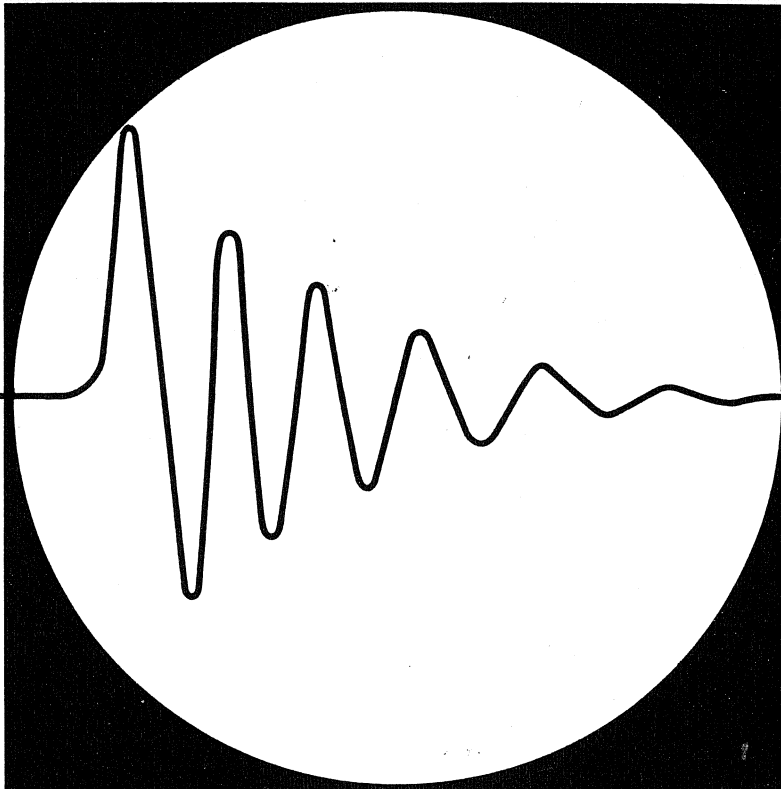


Model 731A Seismic Accelerometer
Model P31 Power Unit/Amplifier



PIEZOELECTRIC
TRANSDUCERS

WILCOXON RESEARCH

- ACCELEROMETERS
- IMPEDANCE HEADS
- VIBRATION GENERATORS
- PREAMPLIFIERS
- HYDROPHONES

Model 731A Seismic Accelerometer
Model P31 Power Unit/Amplifier

Warning!

Remove accelerometer from magnet before applying magnet to steel surface.

Sudden jolts will damage accelerometer.

Model 731A Seismic Accelerometer
Model P31 Power Unit/Amplifier

OPERATING GUIDE

Warranty Service Plan. WRI offers, as part of this agreement, a service plan for all WRI manufactured products. Under this plan WRI will repair or replace any part or component that is not operating in accordance with published specifications.

- This warranty service plan does not include:
- Products improperly installed or calibrated.
 - Products damaged, misused or misapplied.
 - Products not manufactured by WRI.
 - Unauthorized repairs or alterations
 - Neglect or accidents.

To receive service, contact WRI for a Return Materials Authorization (RMA) number. To assure delivery acceptance, write the RMA number clearly and in an obvious place on the outside of the package containing the part or component. The RMA number should be referenced on all paperwork. Shipment to WRI must be prepaid by the Customer. After repair or replacement, WRI will return the part or component to the Customer prepaid by WRI. Alternatively, the Customer may desire on-site work. In such case, the Customer may be required to pay travel and per diem for service personnel.

This service is offered to the Customer at **NO CHARGE** for a period of two years from shipment of the hardware from the factory. The period of this Service Plan may vary for specific models. At the end of this period the repair or replacement service shall be terminated. Renewals of this basic plan will be available on selected products. The products must be recertified or repaired to original specifications by WRI before the service agreement can be renewed. **THIS PLAN IS THE EXCLUSIVE REMEDY FOR CORRECTION OF IMPROPERLY PERFORMING PARTS AND COMPONENTS, NO WARRANTIES EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE, ARE GIVEN.** If full payment on the goods is not received by WRI, this Warranty Service Plan is null and void. For detailed information, please contact WRI.

Damaged Material. This material was thoroughly inspected and carefully packed in our factory. When the carrier accepted it he assumed full responsibility for its safe delivery to you. Should this material arrive in a damaged condition, apparent or concealed, claim for damage must immediately be made upon the carrier.

WILCOXON RESEARCH, INC.

Packed by _____

21 Firstfield Road, Gaithersburg, MD 20878 USA • 1-800-WILCOXON • 301-330-8811 • Fax 301-330-8873

#96026 Shipping Warranty Rev. 6 /95

Operating Instructions 90225 Rev.B2 10/94

As a result of continuing research and development, specifications are subject to change without notice.

Model 731A Seismic Accelerometer
Model P31 Power Unit/Amplifier

OPERATING GUIDE

MODEL 731A SEISMIC ACCELEROMETER
MODEL P31 POWER UNIT/AMPLIFIER

WILCOXON RESEARCH, INC.

