Bearing/Balancing Fault Simulator

Hands-on system to study bearing faults and shaft unbalance

SpectraQuest, Inc.
8201 Hermitage Road, Richmond, VA 23228 U.S.A.
TEL +1-804-261-3300/FAX +1-804-261-3303
www.spectraquest.com

Bearing/Balancing Fault Simulator

- Designed to demonstrate and support the study of bearing faults and unbalance under controlled conditions
- Generate each type of fault individually or in combinations, providing a stable platform for study.
- The BBS provides a basic setup for performing experiments and learning vibration signatures of unbalance and bearings malfunctions.
- Detailed investigation of particular and more advance vibration phenomena will require additional attachments and fixtures which are available through optional kits.

BBS


Tachometer
1/3 HP variable speed controller
1/3 HP motor
Two 6” aluminum rotors for balance studies
Rolling bearing

BBS Features

- Portable, robust, cost-effective balance and bearing vibration trainer
- Ideal for teaching multi-plane balancing with centerhung / overhung rotors
- Can be setup to exhibit bearing fault frequencies both further away from, and closer to multiples of the shaft rotational speed
- Develop signal processing techniques to identify bearing fault frequencies in the presence of defects, at multiples of shaft speed, without using high-resolution spectra
- Use the BBS to recognize the vibration spectra of different bearing faults

Basic BBS

- 1/3 HP variable frequency AC drive with multi-featured front panel programmable controller
- 3 Phase, 1/3 HP motor, pre-wired self-aligning mounting system for easy installation/removal
- Built-in tachometer with LCD display and one pulse per revolution analog TTL output for DAQ purposes
- Two rolling element ball bearings with squeeze lock type
- Vibration isolators mounts and base stiffener
- Two balance rotors with two rows of holes
- One 5/8" TGP straight steel shaft
- Impact resistant clear safety cover with safety interlock

Option Kits

- SpectraQuest offers a complete array of option kits enabling detailed investigations of particular and more advance vibration phenomena or machinery faults.

Balancing Training Book	B-BK
Eccentric rotor	M-ER-5/8
Cocked rotor	M-CR-5/8
Centrally bent rotor shaft for balance studies	B-BRS-5/8
5/8" shaft bearing fault kit	M-BFK-5/8
5/8" shaft bearing loader	M-BL-5/8
1" shaft bearing study kit	B-BSK-1
1" shaft bearing fault kit (Requires B-BSK-1)	M-BFK-1
1" shaft bearing loader (Requires B-BSK-1)	M-BL-1
Cocked bearing housing	M-CBM-5/8
5/8" shaft sleeve bearing kit	M-SBK-5/8

Balancing Training Book (B-BK)

- The Balancing Training Book teaches the basics of machine balancing.
- Use prescribed laboratory exercises to enhance learning through hands-on experimentation.

Eccentric Rotor (M-ER-5/8)

- Learn the effects of rotor eccentricity on vibration spectra.
- Determine relationships between eccentricity and unbalance.
- Develop techniques to locate and correct the effects of eccentricity.
- Learn the effect of varying the mass moment of inertia on vibration amplitude.
- The kit consists of one aluminum rotor with an asymmetrically located center and one clamp collar.

Cocked Rotor (M-CR-5/8)

- Learn the effects of a sheave that has not been fitted to the shaft properly.
- Learn vibration signature of a cocked rotor.
- Develop methods to correct cocked rotor problems.
- Learn the effect of varying the mass moment of inertia on vibration amplitude.
- The kit consists of a cocked aluminum rotor (0.5 degree off-axis) and one clamp collar

Centrally Bent Rotor Shaft (B-BRS-5/8)

- Demonstrate the signature of a bent shaft.
- Observe the difficulty associated with attempting to balance a rotor mounted on a bent shaft.
- Learn to cope with the alignment issues due to a bent shaft.
- The kit consists of one 5/8” shaft centrally bent ~0.020”

5/8" Shaft Sleeve Bearing Kit (M-SBK-5/8)

