

Series 4235 Enhanced High Temperature  
Extensometer with 3-4 Point Bend Test Fixture

ATS 53200 (Reference IM 360) 08/03 Above: Overall Front View of Series 4235 Extensometer

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INSTRUCTION MANUAL ATS 08/03  
MODEL 4235 ENHANCED HIGH TEMPERATURE EXTENSOMETER  
WITH 3-4 POINT BEND TEST FIXTURE

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# Section 1. Preface

## 1.1 Unpacking

Retain all cartons and packing materials until the unit is operated and found to be in good condition. If damage has occurred from shipping, notify Applied Test Systems, Inc. and the carrier immediately. If it is necessary to file a claim, retain the packing materials for inspection by the carrier.

## 1.2 Warranty

All ATS, Inc. manuals are shipped with a warranty. Units have a warranty against defective parts and workmanship for one full year from date of shipment. See the back page of this manual for details.

## 1.3 After-Sale Support

If you have any questions concerning the operation of your unit, contact our Service Department (724-283-1212 or [service@atspa.com](mailto:service@atspa.com)).

## **Section 2. Safety**

### **2.1 For Owners, Operators, and Maintainers**

Read and understand all instructions and safety precautions listed in this manual before installing or operating your unit. If you have any questions regarding operation of the unit or instructions in this manual, contact our Service Department.

In addition to the safety warnings listed on the following page, notes are posted throughout the manual. Read and follow these important instructions. Failure to observe these instructions can result in permanent damage to the unit, significant property damage, or serious injury.

## Section 2. SAFETY GUIDELINES

**CAUTION:** UPON SPECIMEN FAILURE, USE CARE TO ENSURE THAT THE UPPER AND LOWER RAMS DO NOT DAMAGE ONE ANOTHER AND THE EXTENSOMETER

**CAUTION:** CUSTOMER SERVICING OF THE INTERNAL ELECTRONIC CIRCUITRY IS NOT RECOMMENDED. RETURN THE MODEL 33 SIGNAL CONDITIONER OR TRANSDUCERS TO THE FACTORY FOR SERVICE.

**CAUTION:** DO NOT EXCEED TRANSDUCER RANGE.

**CAUTION:** IF IT BECOMES NECESSARY TO CHANGE THE EXTENSOMETER/SIGNAL CONDITIONER CONNECTOR, OBSERVE THE COLOR CODING ON THE EXTENSOMETER LEADS AND MATCH TO THE CONNECTOR ON THE SIGNAL CONDITIONING UNIT.

**CAUTION:** DO NOT USE THE EXTENSOMETER HOUSING AT TEMPERATURES ABOVE ROOM TEMPERATURE.

**CAUTION:** SUPPORT THE CABLES FROM THE LVC TRANSDUCERS. DO NOT ALLOW THE CABLES TO PULL ON THE HOUSINGS. FALSE BENDING DATA MAY BE INDUCED INTO THE EXTENSOMETER OR SPECIMEN.

**CAUTION:** DO NOT APPLY A LOAD TO THE BEND TEST FIXTURE AT ROOM TEMPERATURE. THE SILICON CARBIDE IS BRITTLE AND BREAKS UNDER A LOAD AT ROOM TEMPERATURE.



