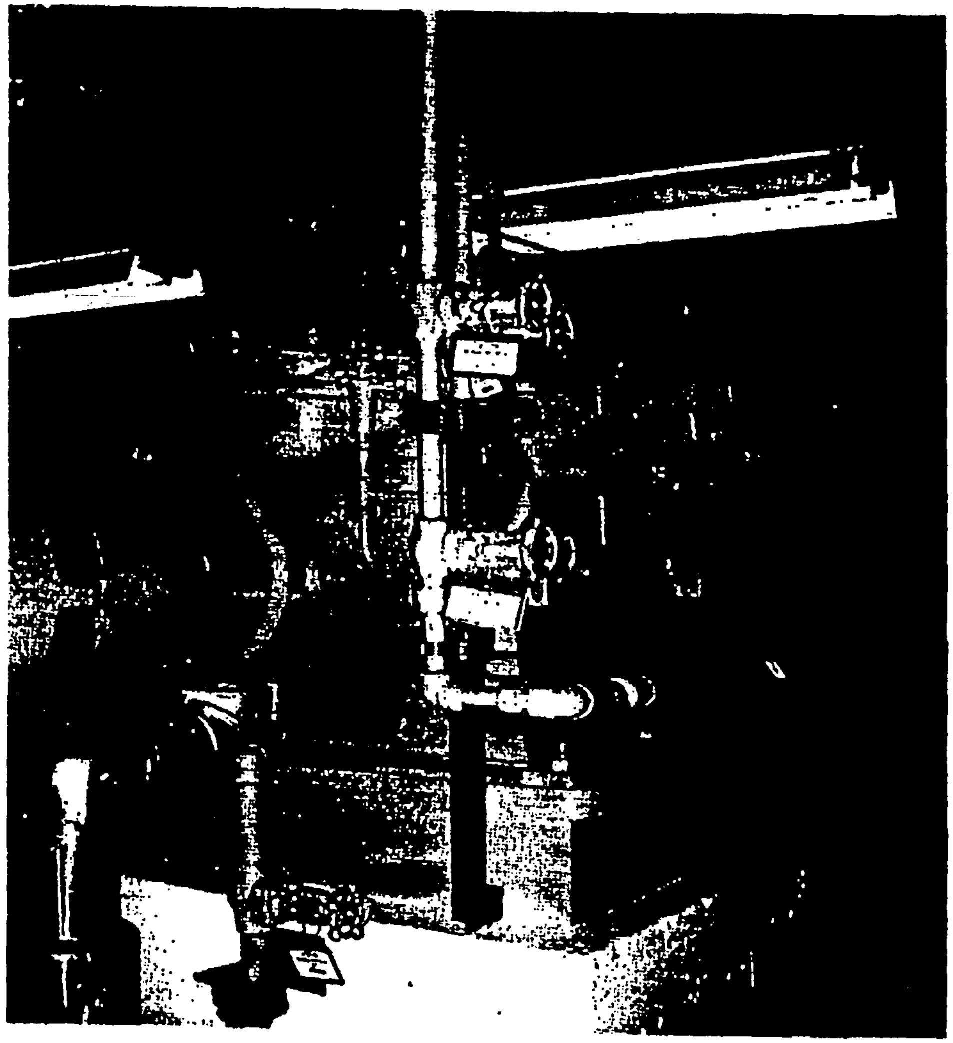
HPCI Pump Configuration



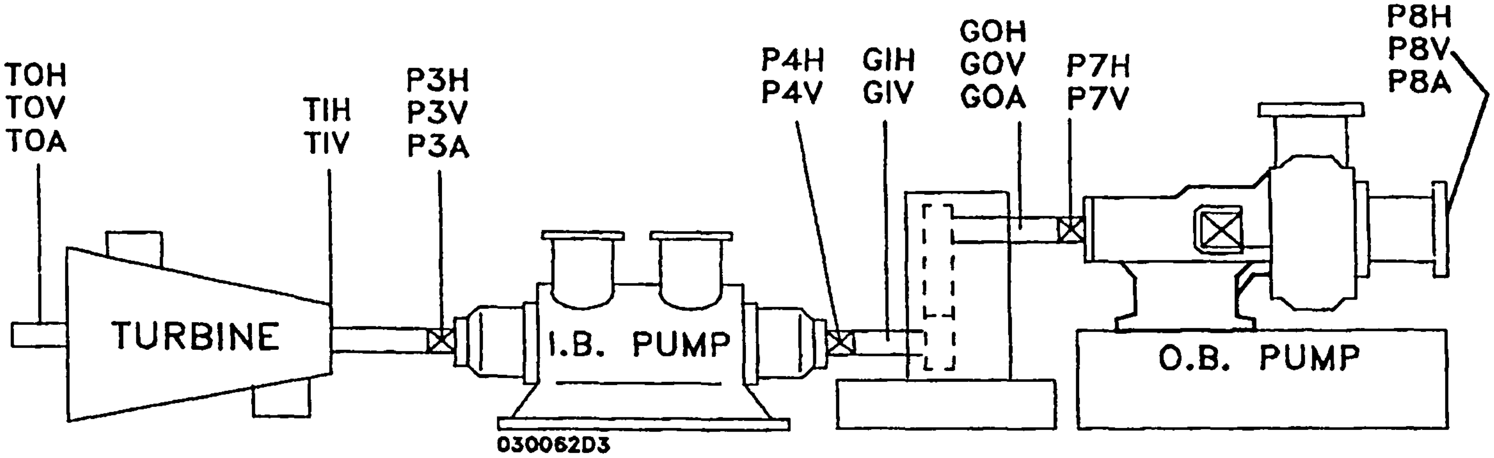
HPCI Pump Configuration



HPCI Pump Configuration



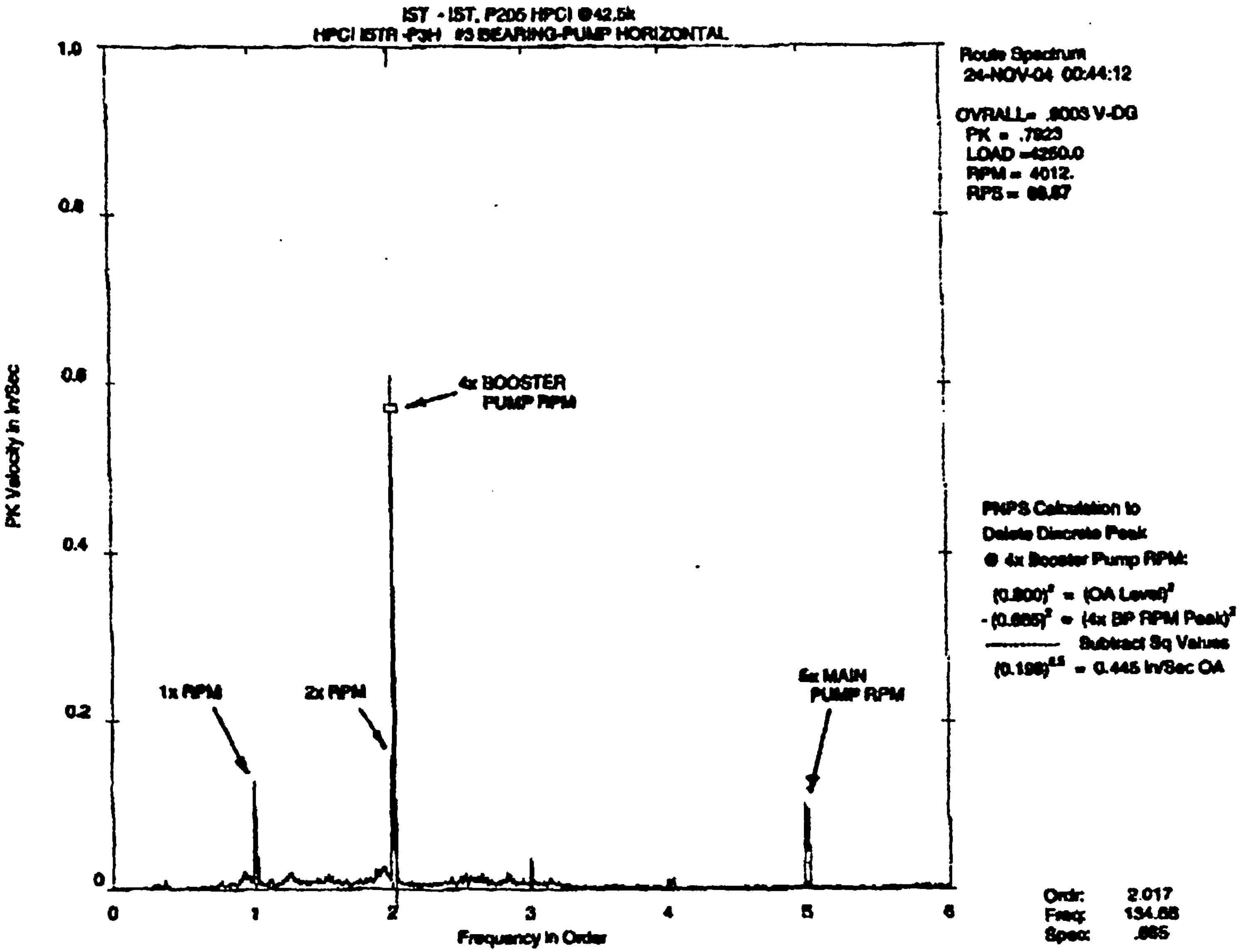
HPCI Pump Vibration Monitoring Program



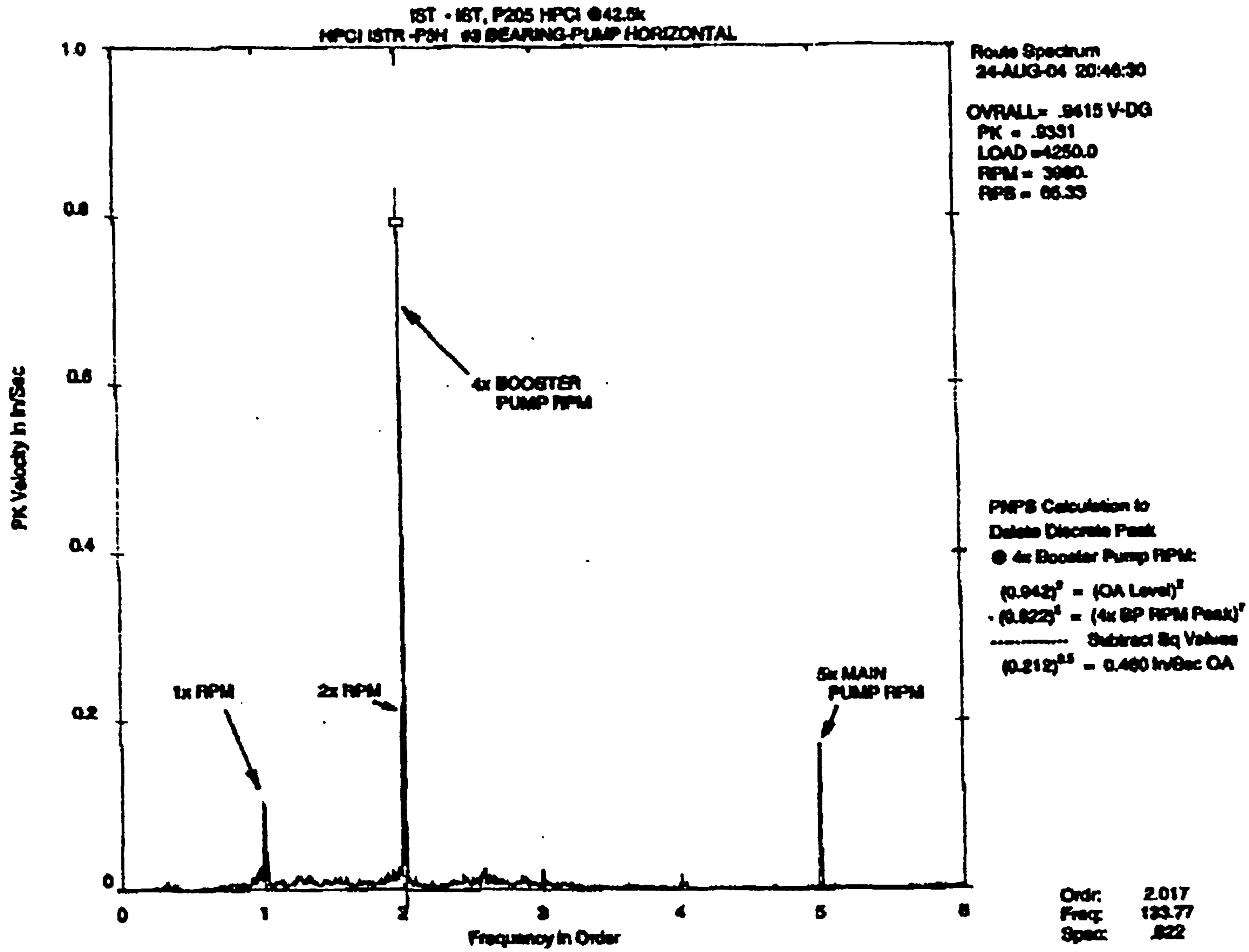
P3H	**P4H**	**P7H**	**P8H**
P3V	**P4V**	**P7V**	**P8V**
P3A			**P8A**

Other points are monitored as part of Vibration Monitoring for Preventive Maintenance and Balance

HPCI Data November 24, 2004

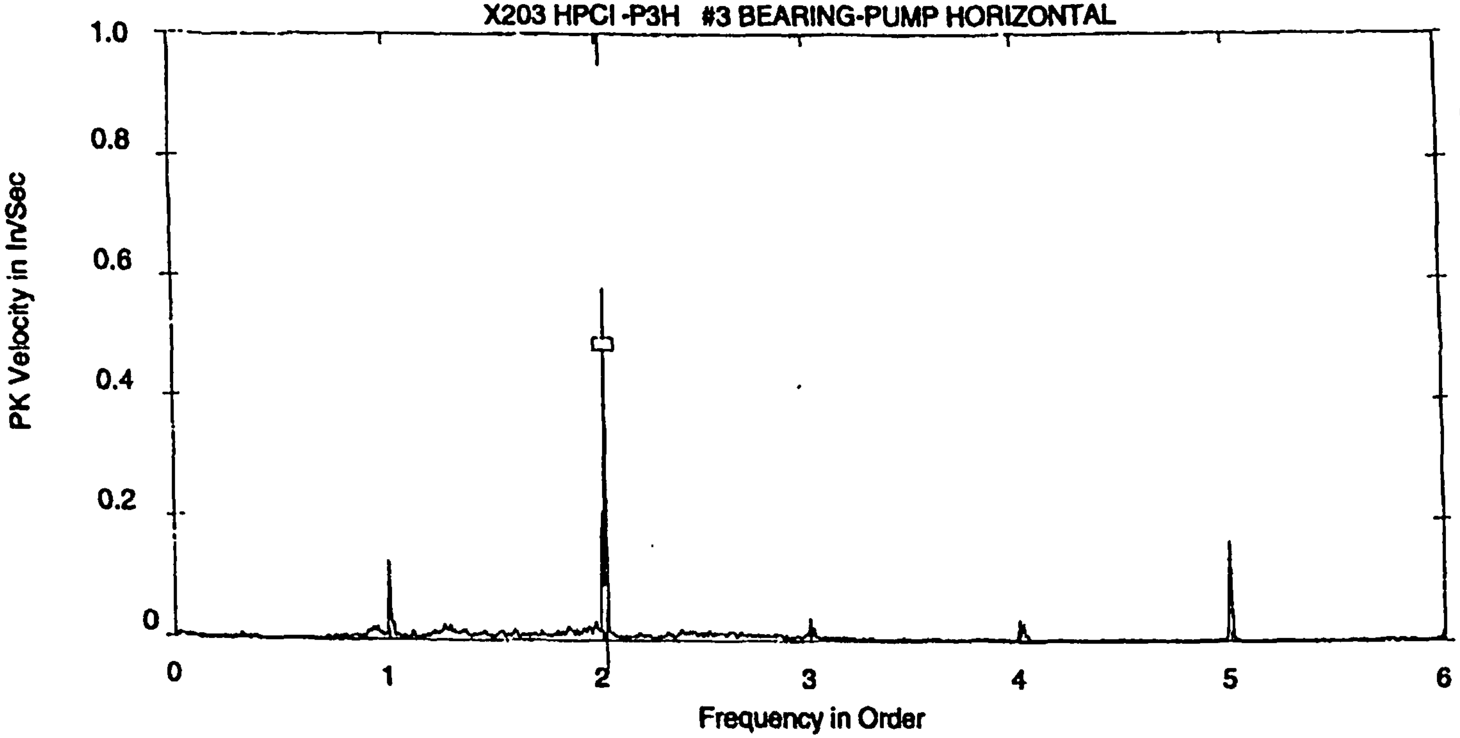


HPCI Data August 24, 2004



RX - X203,P205 HPCI TURB & PUMP

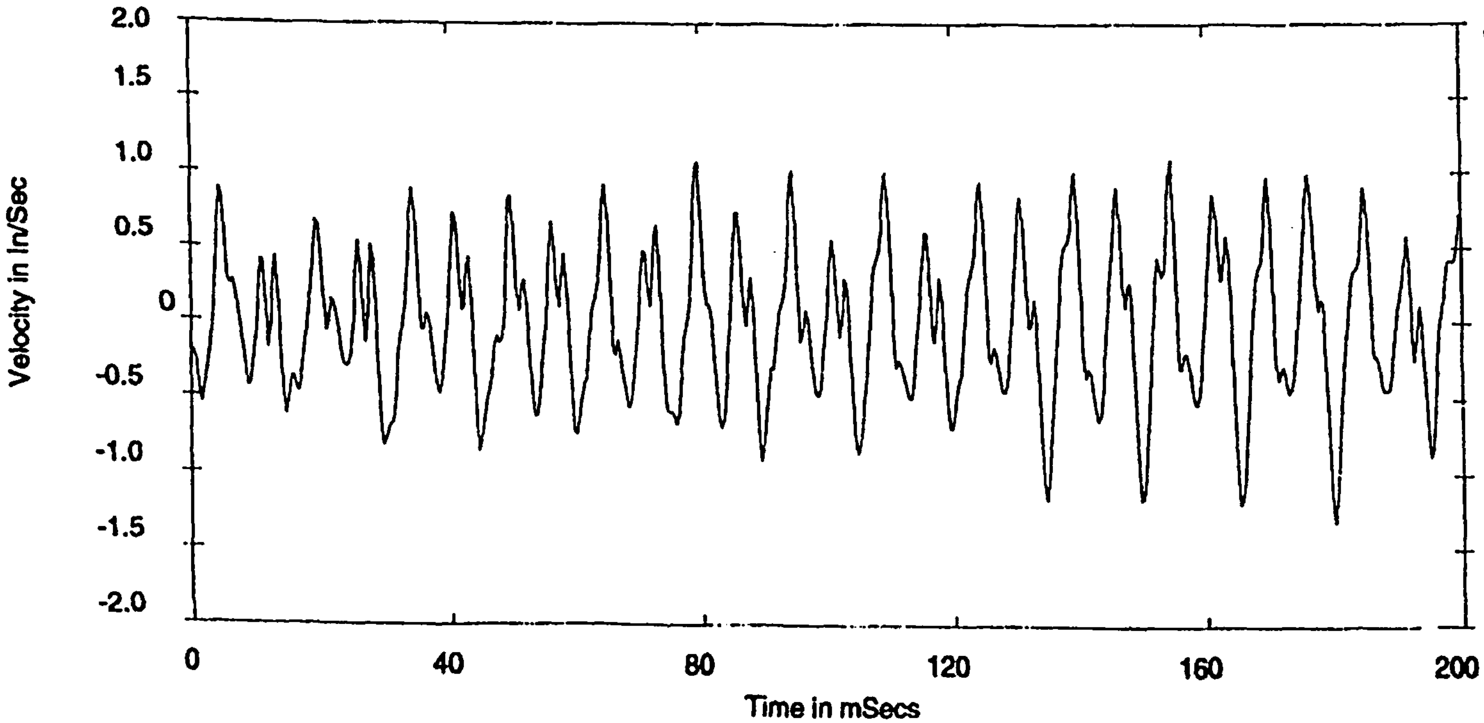
X203 HPCI -P3H #3 BEARING-PUMP HORIZONTAL



ROUTE SPECTRUM
17-DEC-97 16:49:30
OVRALL= 1.42 V-AP
PK = .6617
LOAD =4250.0
RPM = 3997.
RPS = 66.61

Delete Discrete Peak
@ 4x Booster Pump RPM:

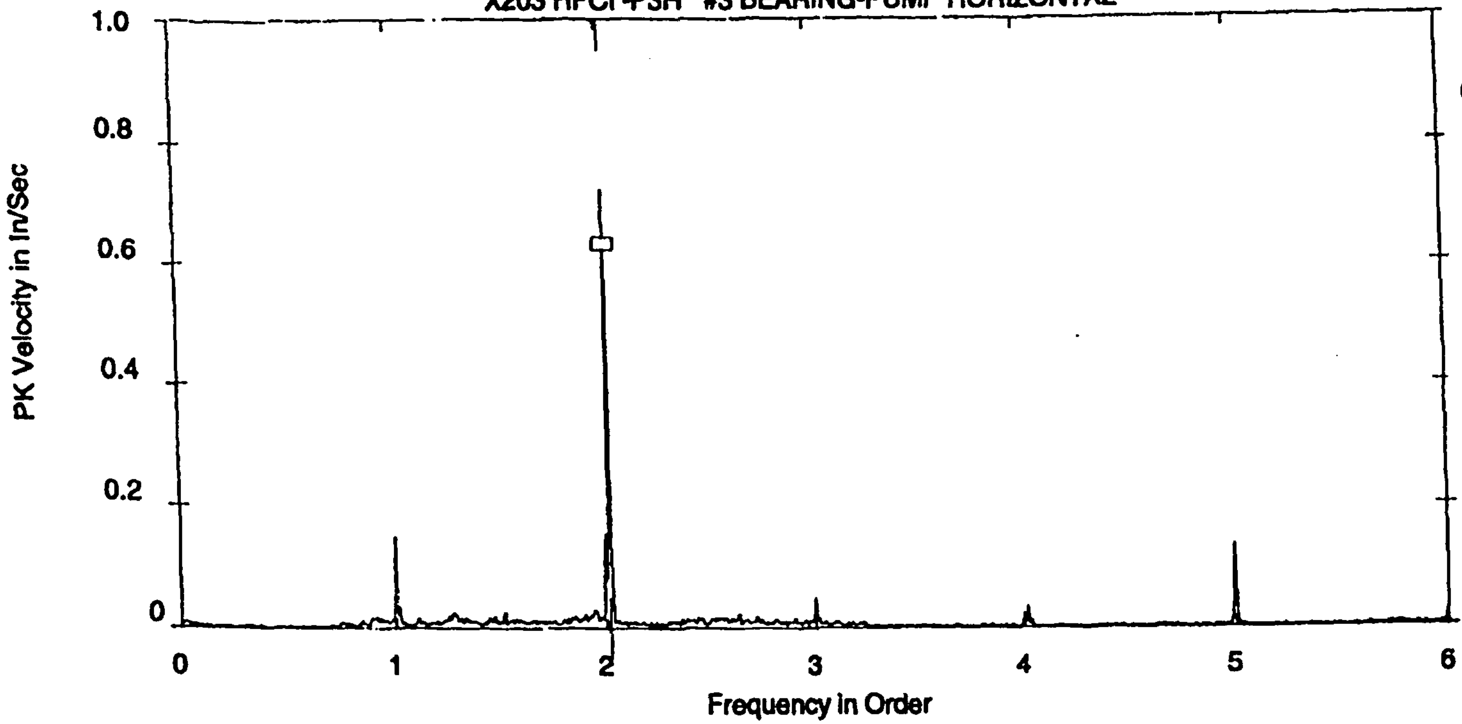
$(0.662)^2$ = $(\text{OA Level})^2$
$- (0.519)^2$ = $(\text{4x BP RPM Peak})^2$
———— Subtract Sq Values
$(0.169)^{0.5}$ = 0.411 In/Sec OA



WAVEFORM DISPLAY
17-DEC-97 16:49:30
PK = .6854
PK(+) = 1.17
PK(-) = 1.54
CRESTF= 2.87

Ordr: 2.016
Freq: 134.27
Spec: .519

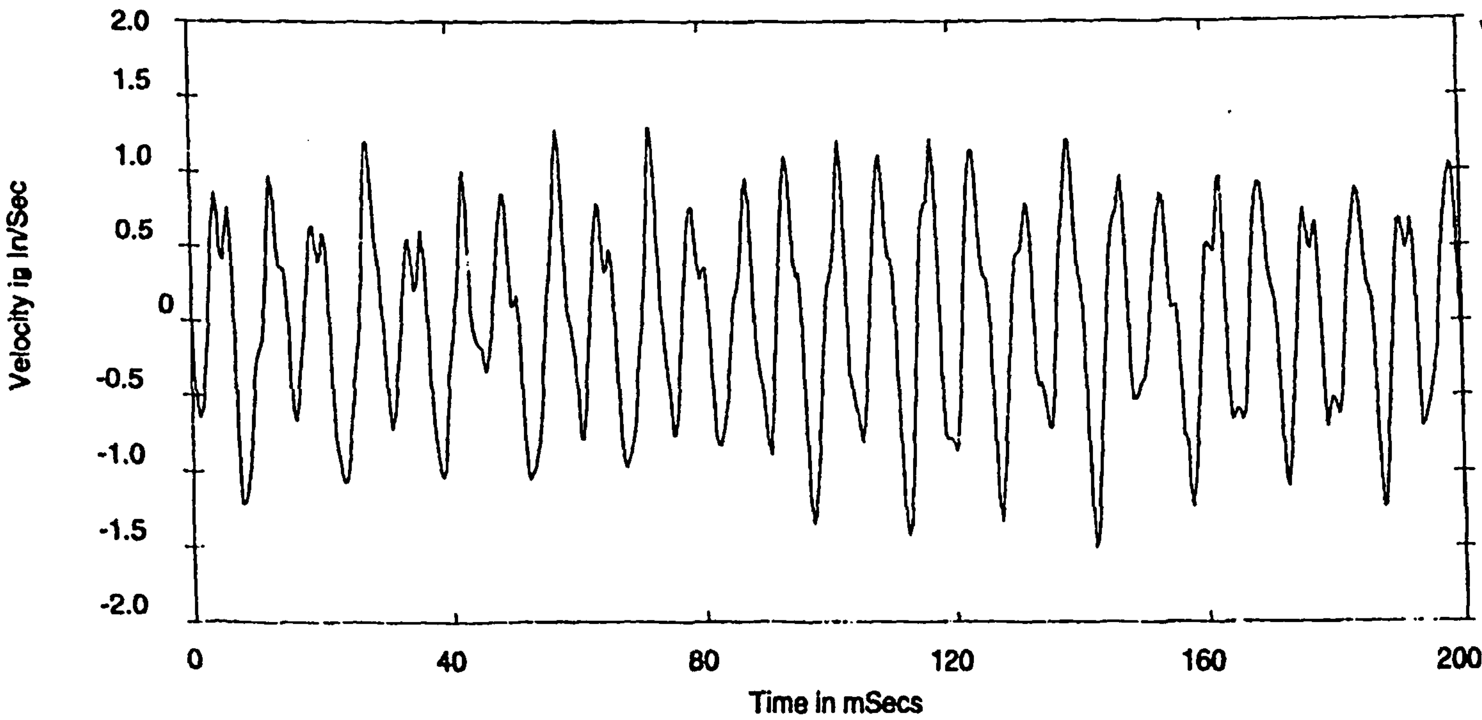
RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P3H #3 BEARING-PUMP HORIZONTAL



ROUTE SPECTRUM
06-MAY-96 09:21:06
OVRALL= .8251 V-DG
PK = .8208
LOAD =4250.0
RPM = 4004.
RPS = 66.73

Delete Discrete Peak
@ 4x Booster Pump RPM:

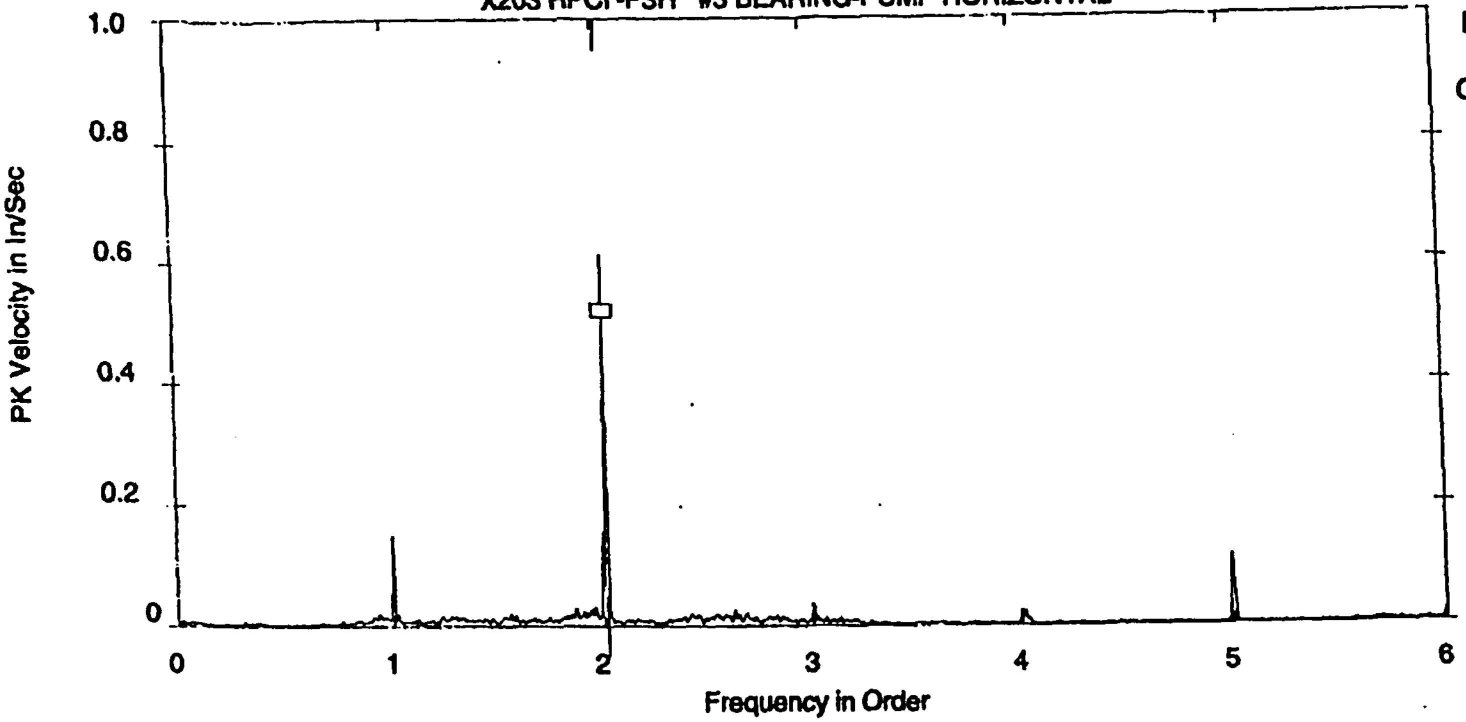
$(0.825)^2$ = $(\text{OA Level})^2$
- $(0.727)^2$ = $(\text{4x BP RPM Peak})^2$
------------ Subtract Sq Values
$(0.152)^{0.5}$ = 0.390 In/Sec OA



WAVEFORM DISPLAY
06-MAY-96 09:21:06
PK = .9211
PK(+) = 1.30
PK(-) = 1.51
CRESTF= 2.26

Ordr: 2.016
Freq: 134.53
Spec: .727

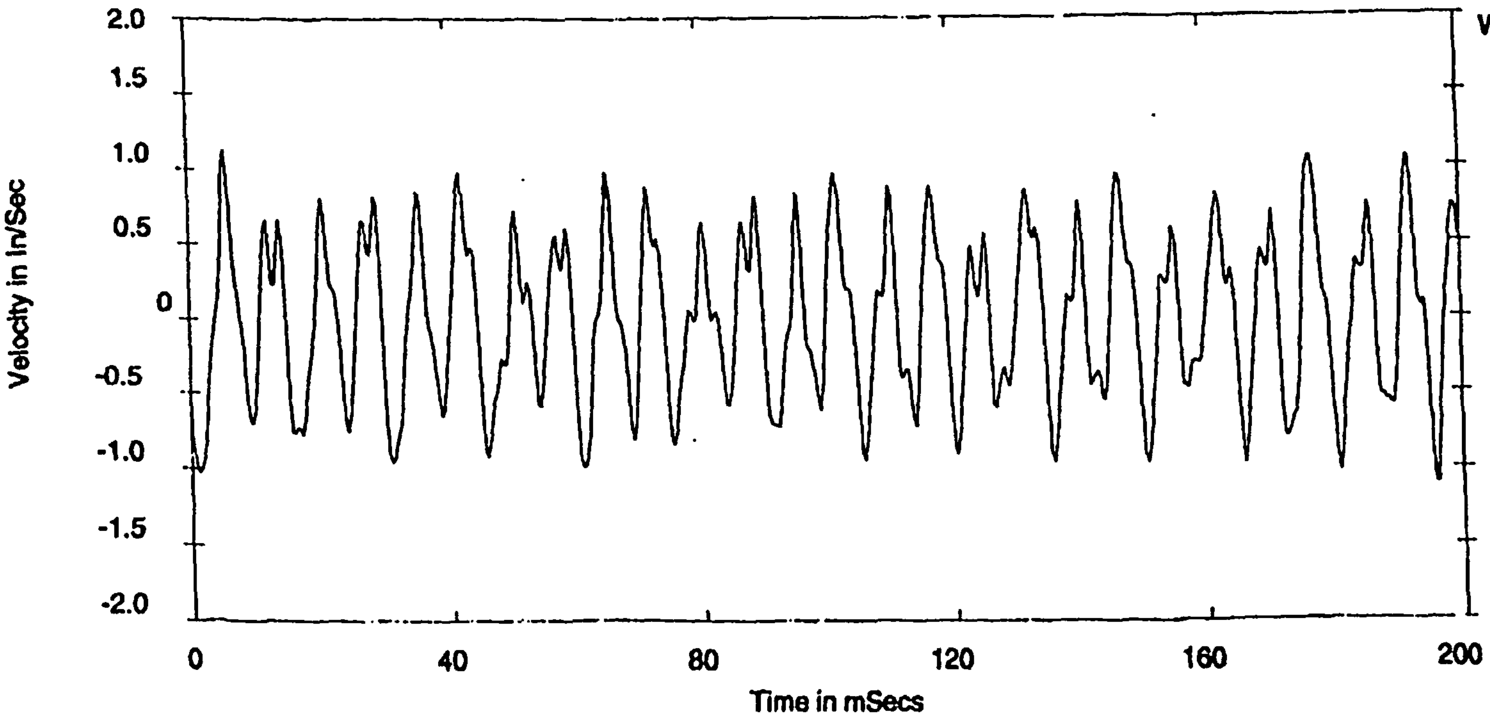
RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P3H #3 BEARING-PUMP HORIZONTAL



ROUTE SPECTRUM
20-NOV-95 01:58:31
OVRALL= .6703 V-DG
PK = .6638
LOAD =4250.0
RPM = 3998.
RPS = 66.63

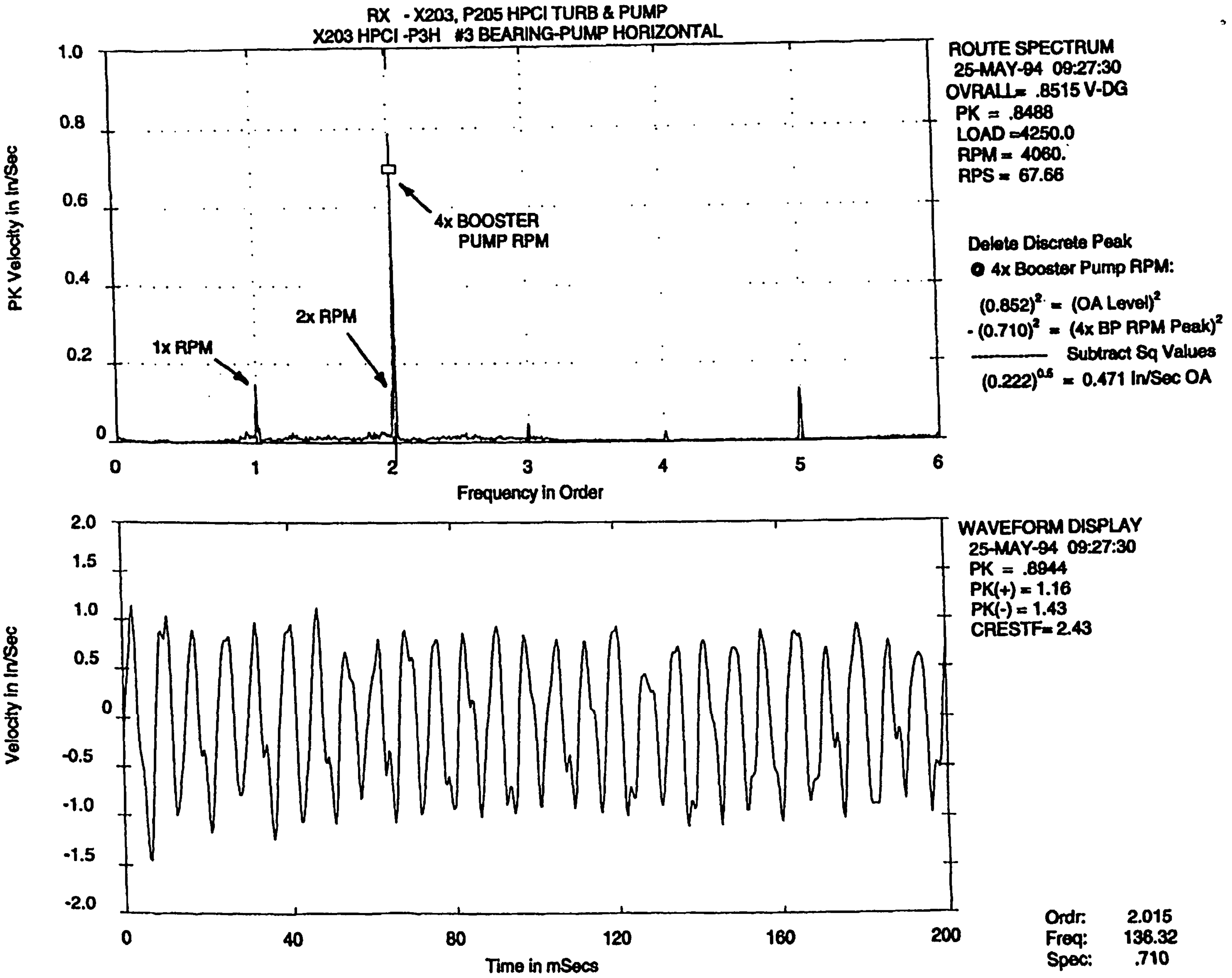
Delete Discrete Peak
@ 4x Booster Pump RPM:

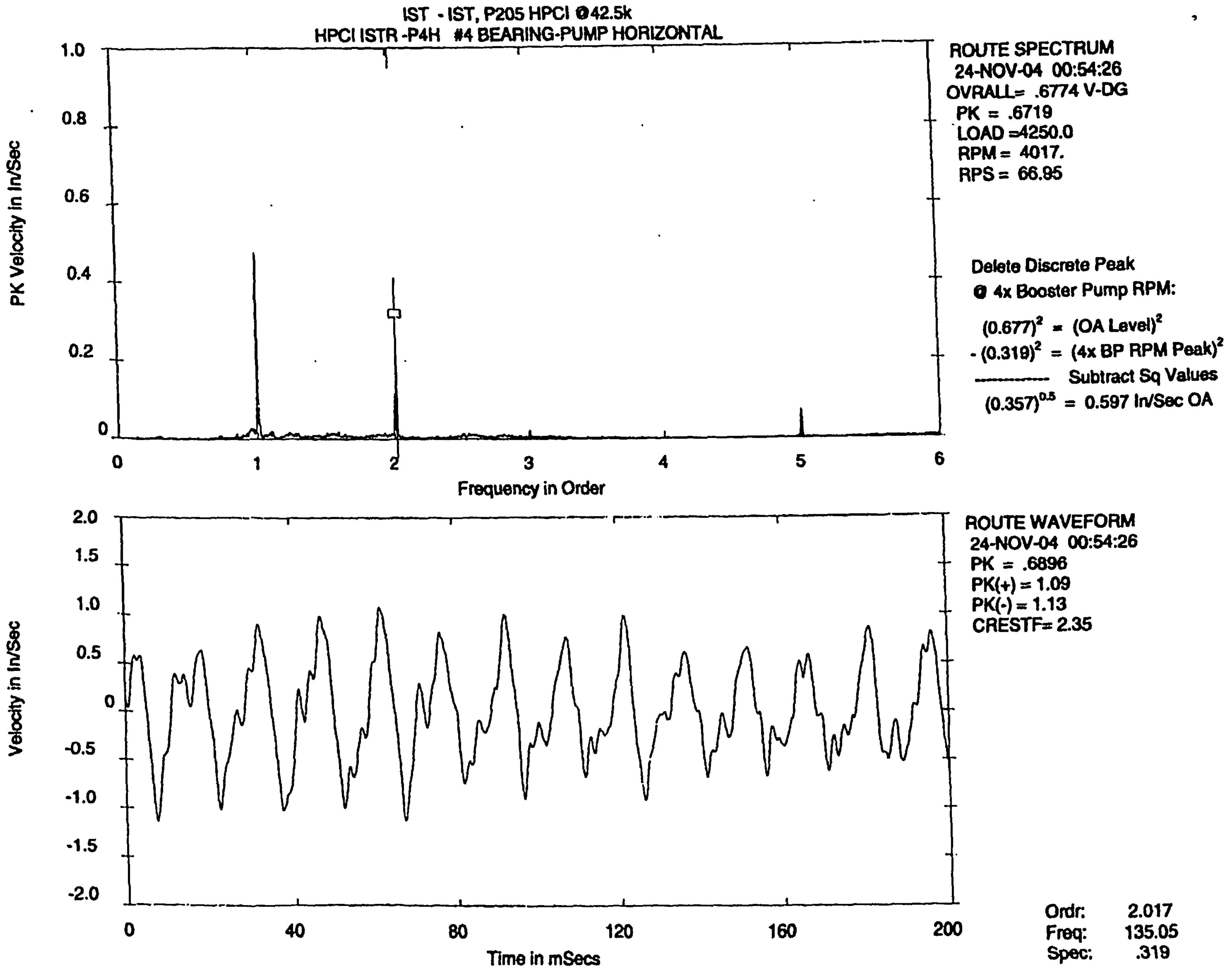
$(0.670)^2$ = $(\text{OA Level})^2$
- $(0.518)^2$ = $(\text{4x BP RPM Peak})^2$
------------ Subtract Sq Values
$(0.181)^{0.5}$ = 0.425 In/Sec OA