21 Firstfield Road • Gaithersburg, Maryland 20878

1-800-842-7367 • 301-330-8811

FAX No: 301-330-8873

Operating Instructions 90225 Rev.B2 10/94

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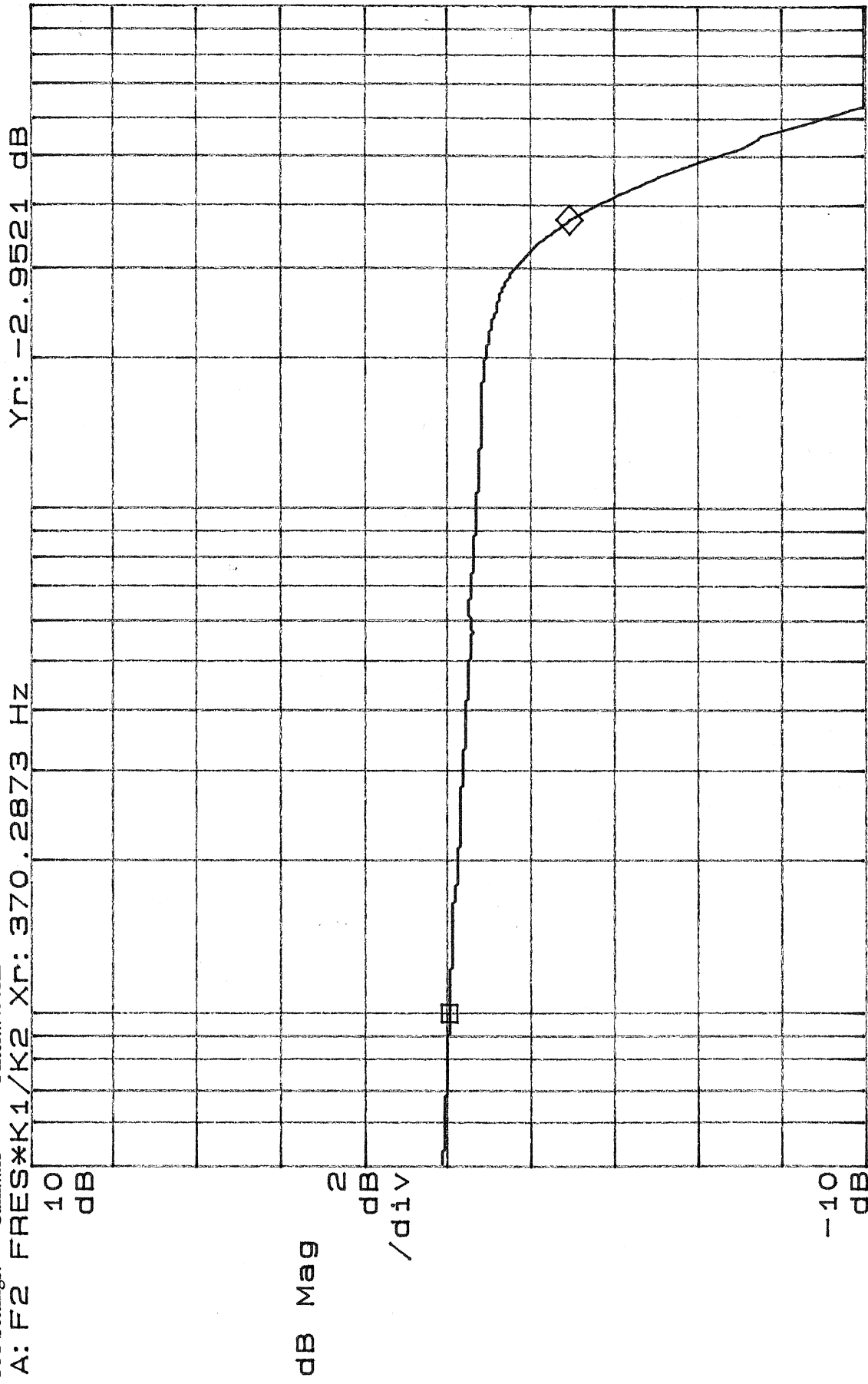
21 Firstfield Road · Gaithersburg, MD 20878

1-800-842-7367 (1-800-VIB-SENS) · 301-330-8811 · FAX 301-330-8873

Accelerometer System, Models 731/P31, Calibration Data

Serial Numbers, 731/P31 1287/953 Mounted Resonance 1128 Hz
 Voltage Sensitivity 10.3 V/g Maximum Amplitude Range 0.5 g Peak
 Transverse Sensitivity 1 % of axial Filter...450Hz
 P31 Settings: Gain...x1 Calibrated By SEM Date 4/09/98

