PERFORMANCE SPECIFICATION
PRIMARY COMPARISON CALIBRATION
STANDARD ACCELEROMETER

Document Number	Rev	Date	Entered by	Description of Change	Change Accountable Engineer	ECO
76702	NR	11-14-22	LAB	Initial Release of Primary Comparison Calibration Performance Specification	LAB	52963

1.0 DESCRIPTION

The ENDEVCO® Model 2270 Primary Comparison Calibration Standard Accelerometer is a combination standard accelerometer and calibration fixture used for performing comparison calibrations on other accelerometers. The extremely high stability and very flat frequency response of the accelerometer is achieved through the use of sensing elements made of ENDEVCO P-10 crystal material. The Model 2270 has a 1/4-28 tapped hole 0.5 inches deep for attaching units under test. Accessory bushings are provided to mount accelerometers that use 2-56, 6-32, or 10-32 thread sizes. Additional adapters with 4-40, 4-48, 8-32, and metric M3x0.5 threads are available.

Signal ground can be switched from grounded to isolated at the user's option by means of a knurled nut on the output signal receptacle.

The Model 2270 is designed to have a high degree of mechanical strain isolation and low sensitivity to transverse motion to minimize sensitivity changes in the standard accelerometer caused by imperfect shaker motion. It can be used with any charge or voltage amplifier. However, the ENDEVCO Model 2710FM13 Calibration Standard Reference Charge Amplifier, and the ENDEVCO Model 2786M3 Computer Controlled Calibration Standard Charge Amplifier, have been designed for use with this accelerometer and their use is recommended. The standard accelerometer-amplifier system such as the Model 2270/Model 2710FM13 or Model 2270/Model 2786M3, are designed to eliminate errors which frequently occur when using instrumentation not specifically designed for use in calibration systems. The ENDEVCO Model 28350F Calibration System incorporating the Model 2270 accelerometer, the Model 2710F13 charge amplifier, an associated Model 2710FM14 calibration standard test unit charge amplifier and a power supply rack is available as a system.

The Model 2270 is supplied with a calibration by primary methods from 20 Hz to 10 000 Hz with all results given in a comprehensive report showing traceability to the U.S. NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY. A graph of sensitivity versus frequency is included in the report. Optional calibrations to extend the frequency response down to 1 Hz or up to 20 000 Hz are also available. Other calibrations available for this accelerometer are shown in the ENDEVCO Calibration Service Bulletin.

1.1 KEY FEATURES

- Laboratory grade primary standard accelerometer for back-to-back comparison calibration
- Stable Endevco P-10 crystal material
- Supplied with absolute calibration at 100 Hz traceable to NIST
- Selectable connection/isolation of signal ground and case

All specifications are typical at 75°F (24°C), referenced at 100 Hz, and conform to ISA-RP 37.2 (1-64) unless otherwise indicated.

2.0	**DYNAMIC CHARACTERISTICS**	
2.1	CHARGE SENSITIVITY	2.2 pC/g ± 20% (0.22 pC/ms^{-2})
2.2	FREQUENCY RANGE [1]	See Figure 2
2.2.1	Accelerometers up to 35 grams	2 Hz to 20 000 Hz
2.2.2	Accelerometers between 35 grams and 100 grams	2 Hz to 5000 Hz
2.3	MASS LOADING EFFECT [2]	Sensitivity change due to relative motion resulting from the mass of the test accelerometer plus adapters or fixtures. See Figure 2.
2.3.1	Sensitivity change	± 0.2% maximum for up to 100 gm at 100 Hz
2.3.2	Sensitivity change	-2% for 50 gm at 10 kHz or 100 gm at 5 kHz
2.3.3	Sensitivity change for 0 to 50 grams at 10000 Hz	-2%
2.4	SHOCK MOTION PULSE DURATION [3]	
2.4.1		100 µs to 25 ms half-sine for accelerometers up to 35 gm.
2.4.2		200 µs to 25 ms half-sine for accelerometers between 35 gm and 100 gm.
2.5	TRANSVERSE SENSITIVITY	3% maximum in any direction, 1% available on special order.
2.6	AMPLITUDE LINEARITY	Sensitivity increases approximately 0.1% per 1000 g, 0 to 15000 g.
2.7	TEMPERATURE RESPONSE	-65°F to 350°F (-54°C to 177°C) referenced to room temperature. See Figure 3.
2.8	CHARGE SENSITIVITY TIME STABILITY	± 0.2% maximum per year.