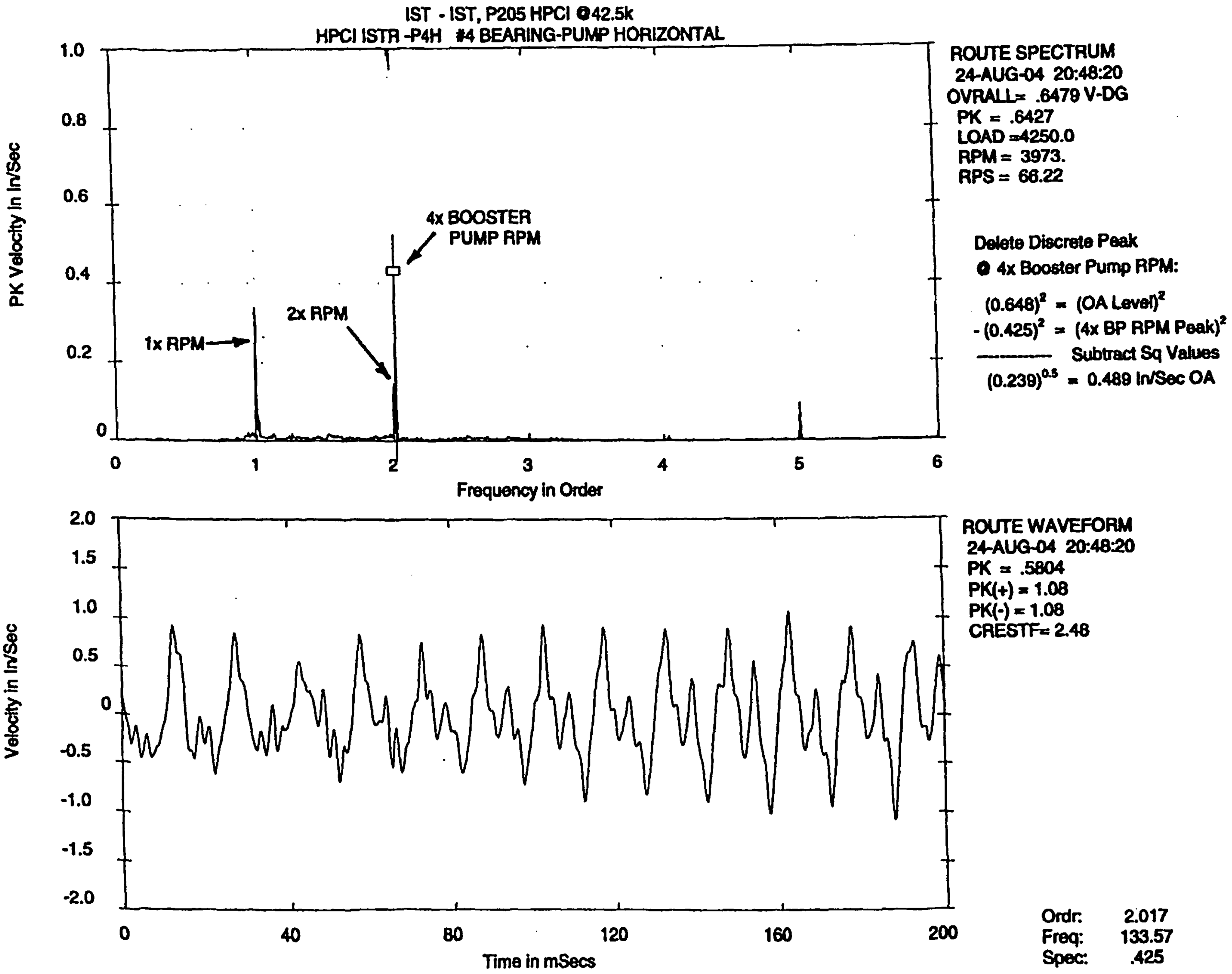
WAVEFORM DISPLAY
20-NOV-95 01:58:31
PK = .7635
PK(+) = 1.23
PK(-) = 1.18
CRESTF= 2.16

Ordr: 2.016
Freq: 134.34
Spec: .518

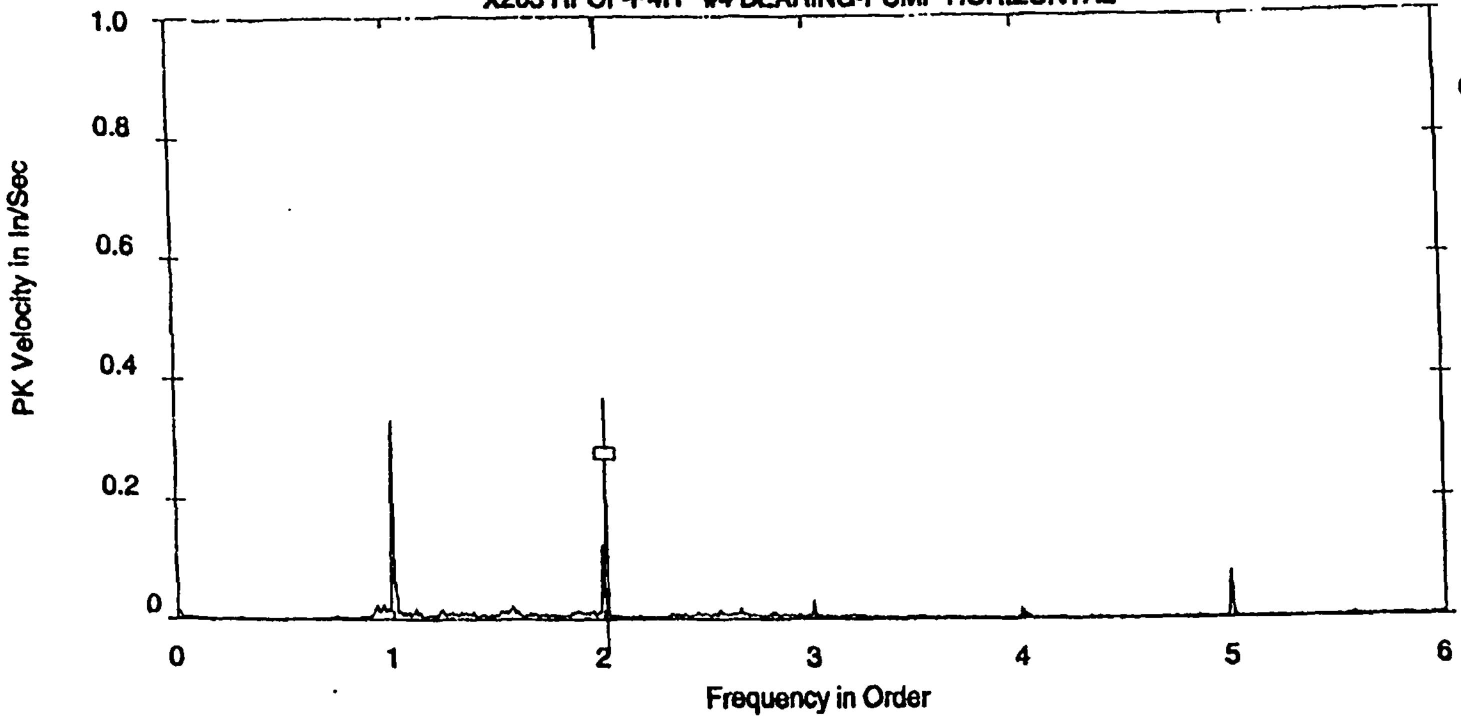

RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P3H #3 BEARING-PUMP HORIZONTAL
ROUTE SPECTRUM
25-MAY-94 09:27:30
OVRALL= .8515 V-DG
PK = .8488
LOAD =4250.0
RPM = 4060.
RPS = 67.66
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
4x BOOSTER PUMP RPM
2x RPM
1x RPM
0
1
2
3
4
5
6
Frequency in Order
Delete Discrete Peak
@ 4x Booster Pump RPM:
(0.852)² = (OA Level)²
- (0.710)² = (4x BP RPM Peak)²
Subtract Sq Values
(0.222)^0.5 = 0.471 In/Sec OA
WAVEFORM DISPLAY
25-MAY-94 09:27:30
PK = .8944
PK(+) = 1.16
PK(-) = 1.43
CRESTF= 2.43
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 2.015
Freq: 136.32
Spec: .710



IST - IST, P205 HPCI @42.5k
HPCI ISTR -P4H #4 BEARING-PUMP HORIZONTAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
24-NOV-04 00:54:26
OVRALL= .6774 V-DG
PK = .6719
LOAD =4250.0
RPM = 4017.
RPS = 66.95
Delete Discrete Peak
@ 4x Booster Pump RPM:
(0.677)² = (OA Level)²
- (0.319)² = (4x BP RPM Peak)²
Subtract Sq Values
(0.357)^0.5 = 0.597 In/Sec OA
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
ROUTE WAVEFORM
24-NOV-04 00:54:26
PK = .6896
PK(+) = 1.09
PK(-) = 1.13
CRESTF= 2.35
Ordr: 2.017
Freq: 135.05
Spec: .319


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P4H #4 BEARING-PUMP HORIZONTAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
4x BOOSTER PUMP RPM
2x RPM
1x RPM
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
24-AUG-04 20:48:20
OVRALL= .6479 V-DG
PK = .6427
LOAD =4250.0
RPM = 3973.
RPS = 66.22
Delete Discrete Peak
@ 4x Booster Pump RPM:
(0.648)² = (OA Level)²
- (0.425)² = (4x BP RPM Peak)²
Subtract Sq Values
(0.239)^0.5 = 0.489 In/Sec OA
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
ROUTE WAVEFORM
24-AUG-04 20:48:20
PK = .5804
PK(+) = 1.08
PK(-) = 1.08
CRESTF= 2.48
Ordr: 2.017
Freq: 133.57
Spec: .425

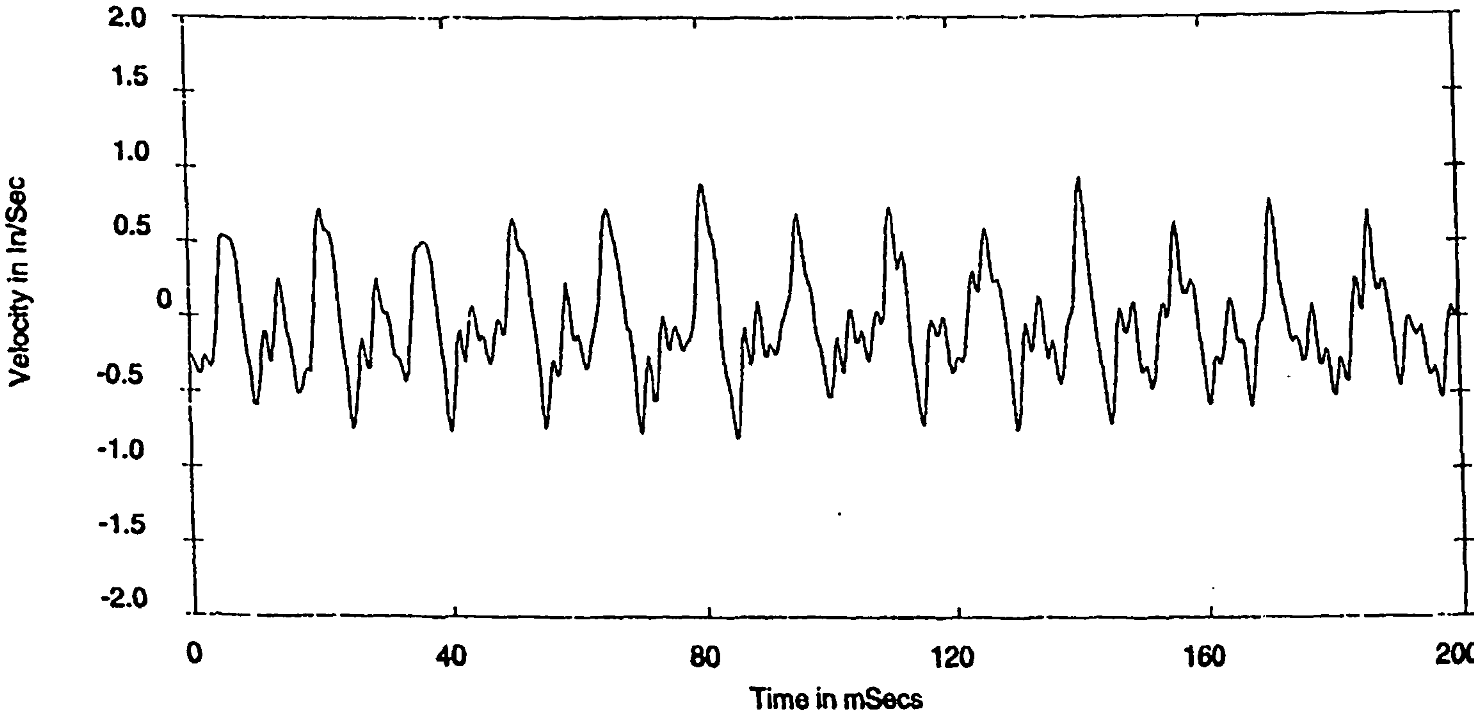
RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P4H #4 BEARING-PUMP HORIZONTAL



ROUTE SPECTRUM
17-DEC-97 16:53:18
OVRALL= 1.11 V-AP
PK = .5153
LOAD =4250.0
RPM = 3996.
RPS = 66.61

Delete Discrete Peak
@ 4x Booster Pump RPM:

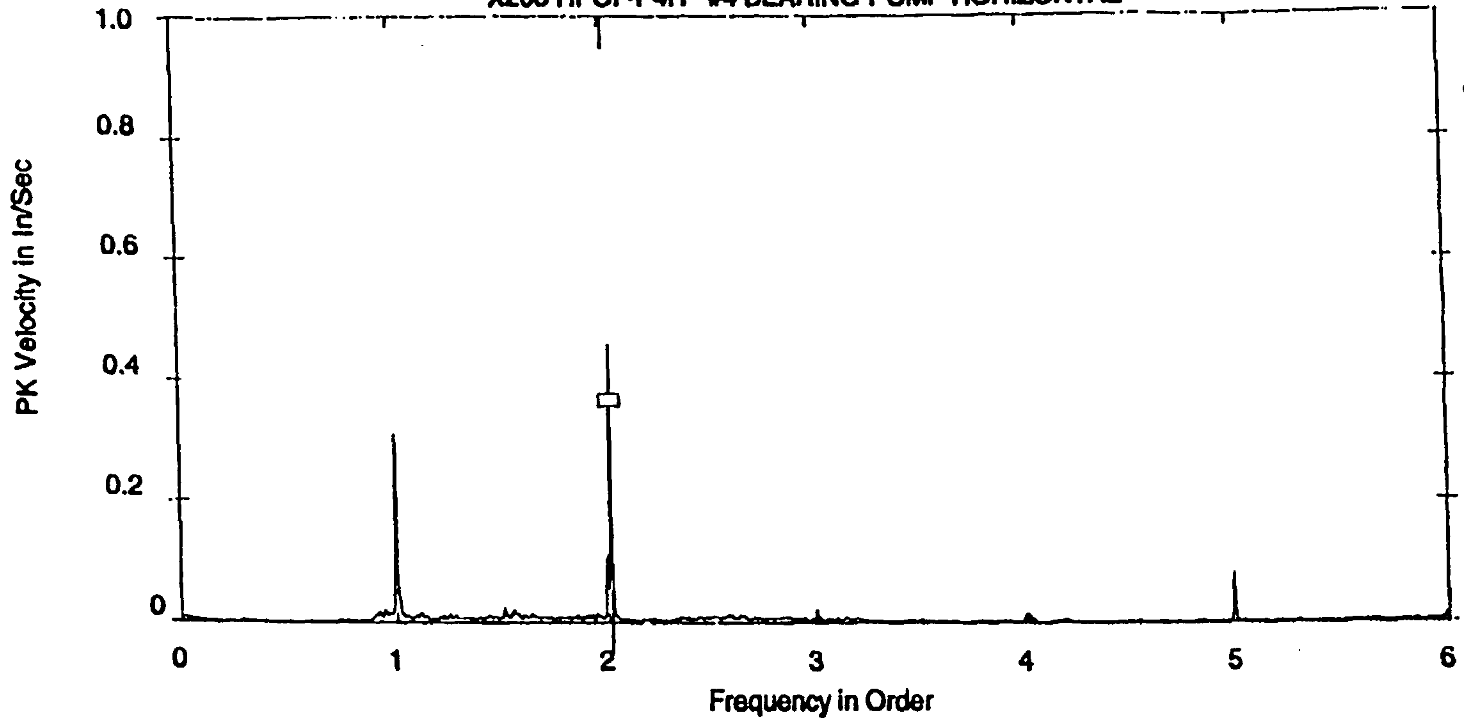
$(0.515)^2$ = $(\text{OA Level})^2$
- $(0.272)^2$ = $(\text{4x BP RPM Peak})^2$
------------ Subtract Sq Values
$(0.191)^{0.5}$ = 0.437 In/Sec OA



WAVEFORM DISPLAY
17-DEC-97 16:53:18
PK = .4948
PK(+) = .9773
PK(-) = .7628
CRESTF= 3.15

Ordr: 2.013
Freq: 134.11
Spec: .272

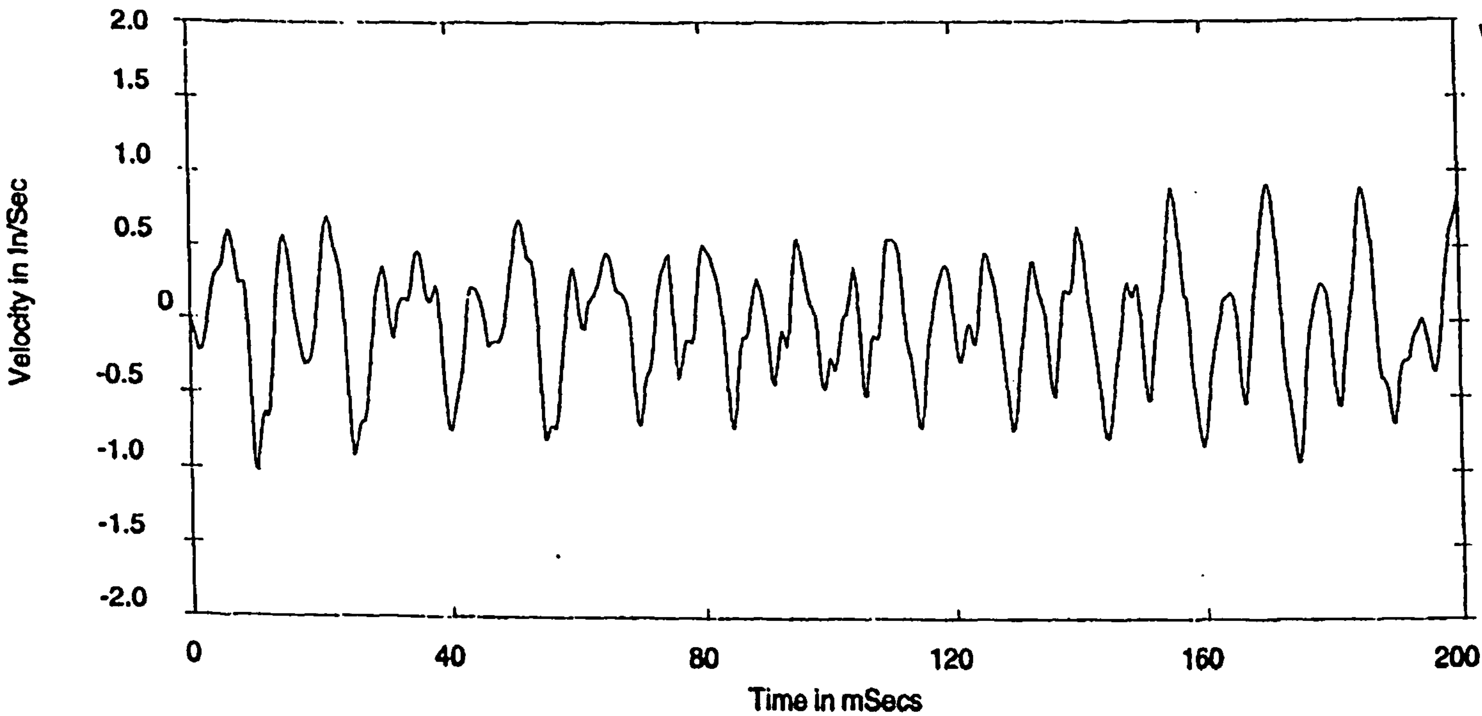
RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P4H #4 BEARING-PUMP HORIZONTAL



ROUTE SPECTRUM
06-MAY-96 09:23:46
OVRALL= .6006 V-DG
PK = .6001
LOAD =4250.0
RPM = 4009.
RPS = 66.82

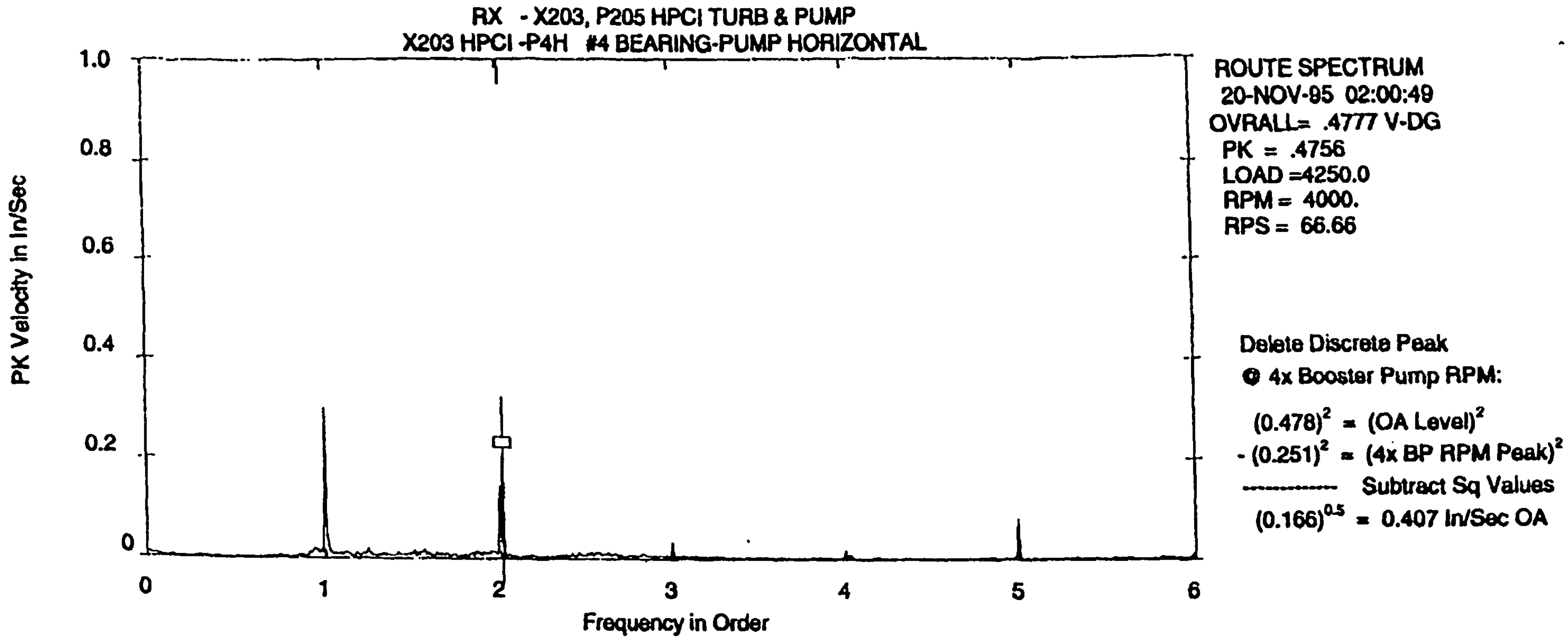
Delete Discrete Peak
@ 4x Booster Pump RPM:

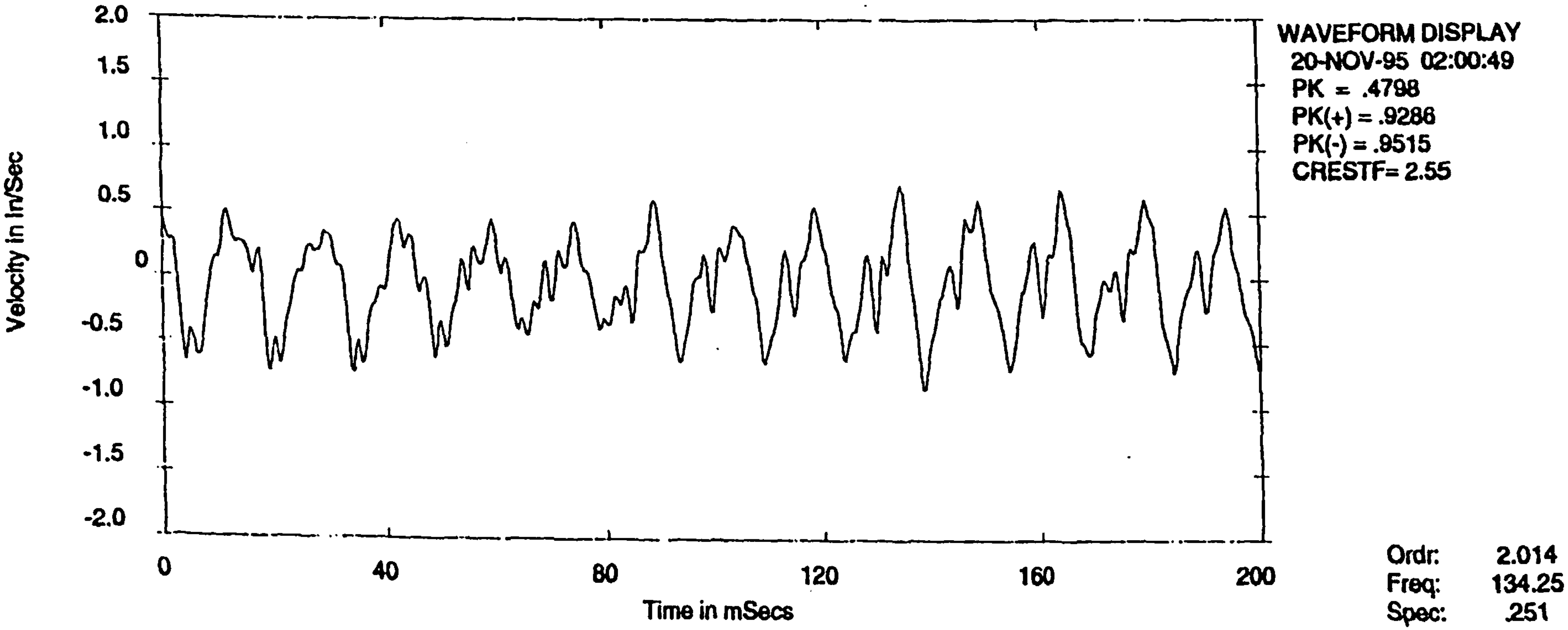
$(0.601)^2$ = $(\text{OA Level})^2$
$-(0.421)^2$ = $(\text{4x BP RPM Peak})^2$
———— Subtract Sq Values
$(0.184)^{0.5}$ = 0.429 In/Sec OA

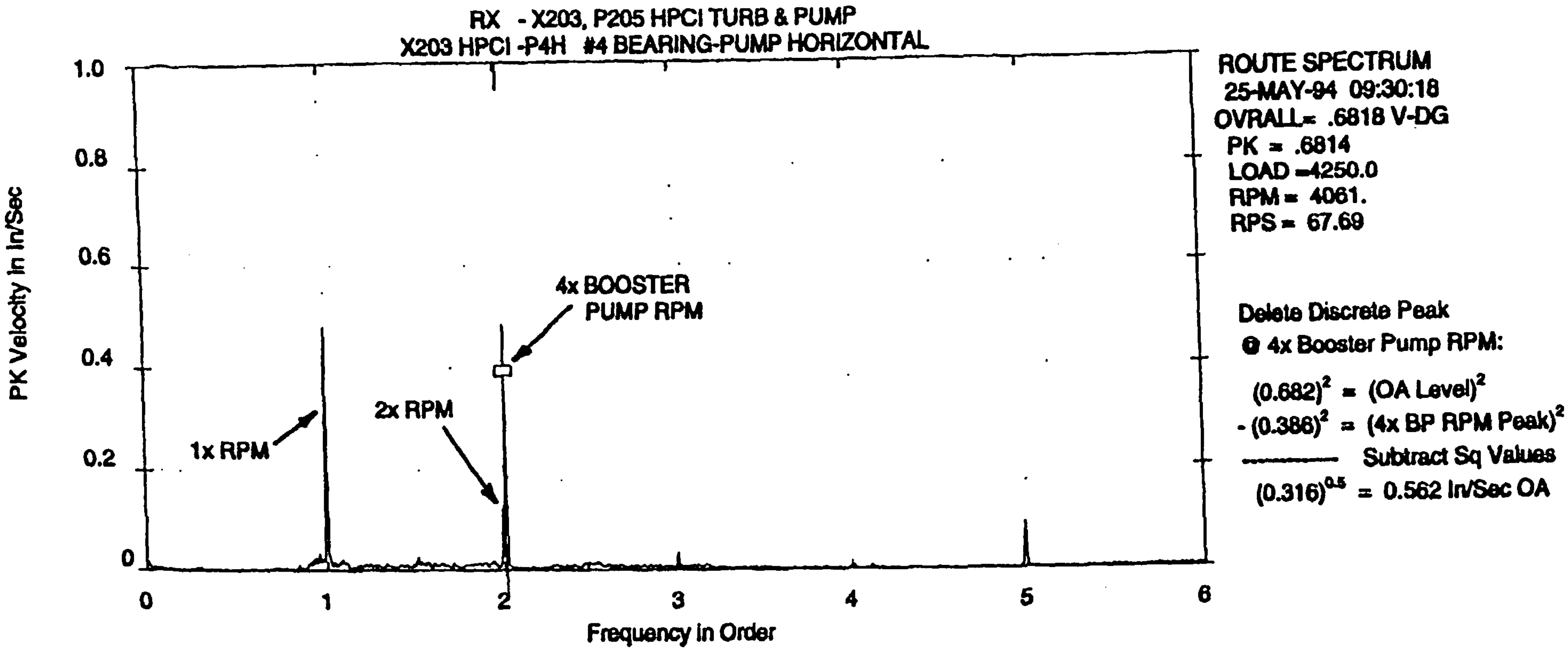


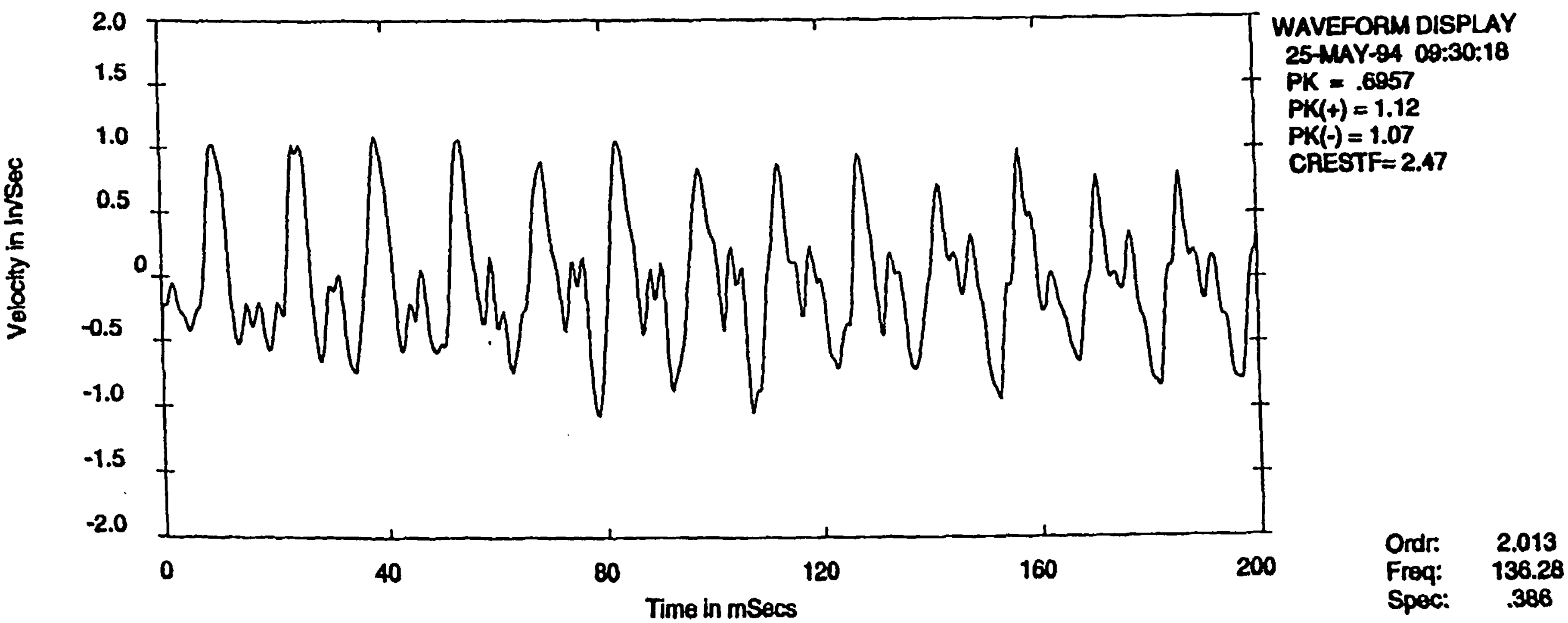
WAVEFORM DISPLAY
06-MAY-96 09:23:46
PK = .5673
PK(+) = 1.10
PK(-) = 1.03
CRESTF= 2.44

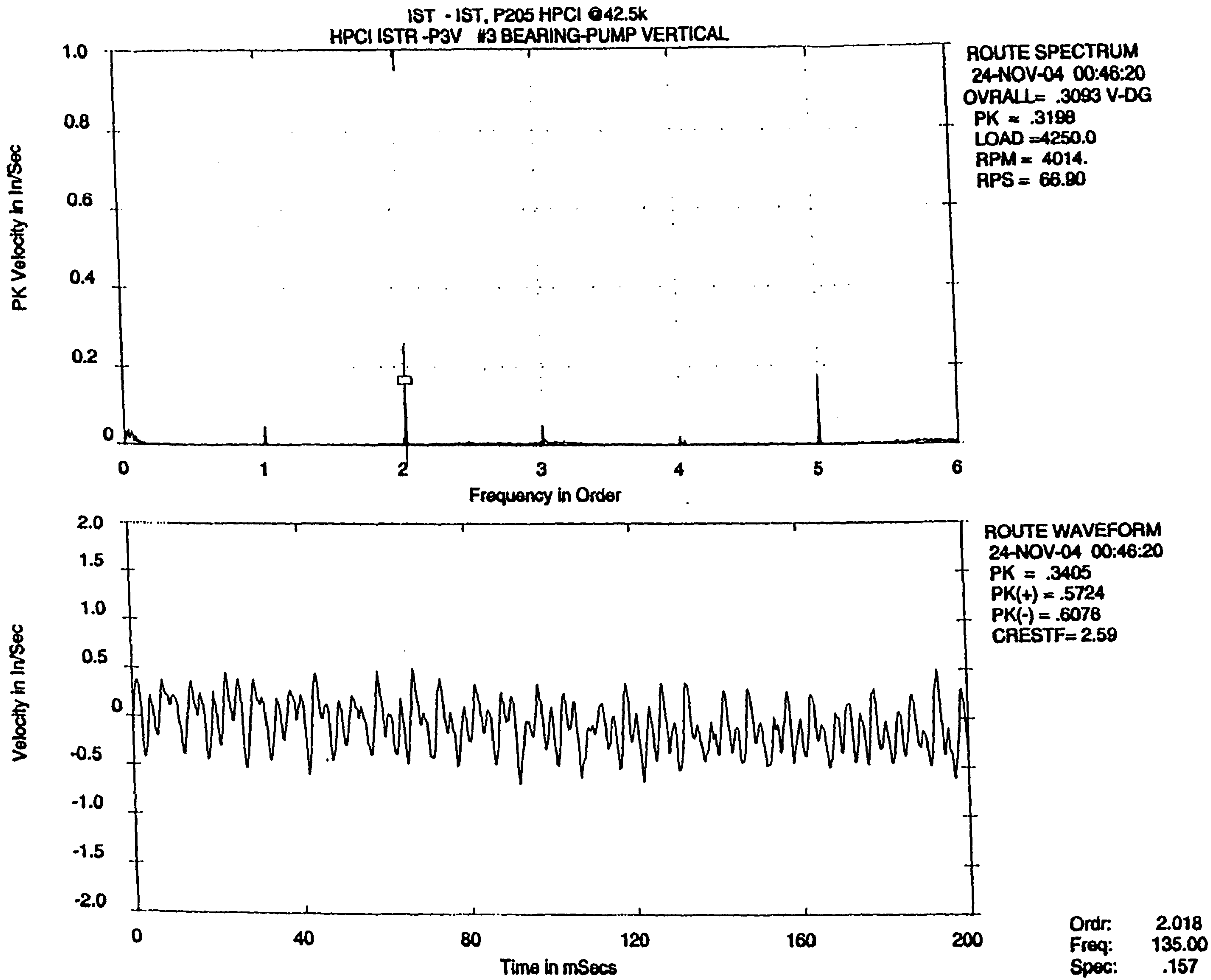
Ordr: 2.013
Freq: 134.53
Spec: .421


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P4H #4 BEARING-PUMP HORIZONTAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
20-NOV-95 02:00:49
OVRALL= .4777 V-DG
PK = .4756
LOAD =4250.0
RPM = 4000.
RPS = 66.66
Delete Discrete Peak
@ 4x Booster Pump RPM:
(0.478)² = (OA Level)²
- (0.251)² = (4x BP RPM Peak)²
Subtract Sq Values
(0.166)^0.5 = 0.407 In/Sec OA

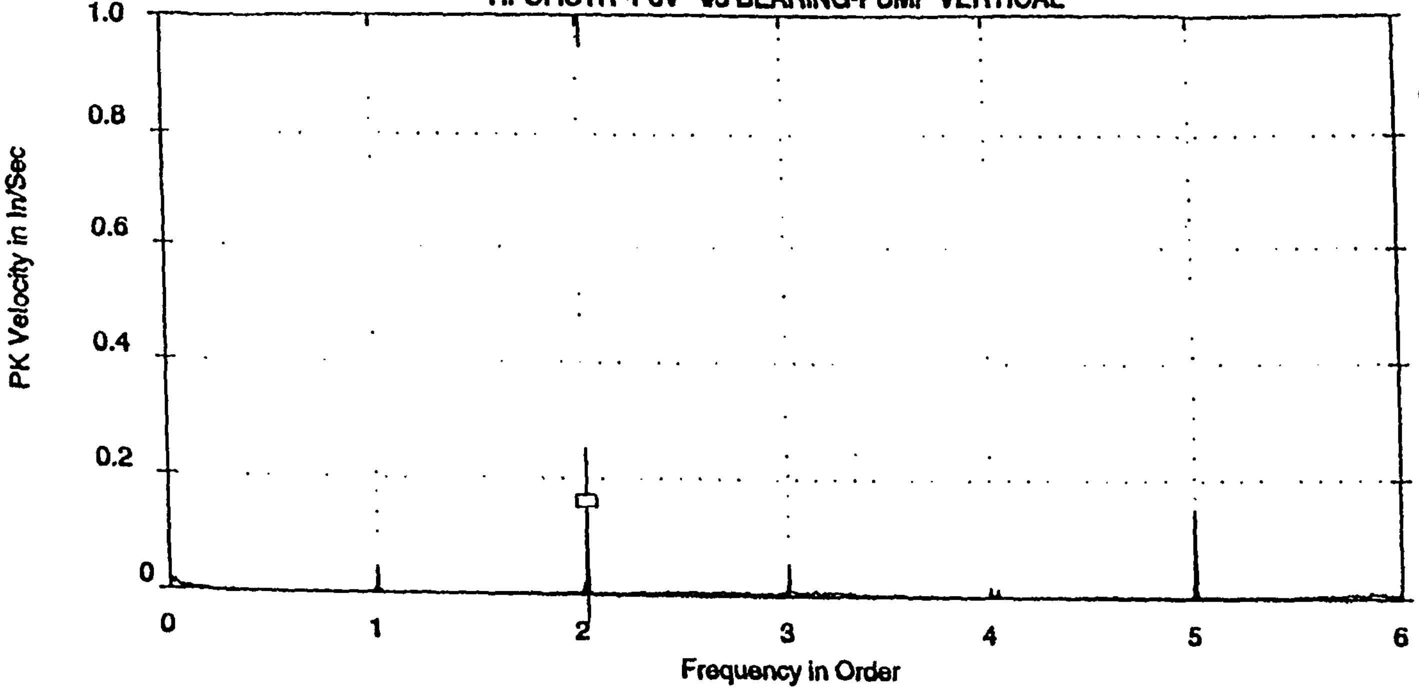

Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
WAVEFORM DISPLAY
20-NOV-95 02:00:49
PK = .4798
PK(+) = .9286
PK(-) = .9515
CRESTF= 2.55
Ordr: 2.014
Freq: 134.25
Spec: .251


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P4H #4 BEARING-PUMP HORIZONTAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
4x BOOSTER PUMP RPM
2x RPM
1x RPM
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
25-MAY-94 09:30:18
OVRALL= .6818 V-DG
PK = .6814
LOAD =4250.0
RPM = 4061.
RPS = 67.69
Delete Discrete Peak
@ 4x Booster Pump RPM:
(0.682)² = (OA Level)²
- (0.386)² = (4x BP RPM Peak)²
Subtract Sq Values
(0.316)^0.5 = 0.562 In/Sec OA

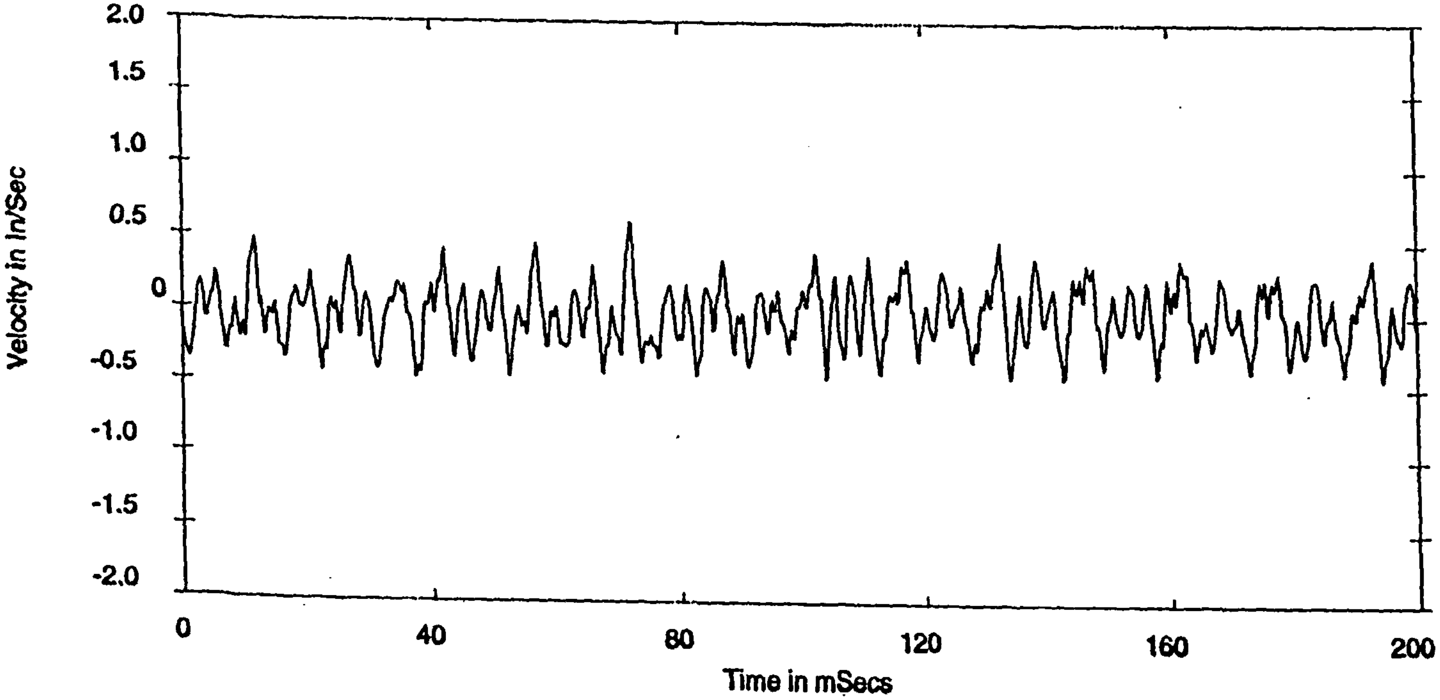

Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
WAVEFORM DISPLAY
25-MAY-94 09:30:18
PK = .6957
PK(+) = 1.12
PK(-) = 1.07
CRESTF= 2.47
Ordr: 2.013
Freq: 136.28
Spec: .386