Nominal Low End Frequency Response:
 -1dB 0.10 Hz
 -3dB 0.05 Hz



5HZ

1KHZ

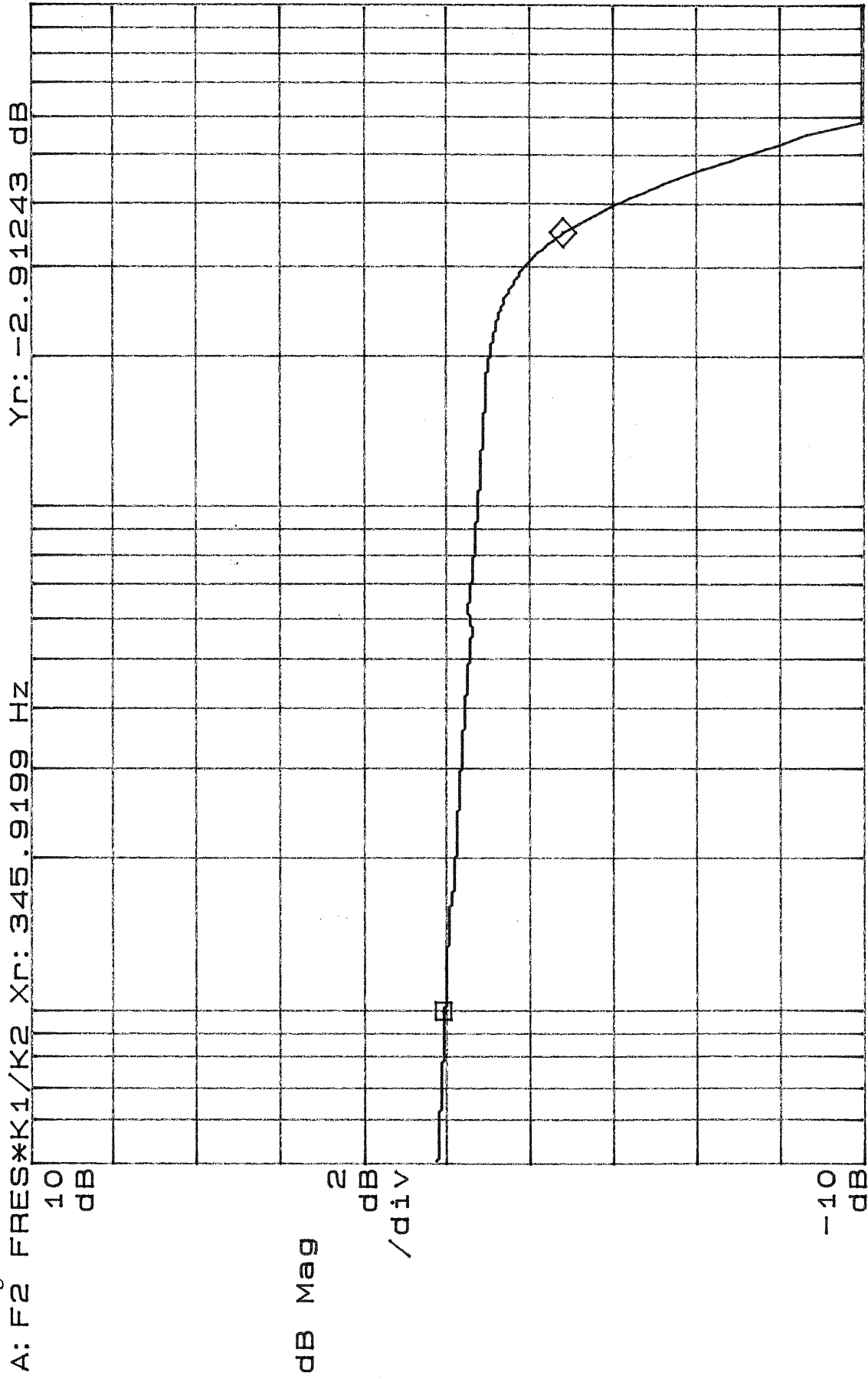


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Accelerometer System, Models 731/P31, Calibration Data

Serial Numbers, 731/P31 1286/952 Mounted Resonance 1128 Hz
 Voltage Sensitivity 10.0 V/g* Maximum Amplitude Range 0.5 g Peak
 Transverse Sensitivity 1 % of axial Calibrated By Sam Y Date 4/09/98
 P31 Settings: Gain...x1 Filter...450Hz
 Nominal Low End Frequency Response: -1dB 0.10 Hz -3dB 0.05 Hz



5HZ

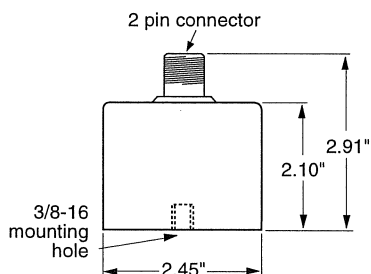
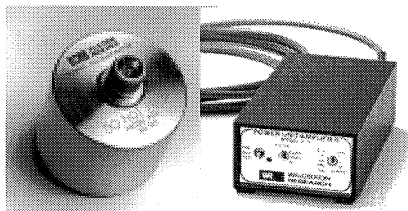
1KHZ

Reference Sensitivity at 10 Hz, 25°C. This calibration is traceable to the National Institute of Standards and Technology, Gaithersburg, MD.