3.0	**ELECTRICAL CHARACTERISTICS**	
3.1	CAPACITANCE	
3.1.1	Accelerometer	1700 pF ± 20%
3.1.2	Accelerometer case to mounting stud	50 pF
3.1.3	Connector ground to case	35 pF
3.2	RESISTANCE	
3.2.1	Transducer	20 GΩ minimum 5000 MΩ minimum at 350°F (177°C)
3.3	ISOLATION	
3.3.1	Accelerometer ground.	10 MΩ minimum case to mounting stud and signal
3.3.2	Output Signal Receptacle ground to case position (5).	10 MΩ minimum with grounding nut in isolated
3.4	POLARITY	Positive output for acceleration into the base.
4.0	**ENVIRONMENTAL CHARACTERISTICS**	
4.1	TEMPERATURE RANGE	-65°F to 350°F (-54°C to 177°C)
4.2	HUMIDITY	Epoxy sealed
4.3	ACCELERATION LIMIT	15000 g pk shock 1000 g pk sinusoidal
4.4	ALTITUDE	Not Affected
4.5	BASE STRAIN SENSITIVITY	0.25 equivalent g pk at 250 µstrain pk
4.6	ELECTROMAGNETIC SENSITIVITY	0.03 equivalent g rms at 100 gauss rms, 60 Hz
4.7	STRAY VOLTAGE SENSITIVITY	0.003 equivalent g per V at the mounting stud

5.0	**PHYSICAL CHARACTERISTICS**	See Outline Drawing
5.1	WEIGHT	1.4 oz. (40 gm)
5.2	CASE MATERIAL	17-4 PH Stainless Steel
5.3	SENSOR	ENDEVCO PIEZITE P-10 in the single-ended compression mode.
5.4	OUTPUT RECEPTACLE [4]	10-32 UNF threaded coax socket type side connector with grounding nut. Mates with ENDEVCO Model 3000 Series Cable Assemblies.
5.5	POLARITY	Standard per ISA-RP 37.2, para. 4.3 (See Outline Drawing).
5.6	MOUNTING [5]	
5.6.1	Vibration exciter mounting stud	Integral stud 1/4-28 UNF thd x 3/8" long
5.6.2	Test accelerometer mounting hole	1/4-28 UNF thd x 1/2" deep for mounting test transducers, see Outline Drawing.
6.0	**CALIBRATION DATA**	See ENDEVCO Calibration Service Bulletin for a complete description of all available calibration services.
6.1	STANDARD	
6.1.1	CS120A	Primary Calibration Laser Interferometer includes frequency response, from 20 Hz to 10 000 Hz. Test results are furnished in a formal report that includes transverse sensitivity, resistance, capacitance and frequency response plots. Traceability to the NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY is shown as required by MILITARY QUALITY CONTROL STANDARDS.
6.2	OPTIONAL	
6.2.1	CS120AL	Extends the frequency response calibration down to 2 Hz.
6.2.2	CS120AH	Extends the frequency response calibration up to 20000 Hz.
6.2.3	CS310	Temperature Response Calibration, -65°F to 350°F (-54°C to 177°C). If temperature points are not specified, the calibration will be performed at -65°F and 350°F (-54°C and 177°C).

7.0 ACCESSORIES

7.1 STANDARD

3090C-120	Cable Assembly [6]
15071	Adapter Stud, 1/4-28 UNF to 10-32 UNF [6]
14159-1	Adapter Bushing, 10-32 UNF [6]
14159-2	Adapter Bushing, 6-32 UNC [6]
14159-4	Adapter Bushing, 2-56 UNC [6]

7.2 OPTIONAL ACCESSORIES

14159-3	Adapter Bushing, 4-40 UNC
14159-5	Adapter Bushing, 4-48 UNF
14159-6	Adapter Bushing, 8-32 UNC
14159-7	Adapter Bushing, M3x0.5

8.0 ORDERING INFORMATION

2270

NOTES:

[1] Low frequency response will be determined by the characteristics of the charge amplifier used with the 2270 standard accelerometer.

[2] Estimated accuracy of correction factor from curves showing typical response is ± 1% (Figure 2). Sensitivity is the standard output divided by the acceleration motion at the surface provided for attaching test accelerometers.

[3] For calibrations with 100 μs duration pulses, the resonant frequency of the test accelerometer should be above 50 kHz.

[4] Tighten the grounding nut to the case finger tight - approximately 4 lbf - in (0.7 N·m). Excessive torque could damage the isolated receptacle assembly. The grounding nut should be in contact with the accelerometer housing when case isolated test transducers are being calibrated, and should be disengaged from the accelerometer housing when disengaged from the accelerometer housing when case grounded test transducers are being calibrated.

