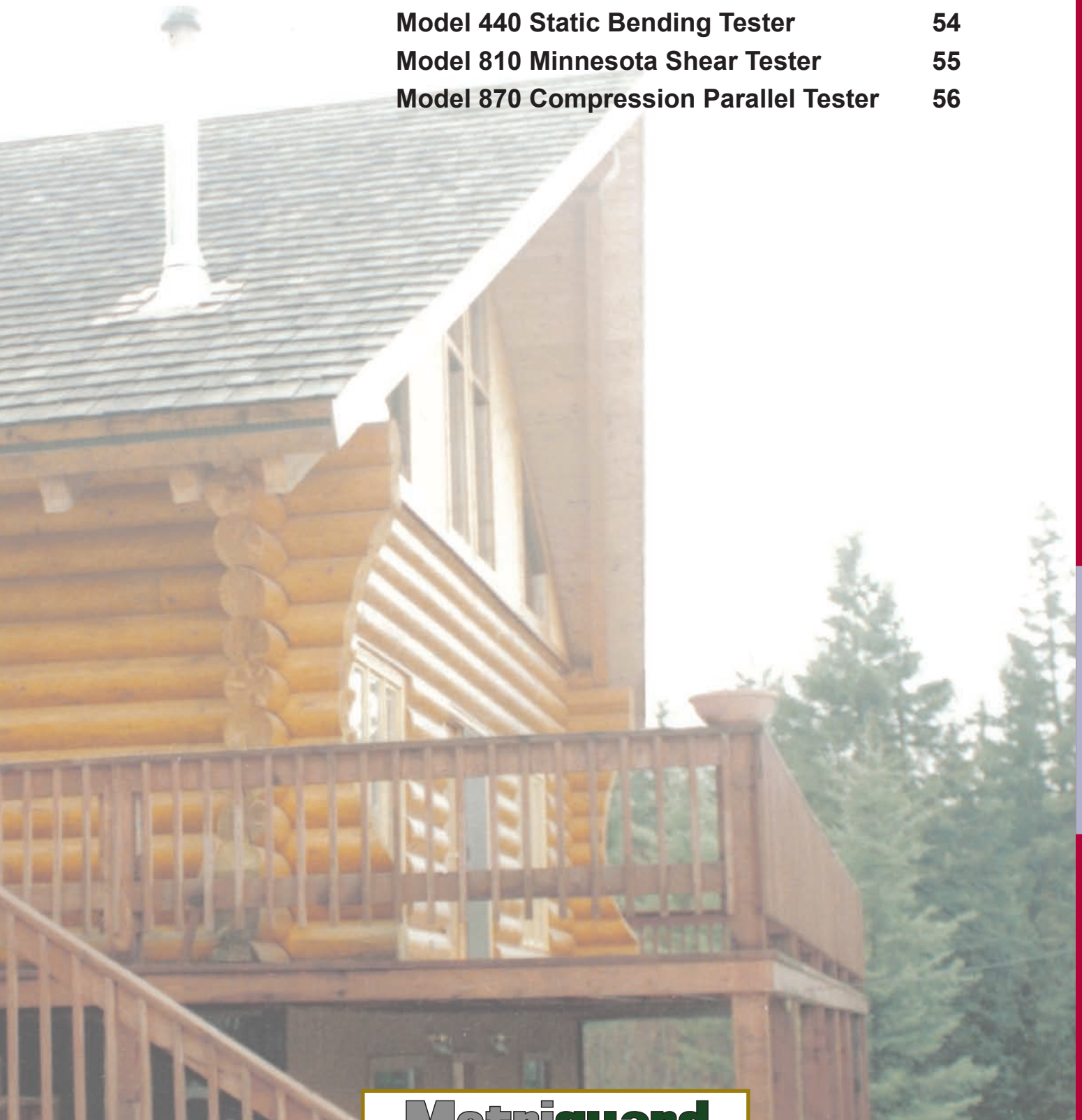


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# Model 239A Stress Wave Timer

