INSTRUCTION MANUAL
For Model 7596A Accelerometer
IM7596A, Revision A

The Model 7596A Valuline™ is a rugged, variable capacitance accelerometer with integral electronics for voltage regulation, filtering and signal amplification. As is the practice with all instrumentation, certain precautions should be followed with check-out, mounting and recalibration.

Materials Required

All the materials used in the mounting of the Model 7596A Valuline accelerometer are supplied with the unit in the shipping container. These materials, as shown in Figure 1, include:

(1) Allen wrench for 4-40 screws- Endevco P/N EHM464
(2) 4-40 x 7/16 inch Socket Head Cap Screws- Endevco P/N EH702
(2) Size 4, Flat Washers- Endevco P/N EHW265

For biaxial or triaxial acceleration measurements, the user should consider the Model 7990 Triaxial Mounting Block, which is available as an optional accessory.

Check-out

Before installation of the accelerometer, it should be checked to insure proper operation. A simple Zero Measurand Output and 2 g Turnover test can be conducted with minimal test equipment. Place the unit on its side so that the accelerometer mounting surface is perpendicular to the table top. Apply the specified excitation voltage to the accelerometer (see data sheet for proper wiring hook-up) and measure the output with a dc millivolt meter. Allow the unit to warm-up for two minutes. The accelerometer should have a Zero Measurand Output (ZMO) within the specified limits in the data sheet.

To perform the 2 g Turnover Test, the Model 7596A Valuline is oriented with its mounting surface on the table top (sensitive axis is vertical) and the output is measured with the dc millivolt meter. The unit is then turned over 180°, resulting in a change of 2 g, and the output is again noted. The sensitivity is computed by dividing the change in output by 2 g. The sensitivity in mV/g should be within the specified limits in the data sheet.

If this initial check does not give a proper reading, indicating a possible malfunction and the reason for the erroneous reading cannot be found, contact Endevco at +1 (866) 363 3826.

Mounting

When mounting the Model 7596A Valuline accelerometer, it is best to utilize the proper techniques and tools listed to ensure optimum performance. For triaxial acceleration measurements, the Model 7990 Triaxial Mounting Block is available - see paragraph 7 below.

1. The mounting surface should be clean and free of burrs. Two #4-40 tapped holes; 0.2 inch minimum depth should be spaced 0.825 inches (20.96 mm) apart. A 32 micro inch rms surface finish with flatness of 0.0001 inches is recommended for the area that will contact the accelerometer. The sensitive axis of the unit is perpendicular to the mounting surface, so the angular alignment of the two mounting holes is not critical.

2. If possible, do not cement the unit to the mounting structure. Use the supplied mounting washers and screws, as shown in Figure 1. Metric size screw M3 may also be used. Note: Adhesive mounting may be used, if necessary. Adhesion of epoxies to the hard anodized case is excellent, but thermal mismatch to the mounting surface can degrade the joint. A compliant adhesive, such as Dow Corning 3145 RTV, is recommended. Use care to maintain flatness of the unit during curing to reduce cross talk errors.