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P3V #3 BEARING-PUMP VERTICAL
ROUTE SPECTRUM
24-NOV-04 00:46:20
OVRALL= .3093 V-DG
PK = .3198
LOAD =4250.0
RPM = 4014.
RPS = 66.90
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE WAVEFORM
24-NOV-04 00:46:20
PK = .3405
PK(+) = .5724
PK(-) = .6078
CRESTF= 2.59
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 2.018
Freq: 135.00
Spec: .157

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P3V #3 BEARING-PUMP VERTICAL



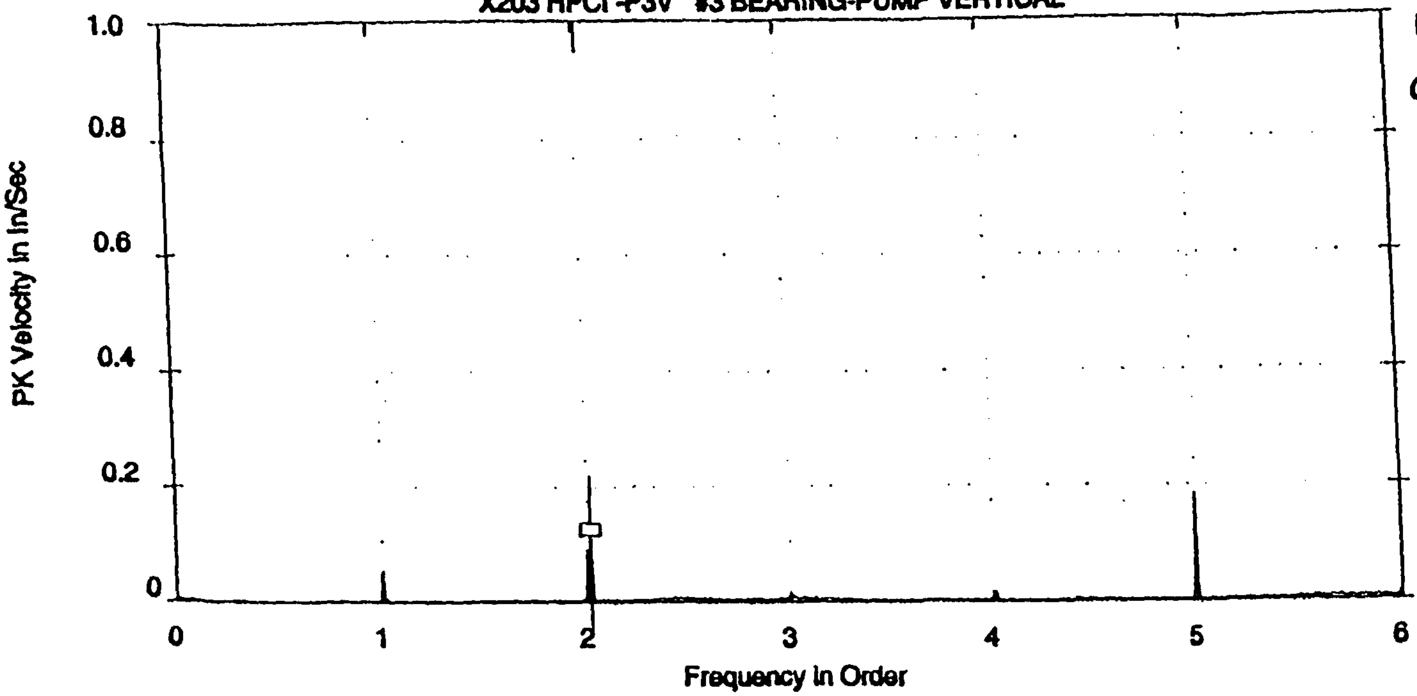
ROUTE SPECTRUM
24-AUG-04 20:47:06
OVRALL= .2864 V-DG
PK = .2821
LOAD =4250.0
RPM = 3971.
RPS = 66.18



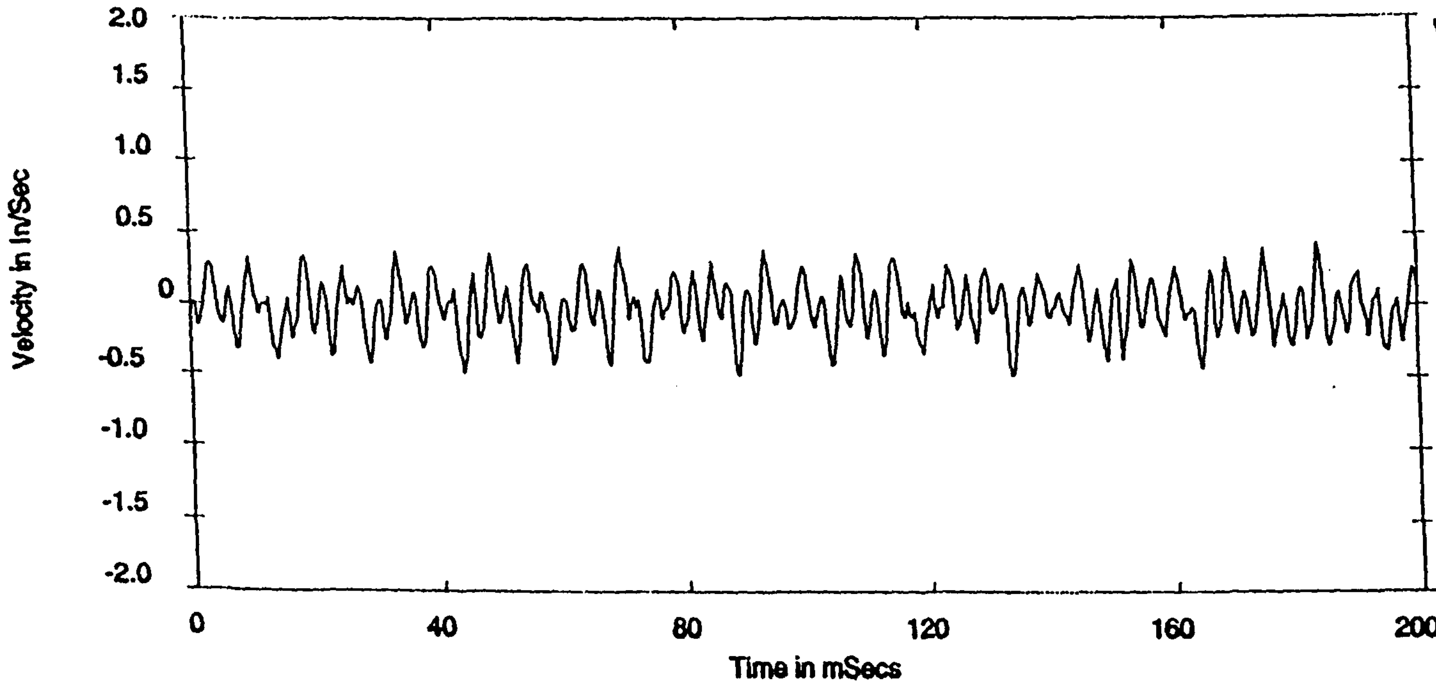
ROUTE WAVEFORM
24-AUG-04 20:47:06
PK = .2857
PK(+) = .6158
PK(-) = .5457
CRESTF= 3.05

Ordr: 2.019
Freq: 133.59
Spec: .151

RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P3V #3 BEARING-PUMP VERTICAL



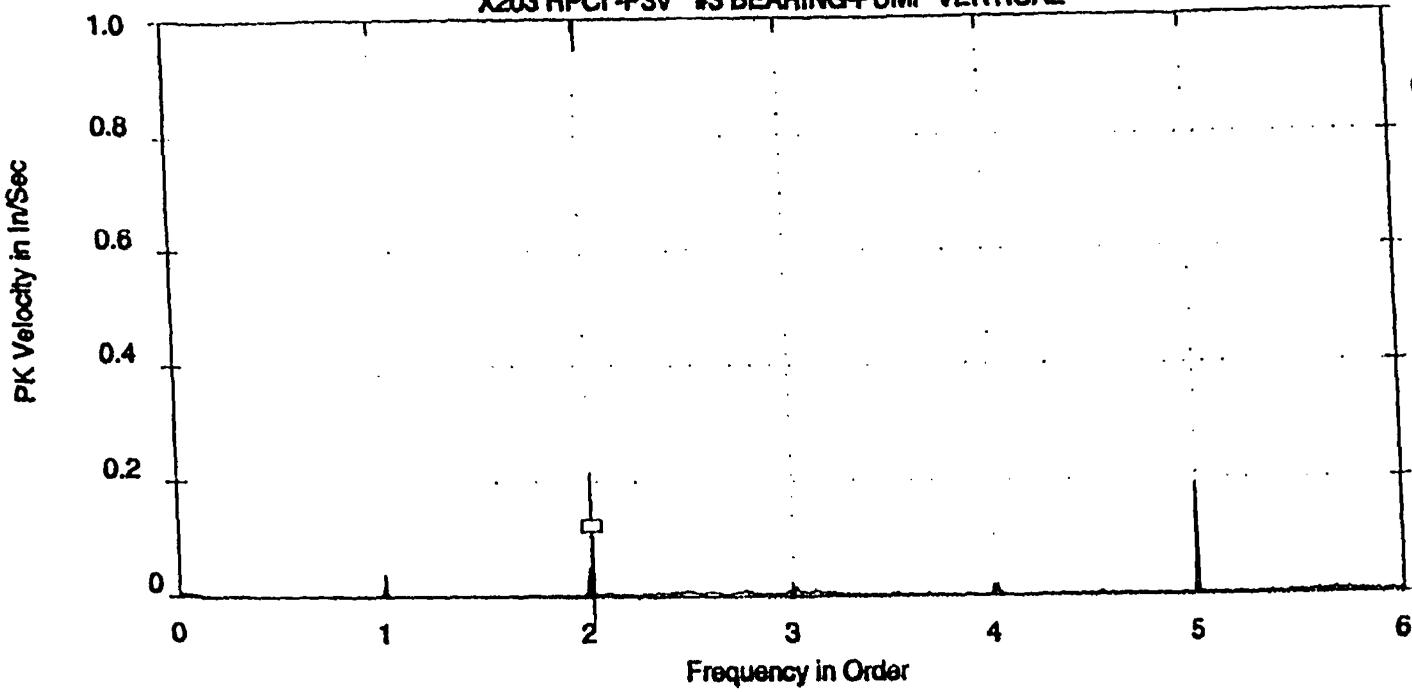
ROUTE SPECTRUM
17-DEC-97 16:51:14
OVRALL= .6209 V-AP
PK = .2802
LOAD =4250.0
RPM = 3990.
RPS = 66.50



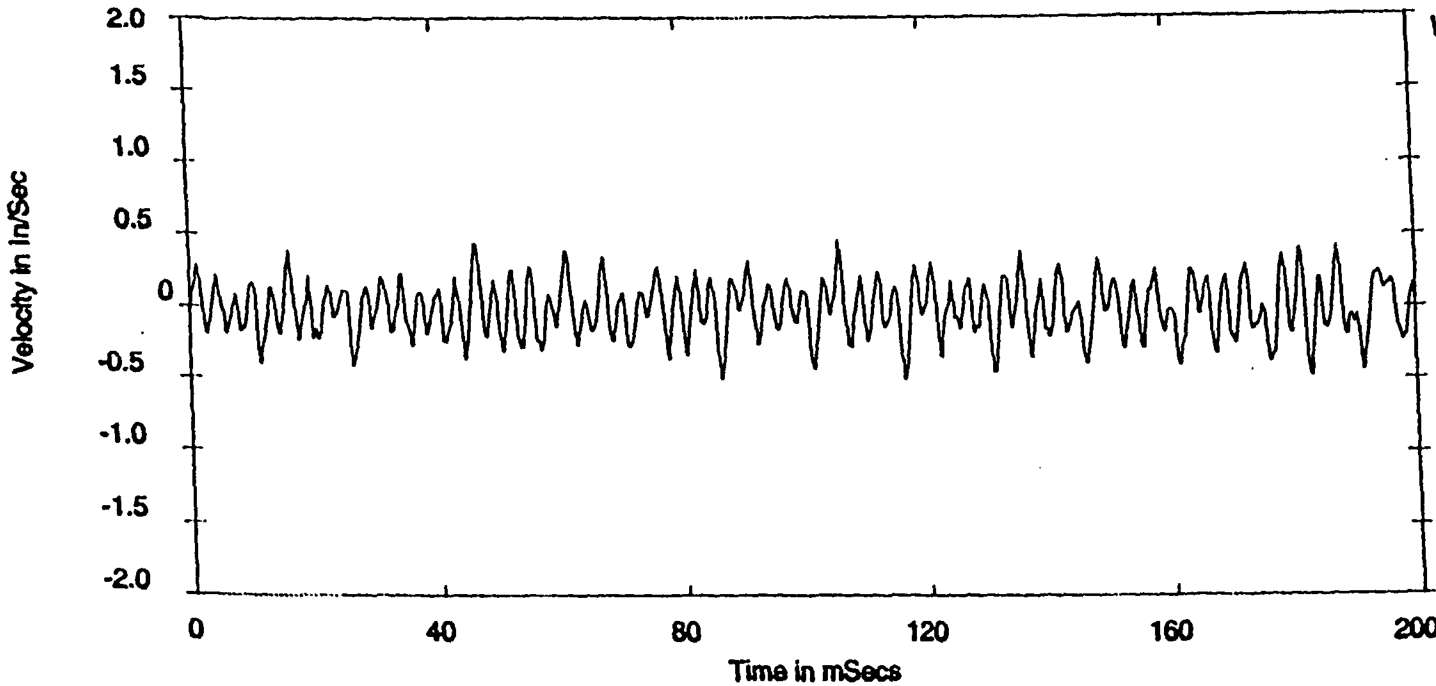
WAVEFORM DISPLAY
17-DEC-97 16:51:14
PK = .2687
PK(+) = .4631
PK(-) = .4749
CRESTF= 2.58

Ordr: 2.015
Freq: 134.01
Spec: .118

RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P3V #3 BEARING-PUMP VERTICAL

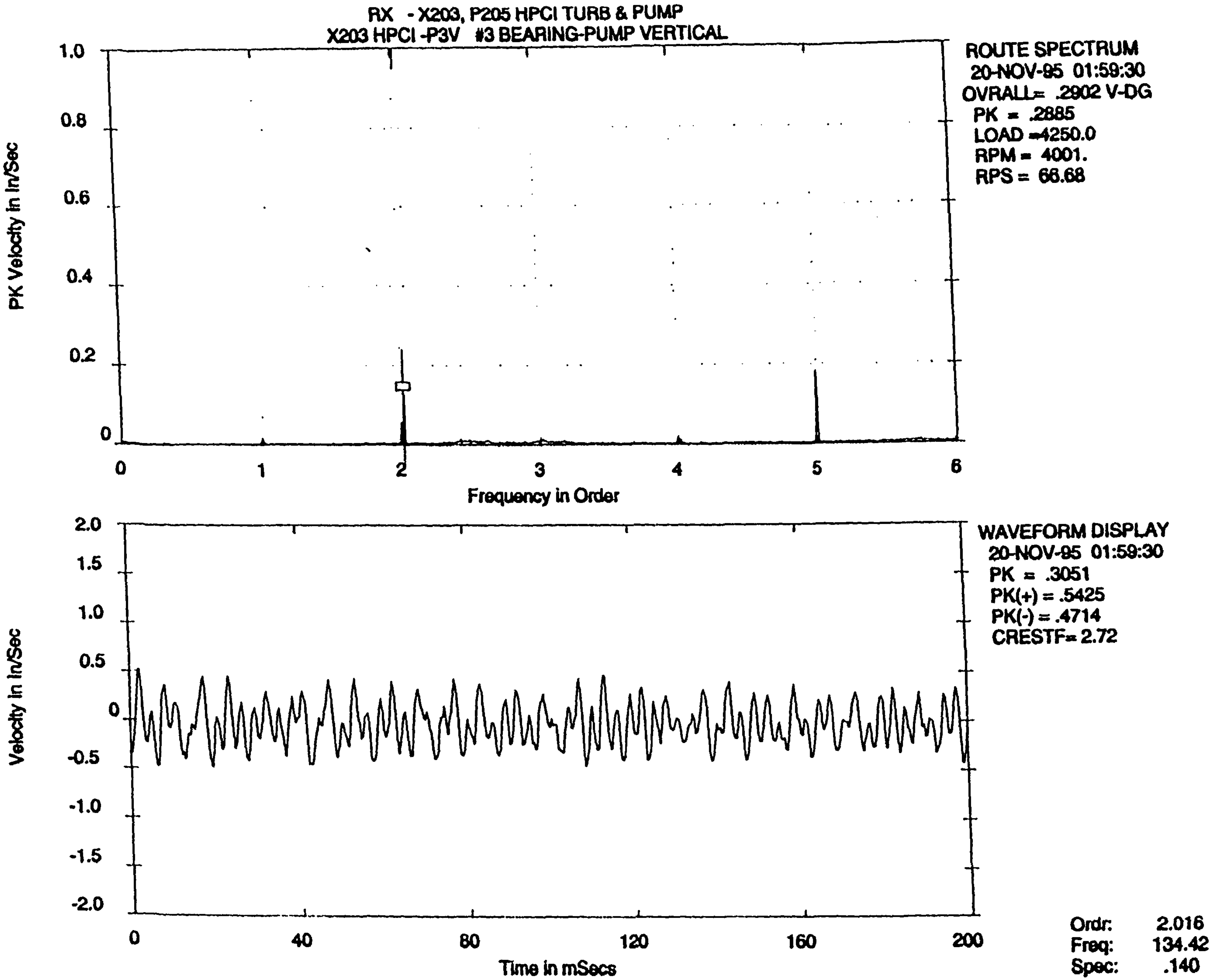


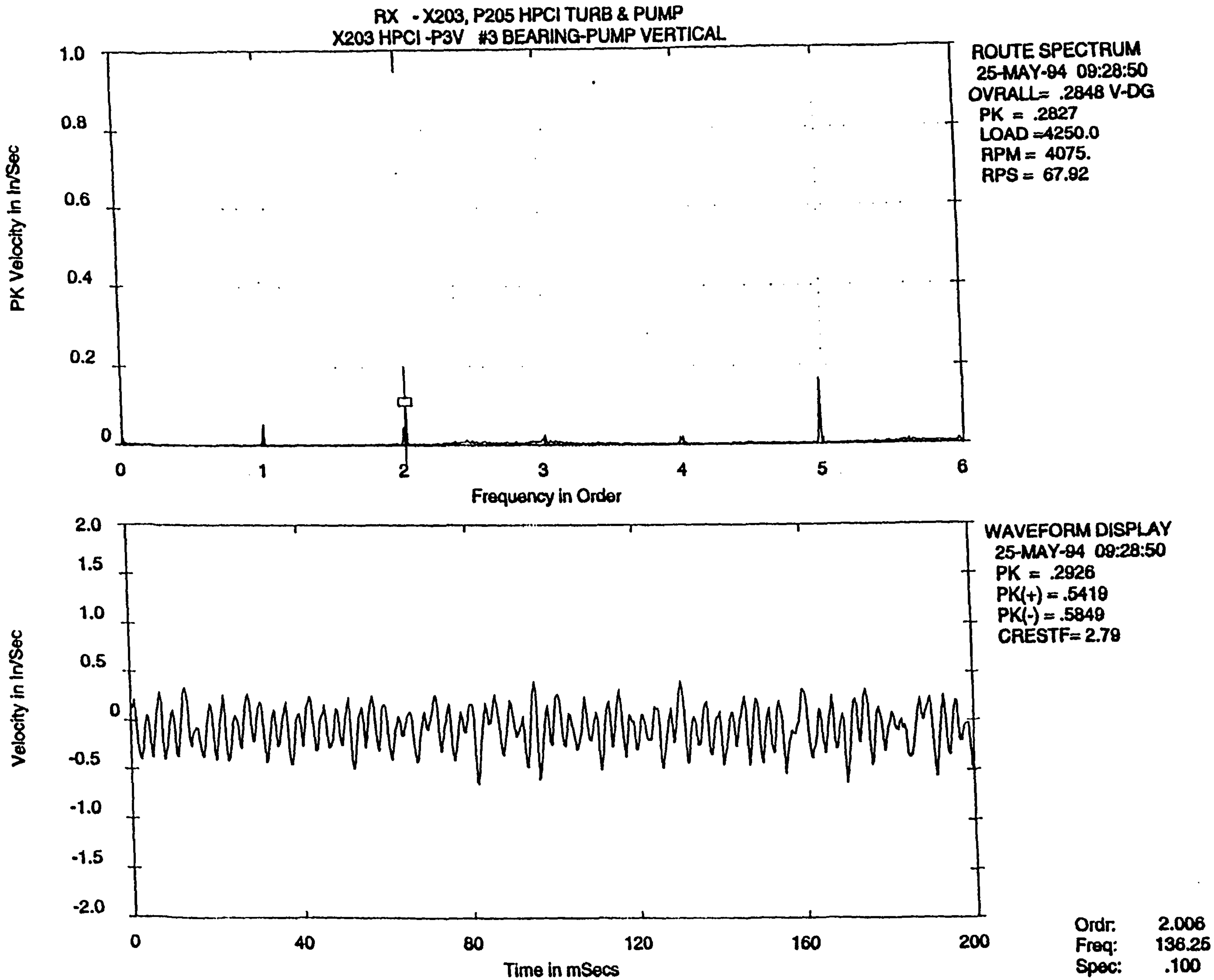
ROUTE SPECTRUM
06-MAY-96 09:22:06
OVRALL= .2835 V-DG
PK = .2818
LOAD =4250.0
RPM = 4003.
RPS = 66.72



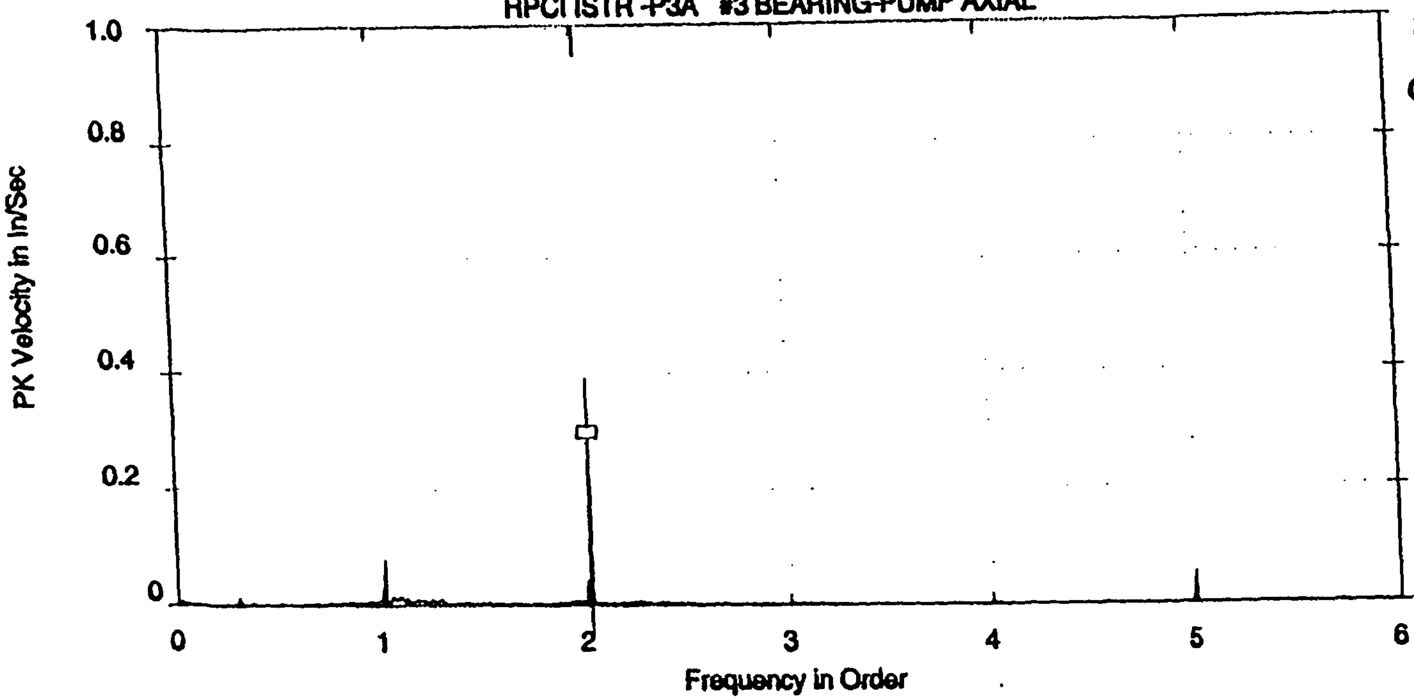
WAVEFORM DISPLAY
06-MAY-96 09:22:06
PK = .2677
PK(+) = .5314
PK(-) = .4947
CRESTF= 2.63

Ordr: 2.016
Freq: 134.49
Spec: .125

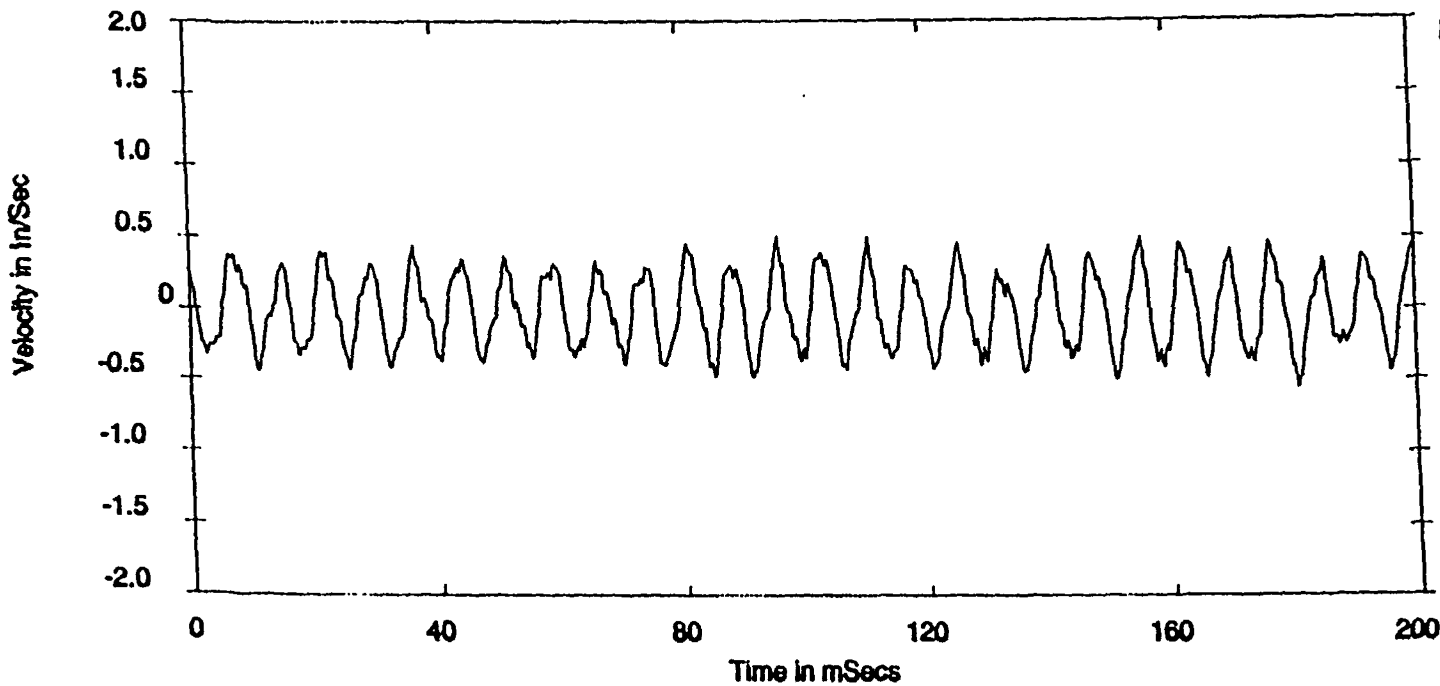

RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P3V #3 BEARING-PUMP VERTICAL
ROUTE SPECTRUM
20-NOV-95 01:59:30
OVRALL= .2902 V-DG
PK = .2885
LOAD =4250.0
RPM = 4001.
RPS = 66.68
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
20-NOV-95 01:59:30
PK = .3051
PK(+) = .5425
PK(-) = .4714
CRESTF= 2.72
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 2.016
Freq: 134.42
Spec: .140


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P3V #3 BEARING-PUMP VERTICAL
ROUTE SPECTRUM
25-MAY-94 09:28:50
OVRALL= .2848 V-DG
PK = .2827
LOAD =4250.0
RPM = 4075.
RPS = 67.92
PK Velocity in In/Sec
Frequency in Order
WAVEFORM DISPLAY
25-MAY-94 09:28:50
PK = .2926
PK(+) = .5419
PK(-) = .5849
CRESTF= 2.79
Velocity in In/Sec
Time in mSecs
Ordr: 2.006
Freq: 136.25
Spec: .100

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P3A #3 BEARING-PUMP AXIAL



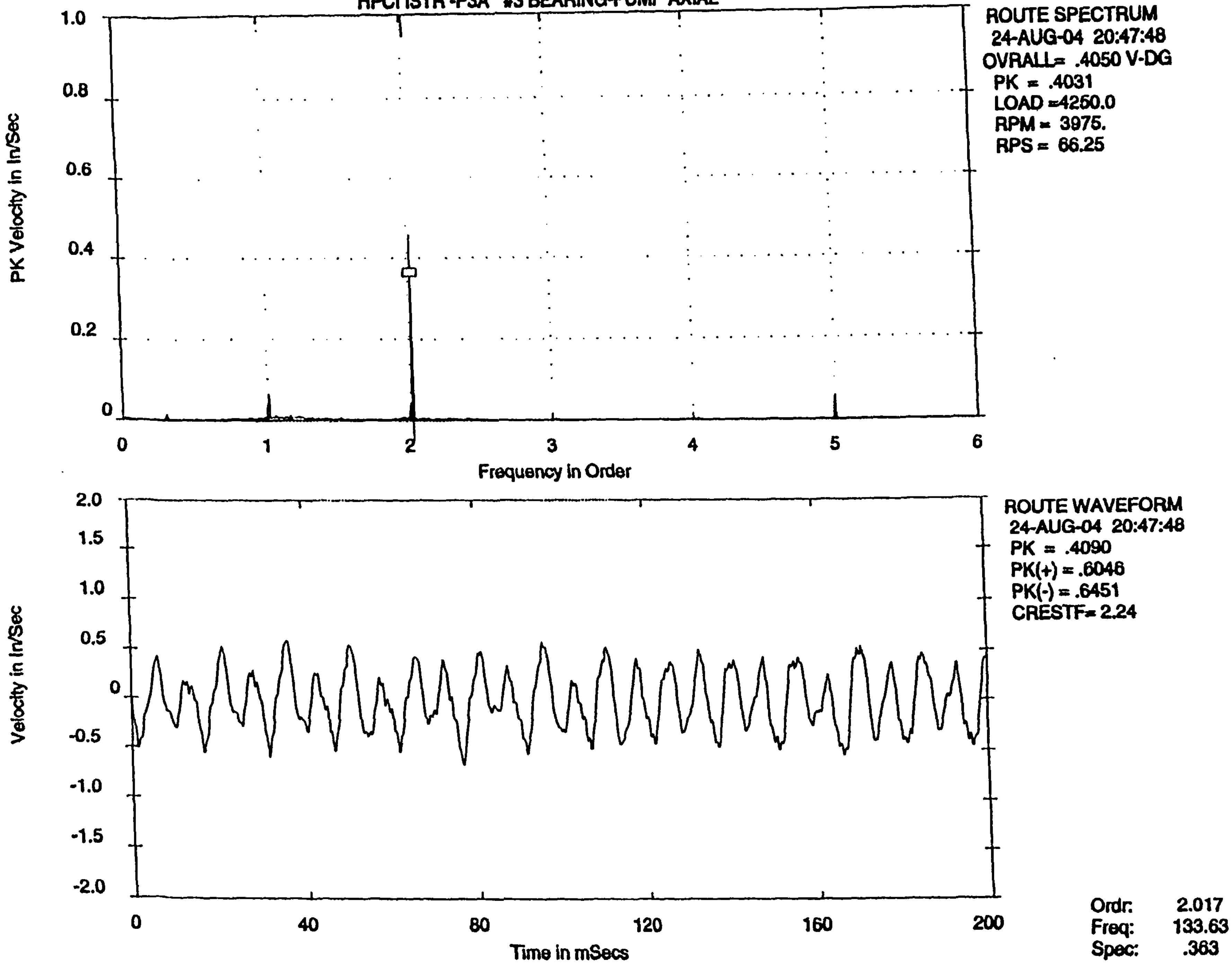
ROUTE SPECTRUM
24-NOV-04 00:51:19
OVRALL= .3549 V-DG
PK = .3531
LOAD =4250.0
RPM = 4018.
RPS = 66.97

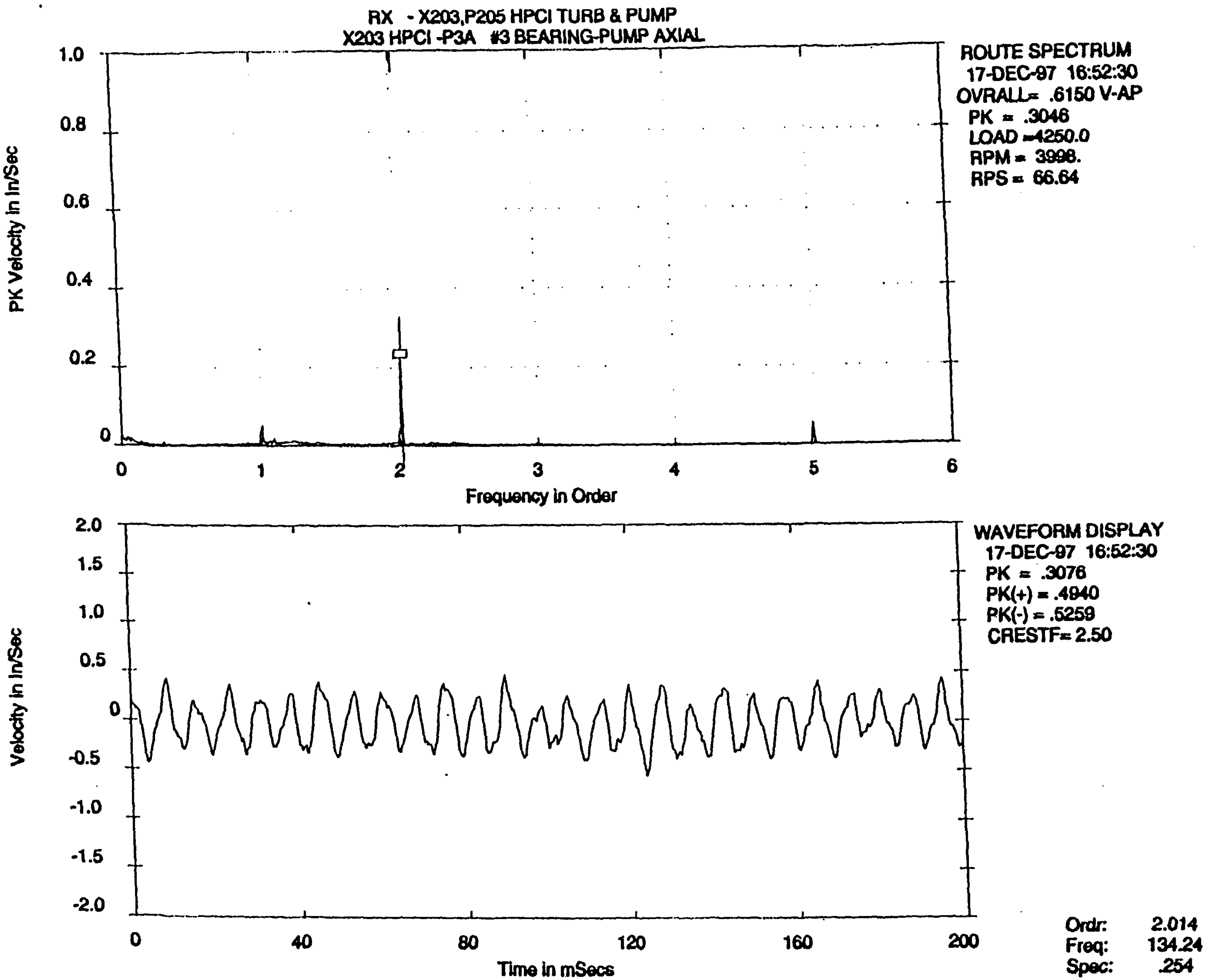


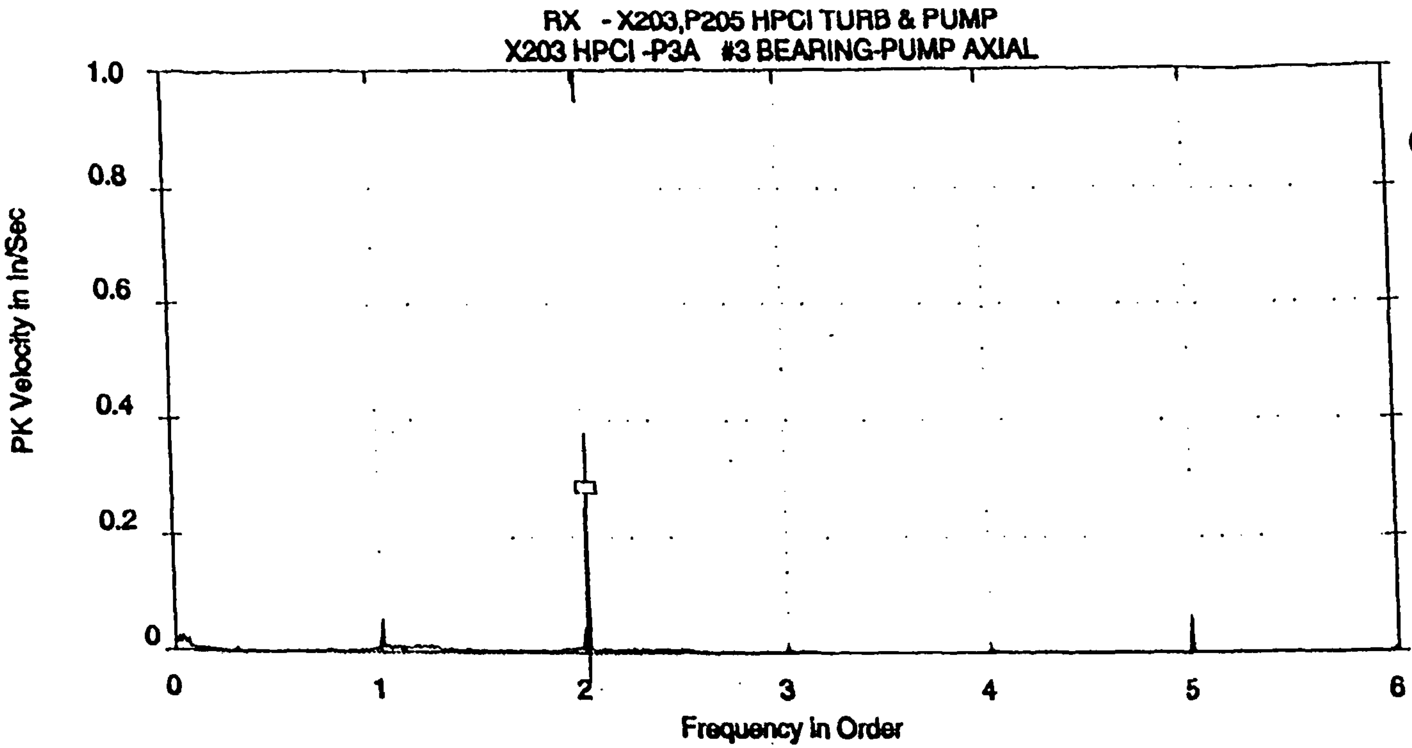
ROUTE WAVEFORM
24-NOV-04 00:51:19
PK = .3707
PK(+) = .5139
PK(-) = .6220
CRESTF= 2.31

Ordr: 2.016
Freq: 135.00
Spec: .289

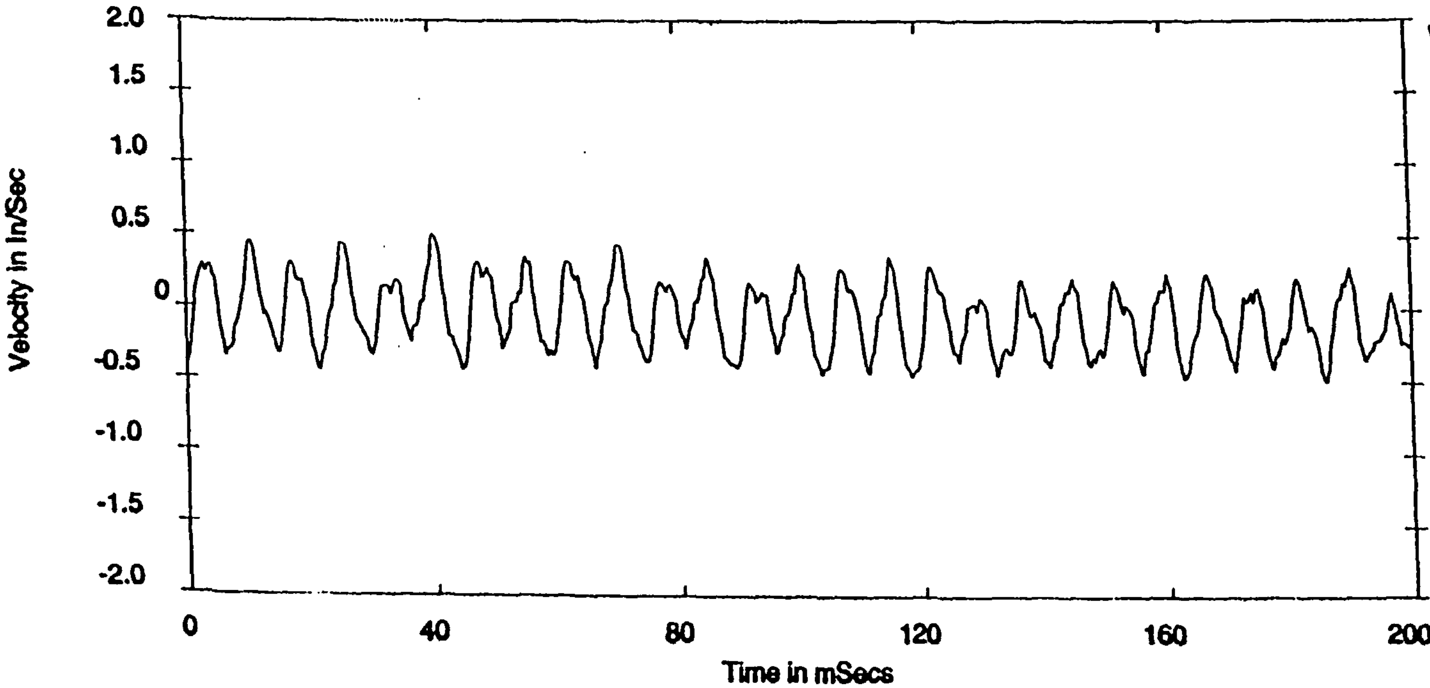
IST - IST, P205 HPCI @42.5k
HPCI ISTR -P3A #3 BEARING-PUMP AXIAL




RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P3A #3 BEARING-PUMP AXIAL
ROUTE SPECTRUM
17-DEC-97 16:52:30
OVRALL= .6150 V-AP
PK = .3046
LOAD =4250.0
RPM = 3998.
RPS = 66.64
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
17-DEC-97 16:52:30
PK = .3076
PK(+) = .4940
PK(-) = .5259
CRESTF= 2.50
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 2.014
Freq: 134.24
Spec: .254



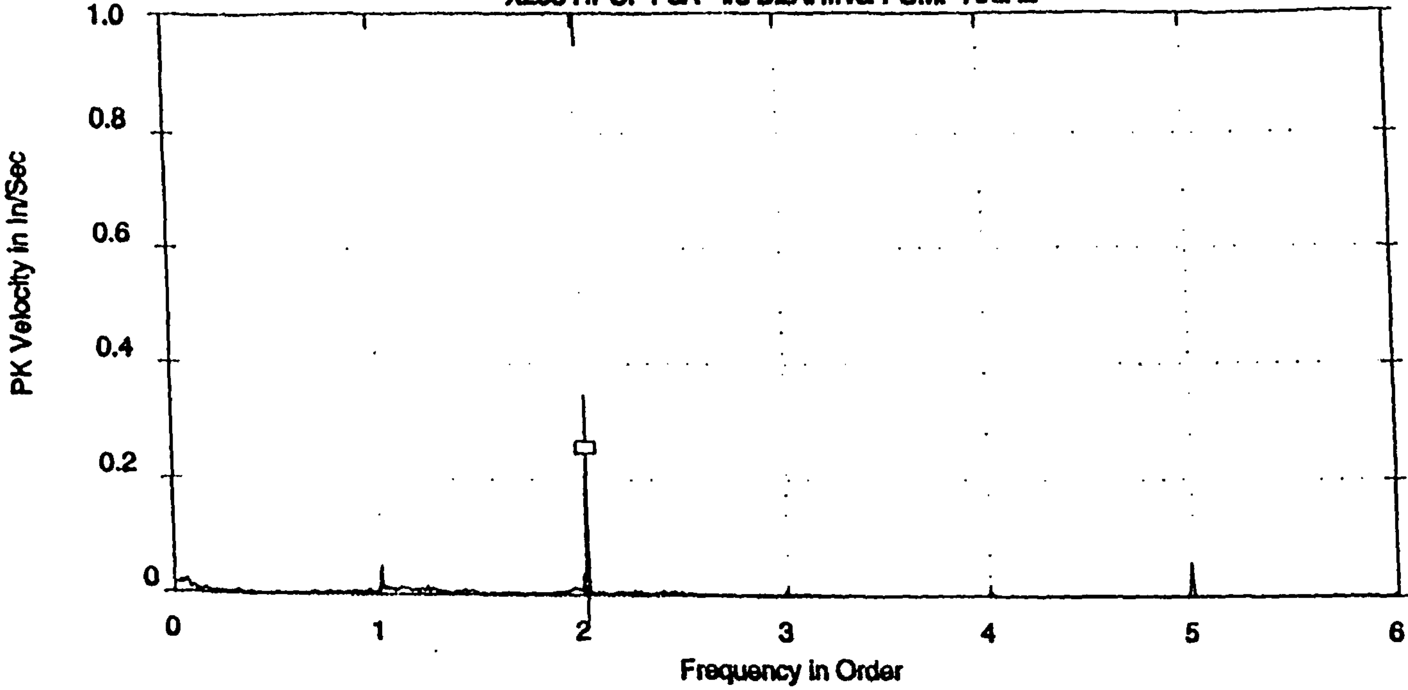
ROUTE SPECTRUM
06-MAY-96 09:23:10
OVRALL= .3468 V-DG
PK = .3533
LOAD =4250.0
RPM = 4008.
RPS = 66.80



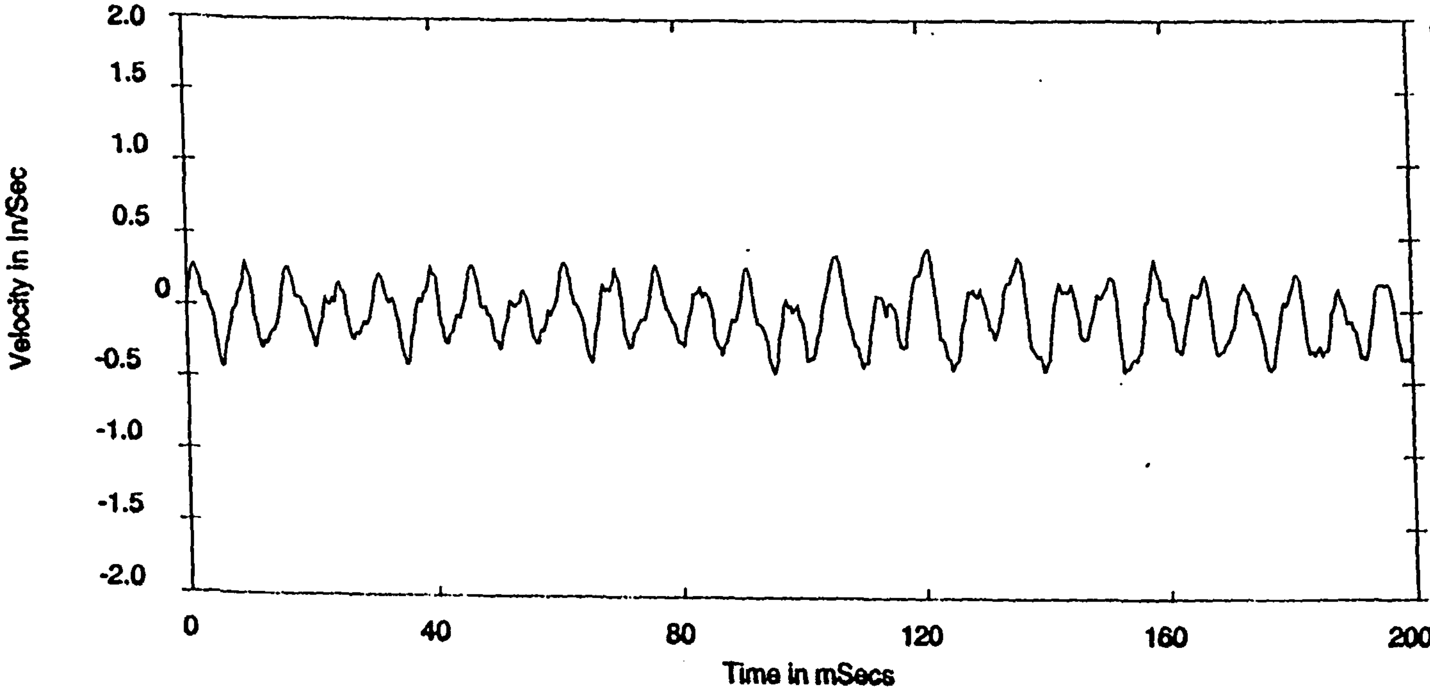
WAVEFORM DISPLAY
06-MAY-96 09:23:10
PK = .3319
PK(+) = .6491
PK(-) = .4948
CRESTF= 2.71

Ordr: 2.014
Freq: 134.56
Spec: .310

RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P3A #3 BEARING-PUMP AXIAL

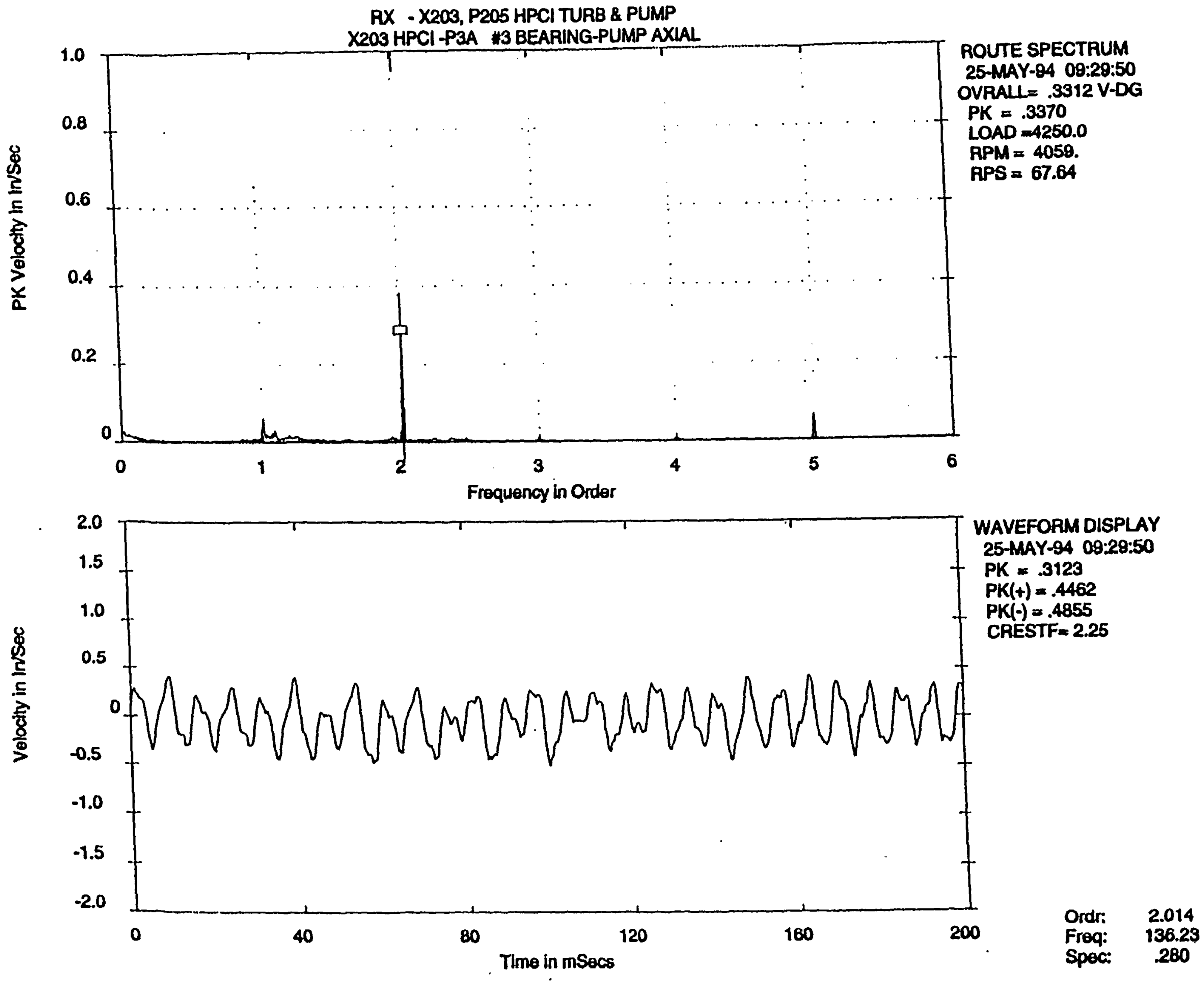


ROUTE SPECTRUM
20-NOV-95 02:00:22
OVRALL= .3028 V-DG
PK = .3110
LOAD =4250.0
RPM = 4002.
RPS = 66.69

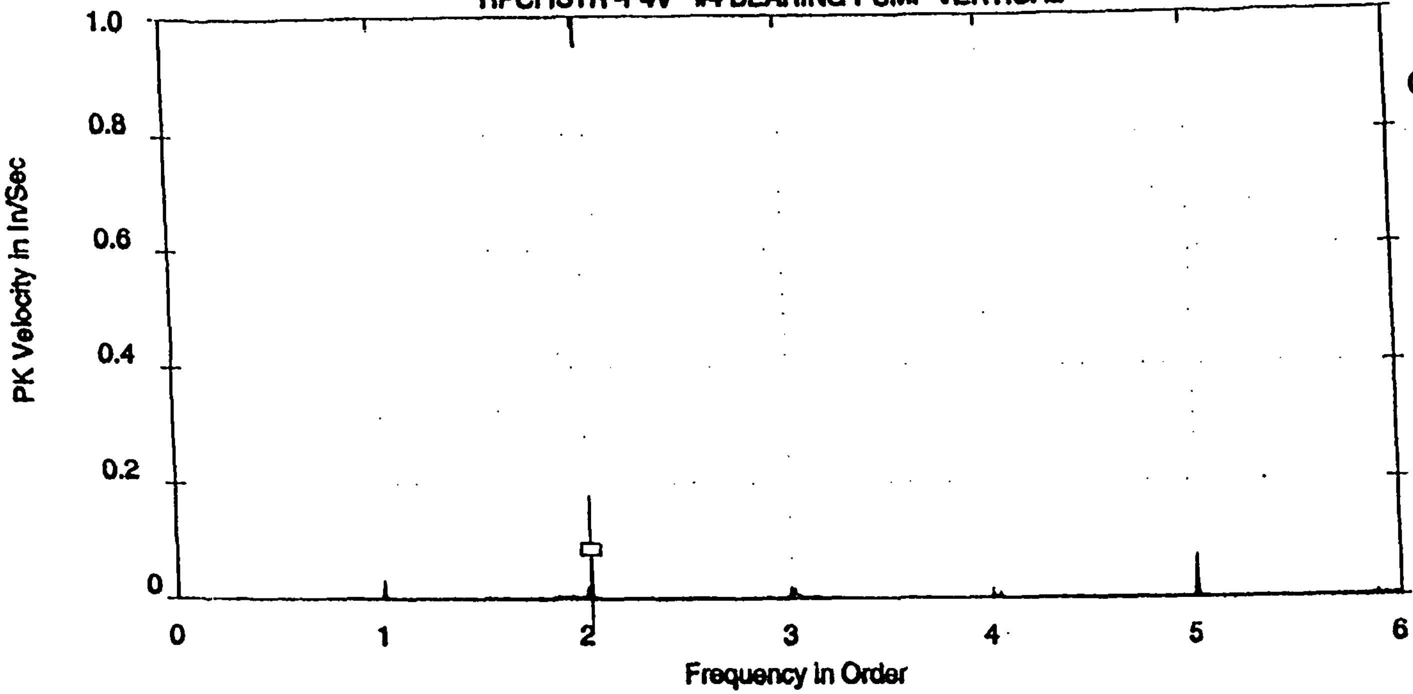


WAVEFORM DISPLAY
20-NOV-95 02:00:22
PK = .2803
PK(+) = .5178
PK(-) = .4524
CRESTF= 2.46

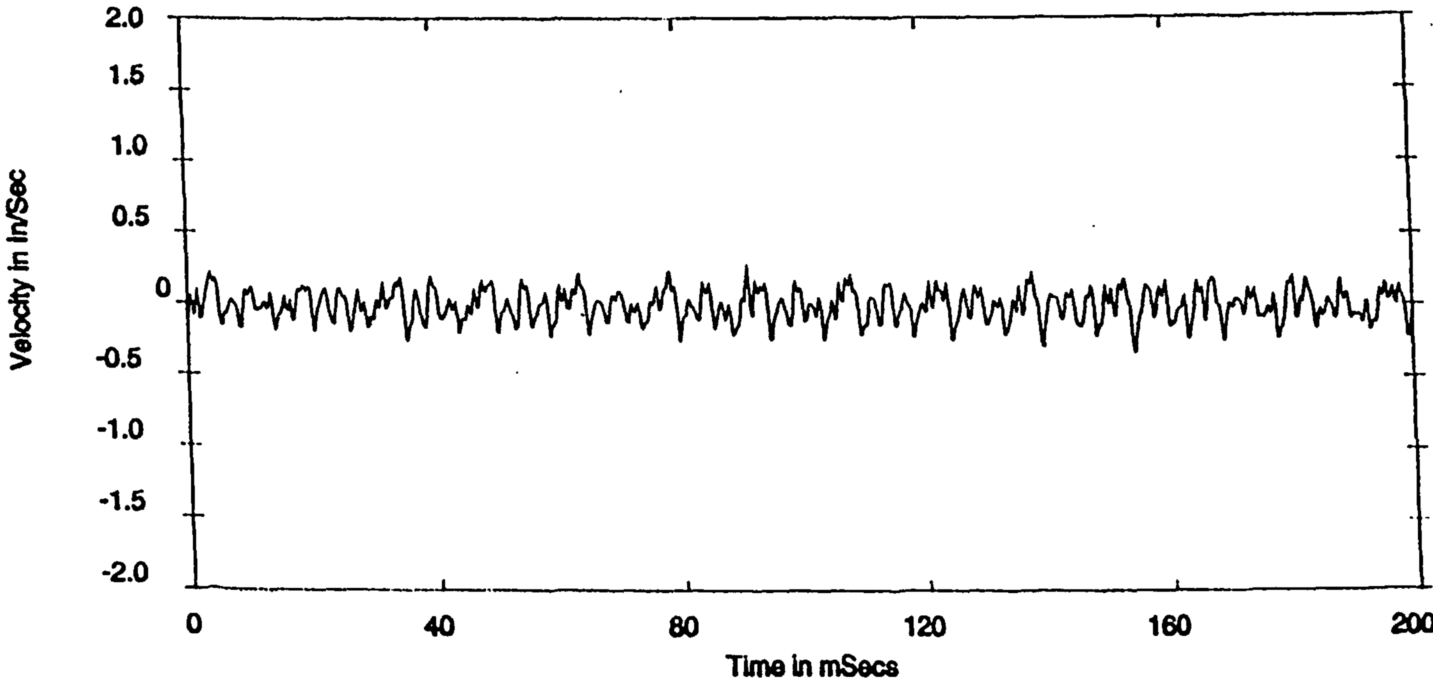
Ordr: 2.014
Freq: 134.29
Spec: .258


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P3A #3 BEARING-PUMP AXIAL
ROUTE SPECTRUM
25-MAY-94 09:29:50
OVRALL= .3312 V-DG
PK = .3370
LOAD =4250.0
RPM = 4059.
RPS = 67.64
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
25-MAY-94 09:29:50
PK = .3123
PK(+) = .4462
PK(-) = .4855
CRESTF= 2.25
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 2.014
Freq: 136.23
Spec: .280

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P4V #4 BEARING-PUMP VERTICAL

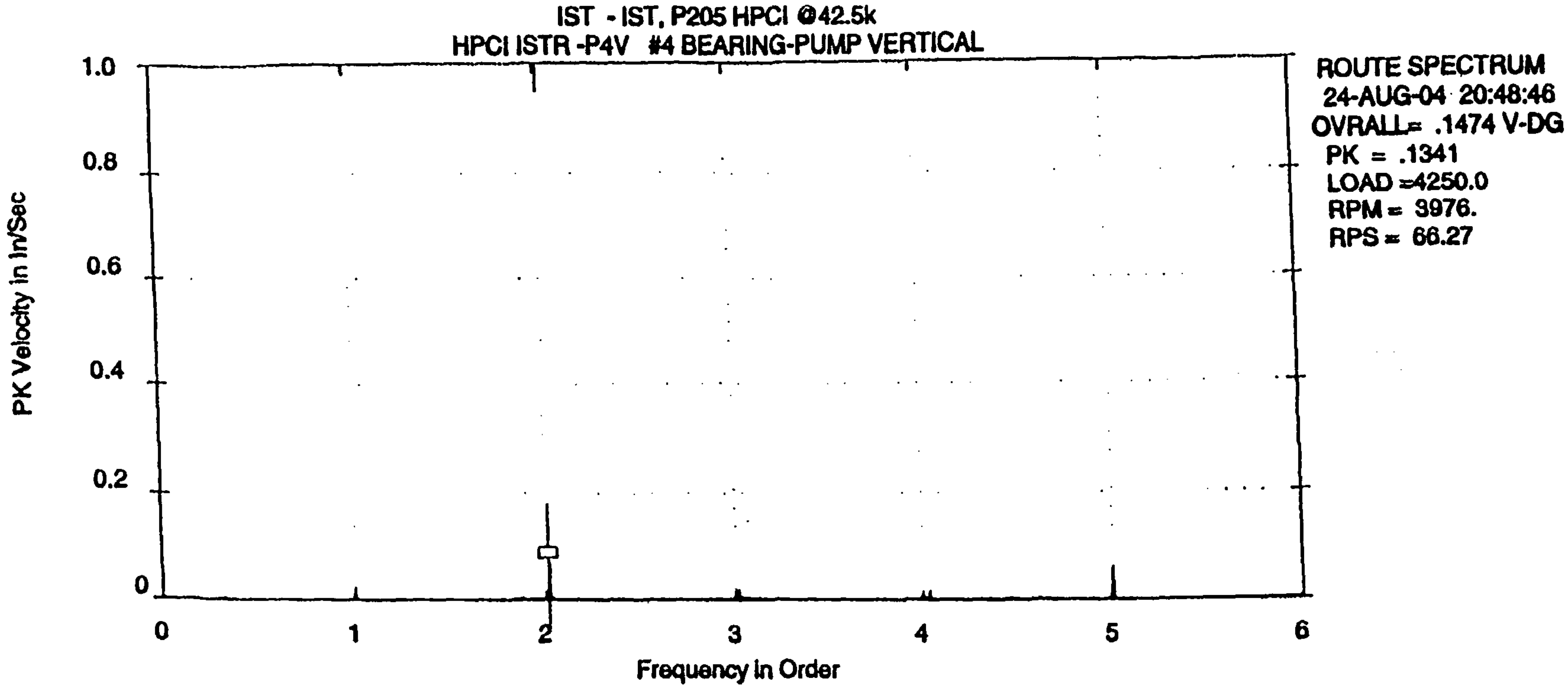


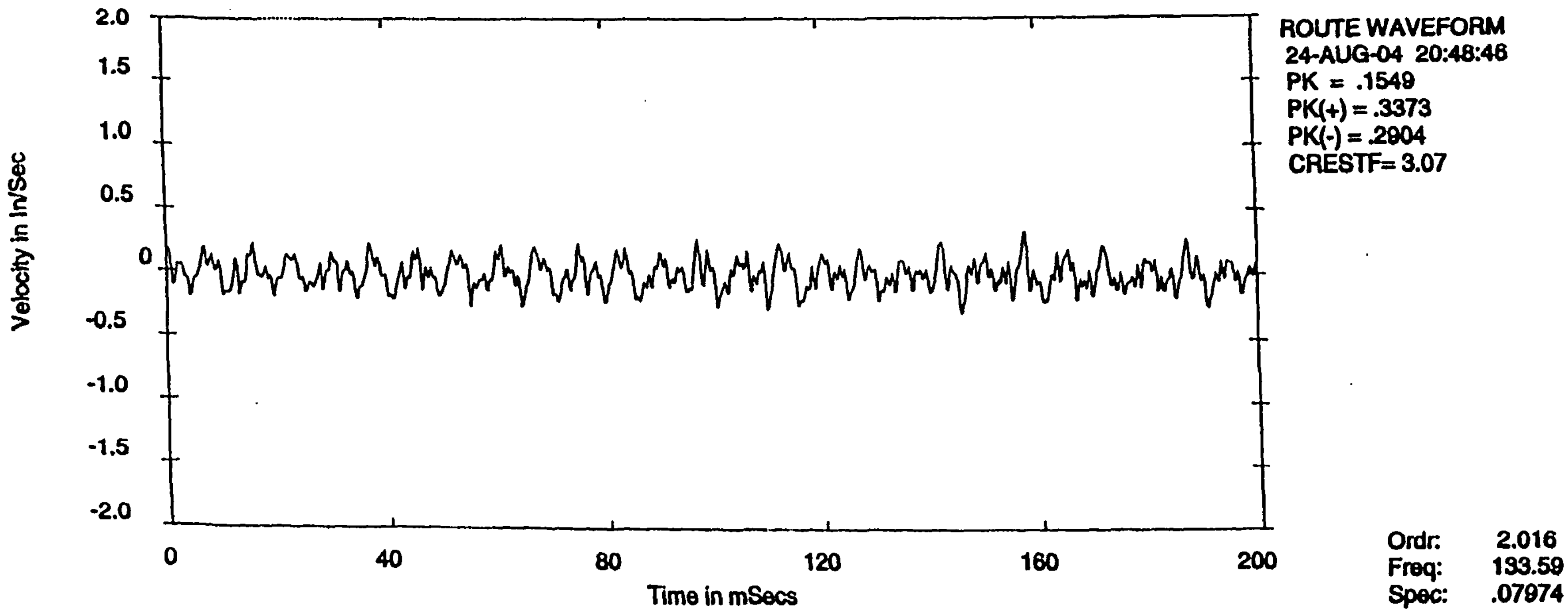
ROUTE SPECTRUM
24-NOV-04 00:52:14
OVRALL= .1642 V-DG
PK = .1516
LOAD =4250.0
RPM = 4019.
RPS = 66.98

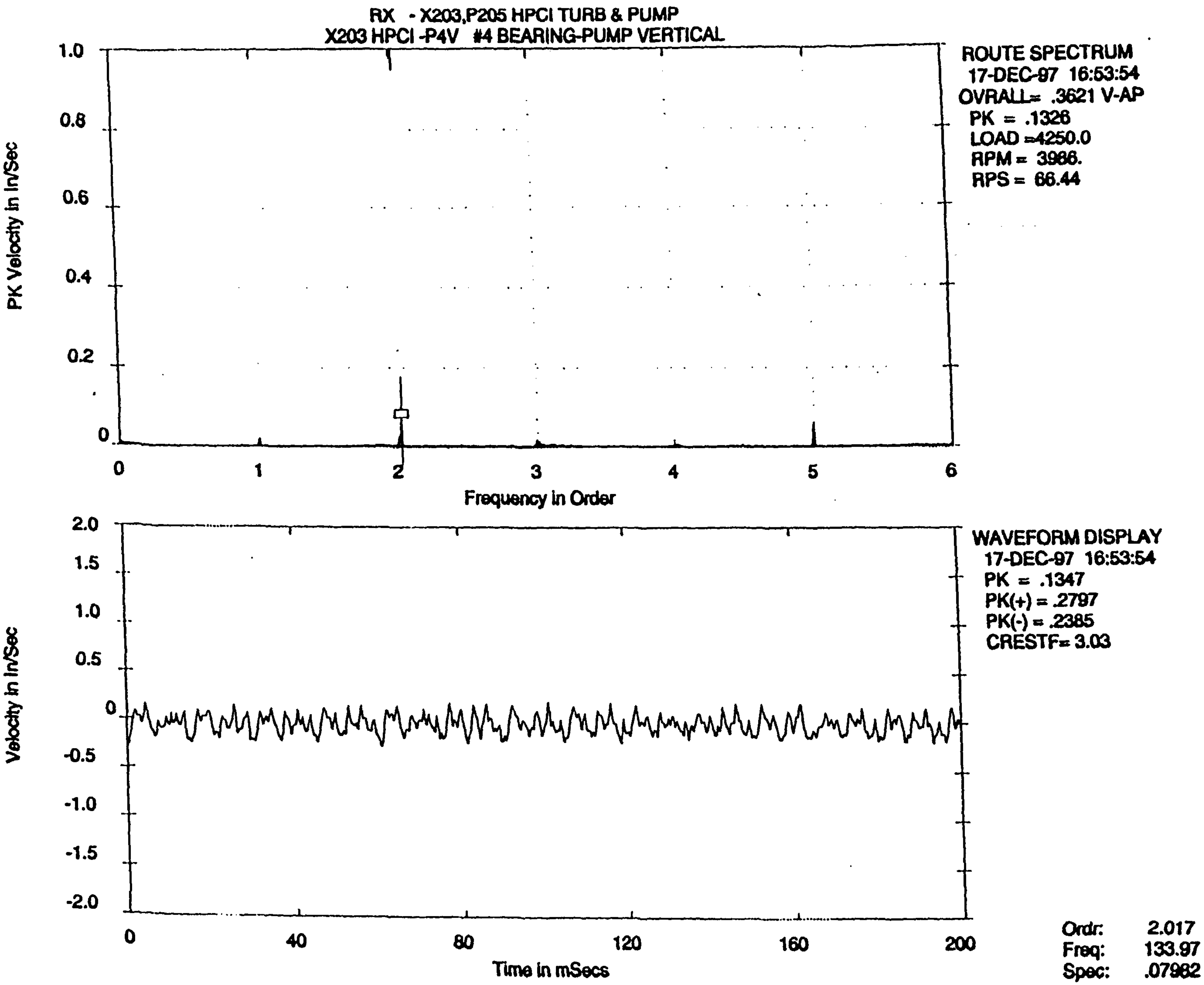


ROUTE WAVEFORM
24-NOV-04 00:52:14
PK = .1506
PK(+) = .2755
PK(-) = .3887
CRESTF= 3.57

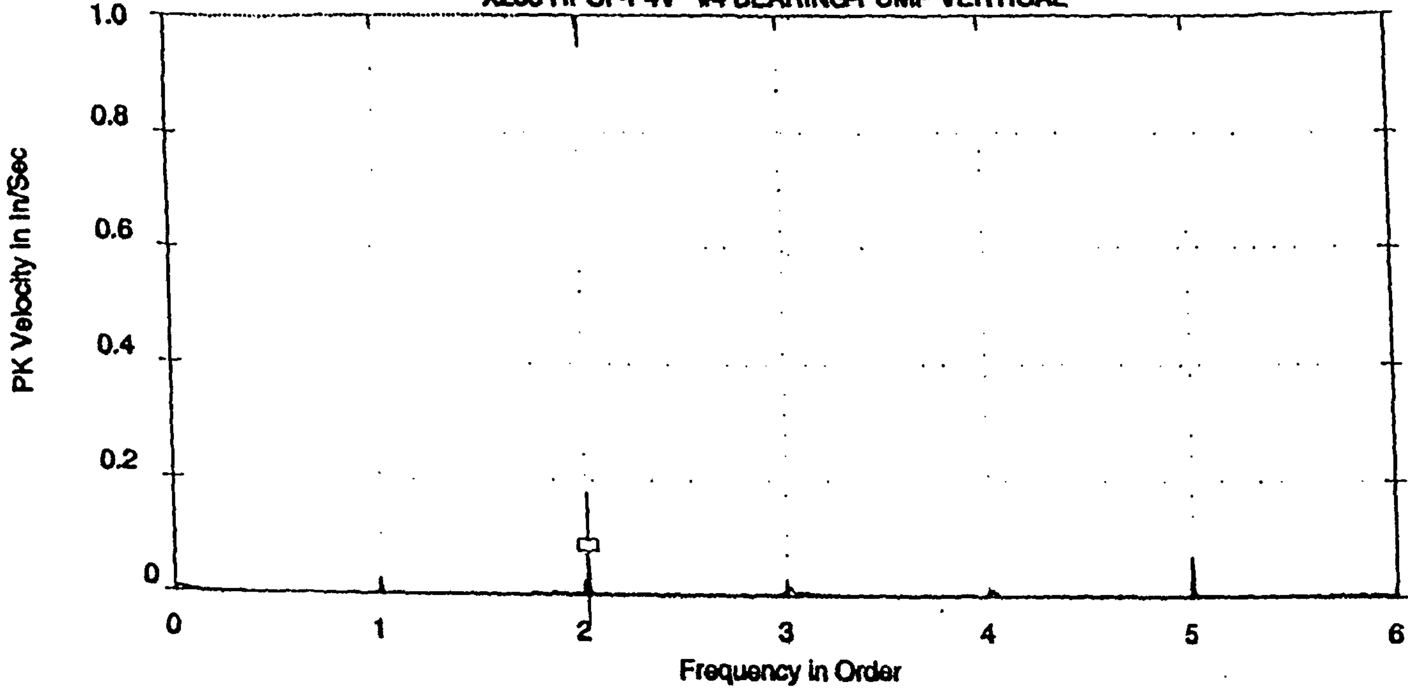
Ordr: 2.016
Freq: 135.00
Spec: .07664


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P4V #4 BEARING-PUMP VERTICAL
ROUTE SPECTRUM
24-AUG-04 20:48:46
OVRALL= .1474 V-DG
PK = .1341
LOAD =4250.0
RPM = 3976.
RPS = 66.27
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order

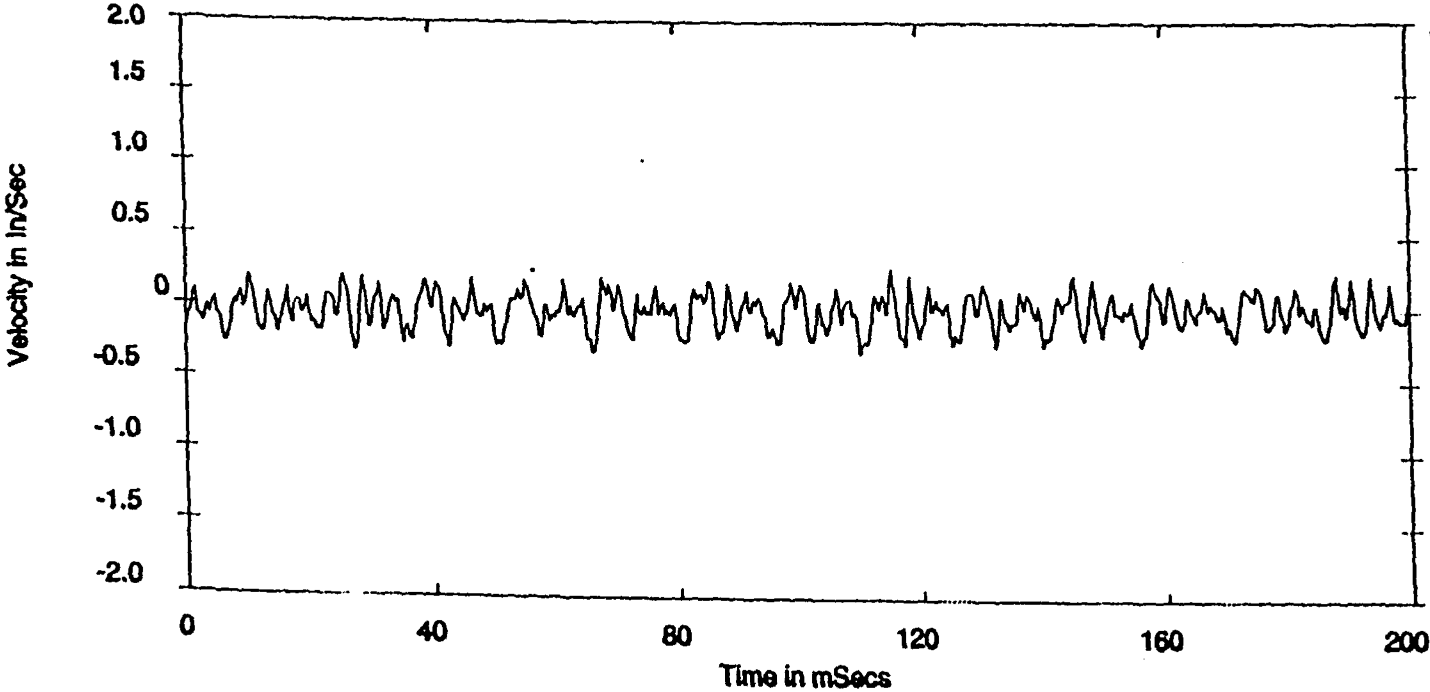

ROUTE WAVEFORM
24-AUG-04 20:48:46
PK = .1549
PK(+) = .3373
PK(-) = .2904
CRESTF= 3.07
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 2.016
Freq: 133.59
Spec: .07974


RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P4V #4 BEARING-PUMP VERTICAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
17-DEC-97 16:53:54
OVRALL= .3621 V-AP
PK = .1326
LOAD =4250.0
RPM = 3986.
RPS = 66.44
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
WAVEFORM DISPLAY
17-DEC-97 16:53:54
PK = .1347
PK(+) = .2797
PK(-) = .2385
CRESTF= 3.03
Ordr: 2.017
Freq: 133.97
Spec: .07982

RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P4V #4 BEARING-PUMP VERTICAL



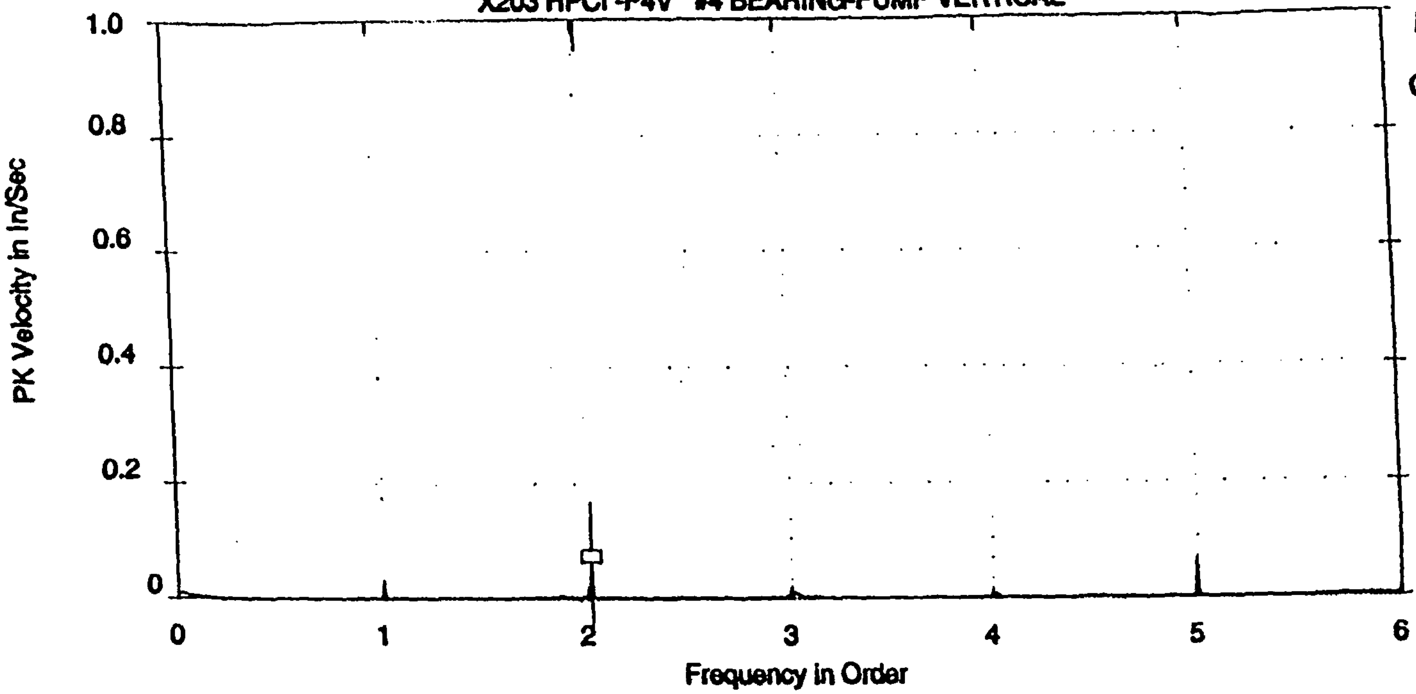
ROUTE SPECTRUM
06-MAY-96 09:24:24
OVRALL= .1621 V-DG
PK = .1533
LOAD =4250.0
RPM = 3999.
RPS = 66.66



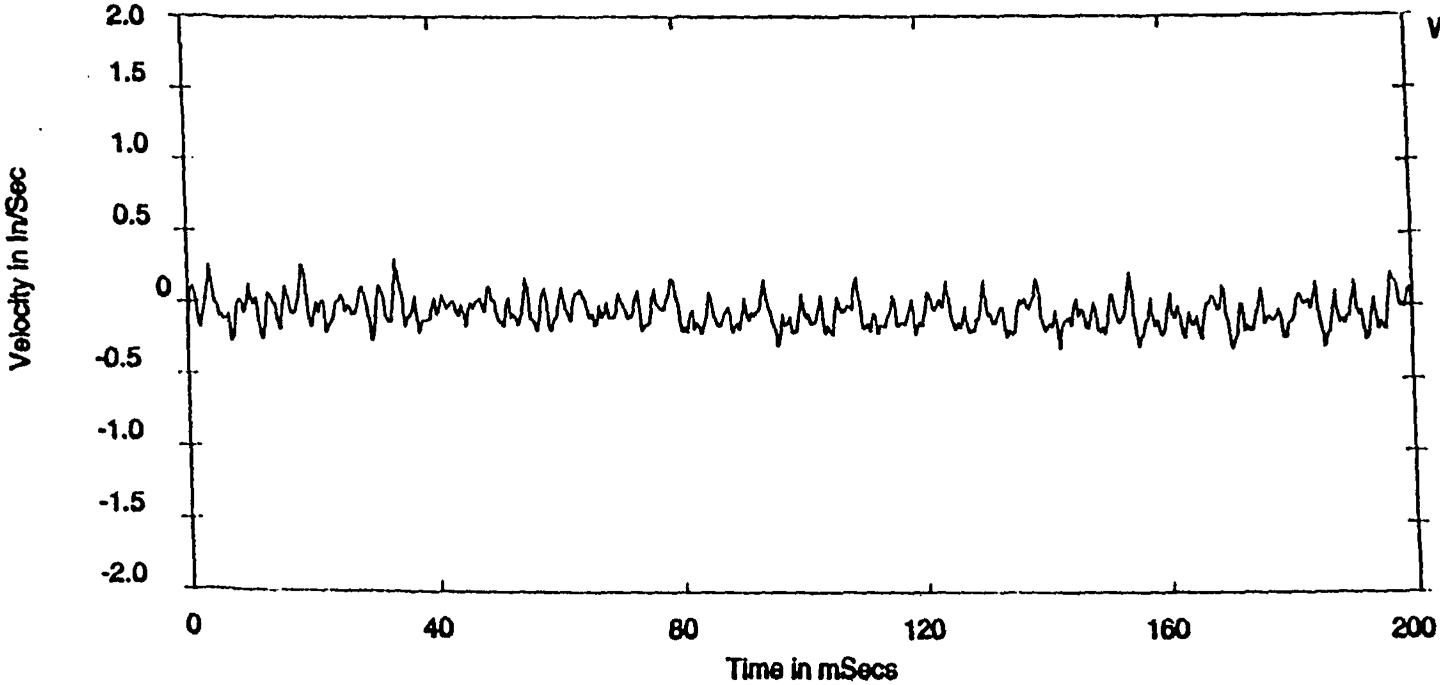
WAVEFORM DISPLAY
06-MAY-96 09:24:24
PK = .1704
PK(+) = .3405
PK(-) = .2944
CRESTF= 2.88

