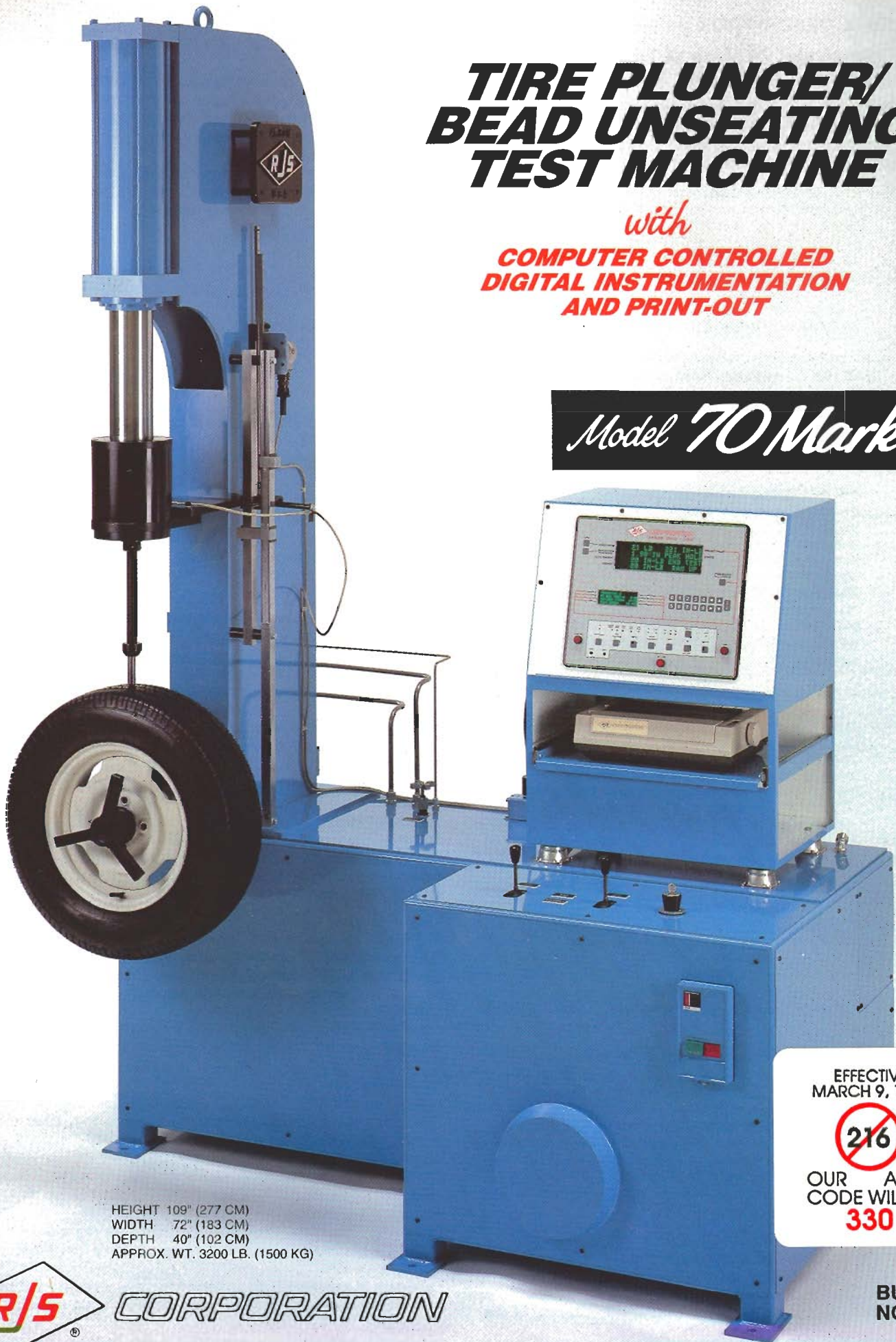


# TIRE PLUNGER/ BEAD UNSEATING TEST MACHINE

*with*  
**COMPUTER CONTROLLED  
DIGITAL INSTRUMENTATION  
AND PRINT-OUT**

*Model 70 Mark III*



HEIGHT 109" (277 CM)  
WIDTH 72" (183 CM)  
DEPTH 40" (102 CM)  
APPROX. WT. 3200 LB. (1500 KG)

**R/S** CORPORATION

EFFECTIVE  
MARCH 9, 1996



OUR AREA  
CODE WILL BE  
**330**

BULLETIN  
NO. PT-295

## GENERAL DESCRIPTION (Pictured on Cover)

### The Model 70 Mark III Tire Plunger and Bead Unseating Test Machine

- Performs the United States Department of Transportation (D.O.T.) Federal Motor Vehicle Safety Standards 109/119 for tire plunger energy and bead unseating, and incorporates flexibility to allow user-designed tests to be conducted.