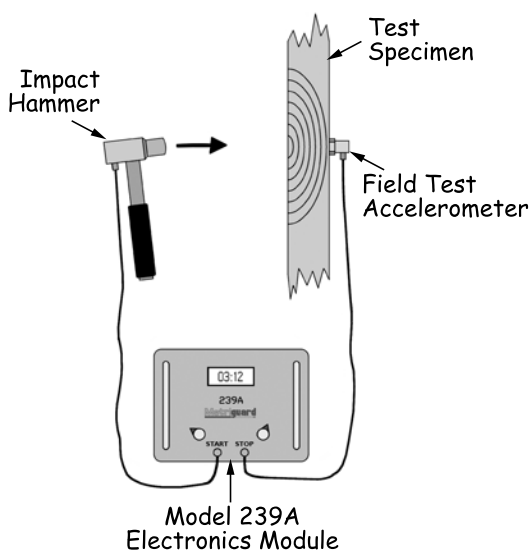
This portable instrument measures sonic propagation time in wood structures such as living trees, waterfront structures, panel products, and poles.

- Detects decay in live trees
- Non-destructive testing to assess the structural integrity of wood structures
- Functions as a crosscheck for other wood testing equipment
- Features multiple capabilities for handling a wide variety of laboratory and field testing needs

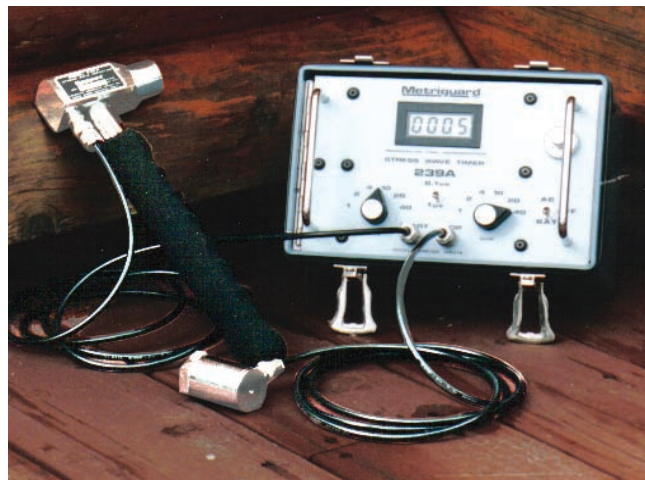


## Description

- Accurately measures and displays mechanical stress wave propagation time or speed of sound through a specimen
- Stress wave propagation time is an excellent indicator of the mechanical properties of wood and wood-based products
- Ideal for testing standing timber, oriented fiberboard and other panels, waterfront pilings, or other structural timbers in place
- The Stress Wave Timer uses two accelerometers along the propagation path to detect the signal. The first accelerometer may be built into the impact device while the second is secured to the specimen.
- In operation, the electronic timer starts when the stress wave front arrives at the first ("start") accelerometer and stops when the wave arrives at the second ("stop") accelerometer.
- Propagation time displayed in microseconds
- Timer automatically filters out noise and other signals, providing a consistent, accurate measurement.
- Accelerometers and impact devices are sold separately to allow customization of stress wave measurement systems.
- Powered by a single 9-volt battery; designed to be very portable, lightweight, durable, and reliable.
- System is configured in kits for the various testing situations. (See Table on p. 50.)



Schematic (above) of the Model 239A for field use, showing relative placement of the impact hammer, field test accelerometer, and Electronics Module, all of which are included in the Field Survey Kit shown at right. (239-KIT-1002)



# Model 239A Stress Wave Timer

## Specifications

### Configuration

The Model 239A Stress Wave Timer is assembled into one integral instrument and mounted in a carrying case.