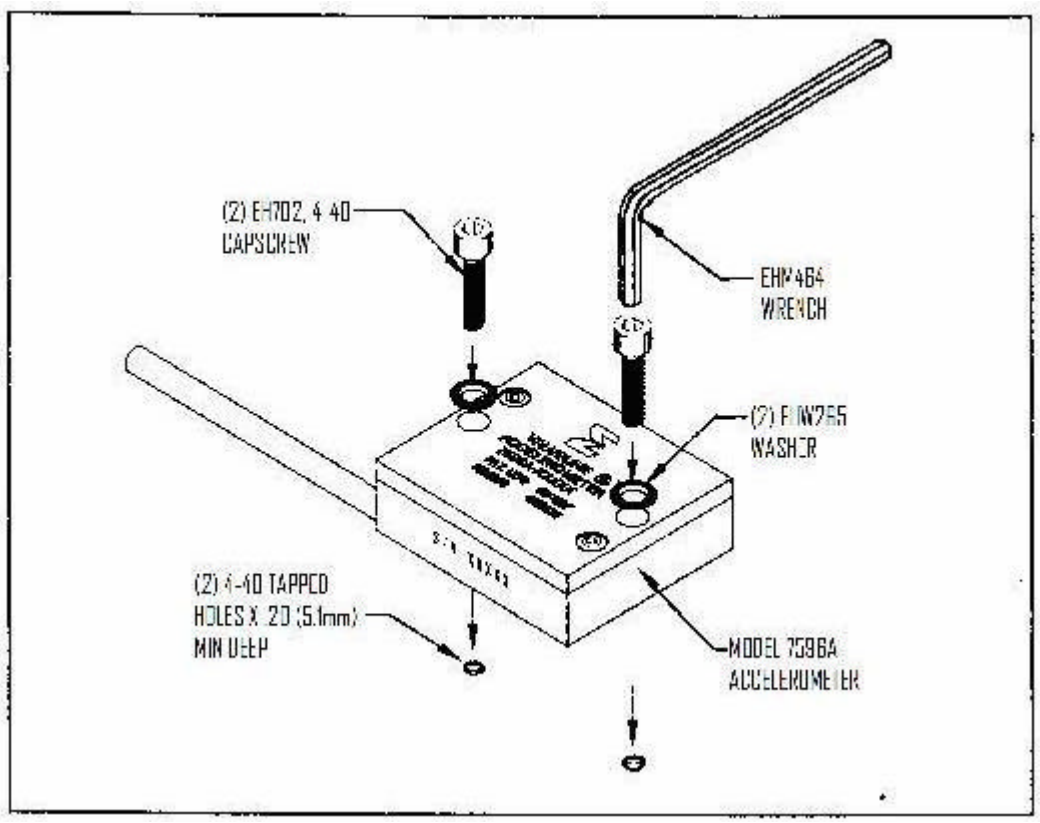

FIGURE 1- Installation of Model 7596A Valuline Accelerometer

3. Remove the unit from the shipping container. Place the unit on the mounting surface and align the mounting holes.

4. Slide the washers over the screws. Using the supplied wrench or a torque wrench, tighten the screws to 6 lbf-in (0.7 Nm). This is roughly equivalent to finger tight with the supplied wrench.

5. As practical, tie down the cable within 2 to 3 inches (4 to 6 cm) of the unit. Whipping of the cable during vibration and shock will strain the cable unnecessarily at the unit. The cable jacket is silicone, so care should be taken to avoid cutting or tearing the jacket. The cable is rated for 300°F (150°C) continuous service.

6. Connect the unit to the signal conditioner using the following lead designation:

Red- Excitation +
Green- Output +
White- Output -
Black- Ground

7. For triaxial acceleration measurements, the Model 7990 Mounting Block is attached to the mounting surface with three (3) 6-32 x 1 inch socket head cap screws as shown in Figure 2, with subsequent attachment of the (3) Model 7596A Valuline Accelerometers per steps 2 through 6 above.

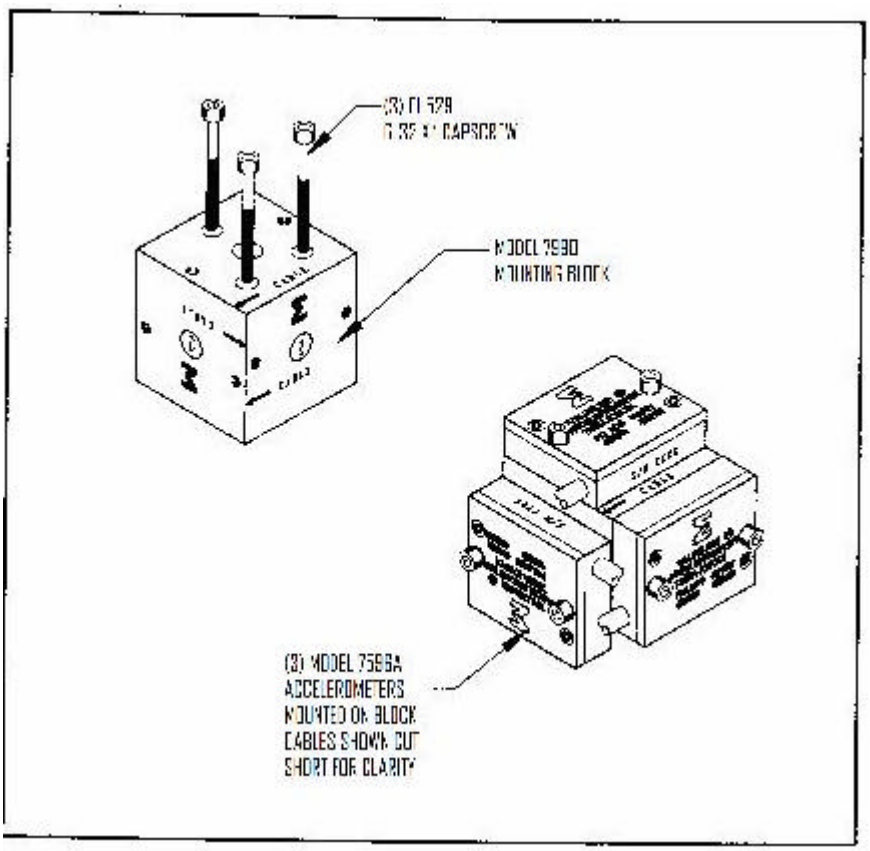

FIGURE 2- Installation of (3) Model 7596A Valuline Accelerometers onto Model 7990 Triaxial Block

Electrical Precautions

1. Excitation- The Model 7596A Valuline has an internal voltage regulator, so excitation from +9.5 to +18 Vdc is adequate. A low noise power supply is recommended and care should be taken to minimize pickup on the cabling to the accelerometer. The maximum current drain over the entire operating range is 15 mA.