The FMV. Safety Standards 109/119 describe the required tests of tire strength as measured by "plunger energy", and the force or load required to unseat the bead of a tire from the rim or wheel upon which it is mounted.

When conducting tests, the machine is selectively placed by the operator in the desired test mode, that is, either PLUNGER ENERGY, BEAD UNSEAT, or OTHER TEST.

- Provides and displays measurements in FREE MODE; or, if in PEAK HOLD, captures, freezes, and displays peak values of load, energy, and deflection/penetration; or if in PRE-SET LOAD/ENERGY signals the operator by sound and automatically freezes all data when a pre-set value of energy (plunger test) or load (unseating test) has been reached.

FREE MODE is the selected condition that allows the digital readout to continuously display the rising or falling values of the measured data as the machine ram applies or releases load to the specimen, whereas PEAK HOLD is the selected condition that allows capture of the peak energy at rupture (plunger test) or peak force (load) of unseating (unseating test). PRE-SET LOAD/ENERGY is the selected condition that allows the operator to enter a pre-set value of energy (plunger test) or load (unseating test).

- Automatically performs required calculations, averages successive measurements on a specimen, and prints out all calculations, running average, and displayed data.

The FMVSS requires reporting the plunger energy average of five tests on a specific specimen, and the unseating force (or load) average of five tests on a specific specimen.

- Is selectively operable in English, Systeme International (SI), and meter-kilogram-second (mks) units.

The instrumentation selectively reports in:

SYSTEM	FORCE OR LOAD	DEFLECTION/PENETRATION	ENERGY	PRESSURE
English	lb.	in	in-lbs	psi
SI	N	mm	N-m	kPa
mks	kg	mm	kg-cm	kg/cm <sup>2</sup> (ksc)

- Accepts and displays manually entered data for each specimen.

The following data may be manually entered into the display:

1. Specimen I.D., 2. Test No., 3. Date, 4. Operator (name), 5. Tire Weight (when performing Bead Unseating), 6. Elapsed Time, 7. Time (24 hour format), 8. Tire Air Pressure, 9. Pre-set Value (desired maximum energy for plunger test; desired maximum load/force for bead unseating). Manually entered data are printed-out along with measured data.

## MACHINE DESCRIPTION

The Model 70 Mark III machine is constructed in a "C" configuration of fabricated steel, and is provided with both a removable rotatable spindle and a flat anvil (Figure 1). The rotatable spindle is movable fore and aft to permit the centering of the plunger probe over the tire specimen.

Rims with hubs are conveniently mounted by use of adaptors directly on the rotatable spindle. The spindle, with the tire specimen, is manually rotatable in the frame of the machine

for the five required test ruptures, or alternatively, five tests conducted at pre-set values of plunger energy without rupture.

The removable flat anvil supplied with the machine is interchangeable in the machine frame with the rotatable spindle, and provides the means to test tires mounted on rims without hubs. When using the flat anvil for this purpose, a radius shoe (provided) may be used.

A second purpose of the flat anvil is to provide a flat surface upon which a calibrating instrument may be set. When used for calibration, the radius shoe is removed.

## TYPE OF OPERATION

Hydraulically operated (oil).

The pressure source is a low-noise hydraulic pump, the flow of which is controlled by a precision, adjustable, flow control valve.

The plunger travel rate is 2 inches (50.8 mm) [± 5%] per minute for testing the specimen and is adjustable. The rapid-travel rate is about 20 inches (508 mm) per minute and is not adjustable.

## CONTROLS

The machine is controlled by two lever operated valves. One controls the rapid-travel, up and down; the second controls the test travel, up and down.

## POWER

The machine motor is 2 horsepower, 1200 rpm or 1500 rpm (depending on line frequency) with a manual push button starter; 3 phase 50 or 60 Hz, any standard voltage, as selected by the customer.

## TIRE SIZE CAPABILITY AND MAXIMUM TEST LOAD

The Model 70 Mark III will accept tires of 56 inch (1422 mm) maximum outside diameter, and 21 inch (533 mm) maximum cross-section.

One rim adaptor (for passenger car wheels) is furnished with the Mark III as "standard", but other adaptors can be supplied optionally to the user's requirements. In such cases, the user must supply dimensional information relative to the test rim or wheels intended to be used so that the special adaptor can be manufactured.

An optional conical quick-change rim adaptor is offered for use with passenger car rim sizes. See list of optional accessories.

The maximum working load capability of the machine is 22,000 lb (10 metric tons). Maximum plunger energy readout, a calculated value, is 99,999 in any units. Maximum ram travel is 20 inches (508 mm).