### Outputs

Digital readout indicates stress wave propagation time from 1 to 9999 microseconds with a resolution of 1 microsecond. Controls: Dual gain control switches and internal sensitivity controls for the start and stop channels.

### Power

Alkaline Battery..... 9 volt

Battery Life ..... in excess of 40 hours

### Dimensions

Electronics ..... 9 x 6 x 8 in (L x W x H)  
(230 x 150 x 200 mm)

Weight ..... 5 lb (2.3 kg)

### Shipping Dimensions

L x W x H ..... 33 x 12 x 12 in.  
(838 x 305 x 305 mm)

Weight ..... 35 lb (15.9 kg)

Approximate shipping container size and weight are given for Model 239A with Laboratory Clamp Set. Sizes and weights will vary with other accessory options.

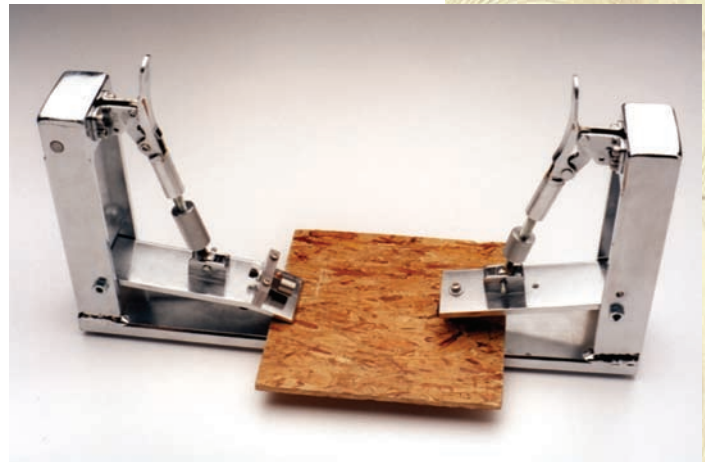
## Options & Accessories

### Laboratory Clamp Set (239-ASM-1003)

Ideal for laboratory testing. Easily fastened to bench top or other work surface for fixed-gauge-length testing. Set includes separate start and stop clamps. The start clamp includes a pendulum ball-hammer device for initiating stress waves; start accelerometer mount; and toggle clamp for convenient attachment to specimen. The stop clamp includes a stop accelerometer mount and toggle clamp. Two Laboratory Application Accelerometers and two 10-32 Micro-to-BNC connector cables are required (sold separately). A portable carrying case is included.

Size (LxWxH)..... 11 x 7 x 11 in  
(280 x 180 x 280 mm)

Weight ..... 19 lb (8.6 kg)



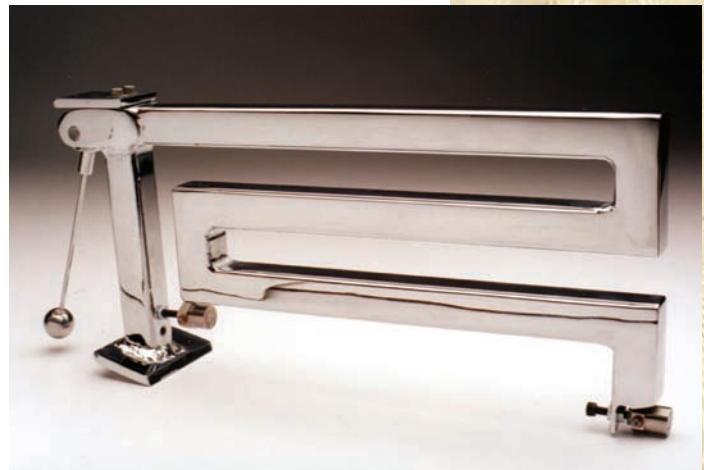
Laboratory Clamp Set (239-ASM-1003), shown with a test piece

### Trombone Clamp (239-ASM-1001)

Ideal for testing panel material; panels may be tested without cutting a specimen. The Trombone Clamp includes a fixture with a pendulum ball-hammer device for initiating a stress wave in a specimen. The fixture is pressed against the surface of a specimen and held in place by hand while the hammer device is actuated and readings are taken on the 239A Stress Wave Timer. Two Laboratory Application Accelerometers and two 10-32 Micro-to-BNC Connector Cables are required (sold separately).