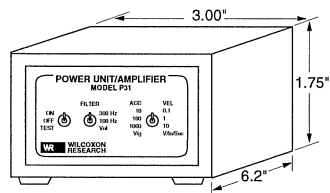


Model 731A/Model P31 System Seismic Accelerometer and Power Amplifier

SPECIFICATIONS



Model 731A



Model P31

DYNAMIC

Acceleration Sensitivity, selectable	10, 100, 1000 V/g
Velocity Sensitivity, selectable	0.1, 1, 10 V/in/sec
Vibration Range, max.	0.5 g peak
Amplitude Nonlinearity	1%
Frequency Response	See graph
Transverse Sensitivity, max.	1% of axial

ELECTRICAL

Output Impedance	2500 Ω
Recommended Load Impedance	> 250 KΩ
Maximum Output Voltage	5 V peak
Noise	See graph
Grounding	Case isolated
Output Connector:	
Model 731A	MIL-C-5015, 2 pin
Model P31	BNC

POWER REQUIREMENTS

Internal Batteries	Four 9 Volt Alkaline
Battery Life	> 150 hours

ENVIRONMENTAL

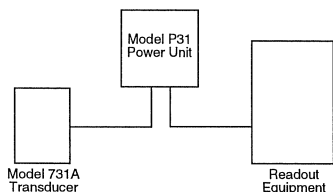
Temperature Range	-10 to 65°C
Vibration Limit	10 g peak
Shock Limit	Fragile ¹
Base Strain, Sensivity	0.0001 g/μstrain

PHYSICAL

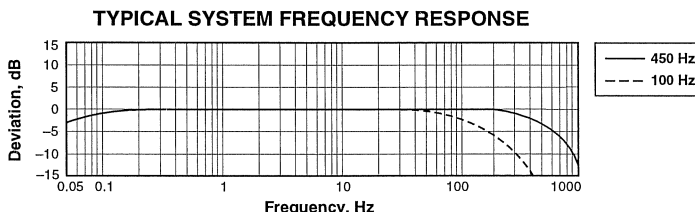
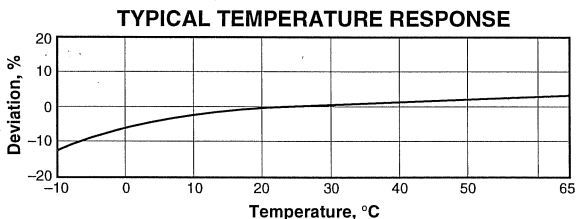
Weight:	
Model 731A Seismic Accelerometer	670 grams
Model P31 Power Unit/Amplifier	600 grams
Interconnect Cable, Model 731A to Model P31	R6-2T-J9-10, two conductor shielded, PVC jacket, 10 ft.

NOTES: ¹ Fragile, but will withstand a six inch drop to concrete.

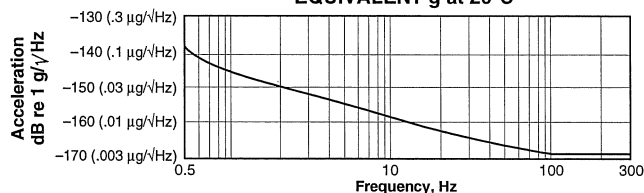
ACCESSORIES SUPPLIED: Calibration data; cable; SF7 mounting stud.



POWERING WITH P31 POWER UNIT



TYPICAL NOISE FLOOR EQUIVALENT g at 20°C



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1. INTRODUCTION

The Model 731A Seismic Accelerometer and Model P31 Power Unit Amplifier is a unique state-of-the-art system for the measurement of extremely low level vibrations. This system has the capability to measure to the sub-micro g level by combining a high sensitivity piezoelectric sensing element, an integral ultra-low noise amplifier and a matching low-noise amplifier/filter/power supply. The amplifier also contains an integration circuit to yield an output proportional to velocity.

This system is particularly suited for the measurement of low level vibrations as in bridge, building, tower and dam motion studies, optical and photographic stability monitoring, electron microscope and microtome monitoring, as well as vibration-isolation table monitoring.

2. DESCRIPTION

2.1 Model 731A Seismic Accelerometer

The Model 731A Seismic Accelerometer incorporates an isolated piezoelectric sensing element which minimizes the effects of transverse motion, base strain, and thermal transients. The accelerometer also contains a proprietary solid state charge amplifier with an extremely low noise floor. This enables the sensing of low level vibration, with a device which has a sensitivity of 10 V/g. The Model 731A Accelerometer is relatively small and comes in a case for safe transport. Due to its extremely high sensitivity, the Model 731A is fragile. Do not drop it! Protect the unit at all times from accidental impacts. Handling vibration and shock must not exceed 15 g peak.

2.2 Model P31 Power Unit/Amplifier

The Model P31 Power Unit/Amplifier is specifically designed to further enhance the capabilities of the Model 731A Seismic Accelerometer by providing signal amplification, selective filtering, and signal integration to yield velocity output signals. It also provides the constant current needed to power the accelerometer's internal amplifier.