## Section 3. System Overview

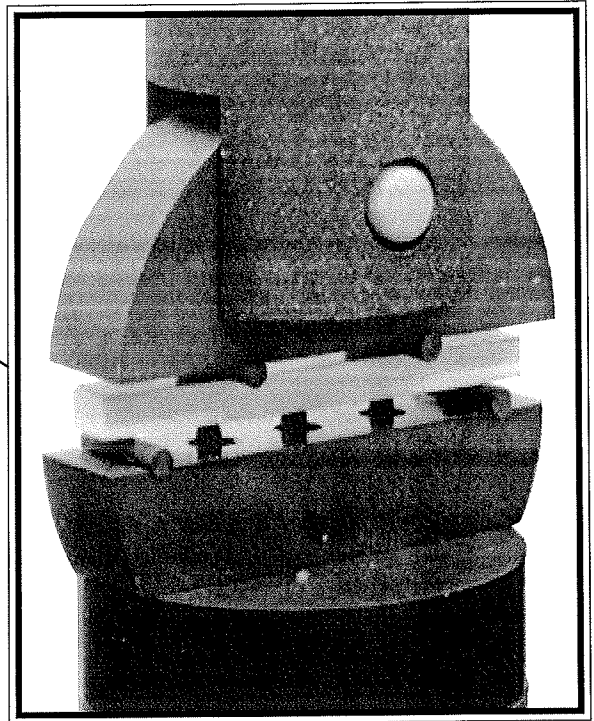
### 3.0 Overview of System and Fixtures

#### 3.1 General Description

Applied Test Systems's Series 4235 High Temperature Bend Testing Extensometer is typically used inside ceramic and metal compression devices for the purpose of measuring deflection. The extensometer averages readings for three and four-point flexural testing.

Bend flexural testing systems typically include the equipment listed below. Refer to Drawings 1 & 2.

- Extensometer & Transducer
- Four Point Bend Test Fixture
- Compression Devices
- Displacement Transducer  
(LVC = Linear Variable Capacitor/  
LVDT = Linear Variable Displacement  
Transducer)



#### 3.2 Extensometer and Transducer

The ATS Series 4235 Extensometer and the Transducer are housed inside a single unit. In Drawing #2, this unit is labeled the "extensometer unit." Extensometer rods attach to the transducer and take readings from the specimen.

#### 3.3 Four-Point Bend Test Fixture

The Four-Point Bend Test Fixture is comprised of several parts including four pins and a lower and upper section. Refer to Figure #1. This fixture is placed over the extensometer rods.

#### 3.4 Compression Devices

The Series 4235 or 4231 Extensometers and the Four-Point Bend Test Fixture are typically used in conjunction with a tester such as an ATS Universal Testing Machine or a Creep Machine. These testers are equipped with an upper compression ram as shown in Figure #1.