Ordr: 2.017
Freq: 134.47
Spec: .08144

RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P4V #4 BEARING-PUMP VERTICAL

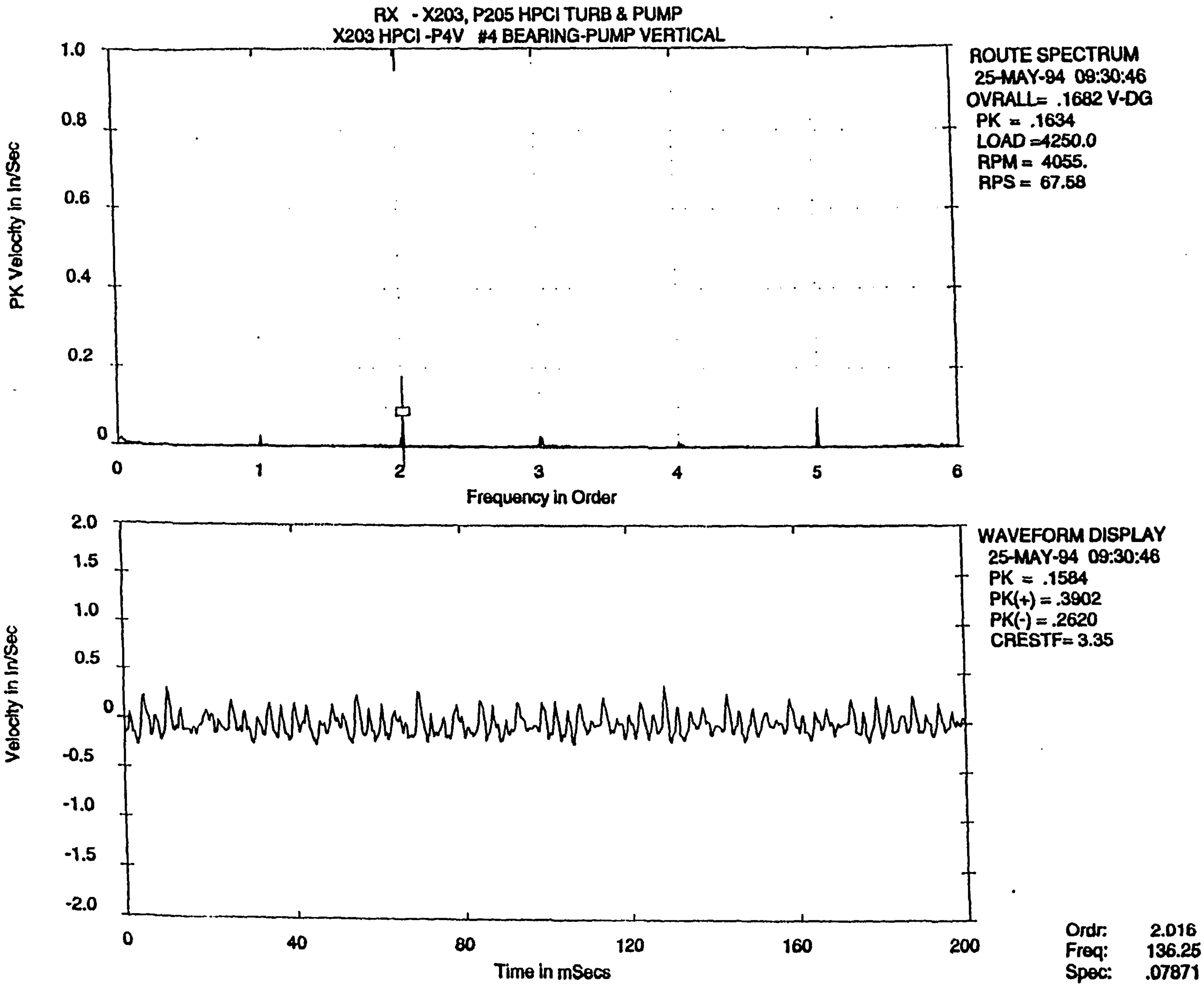


ROUTE SPECTRUM
20-NOV-95 02:01:17
OVRALL= .1456 V-DG
PK = .1375
LOAD =4250.0
RPM = 3992.
RPS = 66.54

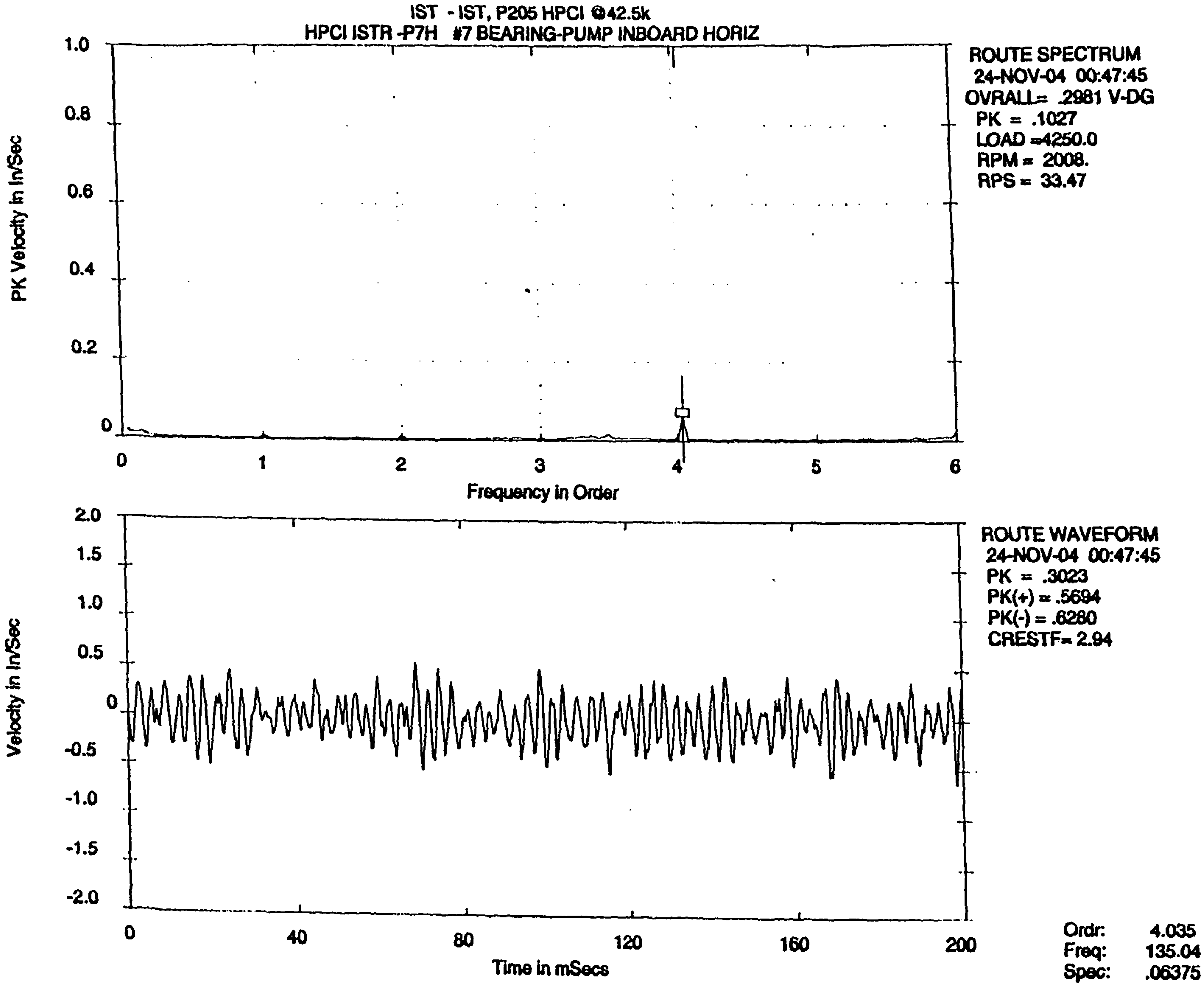


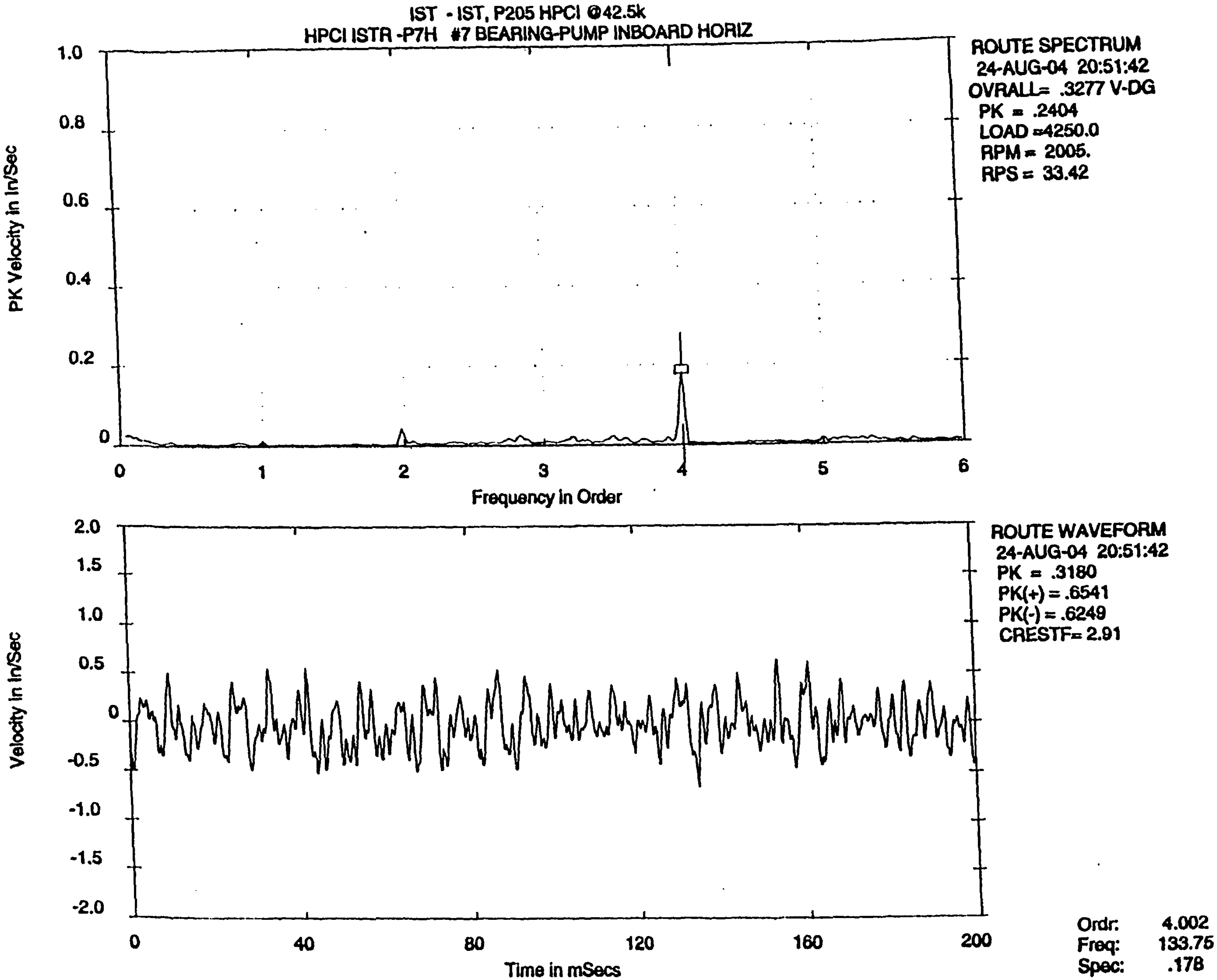
WAVEFORM DISPLAY
20-NOV-95 02:01:17
PK = .1486
PK(+) = .3539
PK(-) = .2796
CRESTF= 3.26

Ordr: 2.016
Freq: 134.17
Spec: .06989

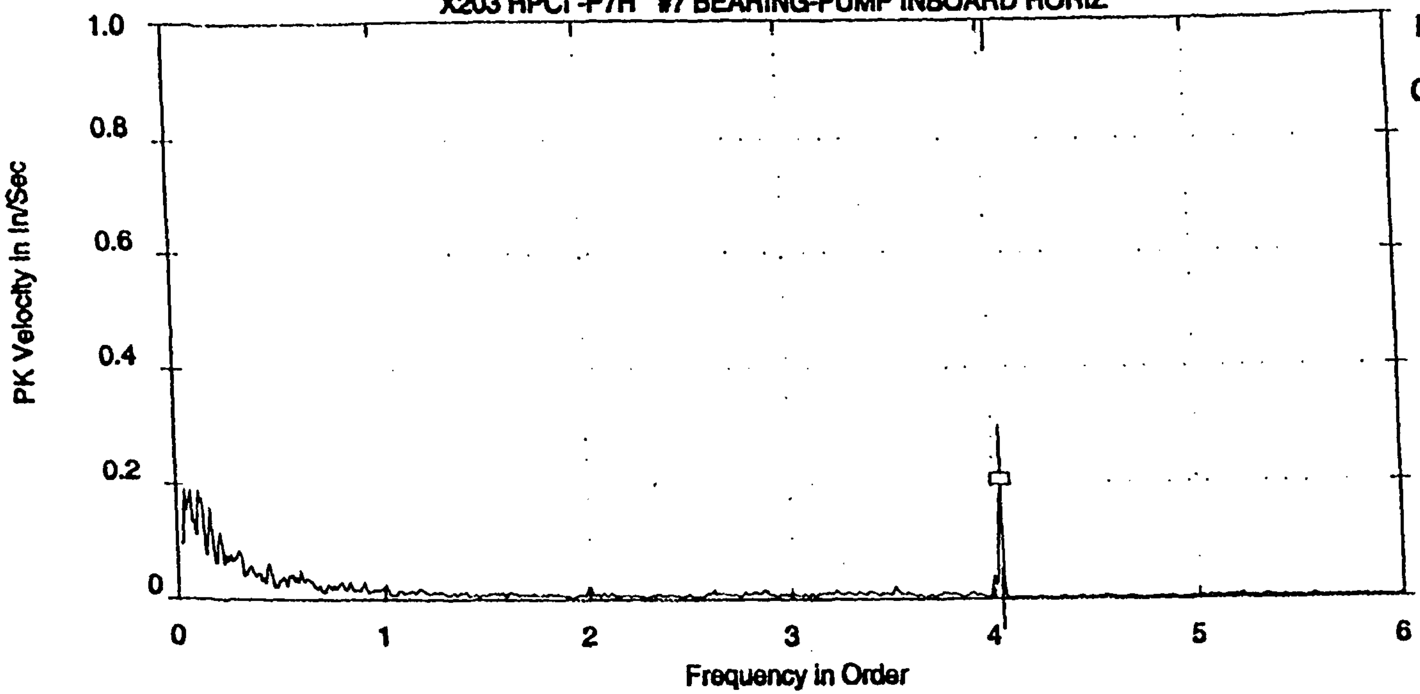


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P4V #4 BEARING-PUMP VERTICAL
ROUTE SPECTRUM
25-MAY-94 09:30:46
OVRALL= .1682 V-DG
PK = .1634
LOAD =4250.0
RPM = 4055.
RPS = 67.58
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
25-MAY-94 09:30:46
PK = .1584
PK(+) = .3902
PK(-) = .2620
CRESTF= 3.35
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 2.016
Freq: 136.25
Spec: .07871

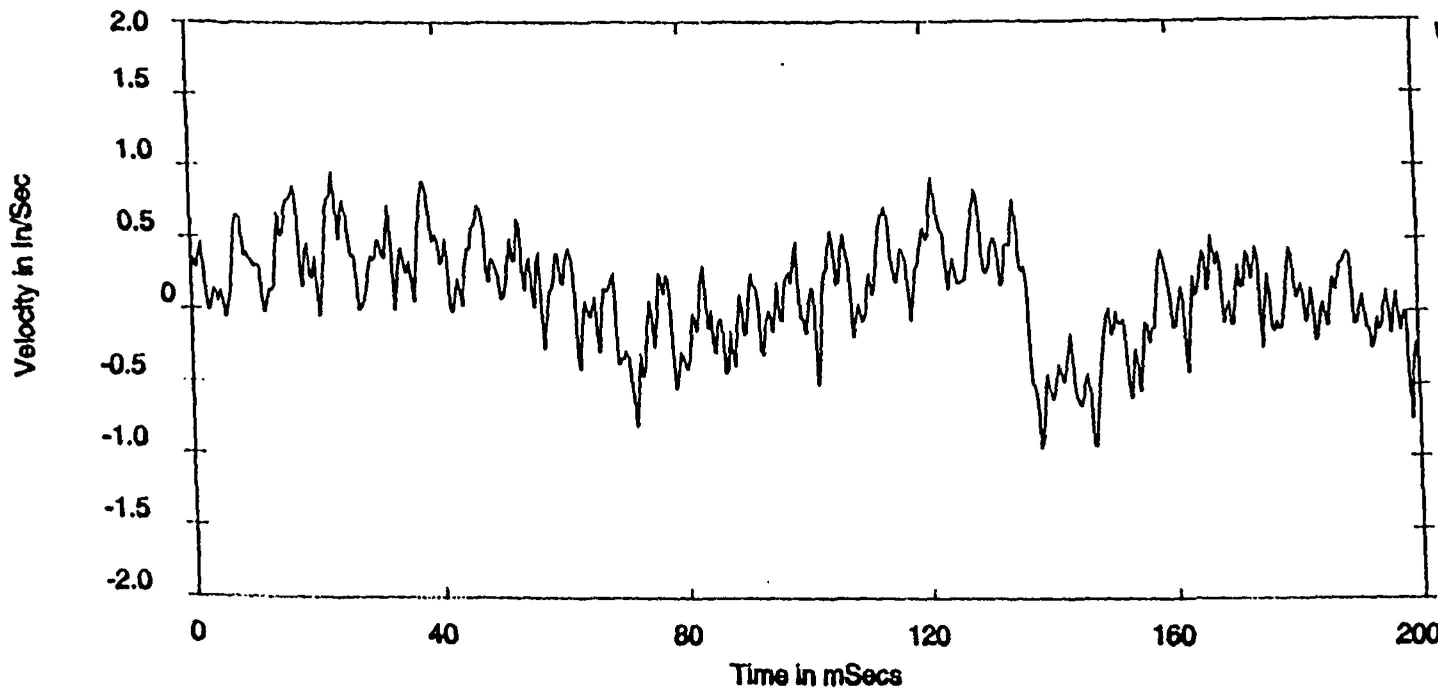

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P7H #7 BEARING-PUMP INBOARD HORIZ
ROUTE SPECTRUM
24-NOV-04 00:47:45
OVRALL= .2981 V-DG
PK = .1027
LOAD =4250.0
RPM = 2008.
RPS = 33.47
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE WAVEFORM
24-NOV-04 00:47:45
PK = .3023
PK(+) = .5694
PK(-) = .6280
CRESTF= 2.94
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 4.035
Freq: 135.04
Spec: .06375


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P7H #7 BEARING-PUMP INBOARD HORIZ
ROUTE SPECTRUM
24-AUG-04 20:51:42
OVRALL= .3277 V-DG
PK = .2404
LOAD =4250.0
RPM = 2005.
RPS = 33.42
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE WAVEFORM
24-AUG-04 20:51:42
PK = .3180
PK(+) = .6541
PK(-) = .6249
CRESTF= 2.91
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 4.002
Freq: 133.75
Spec: .178

RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P7H #7 BEARING-PUMP INBOARD HORIZ

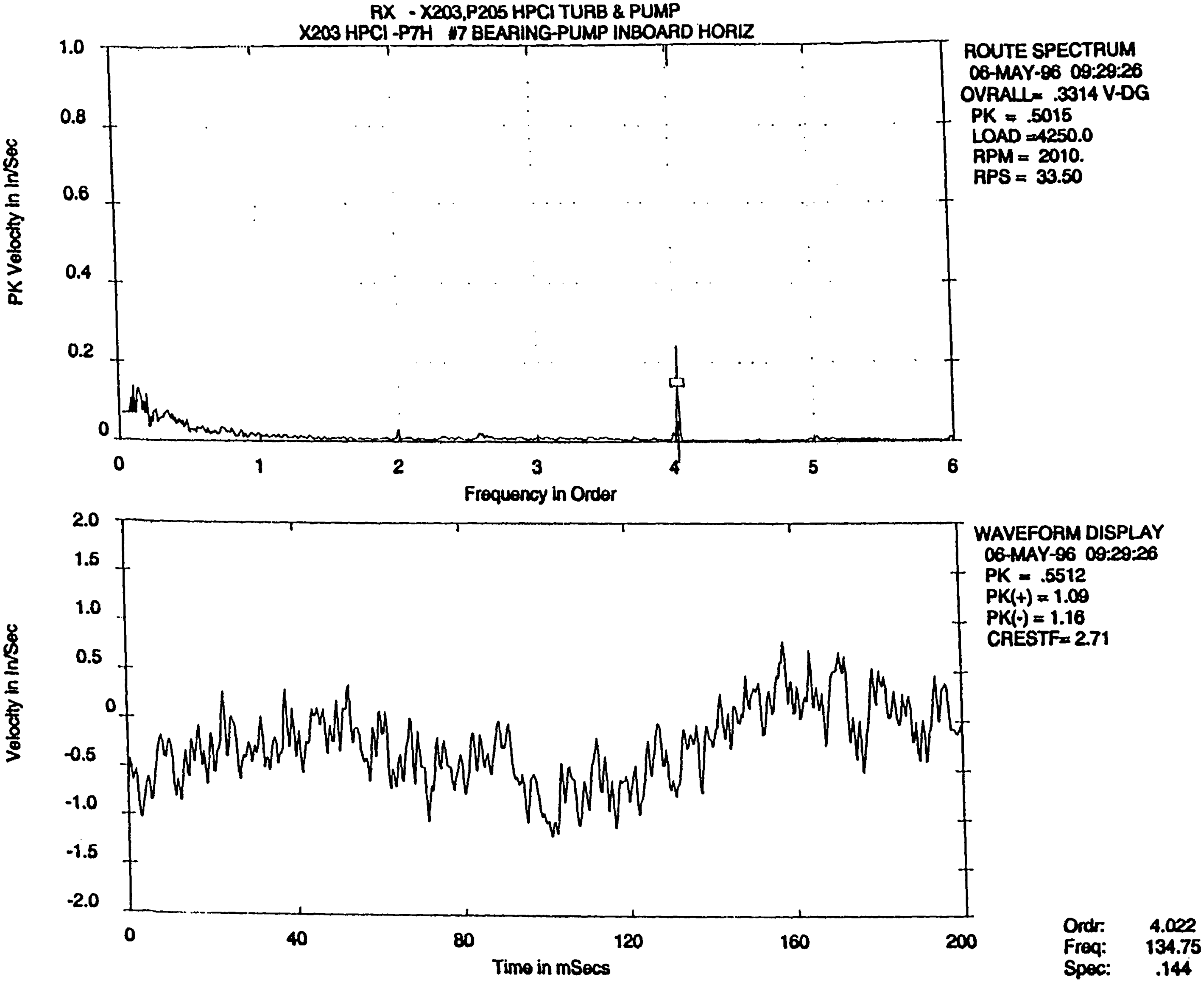


ROUTE SPECTRUM
17-DEC-97 21:49:48
OVRALL= 1.98 V-AP
PK = .6538
LOAD =4250.0
RPM = 1993.
RPS = 33.21

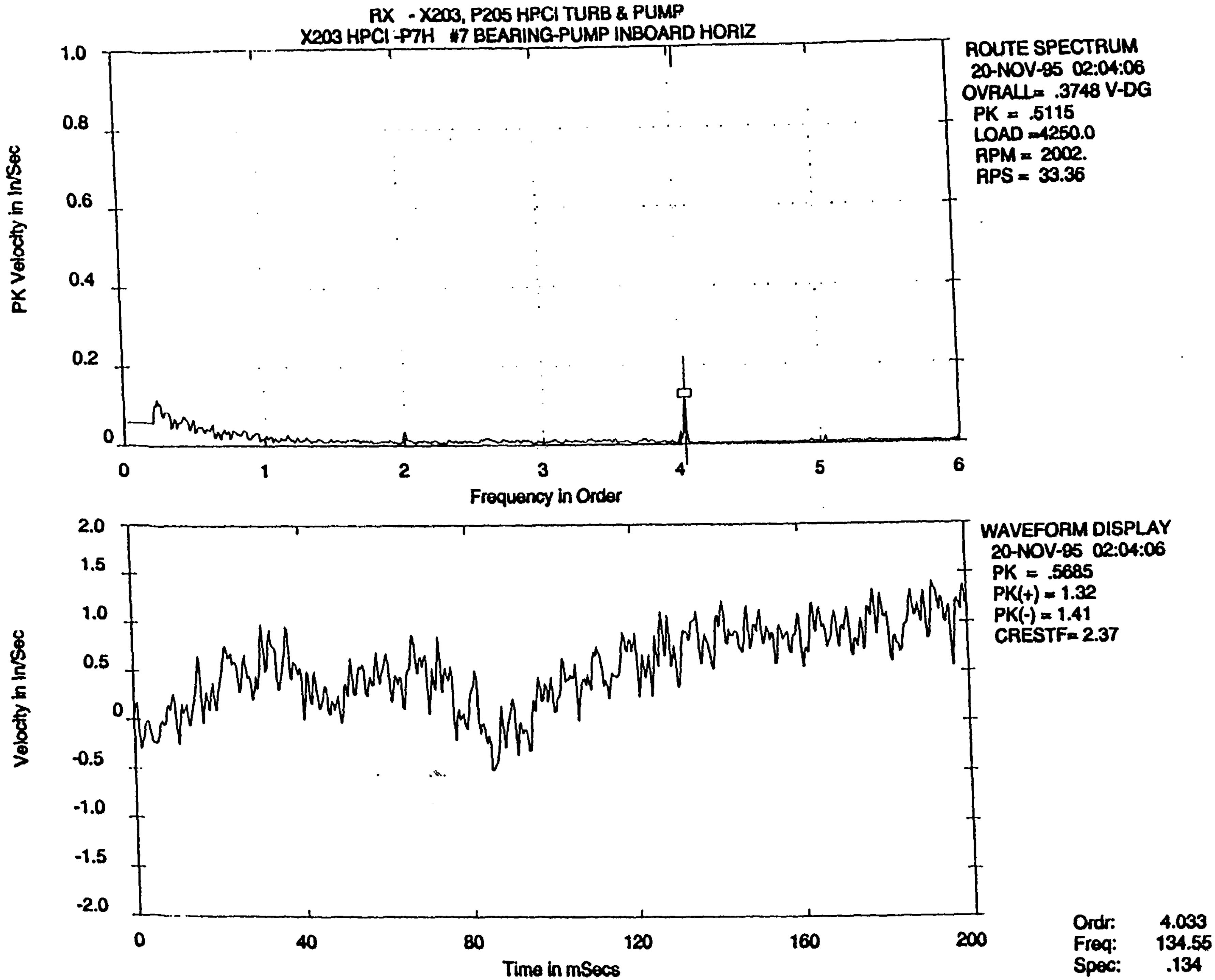


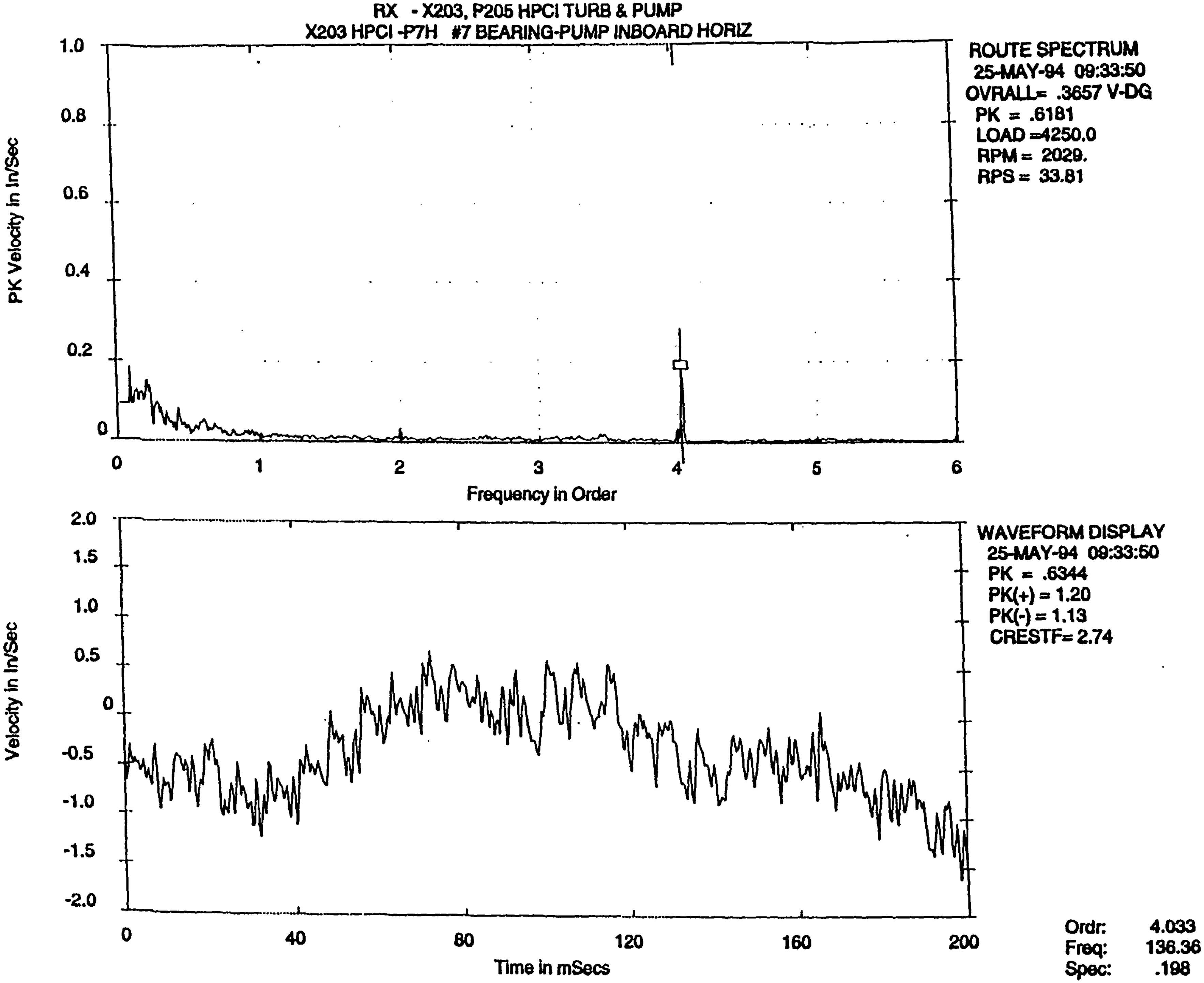
WAVEFORM DISPLAY
17-DEC-97 21:49:48
PK = .4923
PK(+) = 1.14
PK(-) = 1.21
CRESTF= 3.11

Ordr: 4.033
Freq: 133.95
Spec: .214

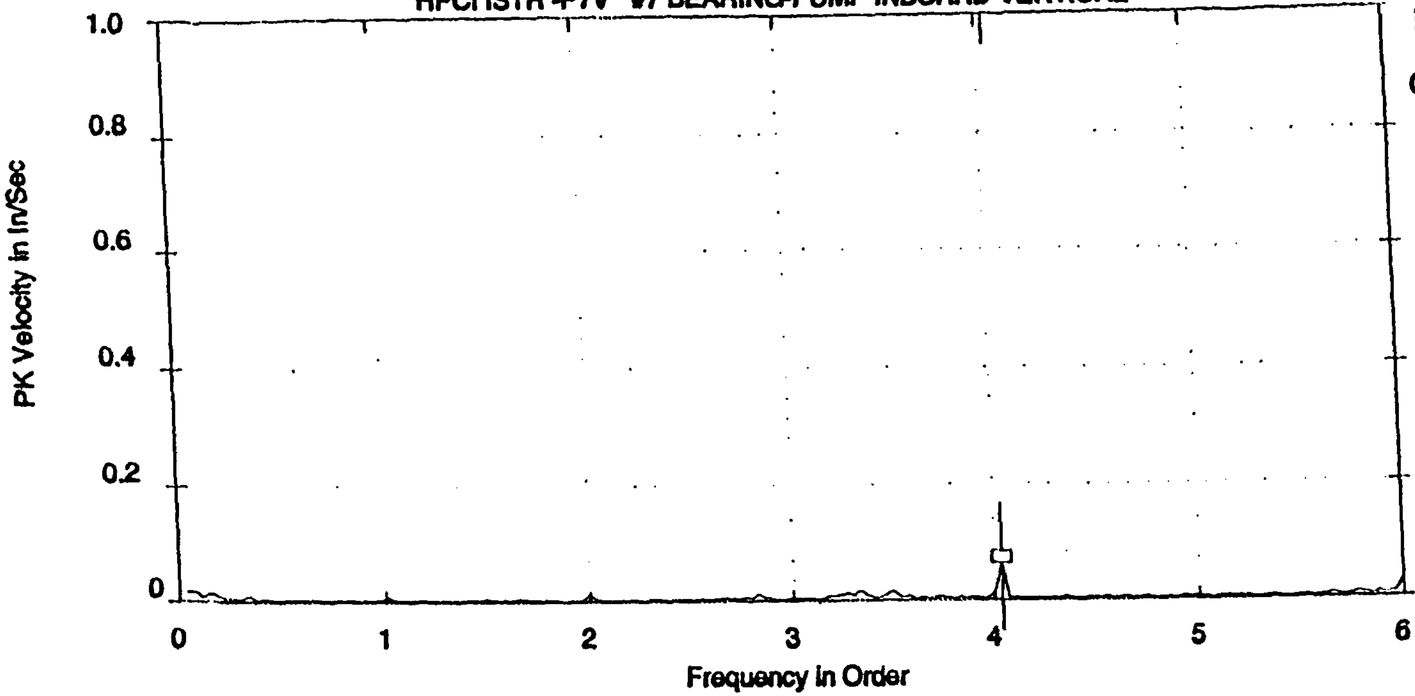


RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P7H #7 BEARING-PUMP INBOARD HORIZ
ROUTE SPECTRUM
06-MAY-96 09:29:26
OVRALL= .3314 V-DG
PK = .5015
LOAD =4250.0
RPM = 2010.
RPS = 33.50
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
06-MAY-96 09:29:26
PK = .5512
PK(+) = 1.09
PK(-) = 1.16
CRESTF= 2.71
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 4.022
Freq: 134.75
Spec: .144

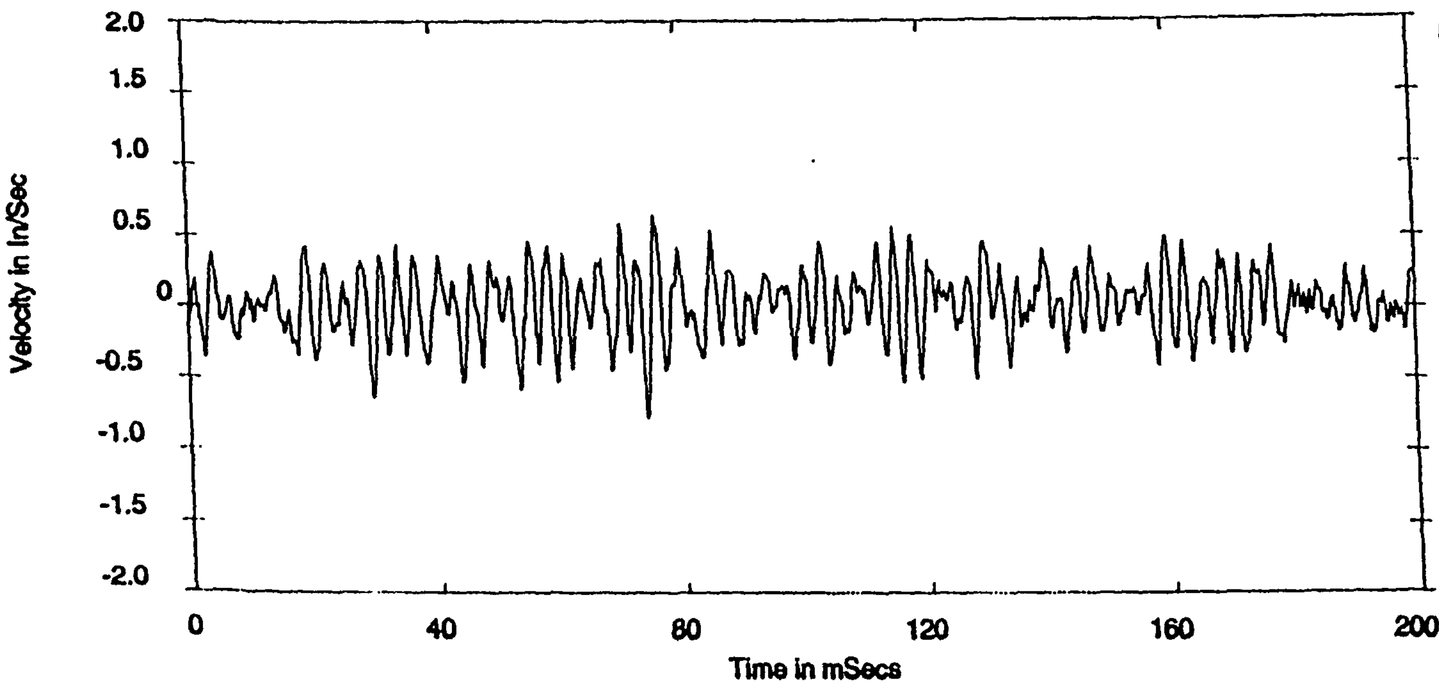

RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P7H #7 BEARING-PUMP INBOARD HORIZ
ROUTE SPECTRUM
20-NOV-95 02:04:06
OVRALL= .3748 V-DG
PK = .5115
LOAD =4250.0
RPM = 2002.
RPS = 33.36
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
20-NOV-95 02:04:06
PK = .5685
PK(+) = 1.32
PK(-) = 1.41
CRESTF= 2.37
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 4.033
Freq: 134.55
Spec: .134


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P7H #7 BEARING-PUMP INBOARD HORIZ
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
25-MAY-94 09:33:50
OVRALL= .3657 V-DG
PK = .6181
LOAD =4250.0
RPM = 2029.
RPS = 33.81
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
WAVEFORM DISPLAY
25-MAY-94 09:33:50
PK = .6344
PK(+) = 1.20
PK(-) = 1.13
CRESTF= 2.74
Ordr: 4.033
Freq: 136.36
Spec: .198

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P7V #7 BEARING-PUMP INBOARD VERTICAL

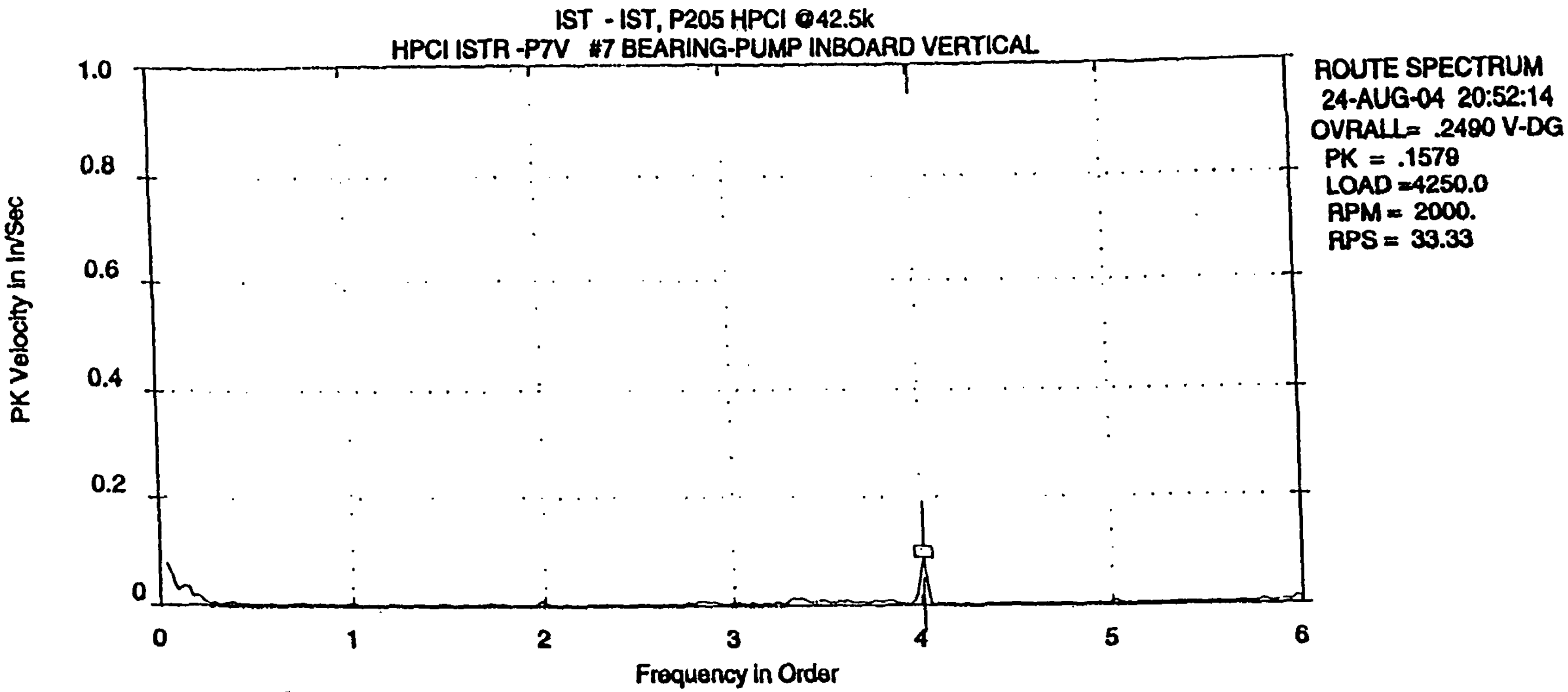


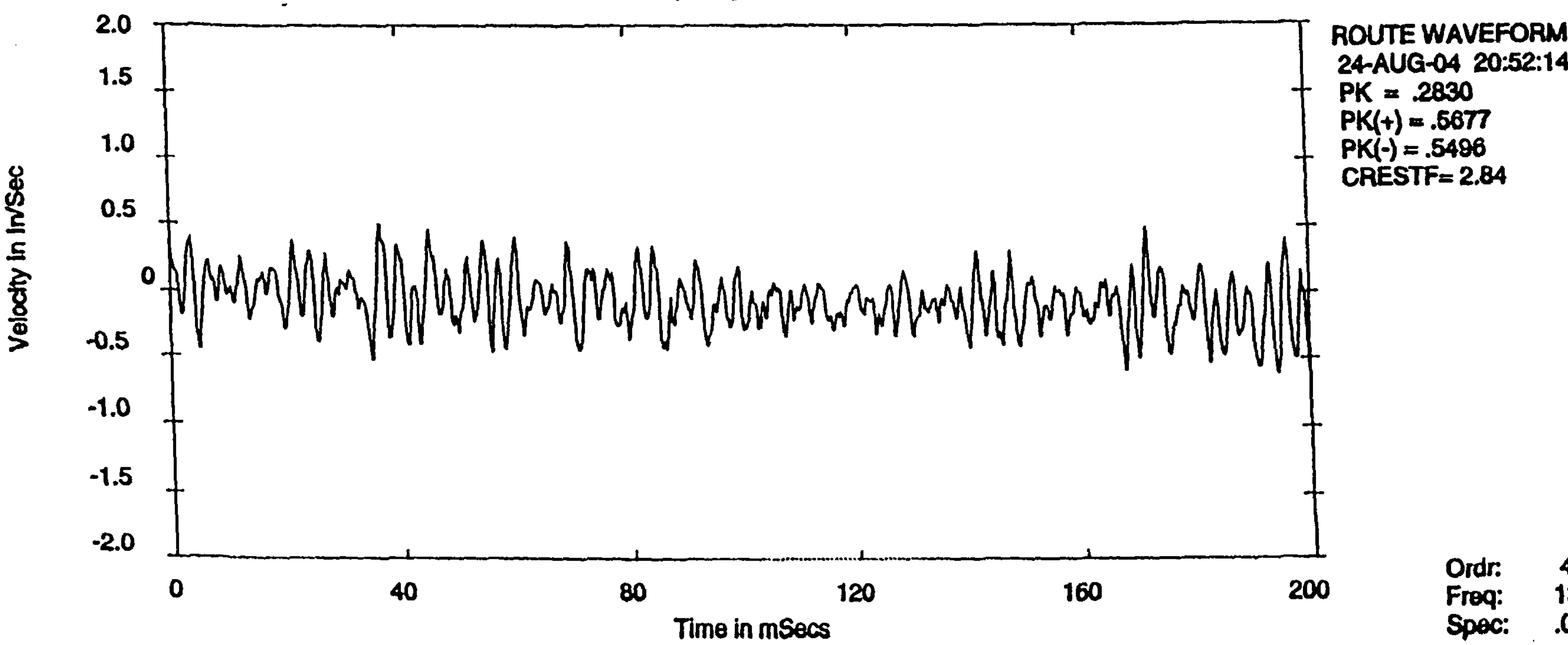
ROUTE SPECTRUM
24-NOV-04 00:48:16
OVRALL= .3021 V-DG
PK = .1053
LOAD =4250.0
RPM = 2007.
RPS = 33.45