## INSTRUMENTATION

The Mark III incorporates microcomputer controlled digital instrumentation with software specifically tailored to conveniently conduct the plunger energy and bead unseating tests while at the same time providing flexibility to perform other tests which the user may require.

Such additional requirements, for example, may include applying specific loads for flat plate deflection measurements, for which a flat plate attachment is provided as a standard accessory.

Additionally, the instrumentation provides not only the conventionally calculated plunger energy, but also calculates and displays the integrated, or actual energy (work) expended when deflecting or penetrating a specimen.

LOAD/FORCE data on the Mark III are taken by a strain gage load cell, while DEFLECTION/PENETRATION is by digital encoder driven from a mechanical gear rack.

DEFLECTION/PENETRATION can also be measured by using the precision mechanical scale built into the Mark III machine.

The Mark III provides high accuracy by use of precision load cells and transducers. Specifications supplied upon request.

## CALIBRATION

LOAD/FORCE calibration is performed by first installing the flat anvil into the machine frame, placing the instrumentation in calibration mode, then applying a force from the ram to a



Testing Tires on Rims Without Hubs

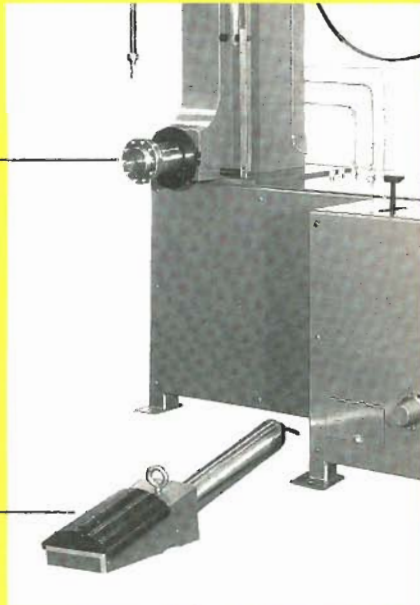


Figure 1



Figure 2  
Protective Shield

known standard (such as a load ring), and adjusting the ZERO/SPAN controls until the Mark III instrumentation conforms to the standard. The LOAD/FORCE value may be zeroed on the Mark III by a push button provided.

DEFLECTION/PENETRATION is measured by use of an incremental 2-phase pulse encoder, which has been selected to deliver the required number of pulses conforming to unit travel.

Adjustment or calibration for DEFLECTION/PENETRATION is not required nor available on the instrumentation, but the readout for DEFLECTION/PENETRATION may be zeroed on the Mark III by a push button provided.

Values for DEFLECTION/PENETRATION are positive for ram travel downward from zero. Negative values for upward travel above zero is indicated by a minus (-) sign. Positive values are not indicated by a sign.

Zeroing of both LOAD/FORCE and DEFLECTION/PENETRATION occurs automatically upon pressing the START TEST push button.

### VISUAL DISPLAY

The bright, lit-up characters incorporated into the instrumentation make the Mark III easy to read as a test is being conducted.

Measured data are indicated by characters 11 mm high, while characters indicating entered data are 5 mm high. All characters are of the vacuum fluorescent type, emitting a pleasant pale green color.

### CALCULATIONS

1. D.O.T. PLUNGER ENERGY:  $W = FxP/2$  (D.O.T. ENERGY = FORCE X PENETRATION / 2)
2. ENERGY (ACTUAL): Integrates the area under the curve defined by the force vs. deflection/penetration.
3. AVERAGES the successive measurements of both D.O.T. and integrated energy (Plunger Test) and load (Bead Unseating Test).

### AUTOMATIC FEATURES

1. Captures data values for load and deflection; calculates and holds energy values upon reaching peak load, predetermined load, or predetermined plunger energy; tracks successive tests for a given specimen I.D.
2. Sounds alarm and display begins blinking **END TEST RAM UP** upon reaching a peak load or predetermined value, whichever occurs first.
3. Averages required test results and automatically prints out all displayed and averaged data for plunger energy and bead unseating tests.
4. Acquired or calculated data for LOAD, DEFLECTION, and ENERGY are reset to zero by manually pressing the appropriate zero button, and automatically when the START TEST button is pressed. Pressing START TEST also causes a sequential number (-1, -2, -3, etc.) to automatically appear in the display to identify each test of a given specimen. When specimen I.D. is changed, sequential numbers automatically begin anew.