2. Signal Leads- The green and white signal leads are differential. The green lead has a varying output, while the white lead is fixed at a reference voltage of approximately +3.6 Vdc. However, using the Model 7596A Valuline in a single- ended mode is not recommended since the internal temperature compensation also corrects for thermal change in the reference voltage. Although the output is high level, at ±2 Vdc, the usual precautions of using twisted pair; shielded instrumentation cable should be taken to avoid noise pickup on the signal leads.

3. Grounding- The case of the Model 7596A Valuline is not attached to circuit ground, and the cable shield is not attached to the case or to circuit ground. The recommended grounding scheme is to ground the cable shield at the power supply ground and to no other point to avoid ground loops.

4. Signal Conditioning- The Model 7596A Valuline has a high level differential output of ±2 Vdc, biased at 3.6 Volts. The 0 g reading, or Zero Measurand Output (ZMO), is 0 volts ± 50 mV. When the accelerometer is subjected to acceleration of 1.75 times range, the output of the unit will electrically clip, with a recovery time of < 10 µseconds.

5. Loading Effects- The Model 7596A Valuline accelerometer performs within specification limits while loaded with 10,000 ohm minimum resistance, and/or 0.1 µfarad maximum capacitance.

Shunt Check

A Shunt Check is performed in applications where the Model 7596A Valuline accelerometer is already mounted on a test structure and cannot be dynamically checked with a 2 g Turnover test. Full details of the Shunt Check procedure is contained in Endevco Tech Data A542.

However, in brief, the shunt check is performed by connecting a precision fixed resistor of known value to the positive output (green lead) of the accelerometer. The other end of the shunt resistor is connected to an excitation voltage source to promote output shifts simulating positive direction accelerations, or to circuit ground for shifts in the negative direction.

The nominal output voltage shift (E_{sh}) based on the fraction of full scale reading desired is:

$$E_{sh} = SENS * FS * n$$

where: E_{sh} = output voltage shift, Vdc

SENS = sensitivity, volts/g

FS = ± full scale acceleration, g

n = fraction of full scale reading

Knowing the desired output voltage shift, (E_{sh}) the value of the external shunt resistor (R_{sh}) is:

$$R_{sh} = \frac{(V_{sh} - V_{ent} - V_{wh} - E_{sh}) \times R_{out}}{E_{sh}}$$

Or conversely, given the value of the external shunt resistor (R_{sh}), the expected output voltage shift, (E_{sh}) is:

$$E_{sh} = \frac{(V_{sh} - V_{out} - V_{wh}) * R_{out}}{R_{sh} + R_{out}}$$

where: R_{sh} = selected external shunt resistor

V_{sh}= voltage applied to shunt resistor (for + acceleration shifts, connect to excitation, V_{sh} = +9.5 to 18.0 Vdc and for negative acceleration shifts, connect to circuit ground, V_{sh} = 0 Vdc)

V_{out} = output signal measurement unshunted, Vdc (positive output signal (green) with respect to negative output signal (white))

V_{wh} = negative output signal (white) with respect to ground, V_{wh}= 3.5 ±0.1 Vdc

R_{out} = output impedance, ohms (R_{out} = 470 ± 24 ohms, ±100 ppm/°C)

E_{sh} = output voltage shift, Vdc

Thermal errors have no significant effect on accuracy as long as the unshunted and shunted measurements are taken at the same temperature.

Recalibration

Sensitivity and Zero Measurand Output calibration should be performed at 6 to 12 month intervals, depending on usage. Ordinarily, recalibration need be performed only at 12 month intervals if it is known that the accelerometer has not been used beyond its rated specifications. If the unit is used under severe environments, it may be desirable to use shorter calibration intervals.

Contact Endevco for local calibration facility information or return the unit to Endevco for recalibration. Endevco maintains an accelerometer recalibration service with NIST traceability in the United States. Endevco European Regional offices maintain accelerometer recalibration services with traceability to national standards.

Dirty units may be wiped clean using a damp cloth and a solvent such as acetone.

Questions

If you have any questions regarding the use of this or any Endevco accelerometer, please contact Endevco at +1 (866) 363-3826 in North America, or your local sales representative.