Size (LxWxH)..... 15 x 3 x 7 in  
(380 x 76 x 180 mm)

Weight ..... 6.5 lb (2.9 kg)



Trombone Clamp (239-ASM-1001)

# Model 239A Stress Wave Timer



## Stress Wave Impact Hammer (SEN-PIE-1005)

Ideal for field testing, this self-contained, stainless steel impact device has a built-in start accelerometer for field testing, such as in structural decay surveys. Striking a test specimen with the Impact Hammer activates the start accelerometer and sends a stress wave through the specimen. The stress wave is then picked up by a stop accelerometer.

A BNC/BNC Cable is required. Either a Field Test or Laboratory Application Accelerometer can be used as the stop accelerometer. (WIR-MUL-1001)

Size (L x W x H)..... 8x1x4in  
(203 x 25 x 102 mm)

Weight: ..... 2 lb (0.9 kg)

## Laboratory Application Accelerometer (SEN-PIE-1001) (not shown)

This Lab Application Accelerometer is ideal for research of stress wave propagation in wood and wood-based products. It includes a 10-32 micro connector, and requires a 10-32 Micro/BNC Cable.

Size ..... 0.75 x 0.75 in (19 mm)

Weight ..... 1 oz (28 g)

## Cable, 10-32 Micro/BNC (WIR-MUL-1006)

Use with Laboratory Application Accelerometer (SEN-PIE-1001)

Length..... 10 ft (3050 mm)

Wire ..... Low-noise coaxial cable



## Field Test Accelerometer (SEN-PIE-1002)

The Field Test Accelerometer is used in field testing to pick up stress waves initiated by the Impact Hammer. It includes a BNC output connector. A BNC/BNC cable is required. The Field Test Accelerometer is shown (above) with a lag screw clip (sold separately).

Size..... 2 x 2 in (51 mm)

Weight ..... 8 oz (227 g)

## Lag Screw Clip (239-ASM-1002)

A lag screw clip is ideal for field tests where the test specimen will be examined repeatedly over a length of time. This clip provides a stable mounting point for the field test accelerometer. The kit includes one lag screw and one clip. Made of stainless steel.

Size ..... 2 x 1 in (51 x 25 mm)

Weight ..... 0.5 oz (14 g)

## Model 239A System Kits

Description	Part Number	KIT 1	KIT 2	KIT 3	KIT 4
KIT 1: Laboratory system	239-KIT-1001				
KIT 2: Field survey system	239-KIT-1002				
KIT 3: Panel testing system	239-KIT-1003				
KIT 4: Everything	239-KIT-1004				
Model 239A electronic unit	239-BAS-1001	1	1	1	1
Model 239A manual	LIT-MAN-1001	1	1	1	1
Laboratory clamp set with carrying case	239-ASM-1003	1			1
Trombone clamp	239-ASM-1001			1	1
BNC/BNC cable	WIR-MUL-1001		2		2
10-32 Micro/BNC cable	WIR-MUL-1006	2		2	2
Stress wave impact hammer	SEN-PIE-1005		1		1
Field test accelerometer	SEN-PIE-1002		1		1
Laboratory test accelerometer	SEN-PIE-1001	2		2	2
Lag screw clips with screws (set of four)	239-ASM-1002		1		1

The Model 239A is available in kits configured for specific uses. The "Everything Kit" includes all the special tools and parts needed to fully realize the potential of this testing instrument.

Individual components may be ordered to build your own customized system.

# Model 340 Transverse Vibration E-Computer

The Model 340 E-Computer measures material properties of a wide range of materials and sizes.