The P31 is battery powered, using four standard 9 volt alkaline transistor batteries with an operating life of approximately 150 hours. The green LED lamp glows for good battery condition when the power switch is moved to the TEST position. All switches and the indicator light are on the front panel, input and output connectors are on the rear panel. The power unit provides 2.4 mA constant current to the Model 731A accelerometer. A selectable-gain amplifier provides gains of 1, 10, and 100.

Acceleration or velocity output is switch selectable. The two acceleration settings provide integral filtering with nominal system band-widths (minus 3 dB) of 0.05 to 450 Hz, and 0.05 to 100 Hz, respectively. The velocity setting yields a nominal system response of 1.5 to 150 Hz (± 1 dB), with outputs of 0.1 V/in/sec., 1 V/in/sec., and 10 V/in/sec. for the three gain levels of 1, 10, and 100.

2.2.1 Model P31 Options

The Model P31-1 has a slightly different design than that of the P31. The filter and velocity switch that is present on the Model P31 is disabled on the Model P31-1. By removing all filters, the phase change from input to output is minimized. However, the resonance of the accelerometer is not dampened, so the user should take care not to overload the system at the natural frequency.

3. OPERATION

3.1 Inspection

After carefully unpacking the Model 731A Accelerometer, the Model P31 Power Unit/Amplifier and cables, inspect the external parts for damage to switches, indicator and connectors. If there is damage, file a claim with the carrier who transported the instrument. Retain the shipping container and packing material for use in case reshipment is required.

CAUTION: Use great care in handling the Model 731A Accelerometer. It is fragile. Never DROP it or hit it against a solid object.

3.2 Preparation For Use

Mount accelerometer on test structure using 3/8-16 UNC stud. The mounting surface should be about 2 3/4" (70 mm) in diameter, flat and clean. Hand tighten accelerometer; do not use wrench. Alternately, the accelerometer may be fastened using cement or bee's wax. Care must be taken that the accelerometer is not accidentally dislodged and damaged. Particular care is needed when mounting the accelerometer to the side of structure (sensitive axis horizontal). A threaded stud is recommended in this case.

Depress POWER SWITCH (1) of the Model P31 Power Unit/Amplifier to TEST position. BATTERY CONDITION INDICATOR (2) should show a steady green light, release switch. Connect the proper cable to the input connector on the P31 and to the Model 731A Seismic Accelerometer to be powered. This cable should be free of kinks and cable connectors should be clean. Connect one end of a coaxial cable to the output BNC connector on the rear panel of the P31 and connect the other end of the cable to the readout or recording instrument.

3.3 Measurement Use

Set FILTER SWITCH (3) to desired mode of operation: "Acceleration, 450 Hz low pass", or "Acceleration, 100 Hz low pass", depending on desired frequency range of measurement. If an output proportional to velocity is desired, set function switch (3) to "Velocity".

Set GAIN SWITCH (4) to desired gain setting. Good operating practice starts with the lowest gain setting to prevent amplifier overloading if input signals are larger than anticipated. Gain settings of 1, 10, and 100 result in system sensitivities (with the Model 731A Seismic Accelerometer) of 10, 100, and 1000 V/g, respectively for both acceleration functions, and 0.1, 1 and 10 V/in/sec. for the velocity function.

Note: It takes about 2 minutes after power-on before the system is ready for use.

3.4 Precautions In Use

The Model 731A Seismic Accelerometer is fragile and must be handled gently. The P31 should not be subjected to environments in excess of its specified temperature and humidity ranges. It should be protected from condensation and corrosive atmospheres.

3.5 Alternate Power Supply

The Model P31 was specifically designed to optimize the capabilities of the Model 731A Seismic Accelerometer. The accelerometer can, however, be operated with an alternate power supply, consisting of a constant current diode (rated at 2 mA to 10 mA) fed from a +18 to +30 Vdc constant voltage supply. A DC voltage will be present at the output of the accelerometer. A blocking capacitor and shunt resistor (as shown in Figure 3) may be added to decouple the DC voltage. The time constant of the capacitor-resistor combination must be large enough to not degrade the capability of the 731A accelerometer (-3 dB at 0.05 Hz).

The model 731A has a two pin (MIL-C-5015) connector with pin A for the DC constant current input and signal high (signal output), and pin B for the signal return.

4. MAINTENANCE AND TROUBLE SHOOTING

The P31 Power Unit/Amplifier is fully adjusted and ready to operate when received from Wilcoxon Research. A new set of 9 volt alkaline batteries is mounted in the power unit. Under normal circumstances, those batteries have an operational life of about 150 hours.

4.1 Battery Replacement

If those batteries need replacement (as indicated by the absence of the green light from the battery condition indicator), this can easily be done. Turn the P31 upside down, remove the retaining screws in the bottom panel and slide the chassis out from the cover box. The batteries are located in an internal, padded container. Simply remove the batteries from the container, unplug the snap-on connectors and plug in the new batteries. Replace them in the container, slide chassis back into cover box and replace the 4 retaining screws. Check the BATTERY CONDITION INDICATOR (2) to make sure the new batteries function correctly.