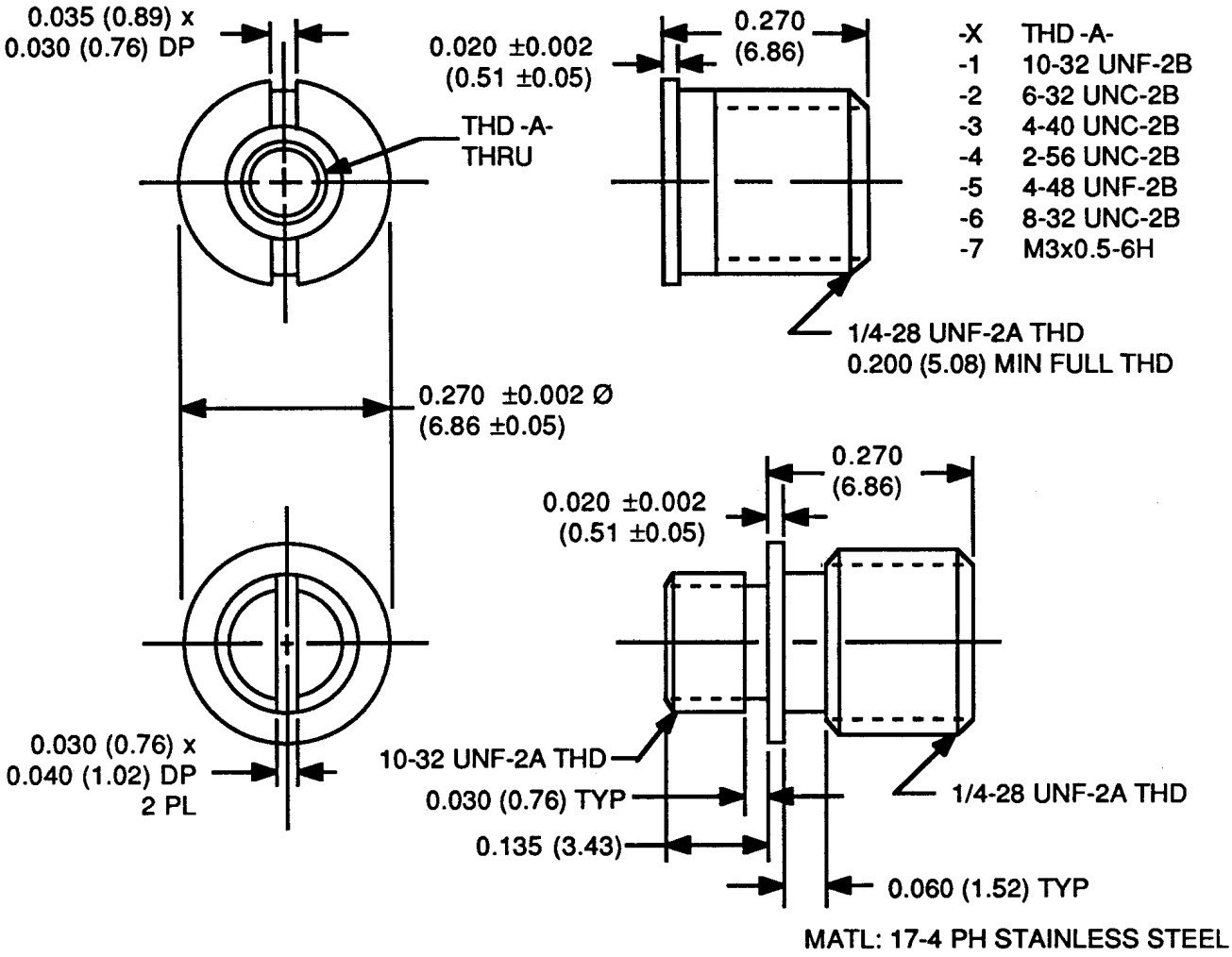
[5] Recommended torque for attachment is 18 lbf - in (2.0 N·m). Torque values above 24 lbf - in could cause permanent damage to the isolated bushing assembly.

[6] For the "-R" assemblies the noted accessories are optional.