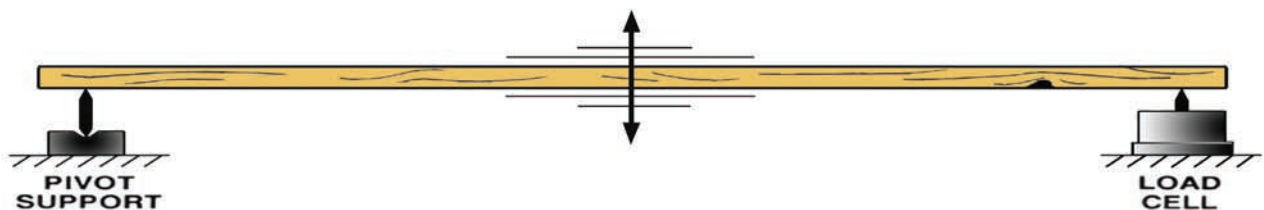
- Provides accurate, repeatable measurement of modulus of elasticity (E) without measuring deflection
- Automatically computes specific gravity and weight
- Saves digital data for convenient processing
- Compact, portable design allows set up for use in just minutes
- Quick and easy to use



Model 340 system set up with the electronics unit, hand-held controller, and a notebook computer (not included) on the work table (also not included).

## Description

- Model 340 operates with a personal computer (not included) to determine material properties of a specimen simply supported as a beam
- This equipment can help you determine E and specific gravity for wood specimens with a wide range of sizes.
- Quick and precise, and eliminates the need for deflection measurement.
- With a test specimen supported by the test tripods and the load cell tripod connected to the Model 340 electronics unit, vibrations are initiated usually by gently striking the specimen by hand near the span center. Measurements are taken as the resonant vibration decays.
- The Model 340 electronic interface unit connects by cable to your personal computer (PC), into which the Model 340 E-Computer software is loaded.
- Information about the test specimen and operating parameters is input to the PC via the keyboard. Results are displayed on the PC monitor, and data is recorded on the PC disk drive(s).



This diagram illustrates the support configuration for the transverse vibration measurement of specimen properties. One end of the specimen is supported by a load cell at a single contact point while the other end is supported by a pivot or spring knife edge support. This provides low compliance in the vertical direction and high compliance in the axial direction so the specimen may vibrate freely.

# Model 340 Transverse Vibration E-Computer

## Specifications

### General

The Model 340 E-Computer includes one electronic interface unit, two tripod assemblies, one calibration weight, one software module on disk, one load cell, and connector cables necessary for connection to RS232C serial port of customer's personal computer. Also included is a carrying bag for the tripods, load cell, cables, and test weight. *Note: This system does not come with a personal or notebook computer.*

E is computed from measured values of weight (W), vibration frequency (f), and "dial-in" values of width (b), thickness (h), and span length (l). K is a calibration constant. Then,  $E = (W l^3 f^3) / (K b h^3)$

### Requires the use of a personal computer (supplied by customer):

Operating System..... Windows-based  
Port..... Serial or USB-to-Serial

### Output

E..... Modulus of Elasticity computed from specimen dimensions and load cell signal.  
Specific Gravity..... Computed from weight at condition of test and specimen dimensions.  
Grade..... Computed E is compared with operator-selected grade thresholds; resultant grade is displayed on screen and recorded with data file.

### Basic System 340 (340-BAS-1001)

Includes:

- Electronic interface (1 ea.)
- Load cell, 500 lbs (2.2kN) capacity (1 ea.)
- Tripod test fixtures with removable legs (1 pair)
- Control wand, (1 ea.)
- Connecting cables
- 9-pin serial connector
- Operating manual (1 ea.)
- Software, provided on CD

### Electronic Interface

Provides excitation and demodulation of load cell signal, and conversion to serial data stream for transmission to computer through a standard RS232C port. Includes cables for ac power, plus a load cell, control wand, and connection to computer serial port. No internal PC modifications are required.