4.2 Amplifier and Accelerometer Checks

If the P31 Power Unit/Amplifier appears to malfunction, its operation can be checked electrically. The output of a signal generator (at about 30 Hz) is fed through an RC network into the input of the P31 Power Unit/Amplifier. This network consists of a 100 μ F capacitor in series with the input and a 3.74 k Ω resistor shunted across the input as shown in Figure 5. In this electrical signal substitution method the signal generator is set to produce an output signal with an amplitude of about 3 V rms at each gain setting. If this test indicates P31 malfunction, the unit should be returned to the factory for repair.

If the Model 731A Accelerometer appears to malfunction, one should measure the DC level (bias output voltage) at the output of the accelerometer (e.g. input of the P31). Note that the turn on time is about two minutes. With no significant vibration input, this DC level should be about +9 Vdc. Much lower or higher DC voltages indicate internal problems and the accelerometer should be carefully packed and returned to the factory for repair.

5. WARRANTY

Limited Warranty

The seller warrants that the goods described in this invoice shall be free from defects in materials or workmanship for a period of one year from the date of invoice. In order for this warranty to be in effect, the specific item claimed to be defective must be returned to the seller, transportation prepaid, no later than 7 days after the expiration of the warranty period. The seller's liability under this warranty is expressly limited to the replacement or repair, at the seller's option, of the specific defective item; liability for incidental and consequential damages is expressly excluded. This warranty shall not apply to any goods which have been subjected to misuse, improper installation, repair, alteration, neglect, accident, or operation outside of their published maximum ratings. There are no warranties, expressed or implied, which extend beyond the description on the face hereof.