ROUTE WAVEFORM
24-NOV-04 00:48:16
PK = .3217
PK(+) = .6252
PK(-) = .7945
CRESTF= 3.49

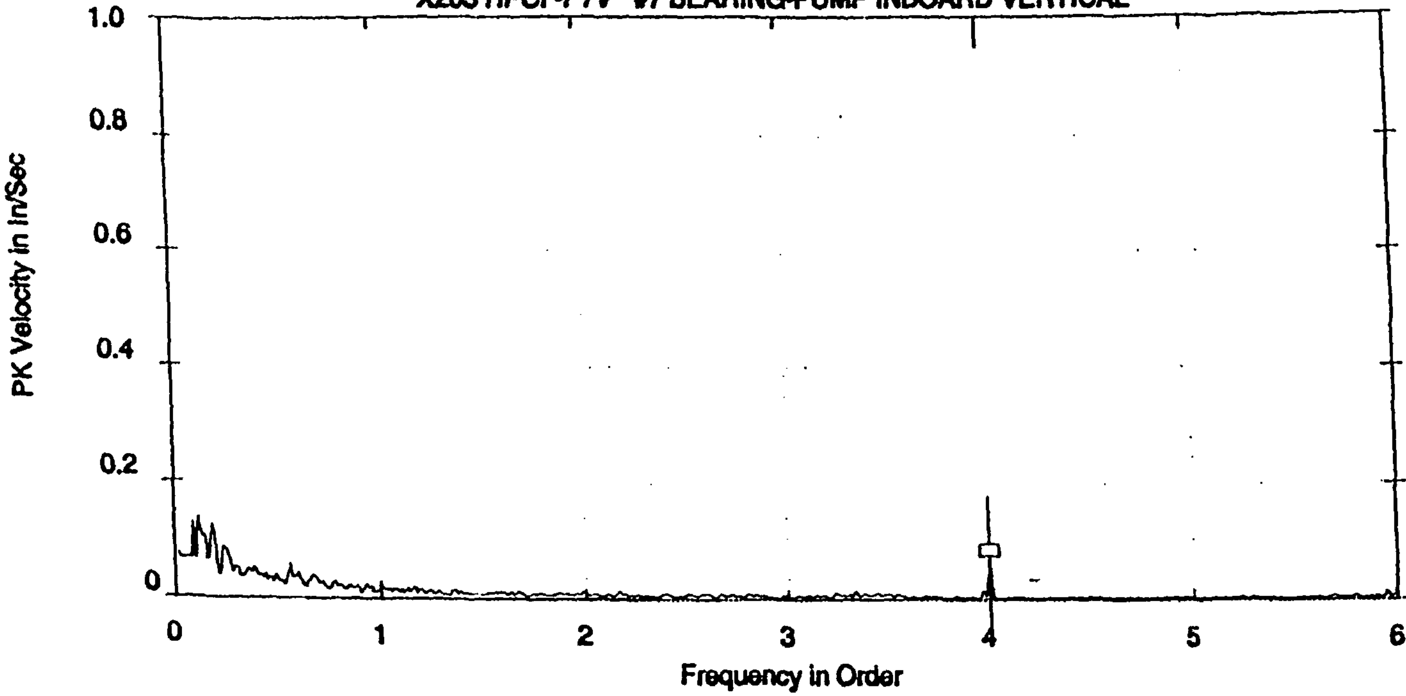
Ordr: 4.033
Freq: 134.90
Spec: .06539



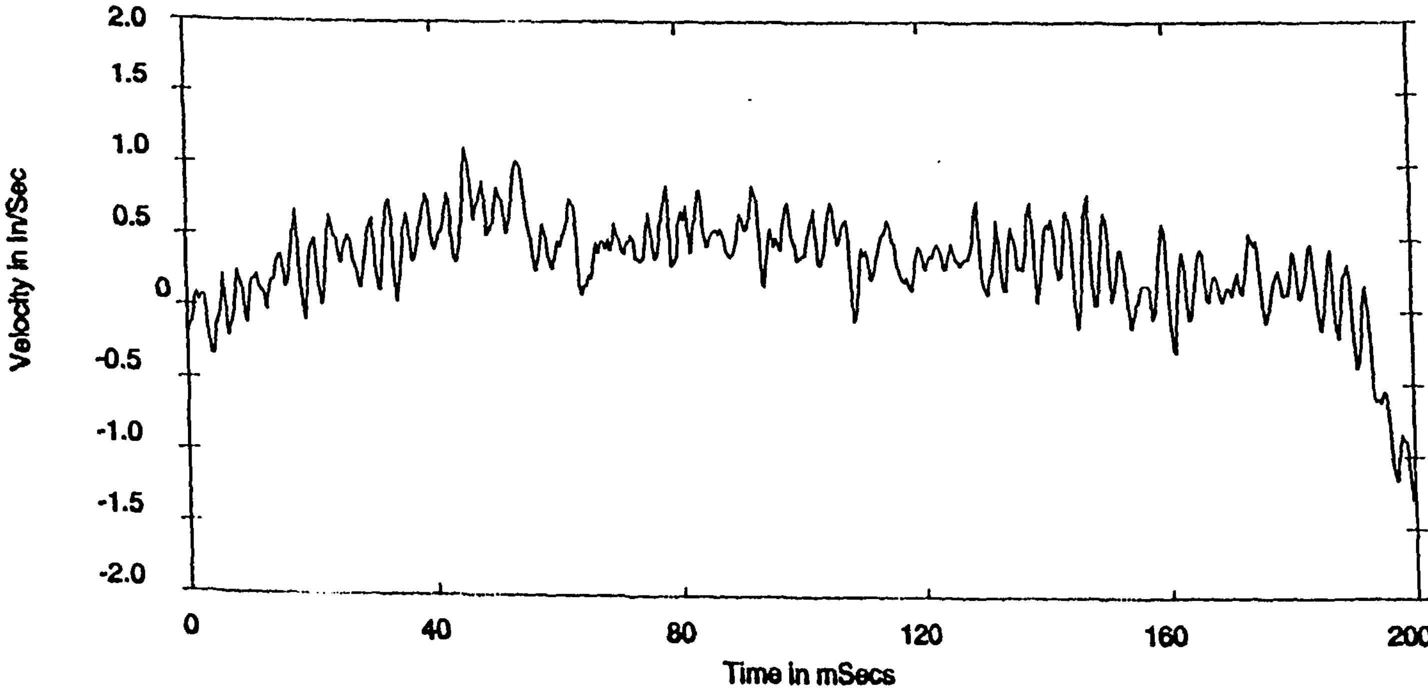


Ordr: 4.010
Freq: 133.67
Spec: .08995

RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P7V #7 BEARING-PUMP INBOARD VERTICAL



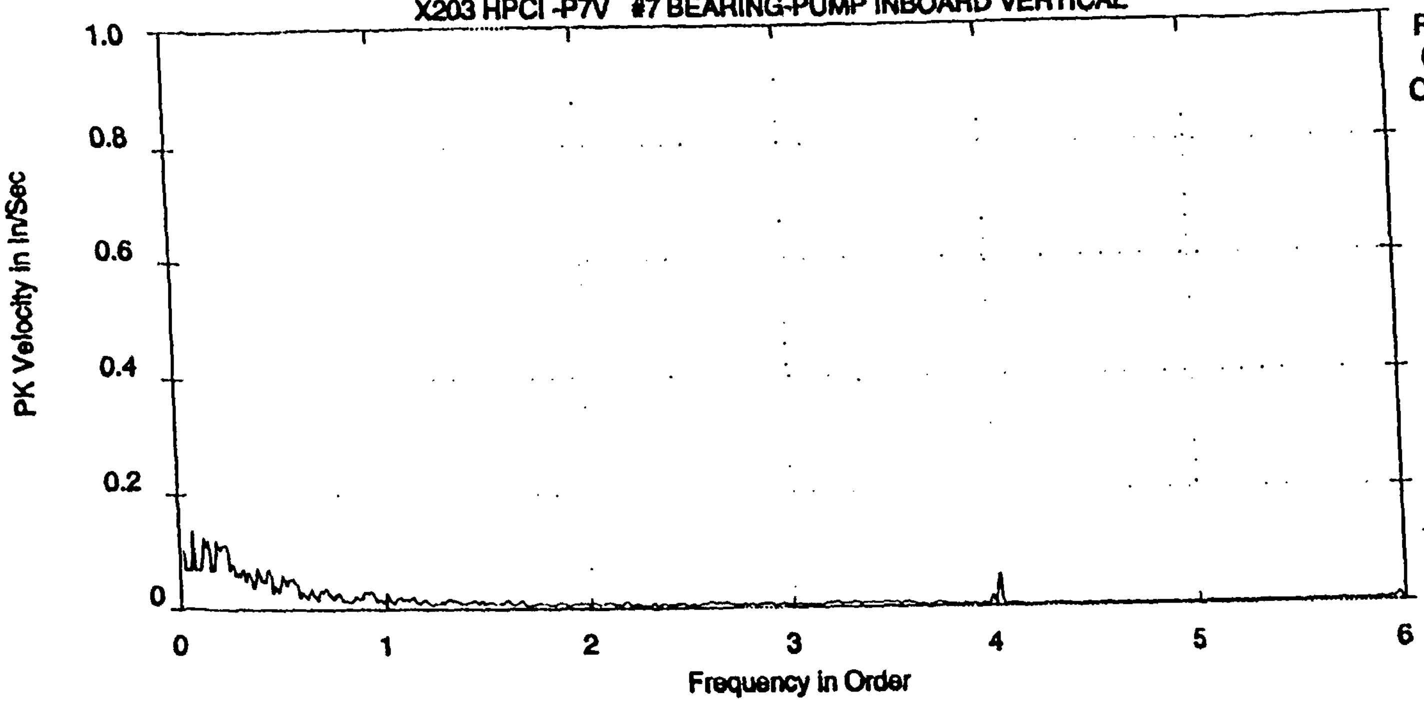
ROUTE SPECTRUM
17-DEC-97 21:50:32
OVRALL= 1.54 V-AP
PK = .4760
LOAD =4250.0
RPM = 2011.
RPS = 33.52



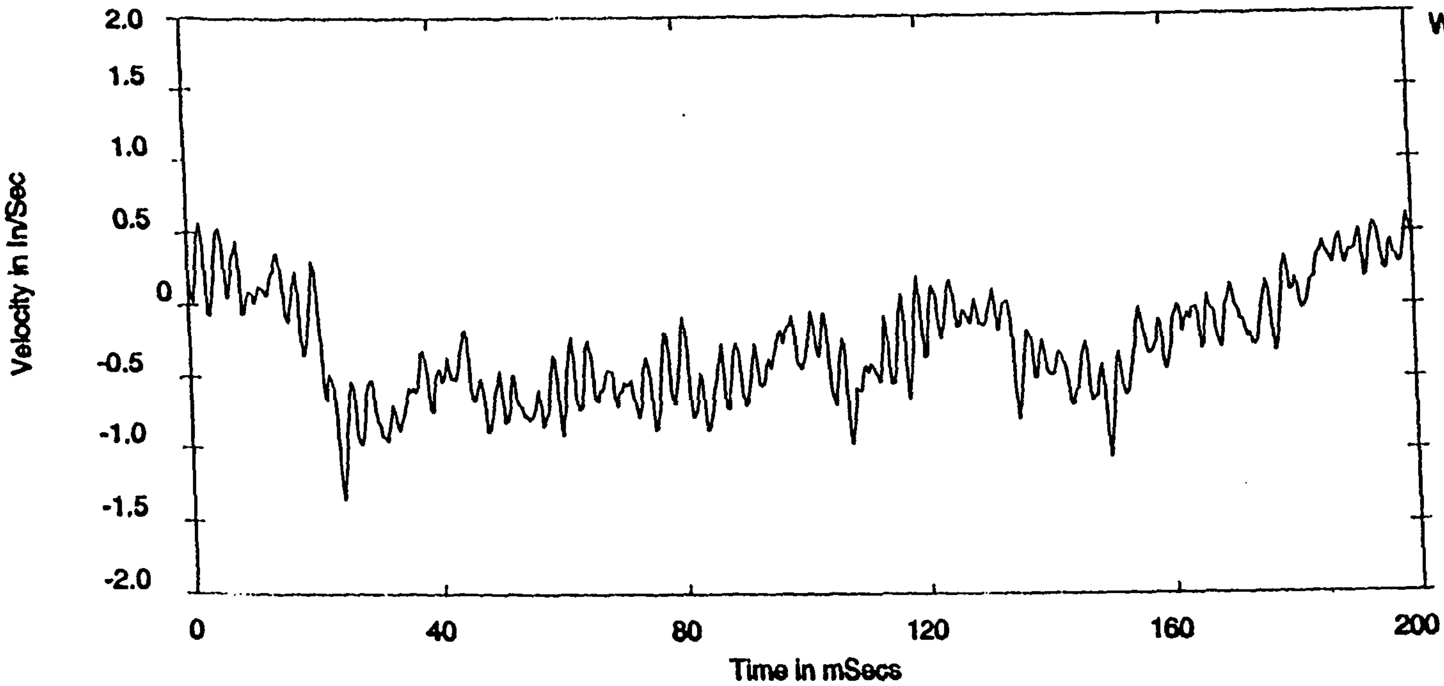
WAVEFORM DISPLAY
17-DEC-97 21:50:32
PK = .4769
PK(+) = 1.02
PK(-) = 1.76
CRESTF= 4.05

Ordr: 4.000
Freq: 134.06
Spec: .07595

RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P7V #7 BEARING-PUMP INBOARD VERTICAL

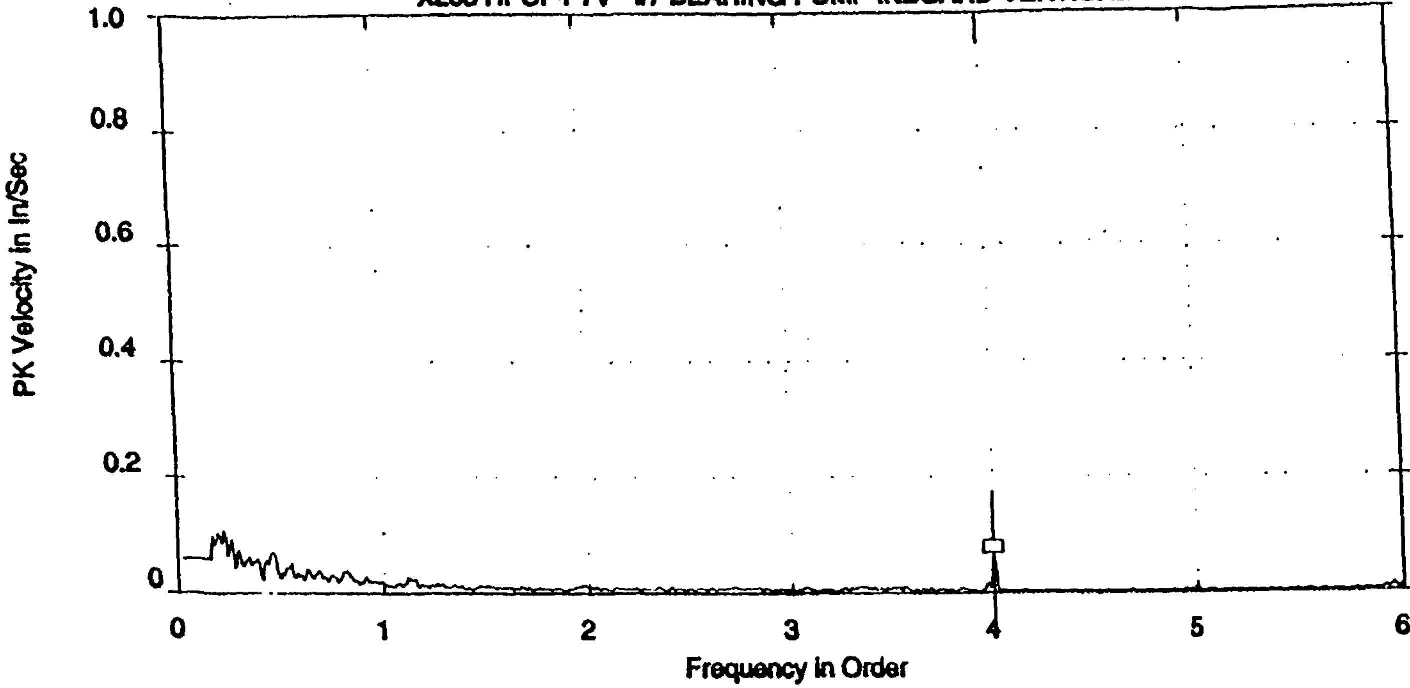


ROUTE SPECTRUM
06-MAY-96 09:30:48
OVRALL= .3408 V-DG
PK = .5168
LOAD =4250.0
RPM = 2010.
RPS = 33.50

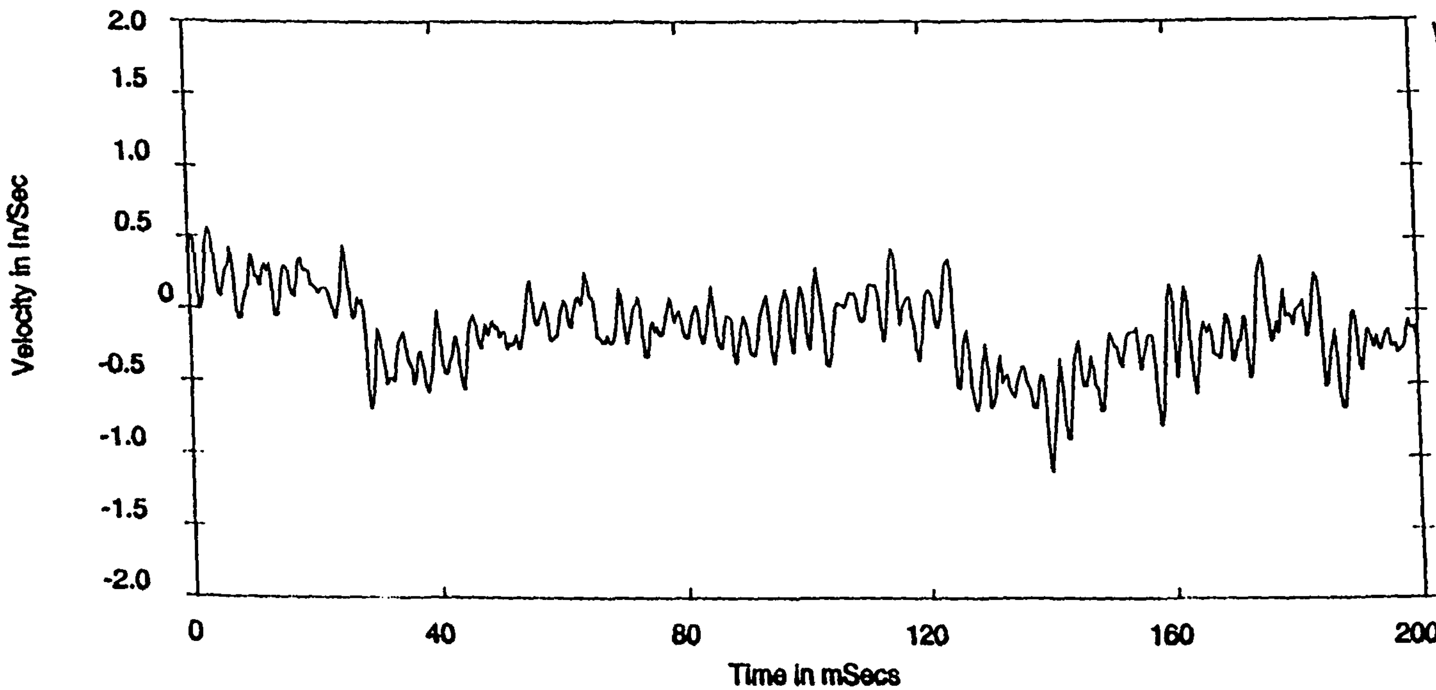


WAVEFORM DISPLAY
06-MAY-96 09:30:48
PK = .5329
PK(+) = .9047
PK(-) = 1.34
CRESTF= 3.24

RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P7V #7 BEARING-PUMP INBOARD VERTICAL

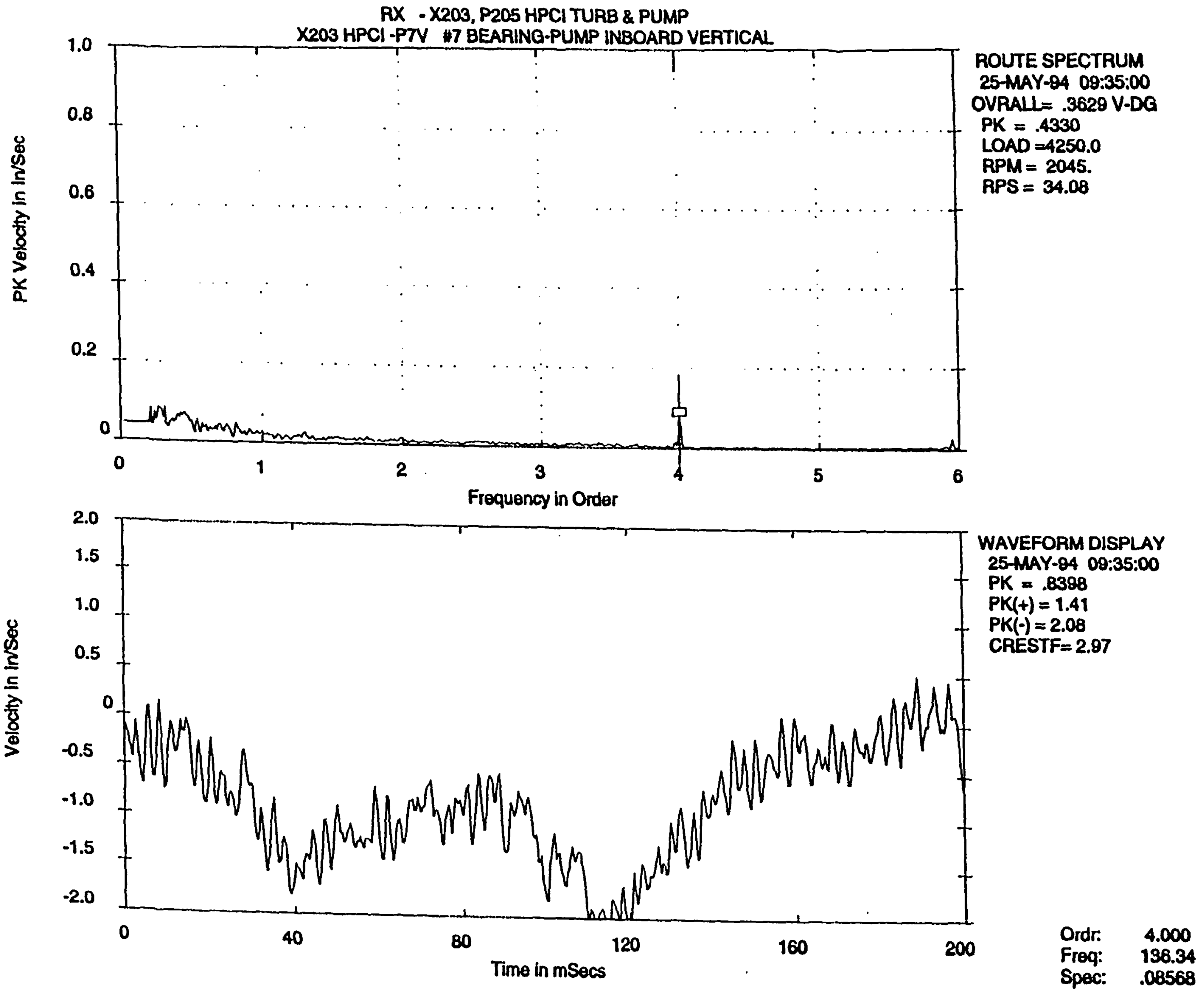


ROUTE SPECTRUM
20-NOV-95 02:05:02
OVRALL= .3429 V-DG
PK = .4597
LOAD =4250.0
RPM = 2016.
RPS = 33.60

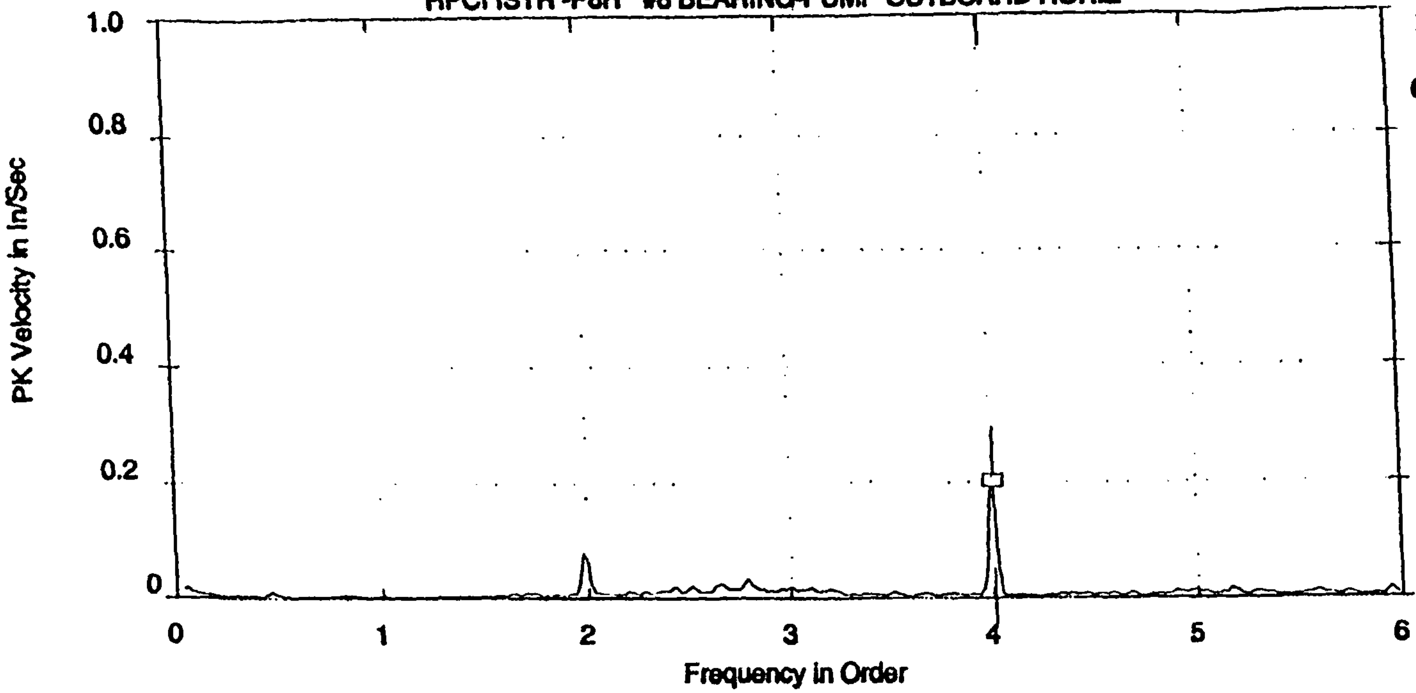


WAVEFORM DISPLAY
20-NOV-95 02:05:02
PK = .3802
PK(+) = 1.98
PK(-) = 2.04
CRESTF= 2.88

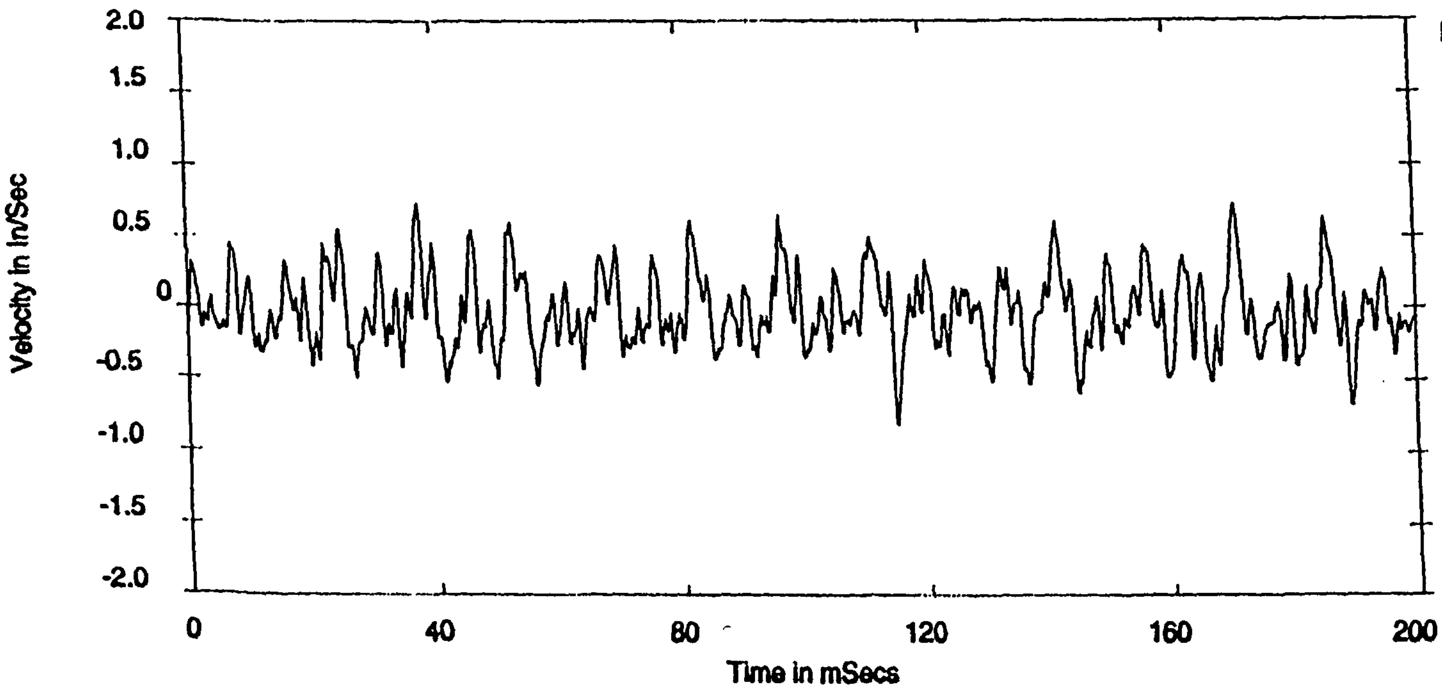
Ordr: 4.001
Freq: 134.46
Spec: .07230


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P7V #7 BEARING-PUMP INBOARD VERTICAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
25-MAY-94 09:35:00
OVRALL= .3629 V-DG
PK = .4330
LOAD =4250.0
RPM = 2045.
RPS = 34.08
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
WAVEFORM DISPLAY
25-MAY-94 09:35:00
PK = .8398
PK(+) = 1.41
PK(-) = 2.08
CRESTF= 2.97
Ordr: 4.000
Freq: 136.34
Spec: .08568

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8H #8 BEARING-PUMP OUTBOARD HORIZ

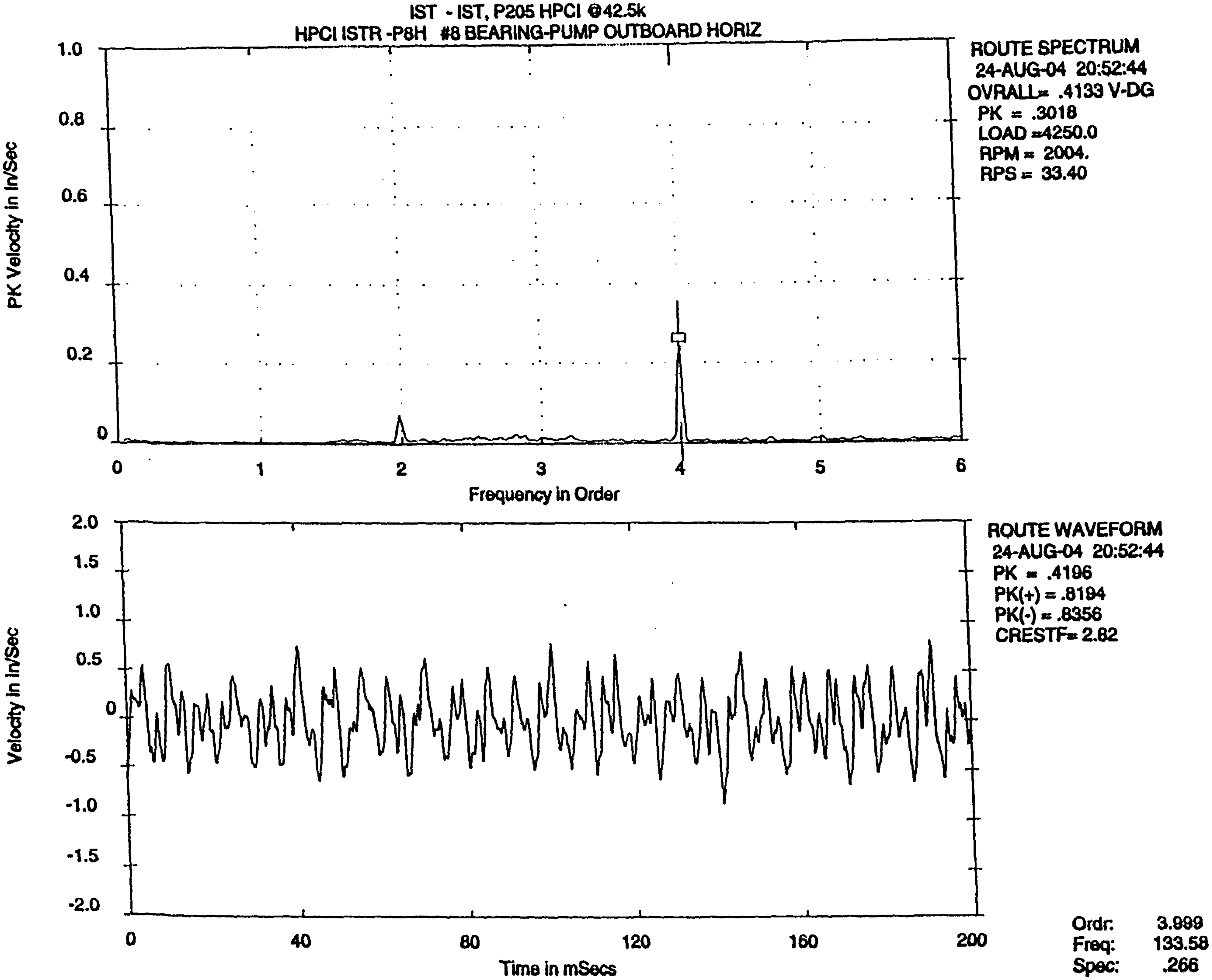


ROUTE SPECTRUM
24-NOV-04 00:57:35
OVRALL= .3549 V-DG
PK = .2767
LOAD =4250.0
RPM = 2030.
RPS = 33.84

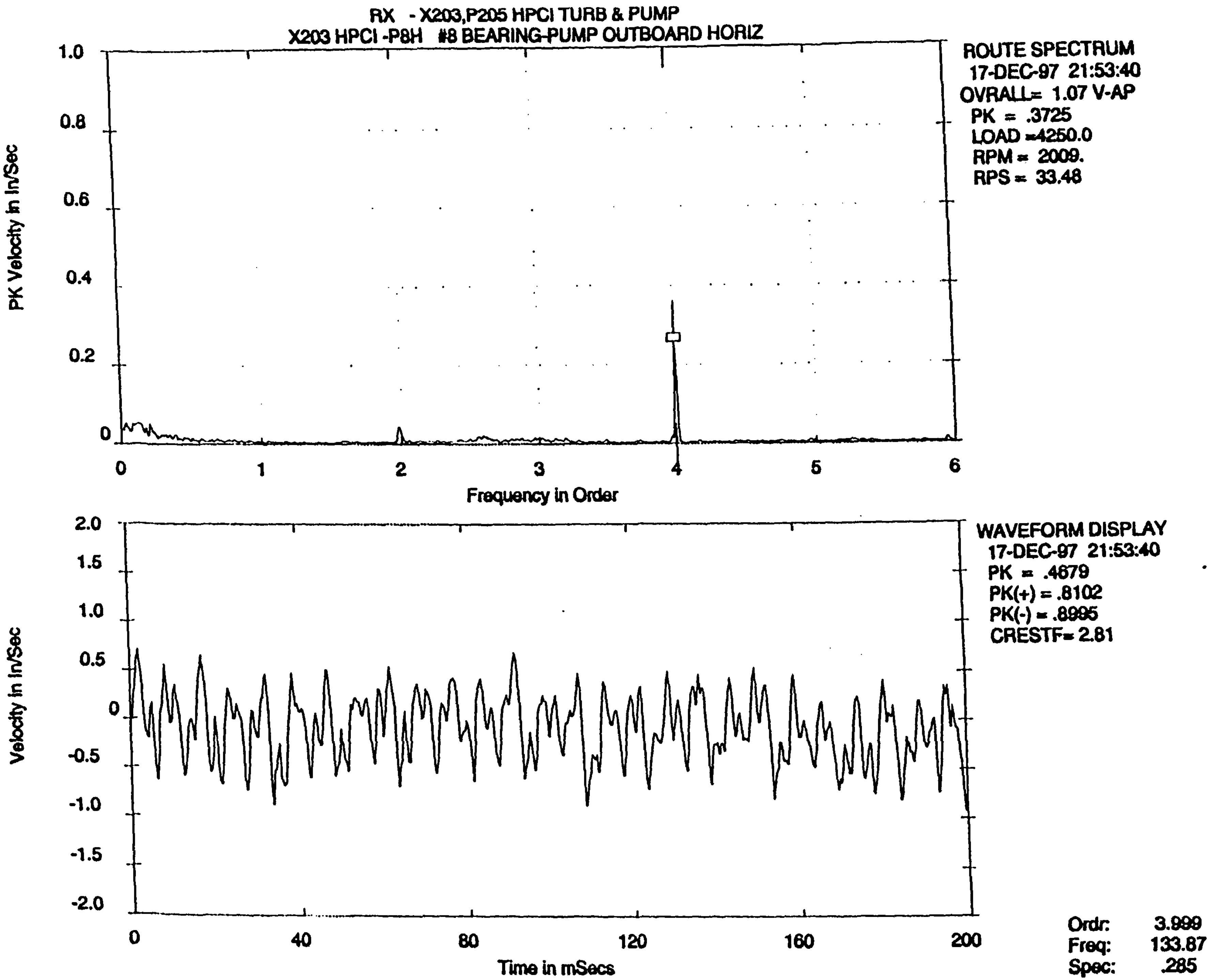


ROUTE WAVEFORM
24-NOV-04 00:57:35
PK = .3686
PK(+) = .7586
PK(-) = .7927
CRESTF= 3.04

Ordr: 4.000
Freq: 135.33
Spec: .225

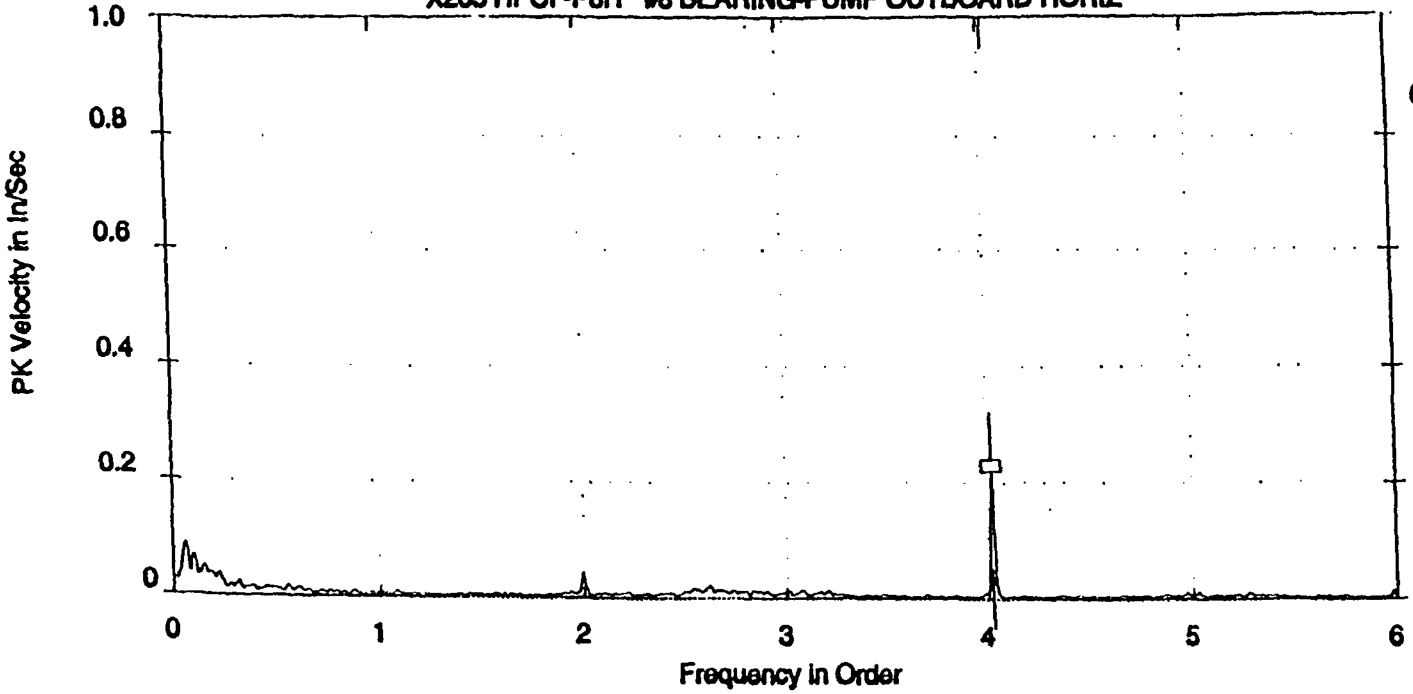


IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8H #8 BEARING-PUMP OUTBOARD HORIZ
ROUTE SPECTRUM
24-AUG-04 20:52:44
OVRALL= .4133 V-DG
PK = .3018
LOAD =4250.0
RPM = 2004.
RPS = 33.40
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE WAVEFORM
24-AUG-04 20:52:44
PK = .4196
PK(+) = .8194
PK(-) = .8356
CRESTF= 2.82
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 3.999
Freq: 133.58
Spec: .266