Five specimen weight ranges provide the sensitivity required for testing the smallest dimension lumber specimens plus the range required to test large laminated and composite specimens. Standard specimen weight range is 25 to 250 lbs (111-1112 N).

Power..... 110 Vac 60 Hz, 1 Amp (220 Vac, 50 Hz optional)  
Weight..... 11 lb (5 kg)  
Dimensions (LxWxH)..... 7 x 10 x 10 in (180 x 250 x 250 mm)  
Shipping Container..... 16 x 16 x 16 in (410 x 410 x 410 mm)  
Shipping Weight..... 15 lb (6.8 kg)

### Tripod Test Fixtures

Load cell and free-edge vibration fixtures are conveniently mounted on tripod supports with removable legs.

Weight..... 30 lb (14 kg)  
Tripod working height..... 37 in (940 mm) with legs attached. Test fixtures can be used without their legs for heavier specimens.  
Control Wand..... Hand control for operating E-Computer electronics;. Connects to electronic interface by cable.

### System Shipping Dimensions

Shipping Container (LxWxH)..... 16 x 41 x 13 in (410 x 1040 x 330 mm)  
Shipping weight..... 60 lb (27 kg)

# Model 340 Transverse Vibration E-Computer

## Options

### Aluminum Calibration Test Bar

(340-ASM-1001)

This test bar simulates a wooden 2 x 4 (1.5 x 3.5 in 38 x 89 mm), with an E of  $2.24 \times 10^6$  psi (15.5 GPa), for calibration purposes.

Size..... 1 x 2.5 x 96 in  
(25.4 x 63.5 x 2438 mm)

Alloy..... 2024-T351 aluminum

### Brass Test Weight

(MIS-MEC-1003)

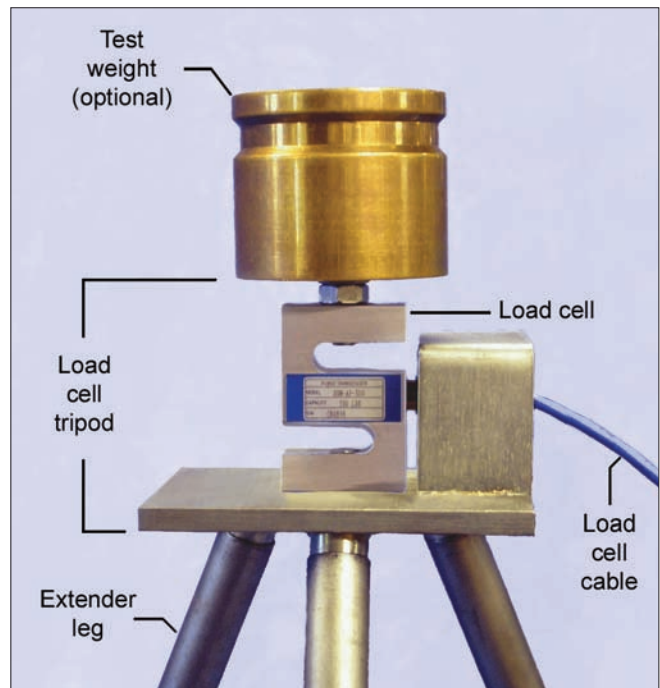
Brass test weight is used to calibrate the gain of the load cell system. After laboratory calibration with both test bar and test weight, only the lighter, less bulky test weight needs to be carried to the field.

Weight ..... 8 lb (3.6 kg)

### Production line Interface

(340-OPT-1001)

Provides hardware and software components for adapting the basic Model 340 E-computer (required) to customer's lumber grading production line. Includes optically coupled solid state relay inputs and outputs for interfacing to customer's grading line control system. Customer controls lumber, lumber vibration and provides signal input to 340 E-computer to start measurement and E computation. Software determines E and grade and puts out digital output signals to customer's control system.