### STANDARD ACCESSORIES PROVIDED

- One each 3/4 inch diameter, and 1-1/4 inch diameter plunger probe.
- One Radius Shoe of 5 inch radius made to RJS drawing B-70-030. Other Radius Shoes at extra cost.
- One Flat Plate Attachment, for taking foot-prints of loaded tires. The plate supplied is 13 inch x 18 inch (330 mm x 457 mm).
- One Wheel Adaptor (B-102-030) for wheels with 4 or 5 mounting holes on a 4-1/2 inch (114.3 mm) bolt circle.
- Protective Shield (Figure 2). Opens to provide easy access for loading.

### OPTIONAL ACCESSORIES AVAILABLE

1. **The Model 100 Bead Unseating Fixture** (See Figure 3)  
The Bead Unseating Fixture is used to measure the load required to force a passenger car tire bead off a rim under certain conditions of test specified by Federal Motor Vehicle Safety Standard 109.

The Unseating Fixture is an optional extra, and is used in cooperation with the Plunger Machine when performing the bead unseating test.

The Model 100 Bead Unseating Fixture conforms dimensionally to Federal standard 109, and is adjustable to receive wheels of sizes 10 inch through 20 inch, as called for therein. However, the Unseating Fixture will be supplied only with adaptor rings for 13, 14, and 15 inch rims, unless other sizes are ordered as optional extras. Optional rim adaptor sizes are 11 inch, 12 inch, 16 inch, 17 inch, 18 inch, 19 inch and 20 inch. (10 inch rims are mounted directly on the Fixture structure.)

**2. X-Y Recorder**

The recorder is supplied with three load ranges and two displacement ranges.

At time of order, the units and ranges are selected by the user.

The standard load ranges are:

- a 0-5,000 lb,      0-10,000 lb,      0-15,000 lb.
- b 0-2,500 kg,      0- 5,000 kg      0- 7,500 kg.
- c 0-2,500 kg,      0- 5,000 kg      0-10,000 kg.

The standard displacement ranges are: full scale and half scale in units selected by user.

Each range is provided with individual span adjustments. Zeroing capability over the full ram stroke of 20 inches is provided.

**3. Conical Quick-Change Adaptor for Passenger Car Tire Rims**

**4. 1-1/2" Diameter Plunger Probe**

**5. 5/16" Diameter Plunger Probe**

**UPGRADING OF EARLIER MACHINES**

If the user's earlier Model 70 Plunger Machine is in good mechanical condition, upgrading of the machine with new instrumentation should be considered.

The older Model 70 may be upgraded in several possible ways, depending on the requirements of the user. The upgrade selections are:

**1. Upgrade to Mark III Configuration (Pictured on Cover)**

- a Mark III instrumentation supplied to replace existing hydraulic load cell and dial indicator.
- b Supply new strain-gauge load cell and load cell housing to supply LOAD data. Old hydraulic load cell and housing discarded. The mounting holes of the new cabinet match the holes of the old cabinet.
- c Supply digital encoder and gear rack drive for DEFLECTION/PENETRATION data.
- d Supply instructions for installation by user.

**2. Upgrade to use Mark III Instrumentation and Existing Hydraulic Load Cell (Similar to Cover Picture)**

- a Mark III instrumentation supplied to replace existing dial indicator. Hydraulic load cell remains in use. The dial indicator is discarded.
- b Supply supplementary pressure-to-voltage transducer to supply LOAD data to the Mark III instrumentation.
- c Supply digital encoder for DEFLECTION/PENETRATION data.
- d Supply instructions for installation by user.

**3. Upgrade to Use Mark III Instrumentation and Existing Hydraulic Load Cell and Dial Indicator (Figure 4)**

- a Mark III instrumentation supplied to supplement the hydraulic LOAD cell and dial indicator.
- b Supply supplementary pressure-to-voltage transducer to supply LOAD data to the Mark III instrumentation.
- c Supply digital encoder for DEFLECTION/PENETRATION data.
- d Supply instructions for installation by user.

A protective shield (Figure 2), standard on new Mark III, is optionally available on upgraded machines.

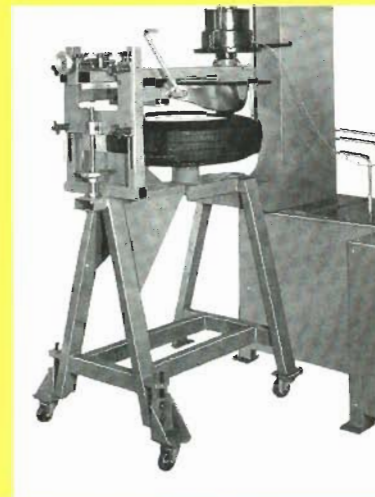


Figure 3  
Bead Unseating Fixture in Place  
for Conducting Unseating Test



Printer Shelf  
Extended for  
Easy Access



Figure 4



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