## Section 4. Assembly & Installation of Fixtures on testing machines

### 4.0 Upper & Lower Ram Fixtures, Bend Test Fixtures, & Cooling Lines

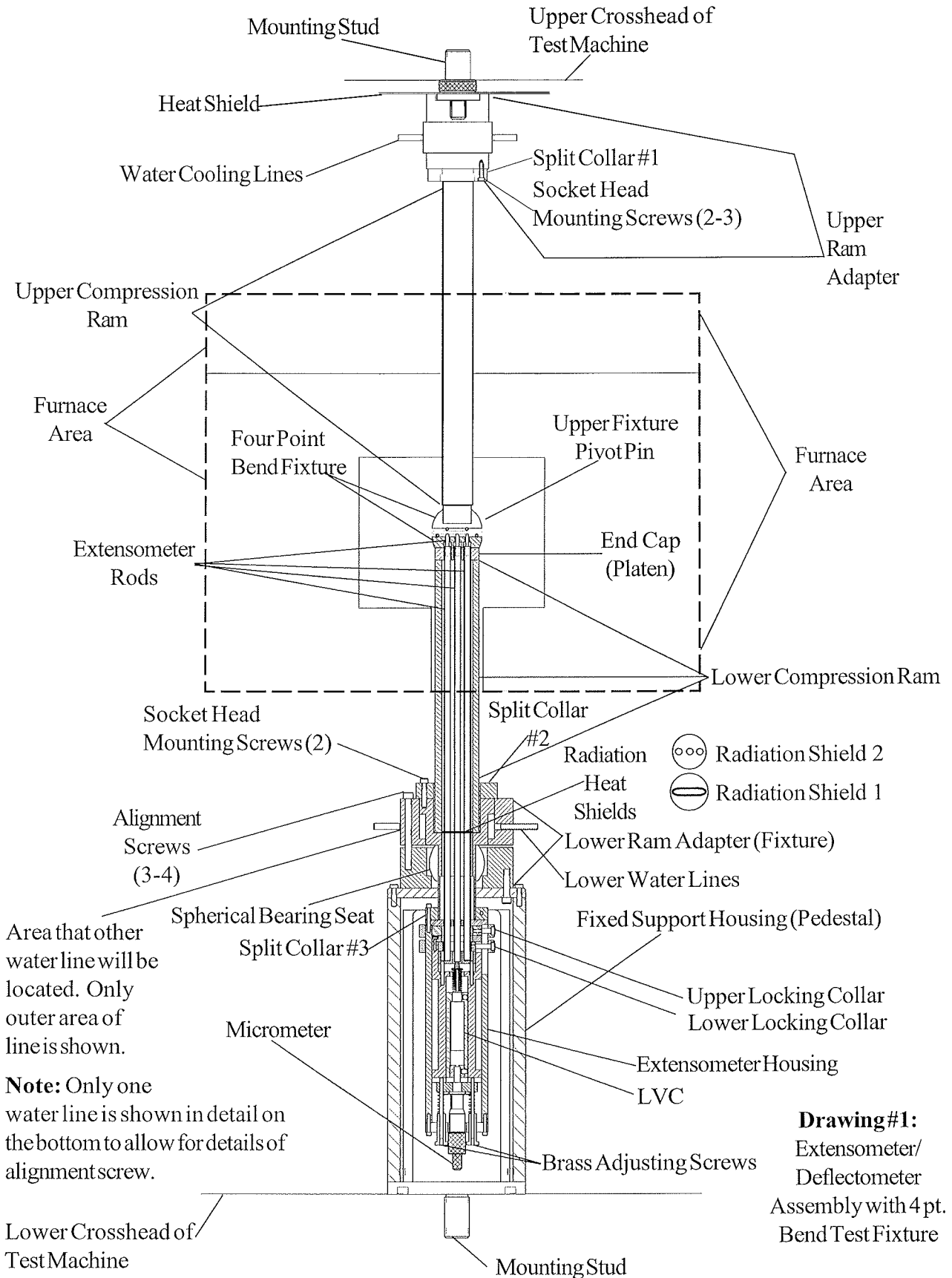
#### 4.1 Upper Ram Fixture

**Note:** Some parts may have already been pre-assembled. Please initially review this as a check list; then use the directions that apply to your equipment.

1. Separate Upper and Lower Crossheads of Testing Machine to maximum to facilitate installation of fixture (Drawing #1: Page 11).
2. Insert Upper Compression Ram into Upper Ram Adapter. Make sure that the ram is seated firmly. Tighten Socket Head Mounting Screws on Split Collar #1 to the Upper Ram Adapter. Tighten the Locking Collar's Socket Head Mounting Screw to a torque rating of 10-in pounds (lbs) (Drawing #1: Page 11).
3. Screw Upper Compression Ram Assembly into Upper Crosshead of Testing Machine; seat firmly (Drawing #1).

#### 4.2 Lower Ram Fixture

1. Bolt Fixed Support Housing Pedestal onto Lower Crosshead of Testing Machine.
2. Place Lower Radiation Shield Support Disc (Radiation Shield #1) into Spherical Seat, aligning slot parallel with crossbeam.
3. Tighten socket mounting screws on Split Collar #2 to the Lower Ram Adapter.
4. Insert Lower Compression Ram into Lower Ram Adapter. Seat firmly. Tighten the Locking Collar's Socket Head Mounting Screw to a torque rating of 10-in. lbs.
5. Place Platen onto Lower Ram Adapter. Lower Upper Crosshead so that the Upper and Lower Compression Rams are approximately 1/8 inch apart.
6. Align Lower Compression Ram vertically with Upper Compression Ram by adjusting Alignment Screws to insure proper vertical alignment and parallel separation. Separate upper and lower crossheads of testing machine to maximum to facilitate installation of fixture. Install Upper Radiation Shield into Lower Compression Ram, placing the Upper Shield on top of the Lower Radiation Shield and aligning three extensometer rod holes parallel with crosshead.  
**Note:** The Upper Radiation Shield is supported by the Lower Shield.
7. Calibrate extensometer to ASTM Standards, using an ATS calibration fixture. This may be done on or off of a test fixture.