6. FIGURES

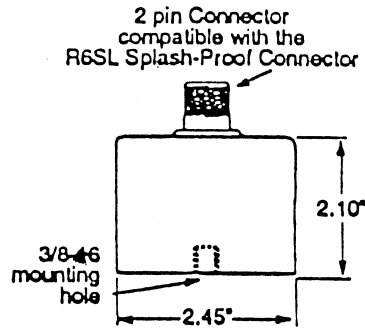


Figure 1: Model 731A Dimensions

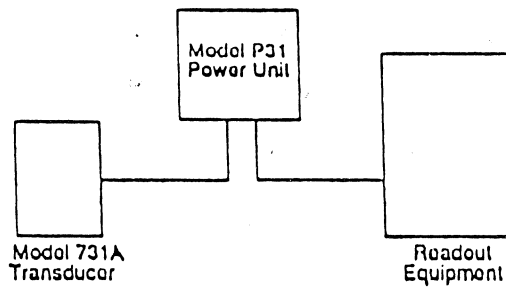


Figure 2: Model 731A System Diagram

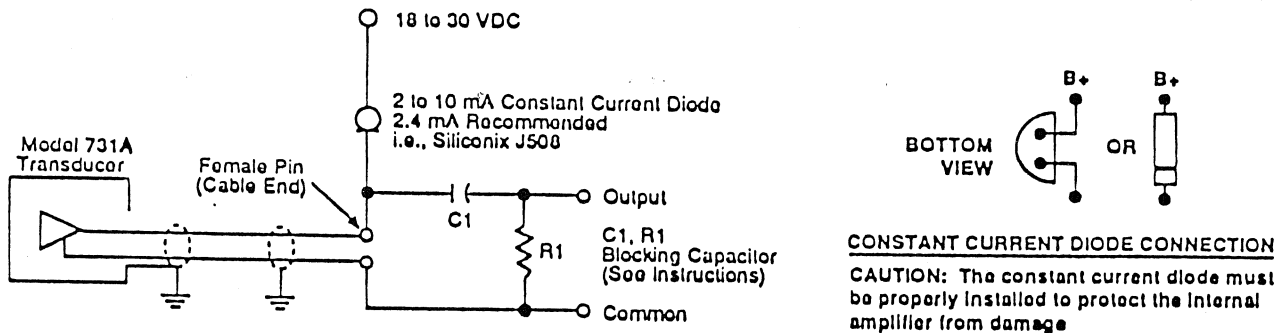


Figure 3: Powering Requirements without P31 Supply

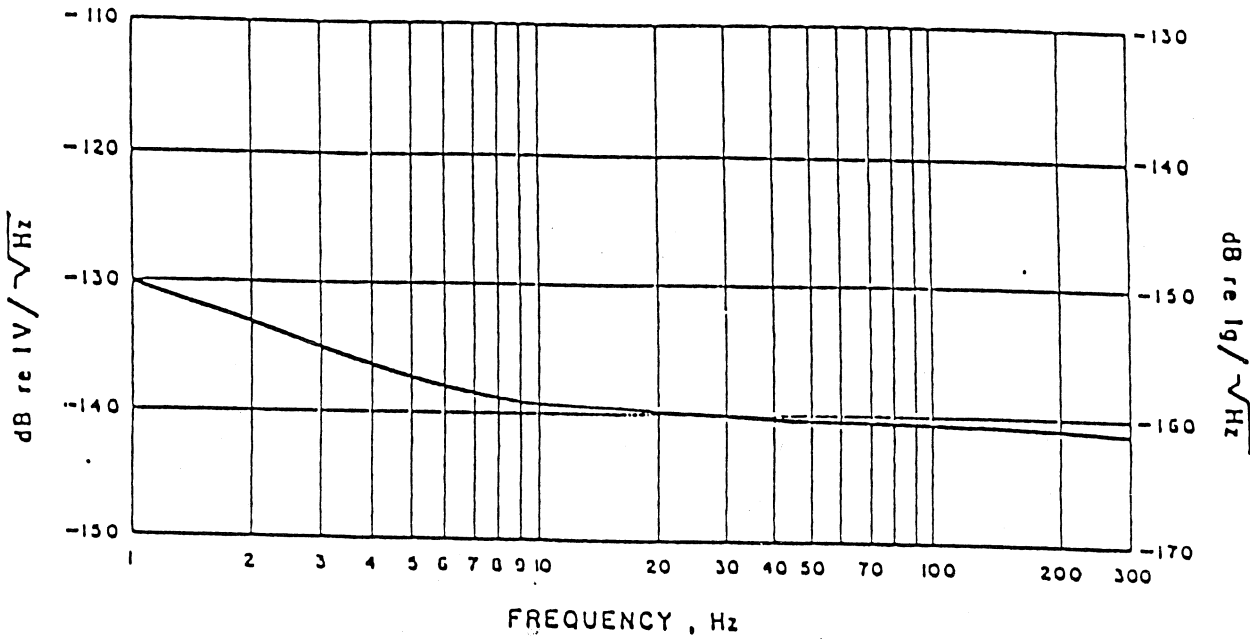


Figure 4: Noise Characteristics of Model 731A

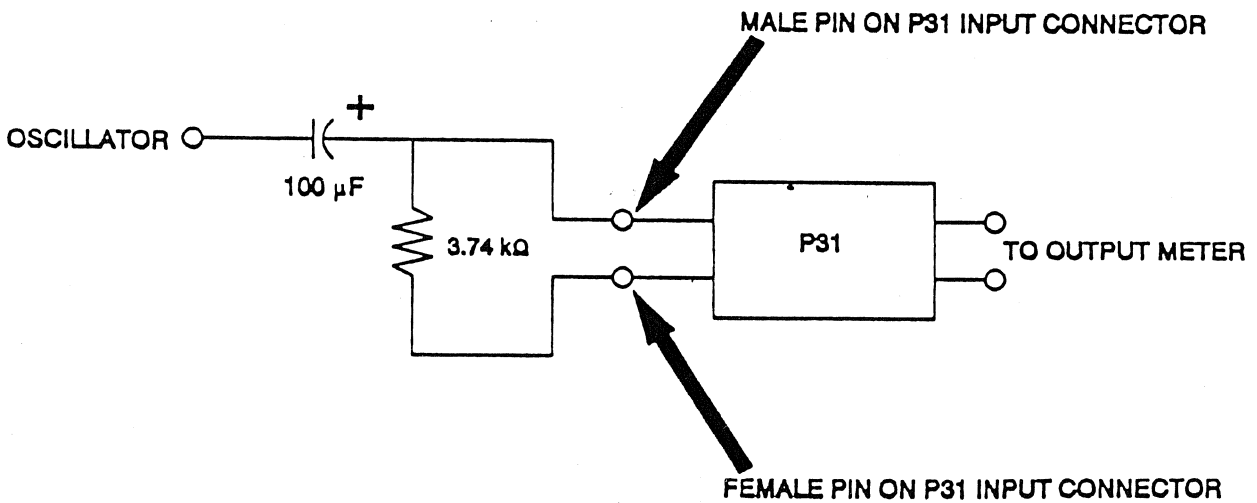
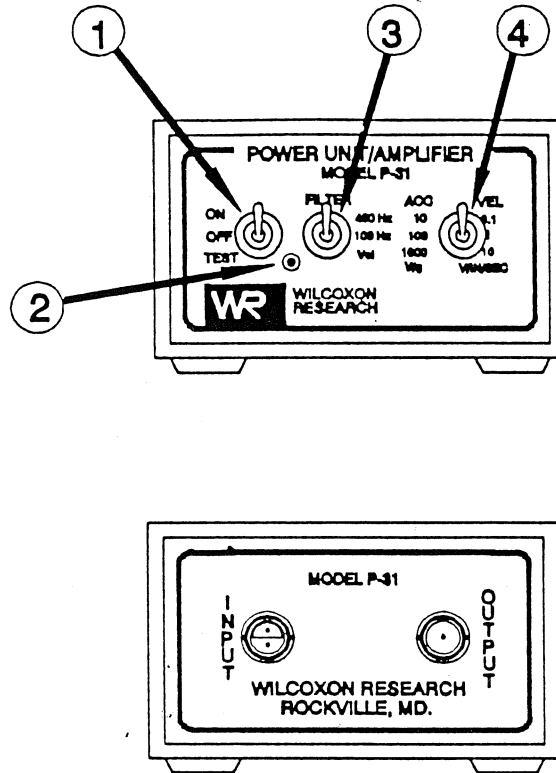