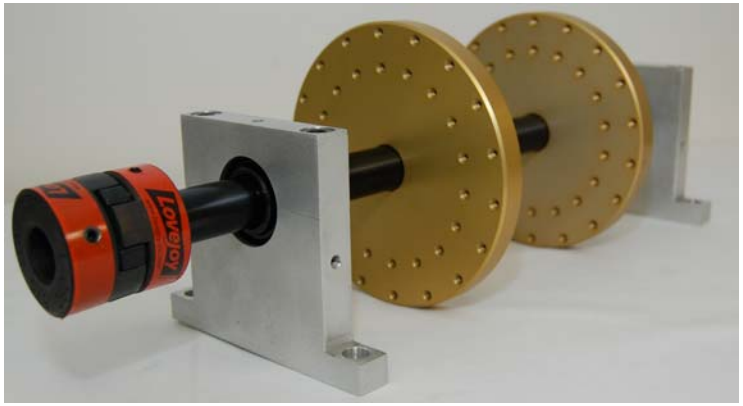
- Investigate waveform and spectral recognition of worn or loose fitting bearings.
- Modify the clearance of the split bearings with plastic shims.
- Perform shaft orbital analysis.
- The kit consists of two customized grease-lubricated, babbitt lined sleeve bearings, two bearing pedestals, and various thickness plastic shims

Cocked Bearing Housing (M-CBM-5/8)

- Recognize the signature of a cocked bearing due to improper seating or due to inconsistent installation.
- The kit consists of one cocked bearing housing

1" Shaft Bearing Study Kit (M-BSK-1)

- Study bearing fault frequencies away from multiples rotational speed. The standard 5/8” shaft exhibit fault frequencies close to multiples rotational speed, requiring ultra high resolution spectra to clearly identify bearing fault frequencies.
- Identify bearing fault frequencies in the presence of defects at multiples of shaft speed without using high-resolution spectra.
- Understand the signal processing issues such as averaging, spectral resolution, and leakage phenomena.
- The kit consists of two split bearing housings, two 1” inside diameter bearings, one 1” diameter shaft, and one coupling



5/8” and 1” Bearing Loader (M-BL-5/8 & M-BL-1)

- Investigate bearing radial loading effects.
- Enhance the spectral amplitude of system.
- The kit consists of one 5/8” or 1” bore loader weighting 11lb (5kg) and two clamp collars

5/8” and 1” Bearing Fault Kit (M-BFK-5/8 & M-BFK-1)

- Learn waveform and spectra of classic bearing defects.
- Learn about signal processing issues such as averaging techniques, leakage, and spectral resolution on determining bearing faults.
- Perform experiments with increasing severity of defects.

- Determine why an ultra-high resolution spectrum is needed to diagnose a bearing fault when fault frequencies are located close to multiples rotational speed.
- Learn how a large signal can mask adjoining low amplitude signal due to spectra leakage.
- The kit consists of one inner race defect, one outer race defect, one with ball defect, and one combination of defects

Value Packages

- The BBS is also available in high value combination packages. From basic to comprehensive, each package is designed to provide you with all the tools needed to study a variety of machinery fault topics:

	Balancing	Bearing defects
PKG 1	X	
PKG 2		X
PKG 3	X	X

	B-BK	SQI-TRCM	M-ER-5/8	M-CR-5/8	B-BRS-5/8	M-BFK-5/8	M-BL-5/8	M-BSK-1	M-BFK-1	M-BL-1	M-CBM-5/8	M-SBK-5/8
PKG 1	X	X	X	X	X							
PKG 2						X	X	X	X	X	X	X
PKG 3	X	X	X	X	X	X	X	X	X	X	X	X

Specifications

Electrical	
Motor	3 Phase, 1/3 HP motor, pre-wired self-aligning mounting system for easy installation/removal
Drive	1/3 HP variable frequency AC drive with multi-featured front panel programmable controller
RPM range	0 to 4000 rpm (short duration) variable speed
Current Measurement	Power leads accessible for current measurements
Tachometer	Built-in tachometer with LCD display and one pulse per revolution analog TTL output for DAQ purposes
Voltage	115/230 VAC, Single phase, 60/50 Hz
Mechanical	
Shaft Diameter	5/8” diameter; Turned, Ground, & Polished (TGP) steel
Bearing	Two sealed rolling element in aluminum horizontally split bracket housing, tapped for transducer mount and three mounting positions
Rotor Base	10” long
Rotors	Two 6” aluminum with 36 threaded holes at 10 degree intervals for introducing unbalance
Safety Cover	Lockable clear, impact resistant hinged plastic cover with motor interlock switch to shut down motor when cover is raised
Foundation	1/2” (12.7 mm) die cast aluminum base, base stiffener and six rubber isolators
Physical	
Weight	Approximately 50lb (20kg)
Dimensions	L=28” (70cm), W=8” (20cm) , H=20” (50cm)