Model 340 load cell tripod set up with the optional brass test weight, ready for system calibration.



A laminated beam, ready for testing, rests on the tripod test fixtures without the tripod legs attached.

# Model 440 Static Bending Tester

Provides laboratory measurement of flatwise bending modulus of elasticity (E).

- Highly accurate
- Accommodates twist
- Built-in, stress-free yoke
- Durable with trouble-free operation

## Description

- Employs a test load and dial indicator to find flatwise bending modulus of elasticity (E) in both North American and metric sizes.
- Specimen is positioned by hand against adjustable stops and a pre-load is applied. A dial indicator contacts the underside of the specimen at mid-span.
- Test load of steel weights are positioned with push-button-controlled air cylinders and is applied equally at the 1/3 and 2/3 test span locations.
- Dial indicator is supported on a separate, stress-free yoke structure to eliminate any frame deflection errors that might occur when the test load is applied.
- Dial indicator withdraws into its protected position simultaneously with the removal of the pre-load from the lumber.



Model 440 Static Bending Tester with test specimen ready for loading.

Accessories and Spares	
Part Number	Description
440-ASM-1001	Test Weight, 50 lb (upper)
PNE-CYL-1010	Cylinder, 440 Bottom Load
PNE-CYL-1011	Cylinder, 440 Dial Indicator
PNE-CYL-1012	Cylinder, 440 Top Load
PNE-VAL-1016	Valve, Load Cylinder
PNE-VAL-1018	Valve, Operator

## Specifications

### Configuration

Pneumatically-operated, static weight bending test machine measures deflection at mid-span, by a yoke-mounted dial indicator gauge. Combination pivot and roller load points accommodate warp in the specimen. Adjustable alignment pins, writing table, and storage drawer are included. Some assembly required.

### General

Bending Test Span ..... 48 in (1219 mm)  
 Test Load Configuration..... 4-point 1/3 span

### Material Size Capacity

*North American lumber sizes:*

Thickness ..... 1.5 in  
 Width ..... 2.5, 3.5, 5.5, 7.25,  
 9.25, and 11.25 in

*Metric sizes (optional):*

Thickness ..... 70, 90, 120, 140,  
 and 180 mm  
 Width ..... 35 & 45 mm

*Other size configurations are available.*

### Test Weights

(440-ASM-1001)

Weight ..... 50.0 lb (22.7 kg)  
 Standard ..... Two weights included (use  
 up to 3 additional weights)

### Power Requirements

Clean shop air pressure ..... 80 psi (550 kPa)  
 Volume ..... 1 cfm (0.03 m<sup>3</sup>/min)  
 Air Volume Per Cycle..... 50 in<sup>3</sup> (1 l)

### Dimensions

Length..... 53 in (1350 mm)  
 Width ..... 22 in (560 mm)  
 Height ..... 78 in (1980 mm)  
 Shipping Weight ..... 670 lb (270 kg) (with two  
 50-lb load weights)

# Model 810 Minnesota Shear Tester

- Internal bond testing of small specimens by equal compression and shear forces
- Provides consistent measurement accuracy
- Features full-face engagement of gripping surfaces
- Complies with ASTM D 1037 standard
- Capable of testing wet or dry specimens
- Needs no special preparation of specimens

## Description

- Attractive alternative to traditional internal bond strength measurement. With no time-consuming gluing or clamping, testing of either wet or dry specimens is quick and easy. The test is applicable to particleboard, oriented strand board (OSB), medium density fiberboard and waferboard as well as other types of panel products such as plywood and wood-cement board.
- Applies a load at a 45° angle to the face of a rectangular specimen, producing equal compression and shear forces.
- Load at which a specimen fails (shears) is recorded by means of a suitable force measurement system, such as the Metriguard 831 Load Cell Display (not included). Recorded load is a measure of specimen internal strength.
- First loading head attaches to the loading apparatus of a testing machine or press (not included). The second loading head includes a low-friction linear roller bearing which allows unrestrained lateral movement to occur as shear strain develops.
- Improves upon earlier configurations of the Minnesota Shear Tester by offering simplified and improved loading heads to ensure uniform loading stress.