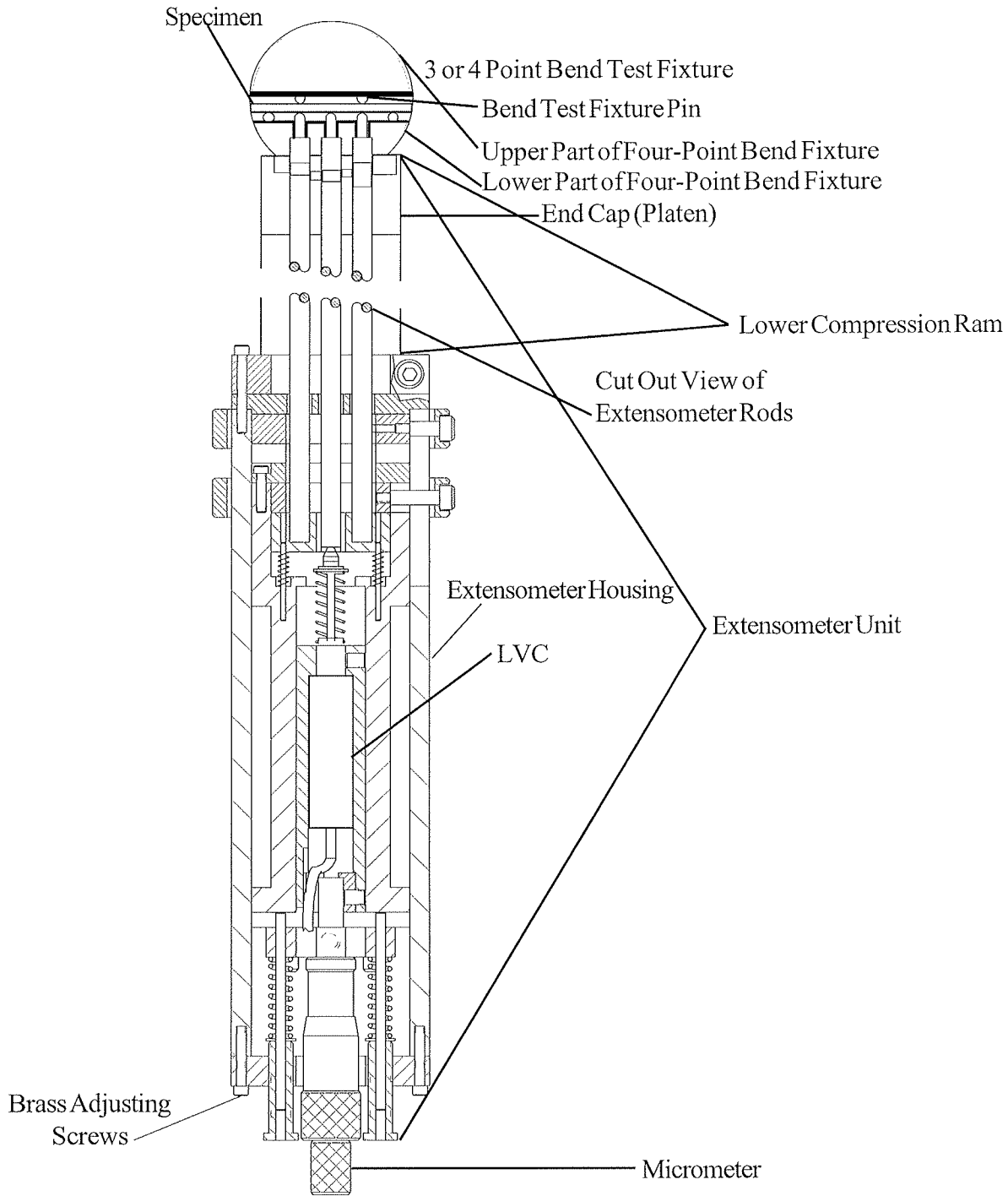


Area that other water line will be located. Only outer area of line is shown.