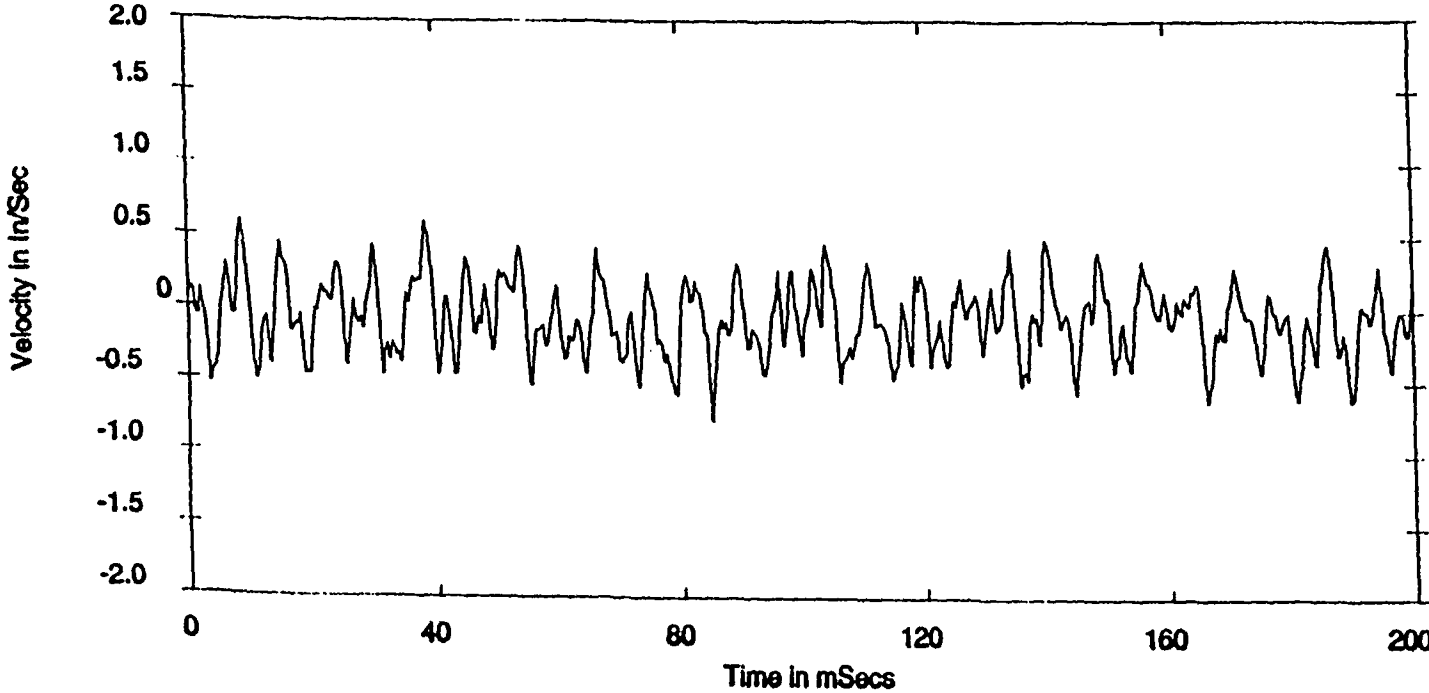


RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P8H #8 BEARING-PUMP OUTBOARD HORIZ
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
17-DEC-97 21:53:40
OVRALL= 1.07 V-AP
PK = .3725
LOAD =4250.0
RPM = 2009.
RPS = 33.48
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
WAVEFORM DISPLAY
17-DEC-97 21:53:40
PK = .4679
PK(+) = .8102
PK(-) = .8995
CRESTF= 2.81
Ordr: 3.999
Freq: 133.87
Spec: .285

RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P8H #8 BEARING-PUMP OUTBOARD HORIZ

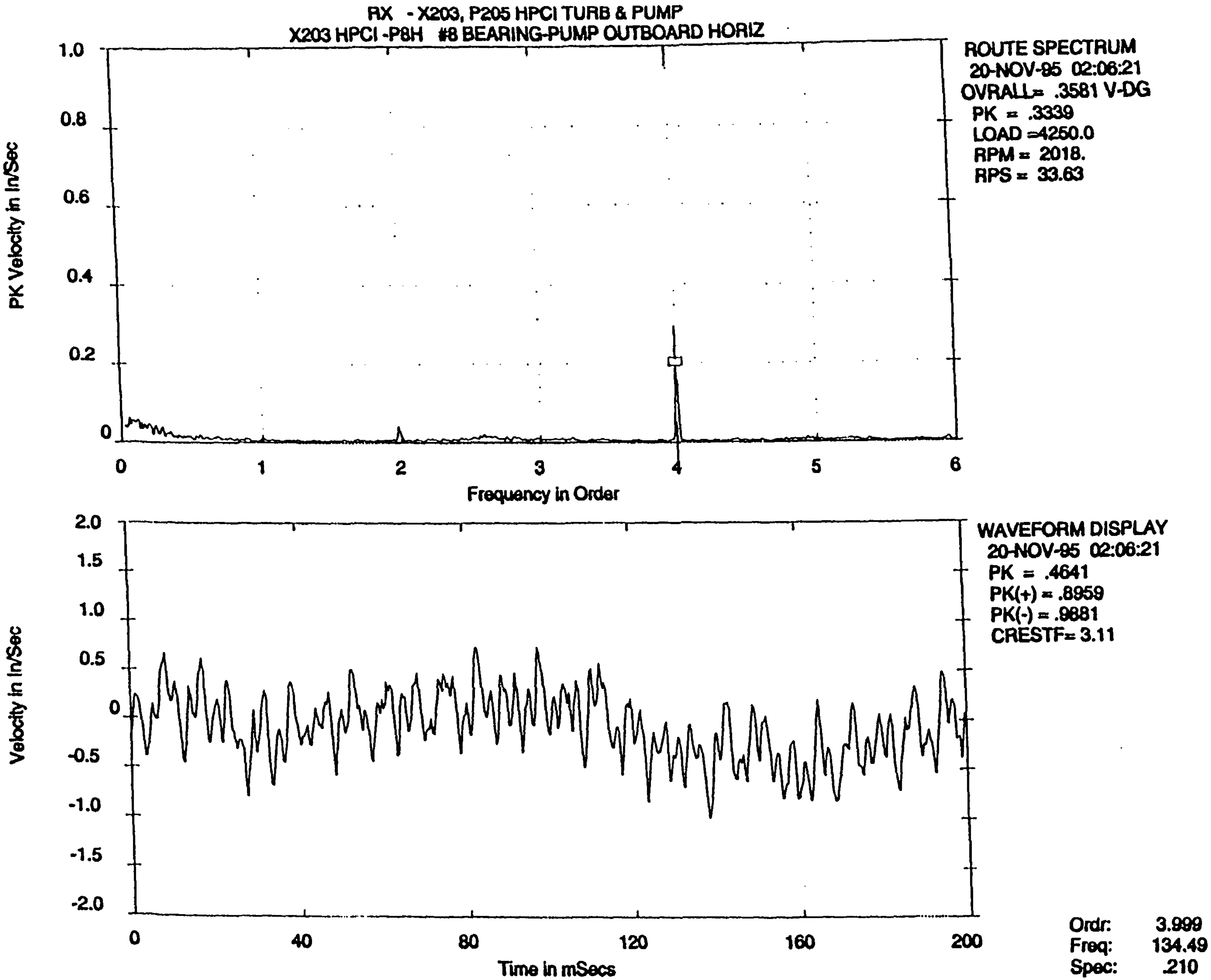


ROUTE SPECTRUM
06-MAY-96 09:31:54
OVRALL= .3510 V-DG
PK = .3499
LOAD =4250.0
RPM = 2010.
RPS = 33.50



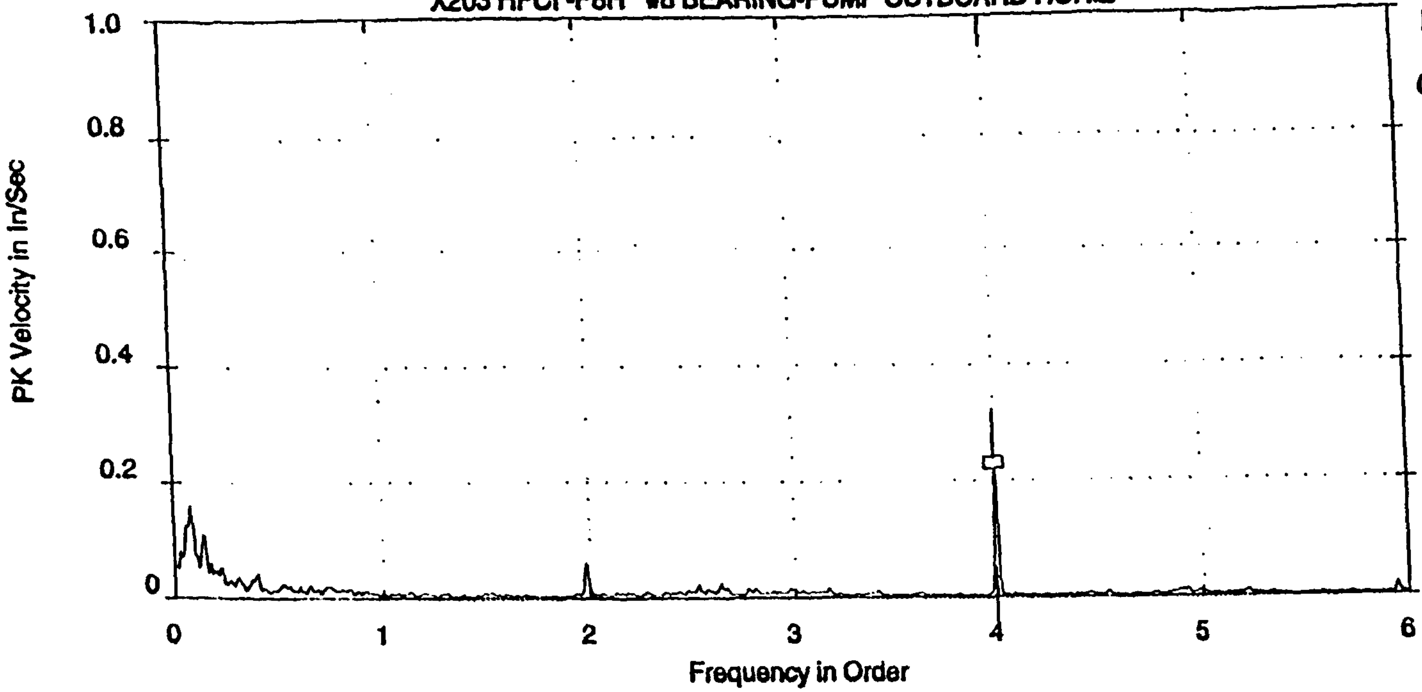
WAVEFORM DISPLAY
06-MAY-96 09:31:54
PK = .3538
PK(+) = .8159
PK(-) = .7937
CRESTF= 3.05

Ordr: 4.023
Freq: 134.78
Spec: .234

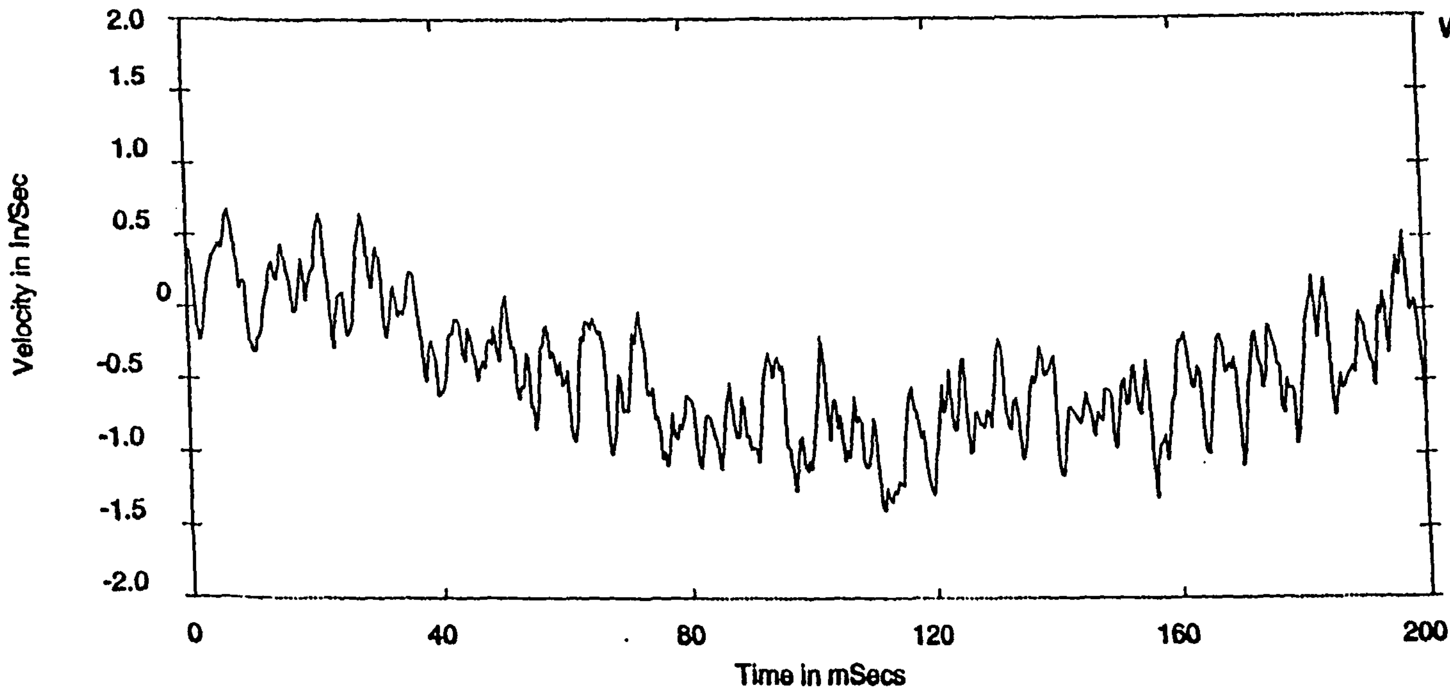


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P8H #8 BEARING-PUMP OUTBOARD HORIZ
ROUTE SPECTRUM
20-NOV-95 02:06:21
OVRALL= .3581 V-DG
PK = .3339
LOAD =4250.0
RPM = 2018.
RPS = 33.63
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
20-NOV-95 02:06:21
PK = .4641
PK(+) = .8959
PK(-) = .9881
CRESTF= 3.11
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 3.999
Freq: 134.49
Spec: .210

RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P8H #8 BEARING-PUMP OUTBOARD HORIZ



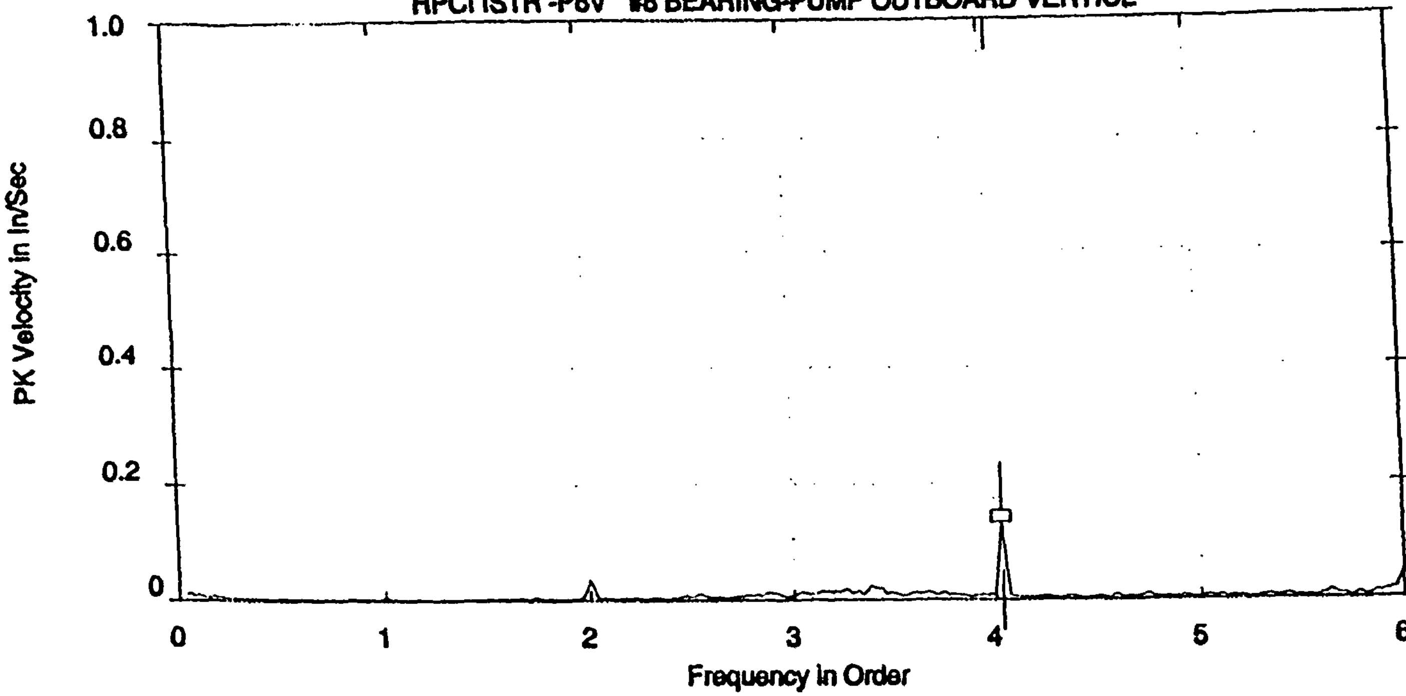
ROUTE SPECTRUM
25-MAY-94 09:36:10
OVRALL= .3571 V-DG
PK = .4744
LOAD =4250.0
RPM = 2046.
RPS = 34.11



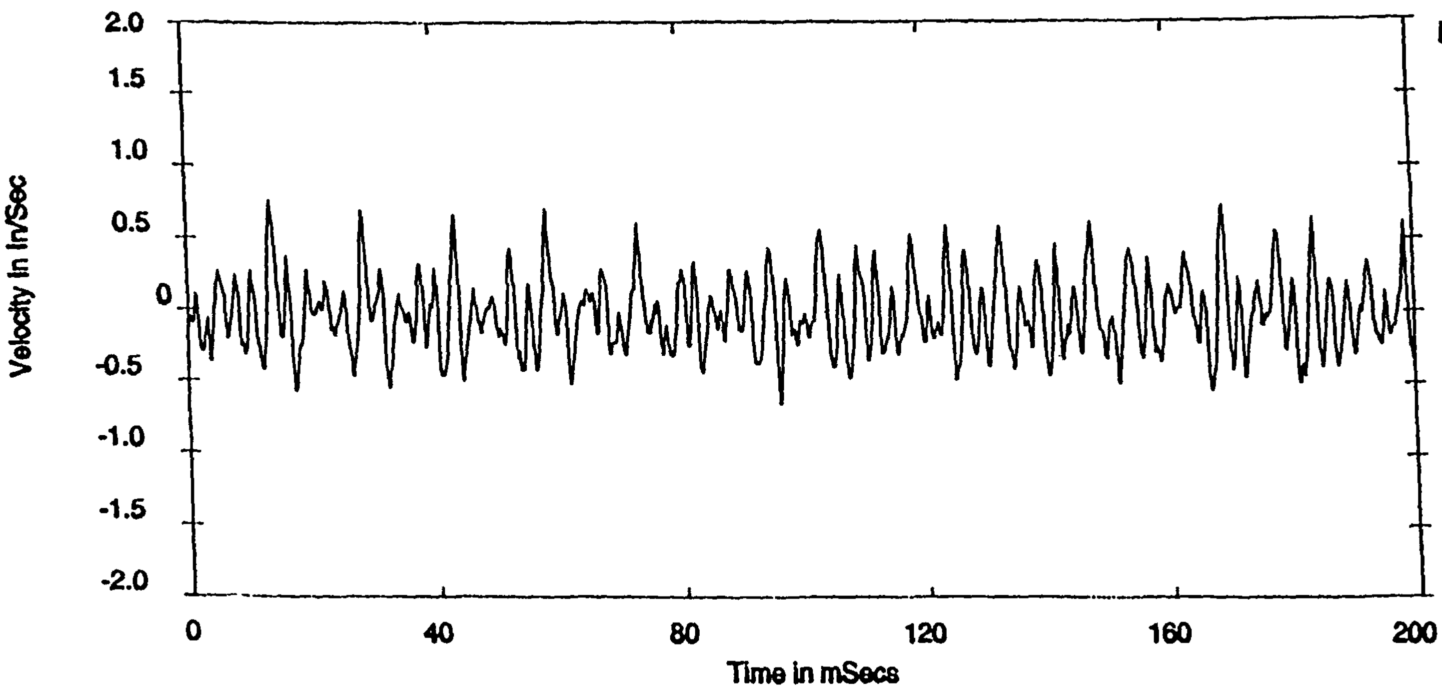
WAVEFORM DISPLAY
25-MAY-94 09:36:10
PK = .6248
PK(+) = .9390
PK(-) = 1.23
CRESTF= 2.71

Ordr: 3.999
Freq: 136.38
Spec: .248

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8V #8 BEARING-PUMP OUTBOARD VERTICL



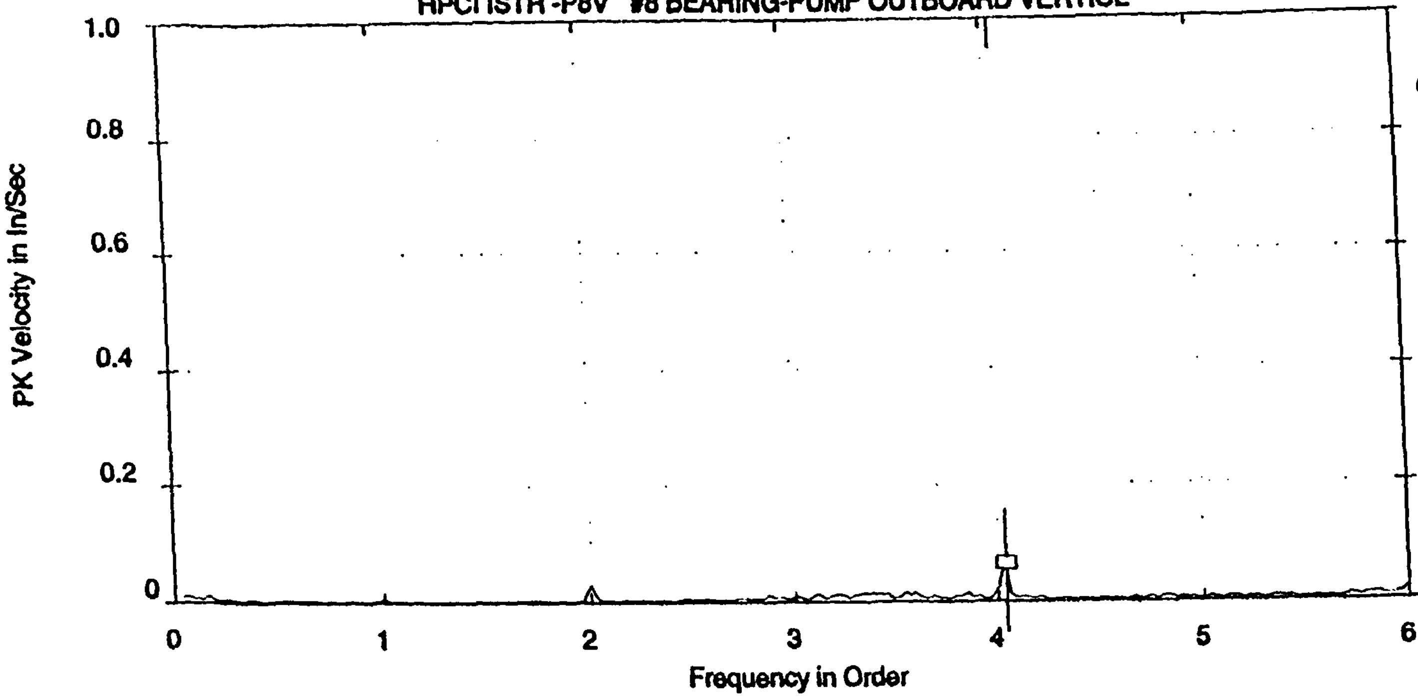
ROUTE SPECTRUM
24-NOV-04 00:50:19
OVRALL= .3576 V-DG
PK = .1753
LOAD =4250.0
RPM = 2007.
RPS = 33.45



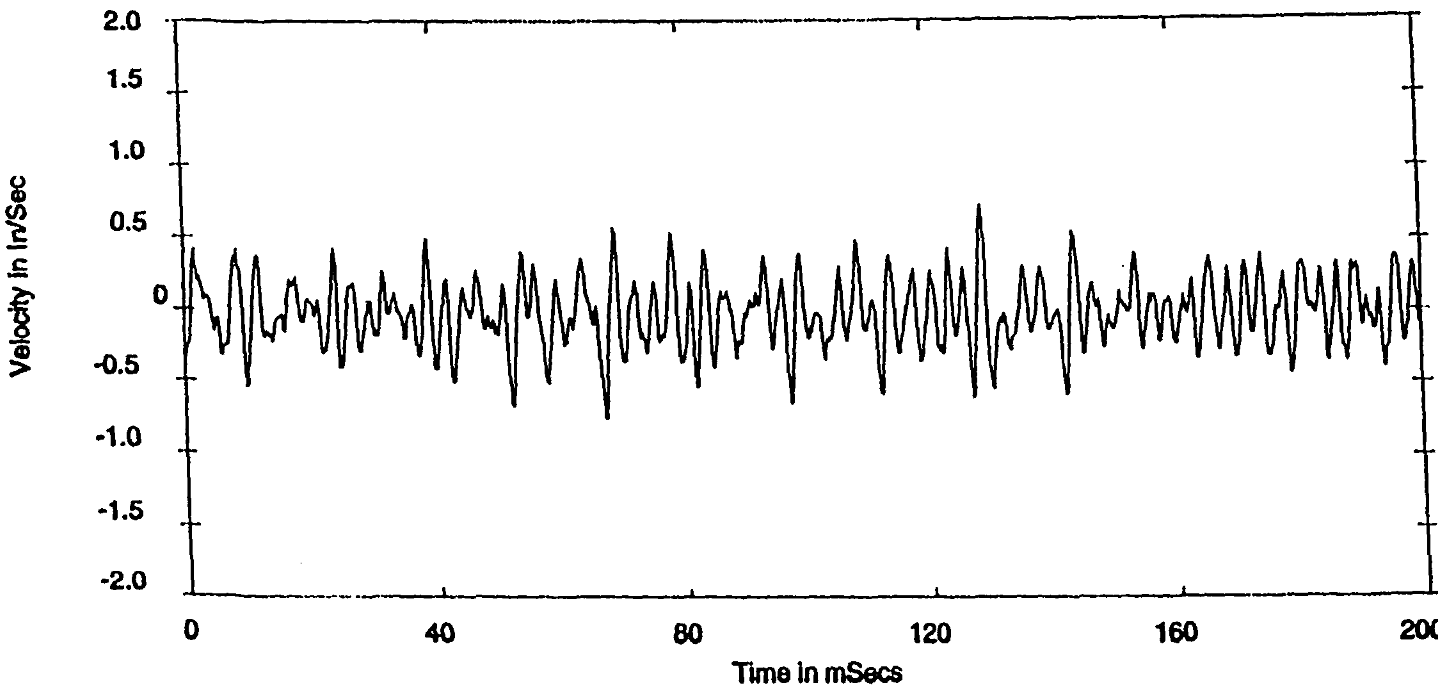
ROUTE WAVEFORM
24-NOV-04 00:50:19
PK = .3635
PK(+) = .7824
PK(-) = .6216
CRESTF= 3.04

Ordr: 4.036
Freq: 135.00
Spec: .133

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8V #8 BEARING-PUMP OUTBOARD VERTICL

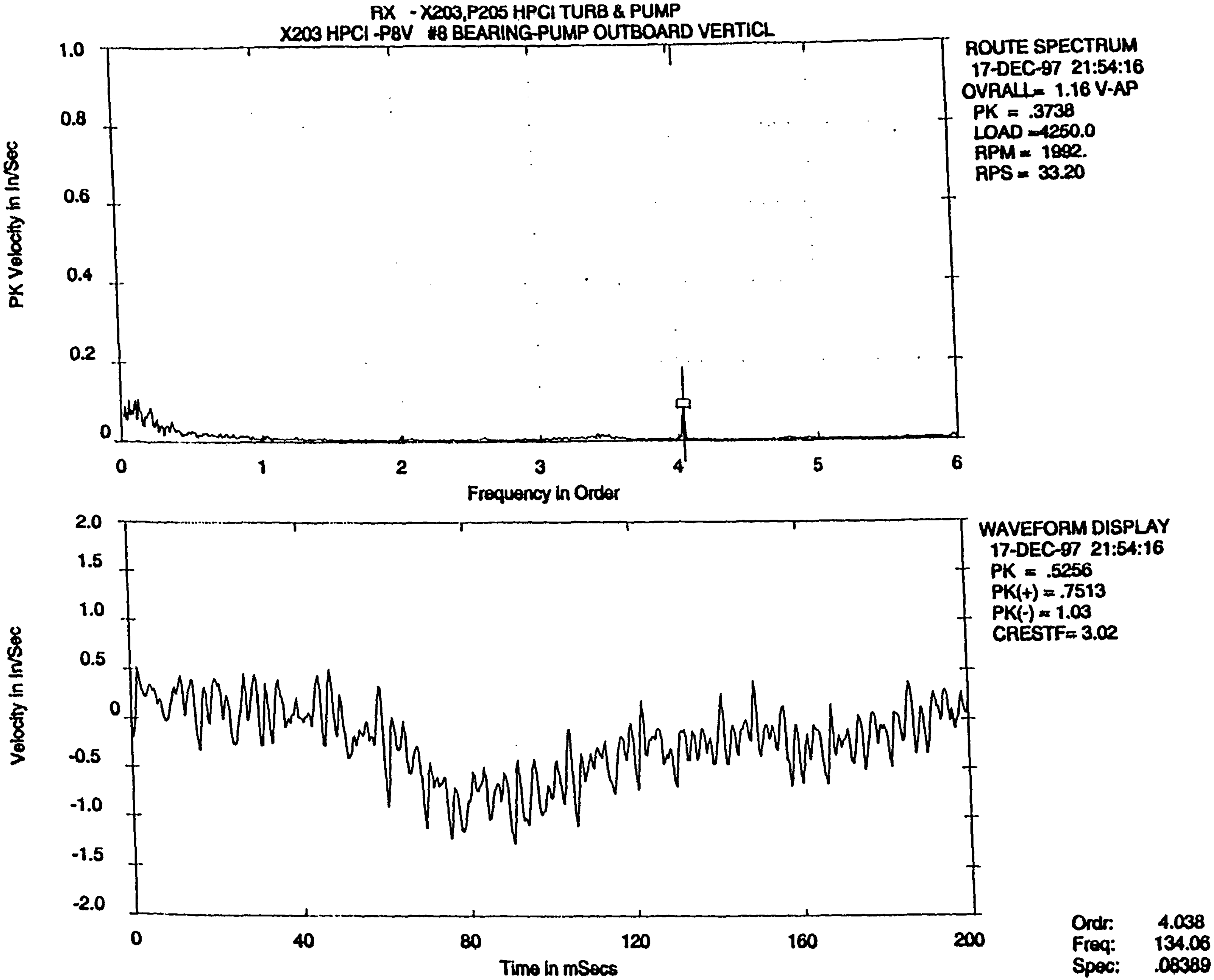


ROUTE SPECTRUM
24-AUG-04 20:53:08
OVRALL= .3336 V-DG
PK = .1177
LOAD =4250.0
RPM = 1985.
RPS = 33.09

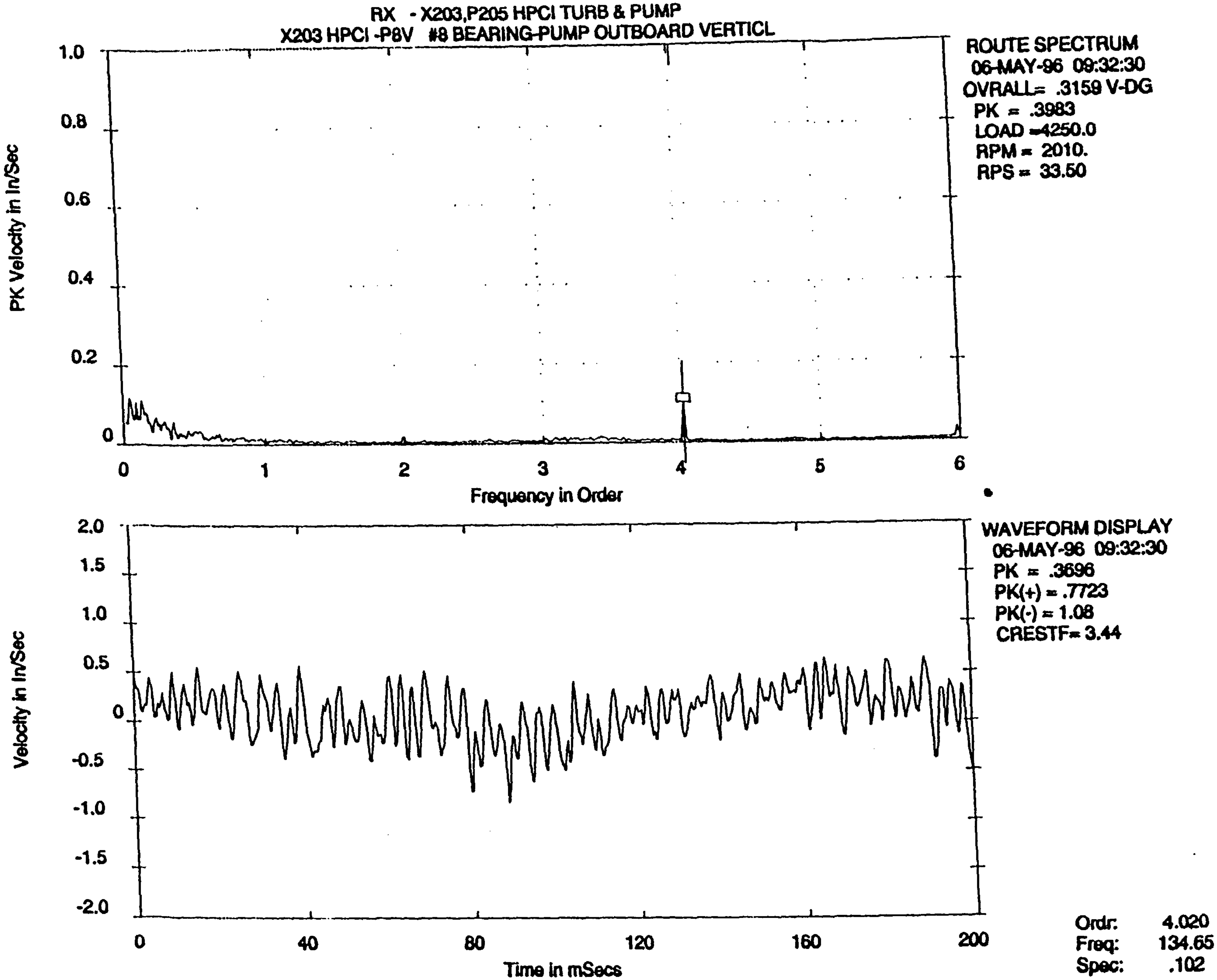


ROUTE WAVEFORM
24-AUG-04 20:53:08
PK = .3259
PK(+) = .7410
PK(-) = .7385
CRESTF= 3.22

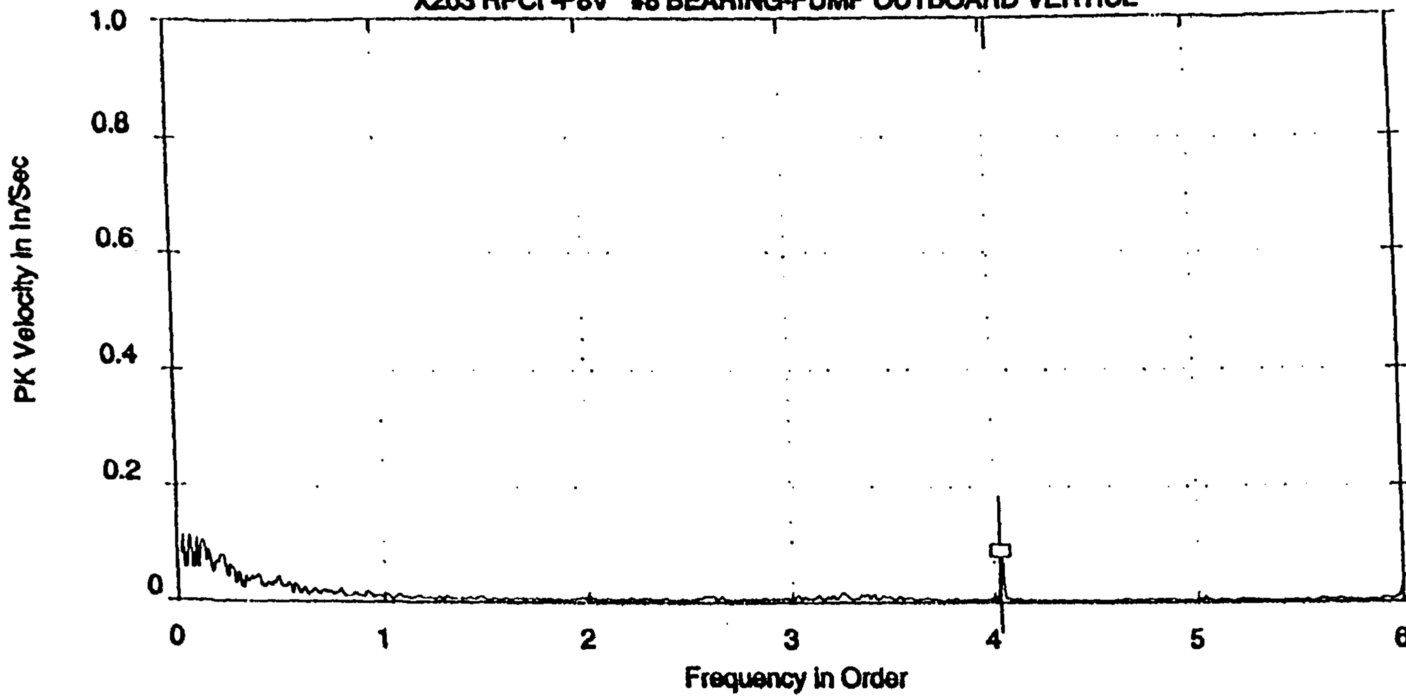
Ordr: 4.033
Freq: 133.44
Spec: .06510



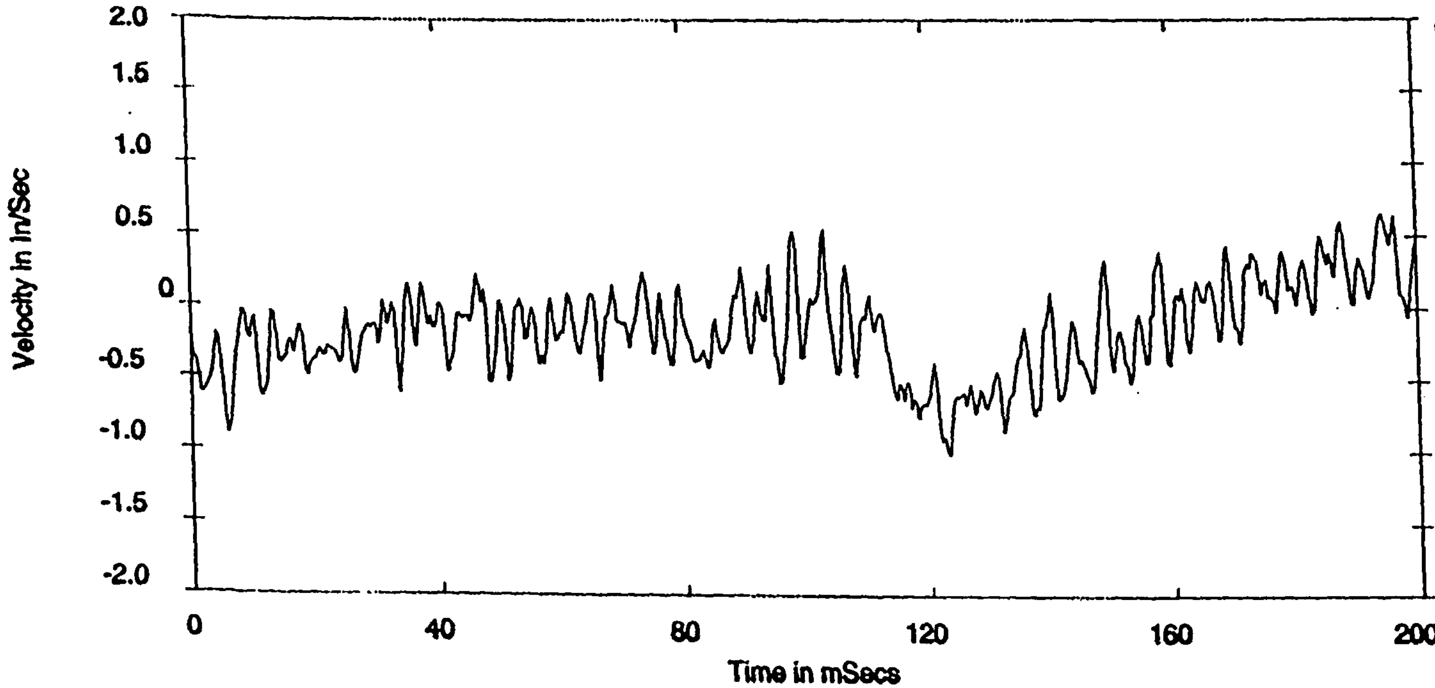
RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P8V #8 BEARING-PUMP OUTBOARD VERTICL
ROUTE SPECTRUM
17-DEC-97 21:54:16
OVRALL= 1.16 V-AP
PK = .3738
LOAD =4250.0
RPM = 1992.
RPS = 33.20
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
17-DEC-97 21:54:16
PK = .5256
PK(+) = .7513
PK(-) = 1.03
CRESTF= 3.02
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 4.038
Freq: 134.06
Spec: .08389


RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P8V #8 BEARING-PUMP OUTBOARD VERTICL
ROUTE SPECTRUM
06-MAY-96 09:32:30
OVRALL= .3159 V-DG
PK = .3983
LOAD =4250.0
RPM = 2010.
RPS = 33.50
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
WAVEFORM DISPLAY
06-MAY-96 09:32:30
PK = .3696
PK(+) = .7723
PK(-) = 1.08
CRESTF= 3.44
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
Ordr: 4.020
Freq: 134.65
Spec: .102

RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P8V #8 BEARING-PUMP OUTBOARD VERTICL

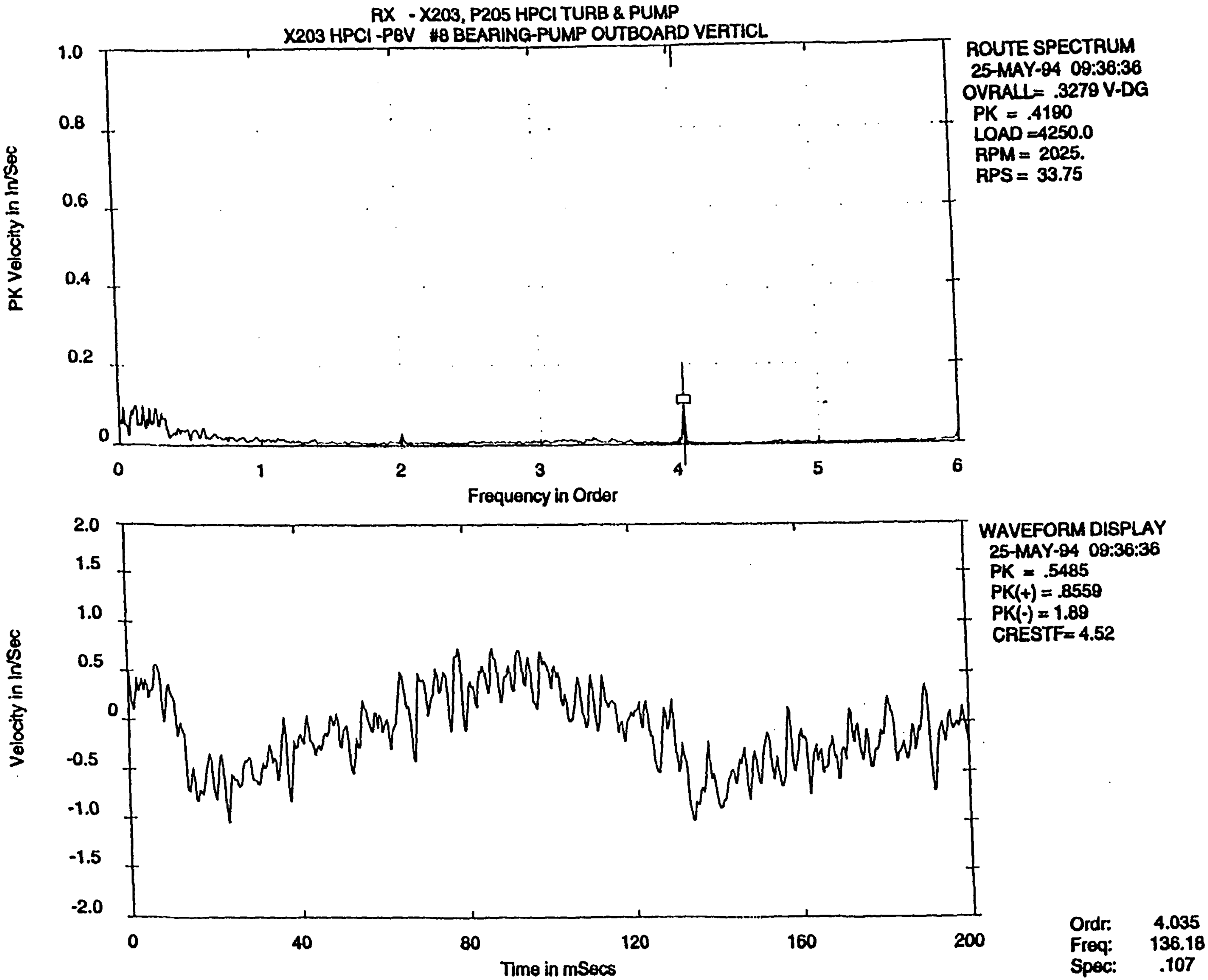


ROUTE SPECTRUM
20-NOV-95 02:06:48
OVRALL= .2974 V-DG
PK = .4175
LOAD =4250.0
RPM = 2001.
RPS = 33.34

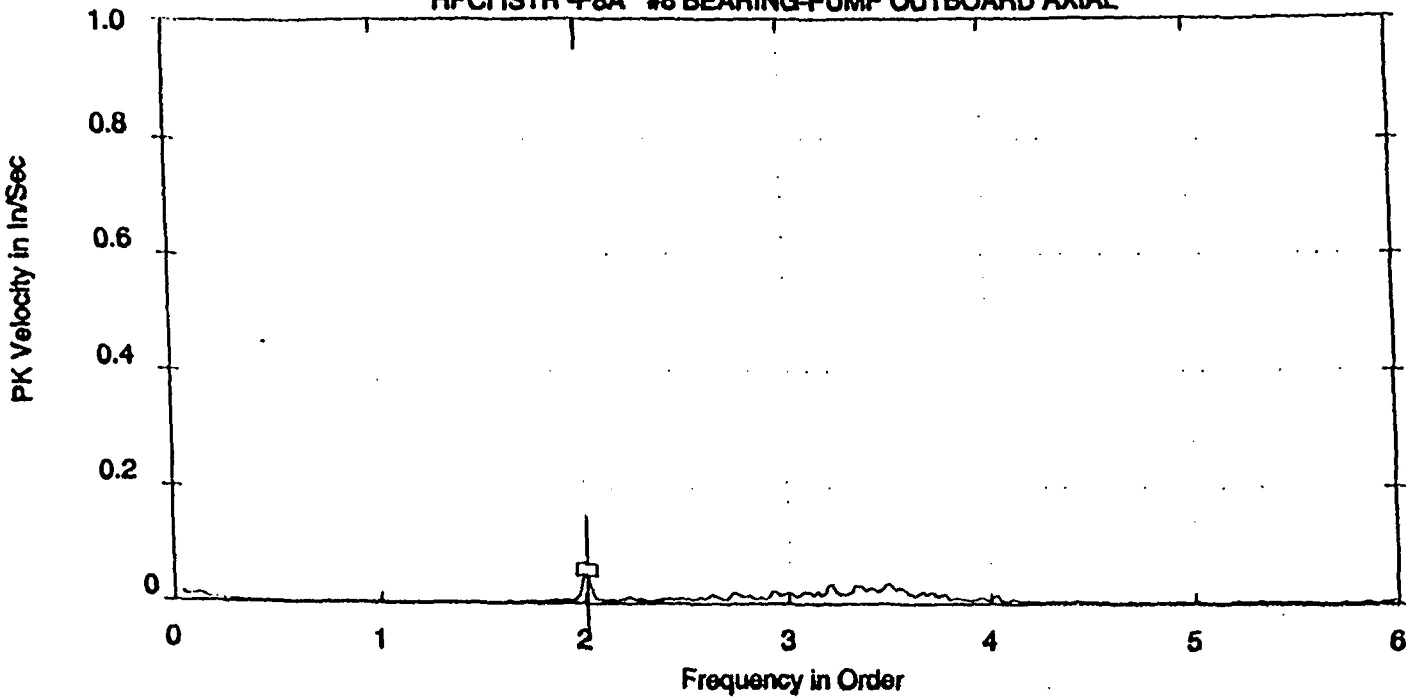


WAVEFORM DISPLAY
20-NOV-95 02:06:48
PK = .4490
PK(+) = .8496
PK(-) = .9198
CRESTF= 2.82

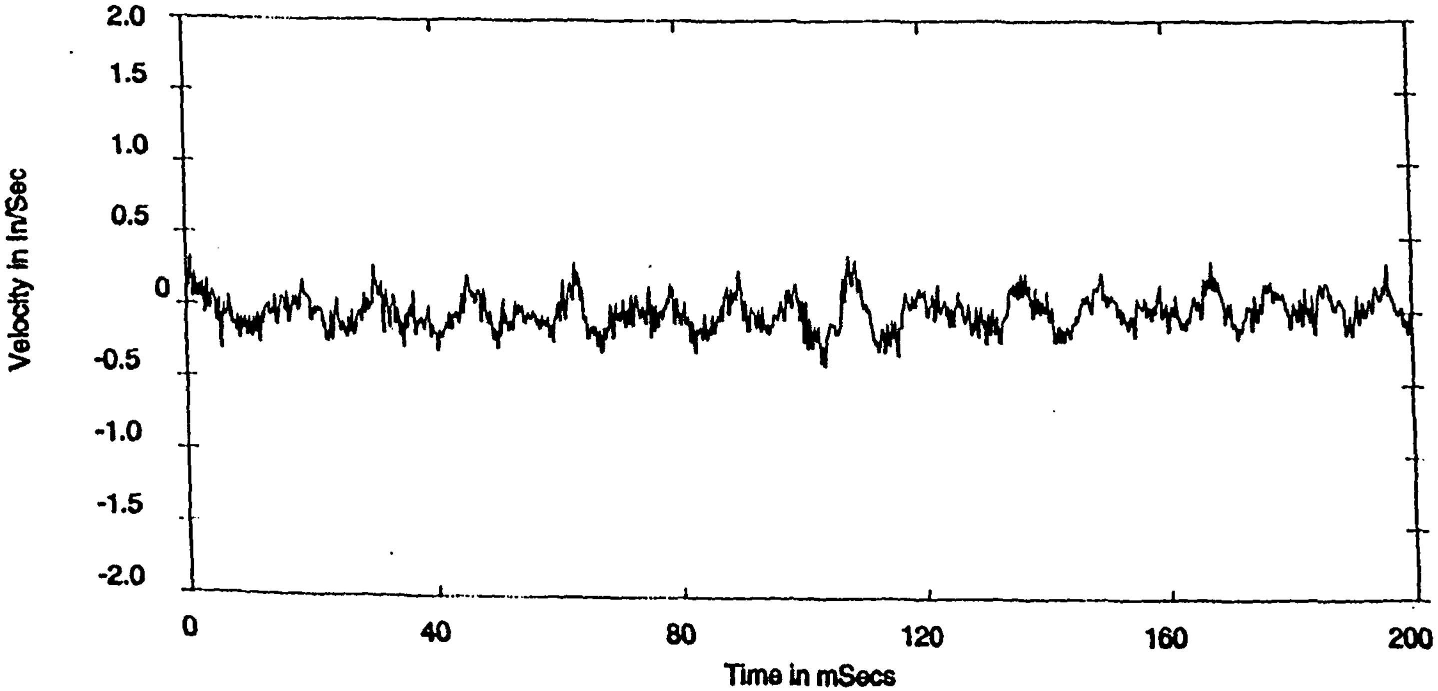
Ordr: 4.034
Freq: 134.52
Spec: .09221


RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P8V #8 BEARING-PUMP OUTBOARD VERTICL
PK Velocity in In/Sec
Frequency in Order
ROUTE SPECTRUM
25-MAY-94 09:36:36
OVRALL= .3279 V-DG
PK = .4190
LOAD =4250.0
RPM = 2025.
RPS = 33.75
Velocity in In/Sec
Time in mSecs
WAVEFORM DISPLAY
25-MAY-94 09:36:36
PK = .5485
PK(+) = .8559
PK(-) = 1.89
CRESTF= 4.52
Ordr: 4.035
Freq: 136.18
Spec: .107

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8A #8 BEARING-PUMP OUTBOARD AXIAL



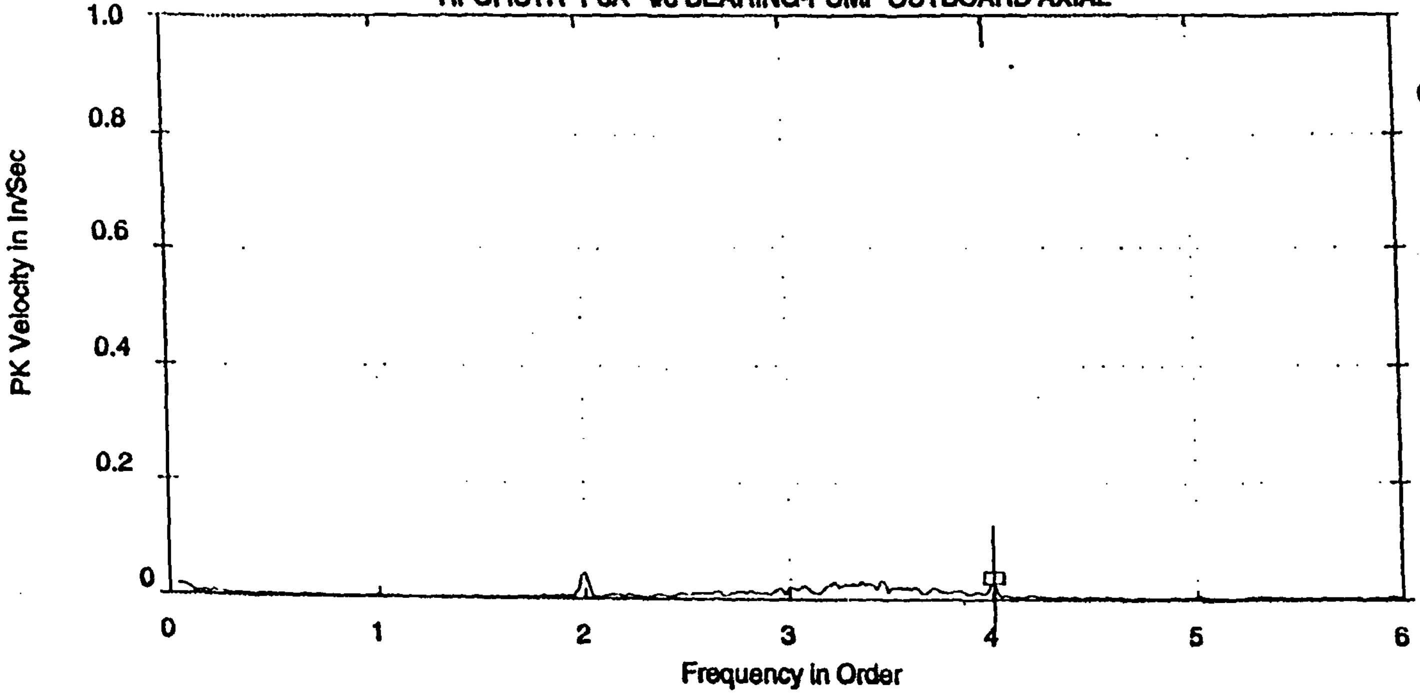
ROUTE SPECTRUM
24-NOV-04 00:57:05
OVRALL= .1761 V-DG
PK = .1523
LOAD =4250.0
RPM = 2017.
RPS = 33.62



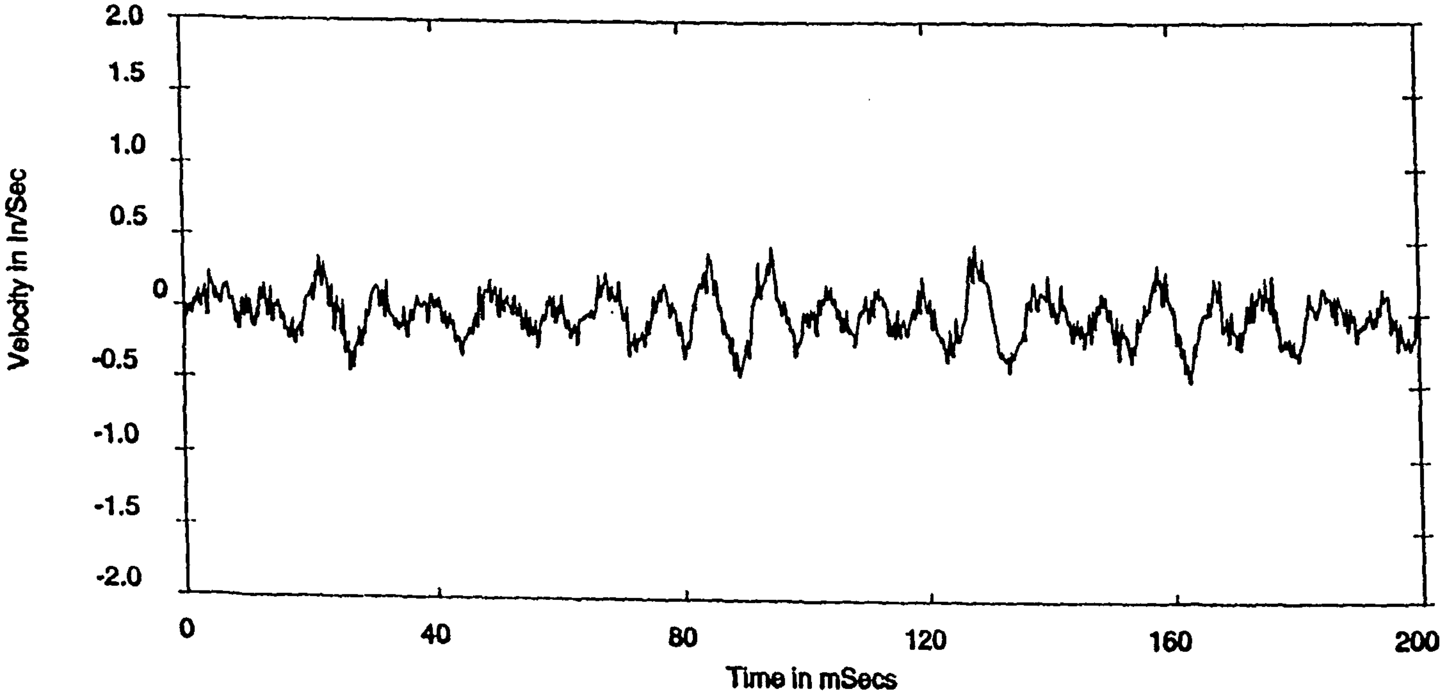
ROUTE WAVEFORM
24-NOV-04 00:57:05
PK = .1719
PK(+) = .3898
PK(-) = .3766
CRESTF= 3.21

Ordr: 2.008
Freq: 67.50
Spec: .04798

IST - IST, P205 HPCI @42.5k
HPCI ISTR -P8A #8 BEARING-PUMP OUTBOARD AXIAL



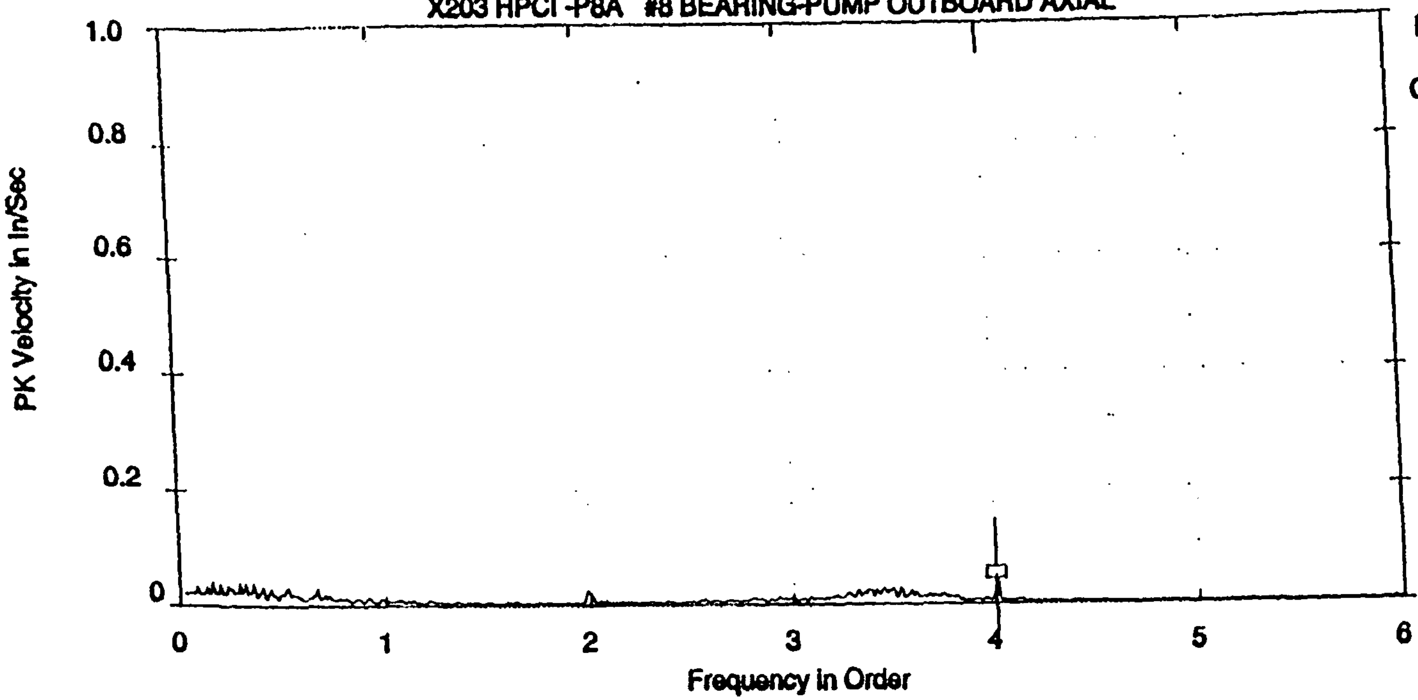
ROUTE SPECTRUM
24-AUG-04 20:53:30
OVRALL= .1736 V-DG
PK = .1499
LOAD =4250.0
RPM = 2003.
RPS = 33.38



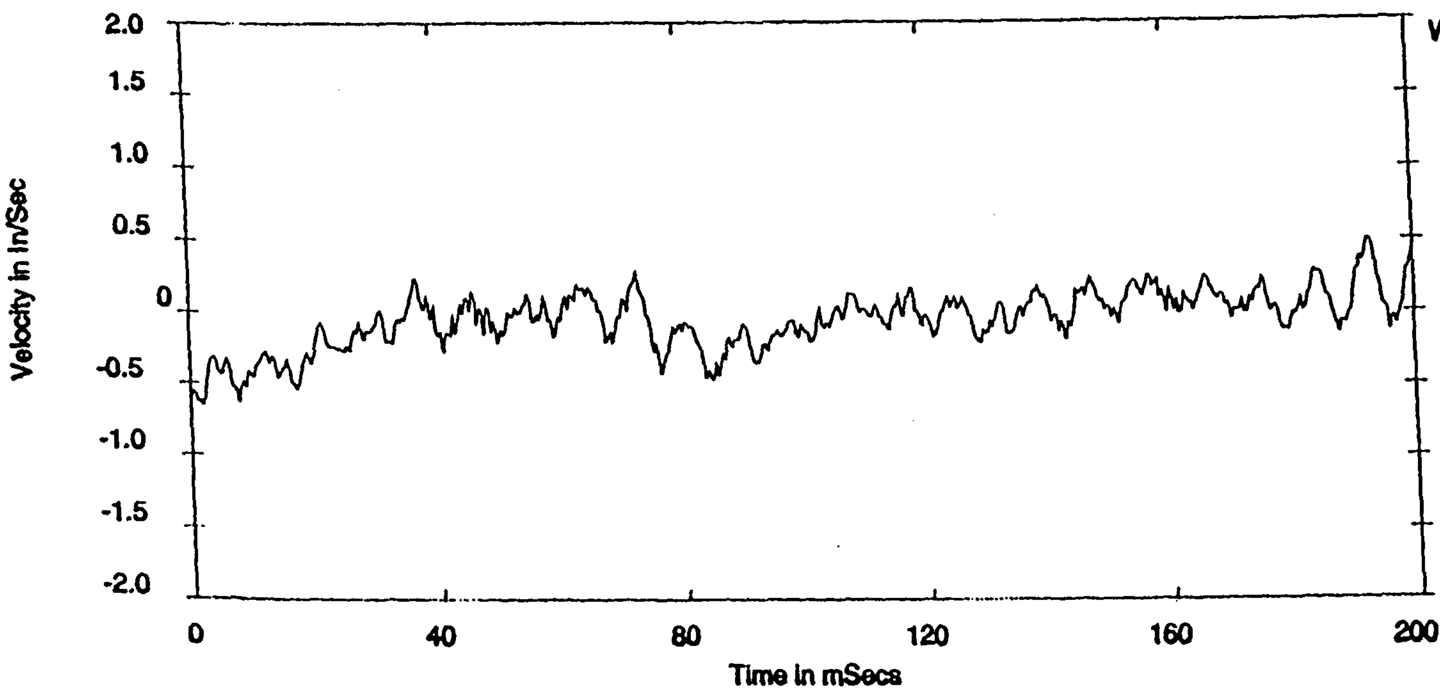
ROUTE WAVEFORM
24-AUG-04 20:53:30
PK = .2222
PK(+) = .4984
PK(-) = .4466
CRESTF= 3.17

Ordr: 4.000
Freq: 133.51
Spec: .03090

RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P8A #8 BEARING-PUMP OUTBOARD AXIAL



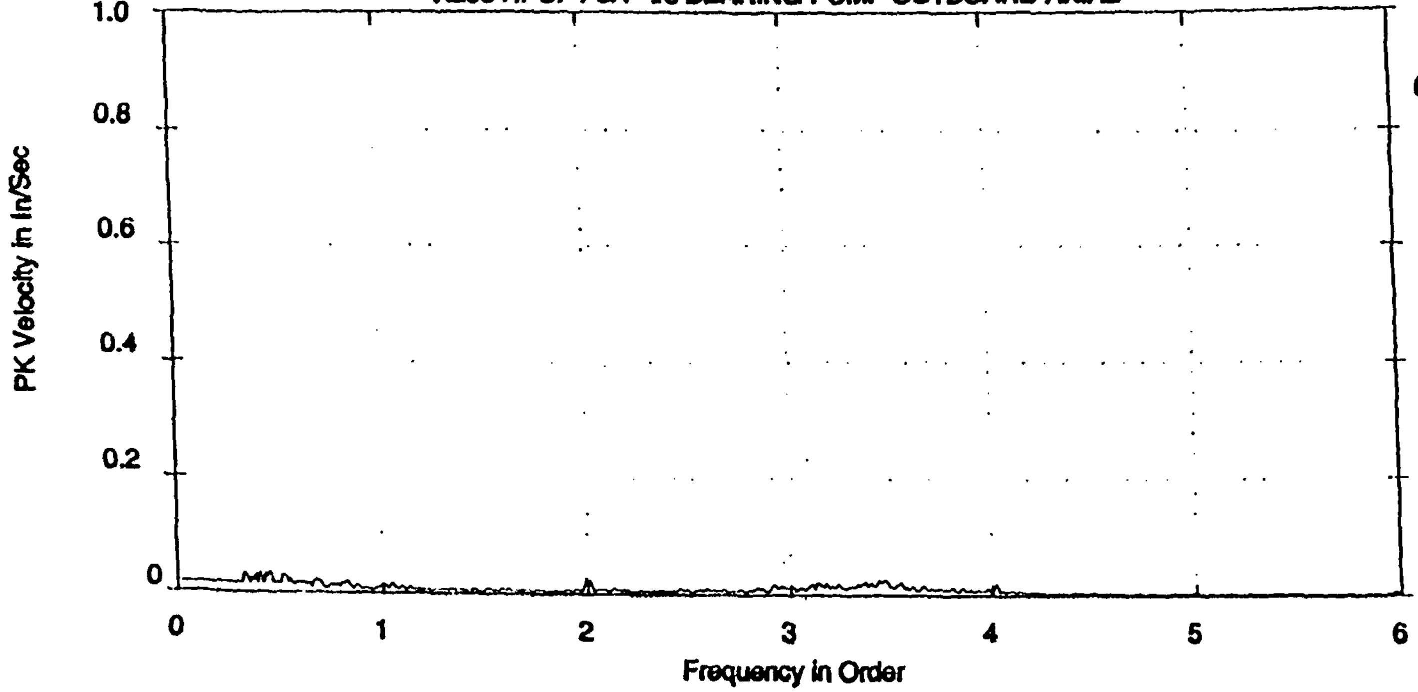
ROUTE SPECTRUM
17-DEC-97 21:54:44
OVRALL= 1.01 V-AP
PK = .2335
LOAD =4250.0
RPM = 2004.
RPS = 33.40



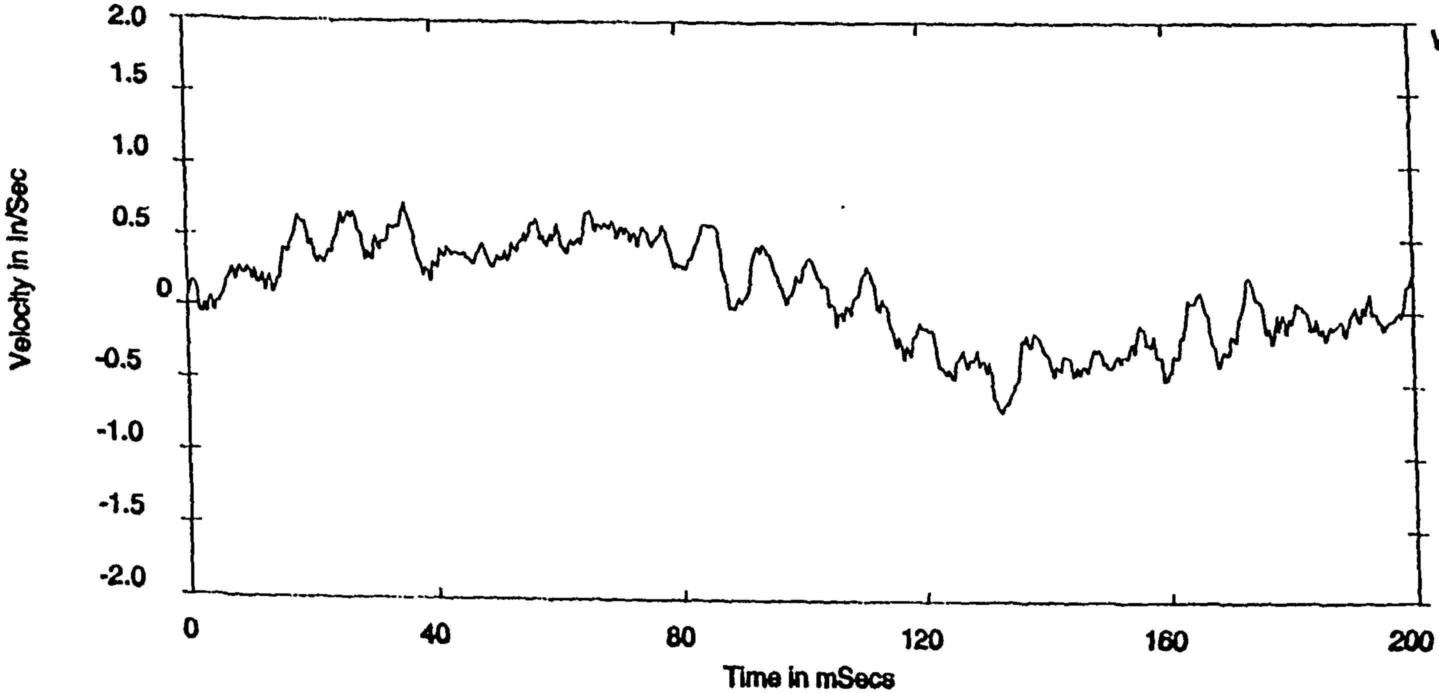
WAVEFORM DISPLAY
17-DEC-97 21:54:44
PK = .2835
PK(+) = .6054
PK(-) = .6909
CRESTF= 3.19

Ordr: 4.005
Freq: 133.75
Spec: .04367

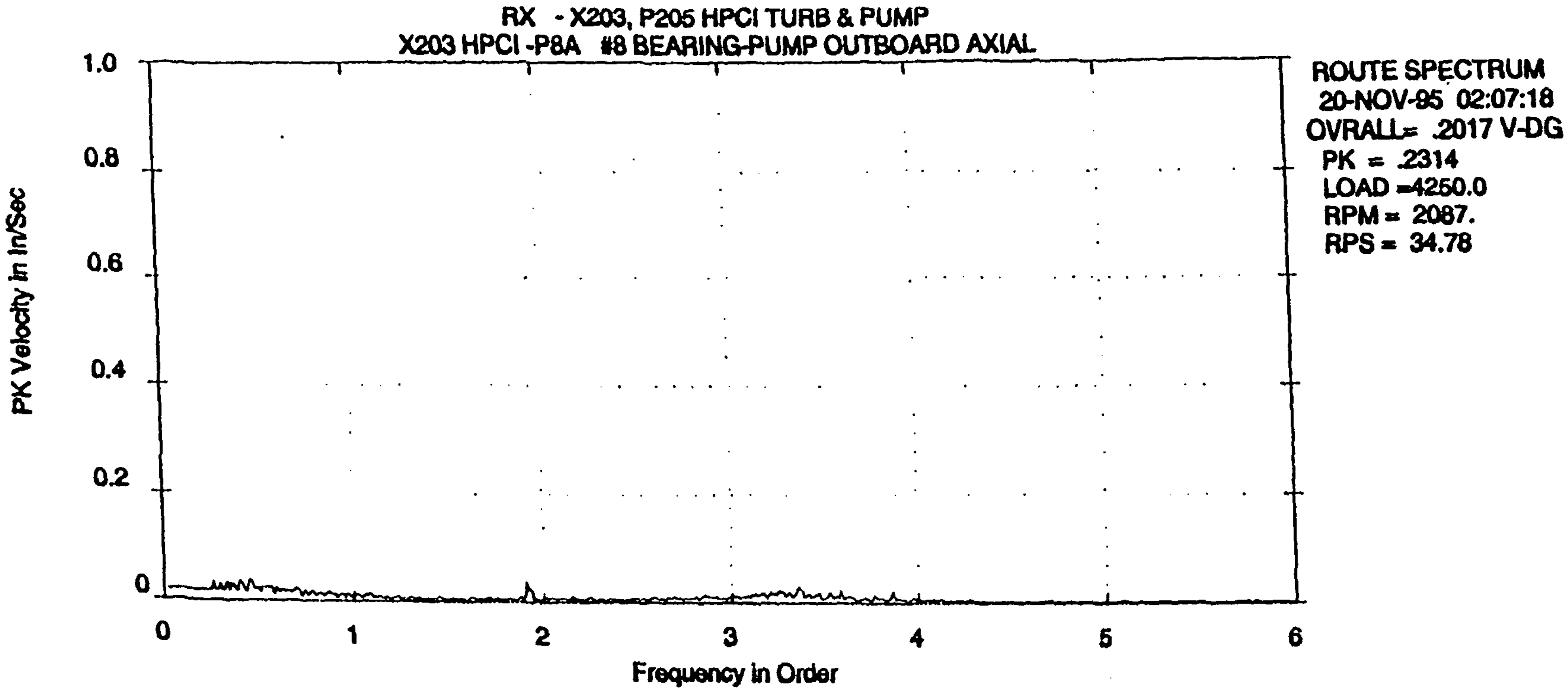
RX - X203,P205 HPCI TURB & PUMP
X203 HPCI -P8A #8 BEARING-PUMP OUTBOARD AXIAL



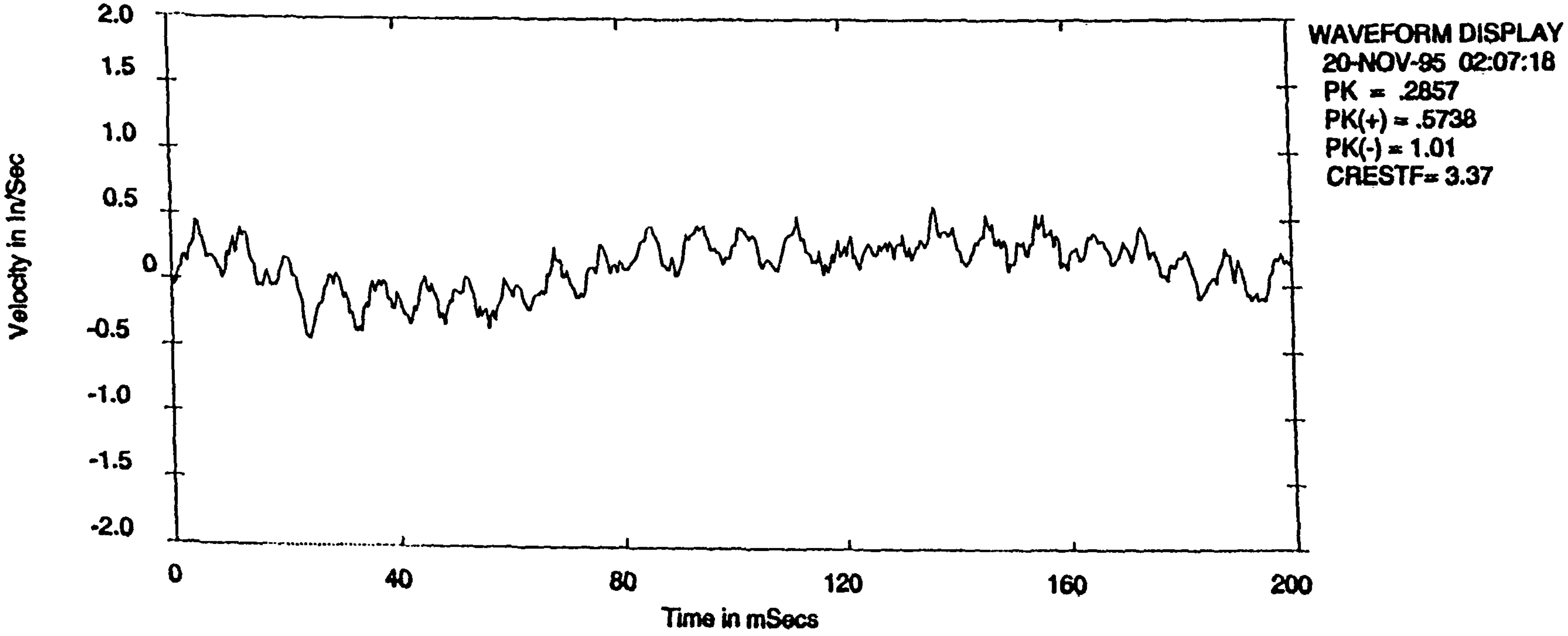
ROUTE SPECTRUM
31-JUL-96 09:54:50
OVRALL= .2007 V-DG
PK = .2261
LOAD =4250.0
RPM = 2025.
RPS = 33.75



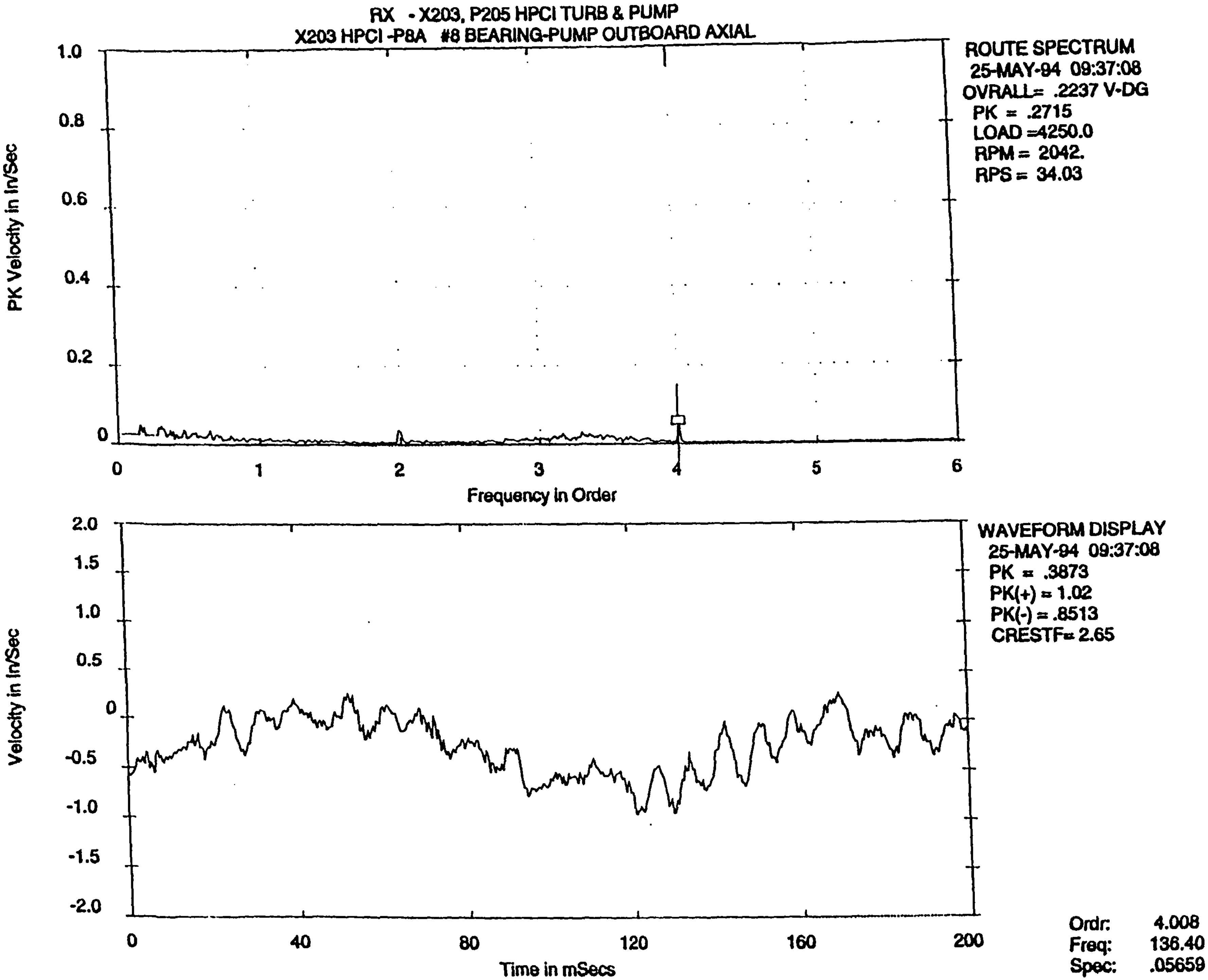
WAVEFORM DISPLAY
31-JUL-96 09:54:50
PK = .4697
PK(+) = .9066
PK(-) = 1.54
CRESTF= 3.25



RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P8A #8 BEARING-PUMP OUTBOARD AXIAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
20-NOV-95 02:07:18
OVRALL= .2017 V-DG
PK = .2314
LOAD =4250.0
RPM = 2087.
RPS = 34.78



Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
WAVEFORM DISPLAY
20-NOV-95 02:07:18
PK = .2857
PK(+) = .5738
PK(-) = 1.01
CRESTF= 3.37



RX - X203, P205 HPCI TURB & PUMP
X203 HPCI -P8A #8 BEARING-PUMP OUTBOARD AXIAL
PK Velocity in In/Sec
1.0
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5
6
Frequency in Order
ROUTE SPECTRUM
25-MAY-94 09:37:08
OVRALL= .2237 V-DG
PK = .2715
LOAD =4250.0
RPM = 2042.
RPS = 34.03
Velocity in In/Sec
2.0
1.5
1.0
0.5
0
-0.5
-1.0
-1.5
-2.0
0
40
80
120
160
200
Time in mSecs
WAVEFORM DISPLAY
25-MAY-94 09:37:08
PK = .3873
PK(+) = 1.02
PK(-) = .8513
CRESTF= 2.65
Ordr: 4.008
Freq: 136.40
Spec: .05659