Figure 5: Schematic for Amplifier Check



1. Power switch with battery test position
2. Battery condition indicator: Green LED
3. Filter Switch:

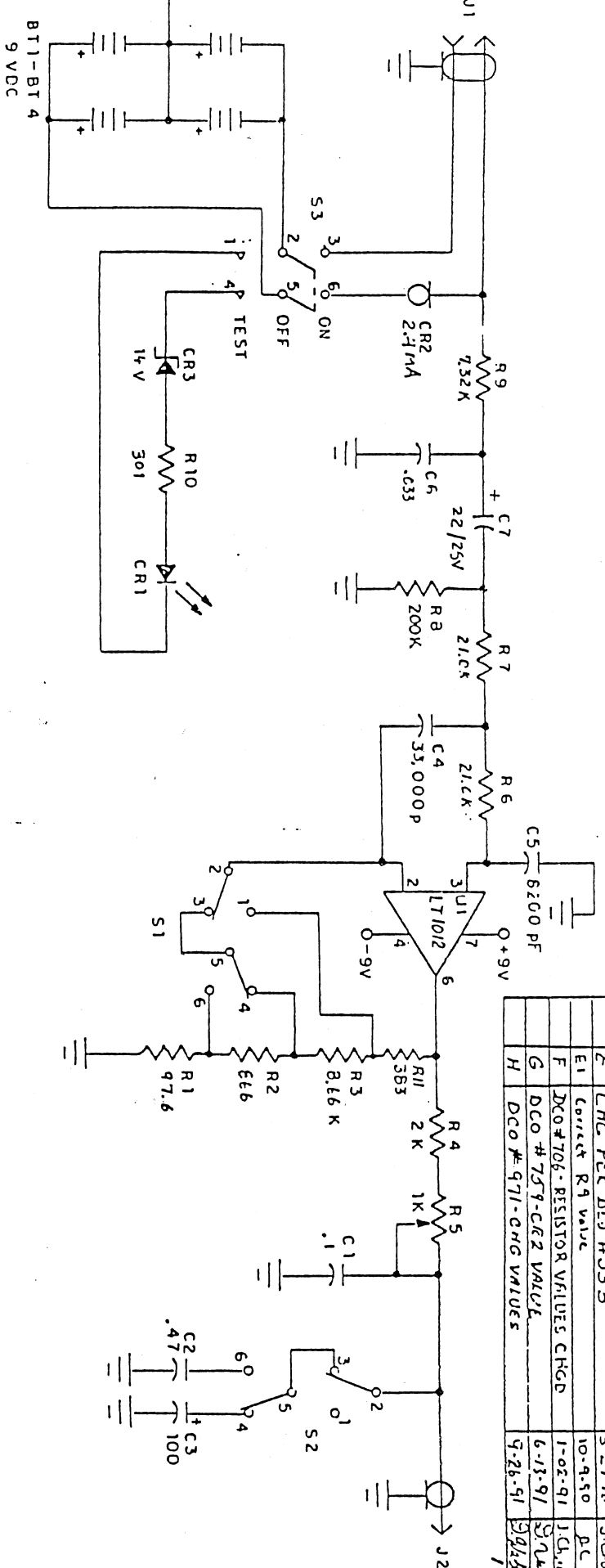
ACCELERATION	450 Hz low pass
ACCELERATION	100 Hz low pass
VELOCITY	
4. Gain Range Switch:

x 1
x 10
x 100

Figure 6: Power Unit/Amplifier Panel Functions

NOTES:
1. UNLESS SPECIFIED ALL 'R' VALUES ARE IN OHMS, ALL 'C' VALUES ARE IN uF

REVISIONS		DATE	APPROVED
ZONE	LTR	DESCRIPTION	
A		RELEASE	
B		ECO 043 - CHANGE C4, C5	6-4-86
C		DCO 103 - CHG VARIOUS CAPIT VALUES	7/16/88 J. Churchill
D		DCO 436 CHG CR2 VALUE	5/16/80 C/L
E		CHG PER DCS #53B	5-27-80 J. Churchill
F		Correct R9 value	10-9-80 PC
G		DCO #706 - RESISTOR VALUES CHGD	1-02-91 J. Churchill
H		DCO #759 - C62 VALUE	6-13-91 J. Churchill
		DCO #971 - CHG VALUES	9-26-91 J. Churchill



MR WILCOXON RESEARCH		CONTRACT NO.	
P31 SCHEMATIC		APPROVALS	
DRAWN J. Churchill CHECKED RCL		DATE 3-7-86	
FINISH		MATERIAL	
DO NOT SCALE DRAWING		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES	
APPLICATION		NEXT ASSY	
P 31		55002	
UICD OM		55004	
SCALE		DRAWING NO. 55004	
SHEET 1 OF 1		SIZE B	

Figure 7: P31 Schematic