Model 810 shown here mounted in an optional testing frame with a load cell.

- Tests by the Natural Resources Research Institute (NRRI) of Duluth, Minnesota, have shown excellent panel-average basis correlations between the compression-shear test performed by the Model 810 and traditional tension strength perpendicular to surface (internal bond) tests.
- Manufactured and sold by Metriguard, Inc., under license from the University of Minnesota.
- An optional bench-top testing apparatus allows the tester to remain ready for use at all times and includes a 10,000-lb (44 kN) capacity press, a load cell, and an electronic force readout unit.

## Specifications

### General

The Metriguard Model 810 Minnesota Shear Tester is comprised of two stainless steel loading heads. One head has a spherical bearing for firm, uniform contact with a specimen. The other head includes a spring-loaded linear roller bearing to allow lateral motion as a specimen undergoes shear deflection. Serrated mating surfaces and restraining bars (stop blocks) prevent specimen faces from moving with respect to the loading head surfaces while load is applied.

### Specimen Thickness Range

Size..... 1/4 to 1-1/4 in (6.35 to 32mm). Test specimens are cut to dimensions specified in ASTM D 1037

### Shipping Dimensions

L x W x H..... 12 x 7 x 5 in  
(300 x 170 x 120 mm).

Weight ..... 20 lbs (9 kg).

### Options

Force Measurement System ..... Model 831 electronic unit  
Load cell: 10,000 lb (44kN)  
capacity  
Digital panel meter  
Shunt calibration

Test Frame..... Built to house a bottle jack  
and the load cell for the  
electronic force measure-  
ment system

# Model 870 Compression Parallel Tester

## Provides measurement of ultimate compression strength, parallel to grain

- Requires little specimen preparation
- Accommodates most dimension lumber sizes
- Designed to ASTM requirements for ultimate compression strength measurement

### Description

- Cage prevents buckling of specimens during compression testing and serves as a guard, containing the specimen during failure
- Spherical bearing in the loading head provides uniform application of the test load over the cross-section of the specimen
- Force applied either by an optional hand or electric hydraulic pump, and measured by one of three optional force measuring systems
- Heavy steel frame provides strength and rigidity needed to apply the full testing force to the specimen, while positioning the specimen at a convenient working height
- Guide bars on the loading heads provide horizontal centering of the specimen prior to application of the test load



Model 870 Compression Parallel Tester with a 2x4 specimen mounted in the testing frame.

### Specifications

#### System Configuration

Specimens are inserted from either the front or the back of the frame. Compression test force is applied by hydraulic pump and cylinder. Force is measured by one of the optional force measurement options. Some assembly required.

#### Material Size Capacity

Thickness ..... 1.5 in (38 mm)  
Width ..... Up to 11.25 in (286 mm)  
Length..... 29 in (737 mm)  
Maximum Compression Force:..... 100,000 lb (444.8 kN)

#### System Dimensions

Mechanical System (including detachable base)  
L x W x H ..... 40 x 40 x 56 in  
(1020 x 1020 x 1420 mm)  
System Weight ..... Approximately 550 lb  
(250 kg) (not including hydraulic power unit or force measurement system)

#### Options:

##### Hydraulic Power Systems

Two-stage hand hydraulic pump  
One-stage hand hydraulic pump  
Half-hp electric hydraulic pump

##### Force Measurement Systems

Hydraulic Pressure Gauge with Peak Needle and Snubber  
Electronic Load Cell with Digital Readout and Peak Track

Guide bars to be specified at time of order. If not specified, the 1-1/2-inch guide bars will be supplied. Special guide bars for other thicknesses are available.