[7] Model Number Definition

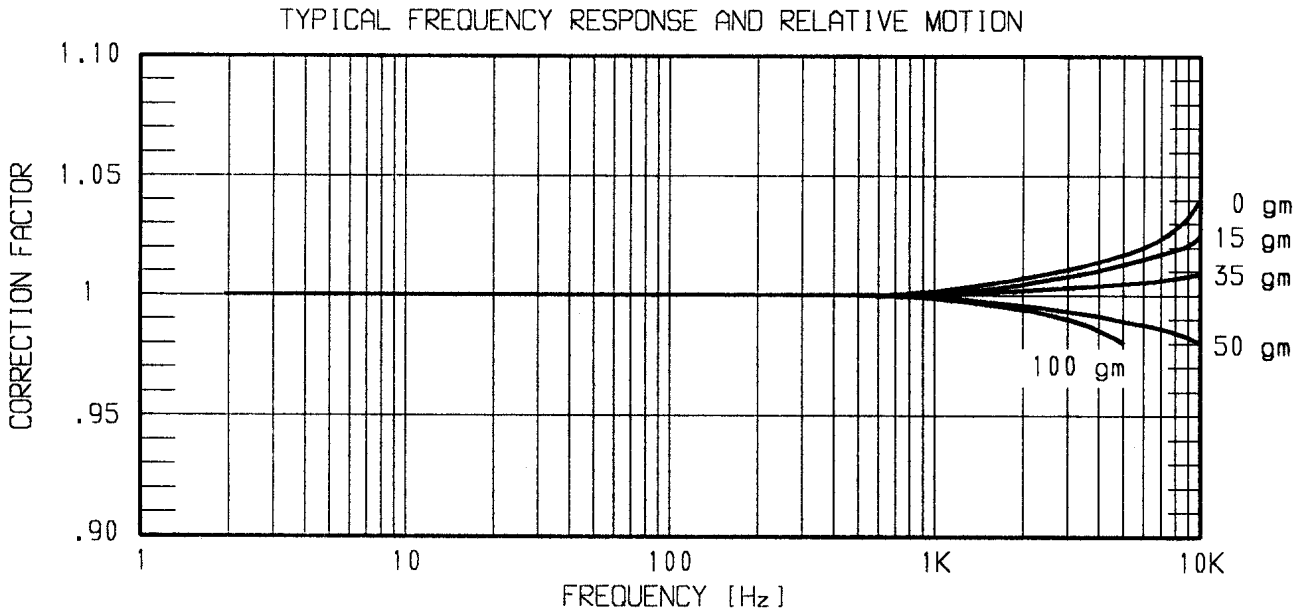
2270 -R
| |
| |___ Indicates replacement unit (omit if units are not replacements).
|
|_____ Basic Model Number

14159-X ADAPTOR BUSHING

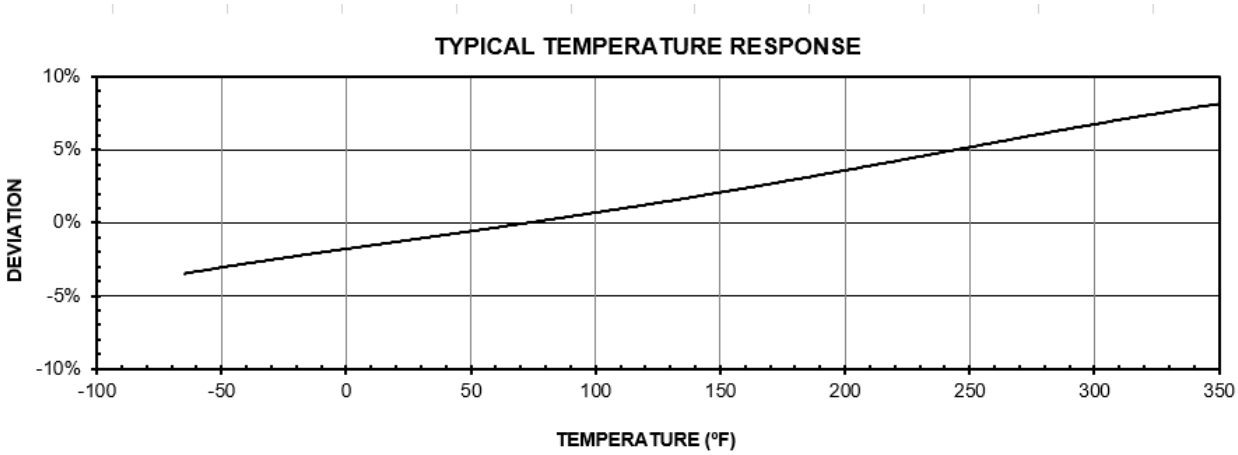


15071 ADAPTOR STUD

ADAPTER DRAWING
FIGURE 1



TYPICAL FREQUENCY RESPONSE
FIGURE 2



TYPICAL TEMPERATURE RESPONSE
FIGURE 3