**Note:** Only one water line is shown in detail on the bottom to allow for details of alignment screw.

**Drawing #1:**  
Extensometer/  
Deflectometer  
Assembly with 4 pt.  
Bend Test Fixture

**Drawing#2:**  
Enhanced Extensometer Unit with 4 Point Point Bend Test Fixture



# Section 4. Assembly & Installation of Fixtures on testing machines

## 4.2 Lower Ram Fixture Continued . . .

8. If the extensometer is removed from the fixture for the calibration, insert calibrated extensometer and LVC (LVDT) Housing through the large opening in the bottom of the Pedestal, making sure extensometer rod holes are parallel with crosshead. Secure to the Split Collar #3 on the Extensometer Housing (Drawing #1: Page 11).

9. Carefully install the two Outer (longer) Extensometer Rods through top of Lower Compression Ram. Make sure rods are properly seated in extensometer housings.

10. Install Center (shorter) Extensometer Rod, using same procedure as described above for outer rods.

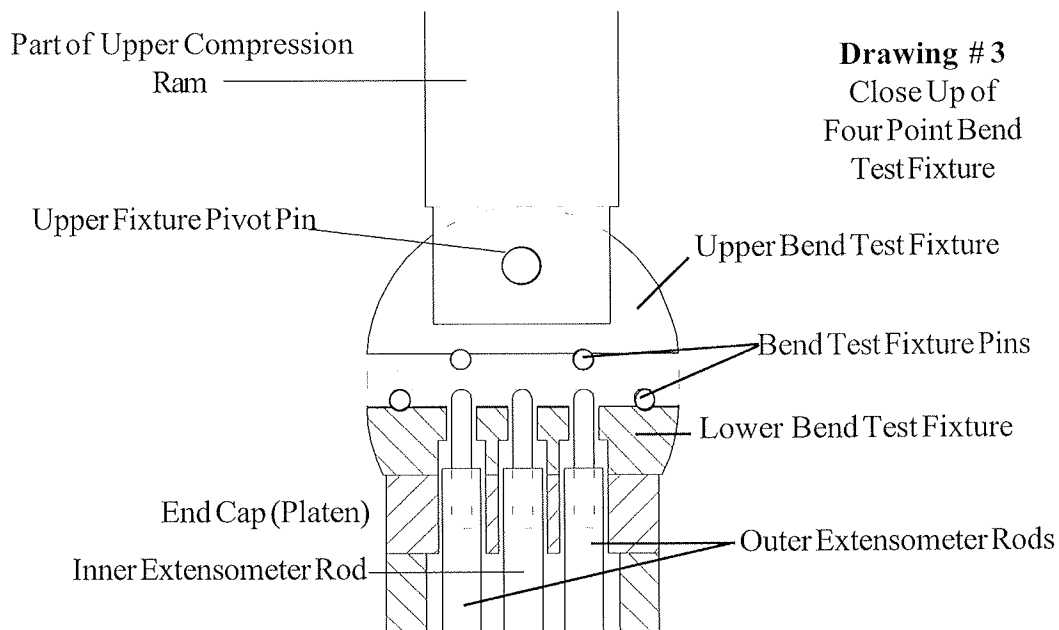
11. Place Platen over the Three Extensometer Rods on top of Lower Compression Ram. Make sure rods have freedom of movement through the Platen.

## 4.3 4-Point Bend Test Fixture

1. Place Lower 4-Point Bend Test Fixture over extensometer rods onto the Platen with Extensometer Rods in the holes (Drawings #1-#3: Pages 11-13).

2. Install Upper 4-point bend test fixture into the Upper Compression Ram with the Upper Fixture Pivot Pin (Drawings #1 & #3: Pages 11 & 13).

3. Lay Lower Bend Test Fixture Pins onto Lower Bend Test Fixture (Drawings #1 & #3).



# Section 4. Assembly & Installation of Fixtures on testing machines

## 4.4 Water-Cooling Lines

1. Install water-cooling lines so that water flows from upper coupling, terminating at discharge. For example, water flow should enter upper coupling at point (A), exit coupling at point (B), flow into lower coupling at point (C), and exit at point (D) to discharge. Do not have contact between the lines and outer shell of the furnace because the outer shell could become so hot that it might melt a cooling line.

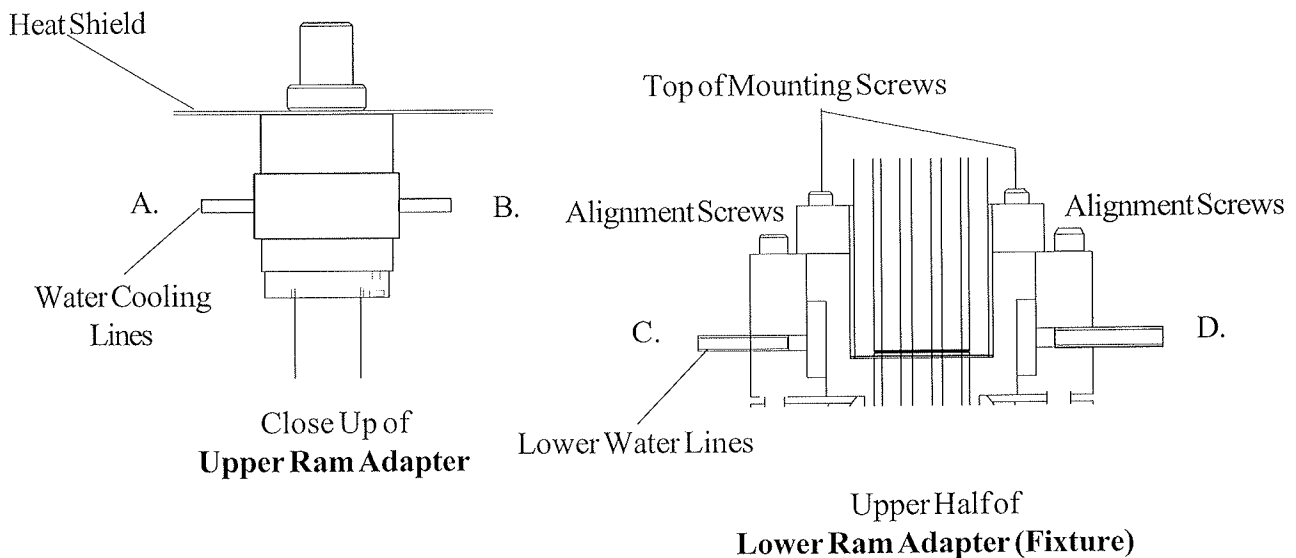
Keeping the lines free of the furnace shell may be accomplished two ways:

1. Run metal tubing from the upper and lower adapters. 2. Run hose through furnace bars.

2. Recommended water flow is warm discharge (Recommended Temp. 130° to 150° F). Also avoid excessive water flow rates. Too high of a flow rate may not remove enough heat from the load train or retort, which could damage retort seals, accessories, or a transducer, if present.

To illustrate this concept: if you tap very briefly on a hot iron you may not get burnt, but if you keep your hand on it for a longer time, there is enough time for heat transference and you will get burnt. This analogy is similar to what occurs with too rapid of a water flow in cooling accessories. There is not enough time for heat to be removed from the load train/retort if the flow rate is too high. Too slow of rate should also be avoided. One possible sign of too slow of a rate is when excessive amounts of steam is generated.

3. Allow water to flow after furnace has been shut off and the rams have cooled.



Drawing #4

# Section 5. Operation

## 5.0 OPERATION OF INSTALLED FIXTURE

### 5.1 4-Point Bend Test

1. Lower LVC (LVDT) and the extensometer rods by pulling upper locking collar down and rotating it to the right. This enables the specimen to be easily placed onto 4-point fixture. Note: It may be necessary to lower the brass adjusting screws in order to lock out LVC (LVDT) extensometer rods. When locking collar is locked out of position, bring both brass adjusting screws up for maximum spring tension. Both adjusting screws should be even. Light specimen may not require maximum tension.

2. Place specimen onto bend test fixture.

3. Place upper 4-point pins onto specimen as upper ram assembly is gently lowered until contact or slight position load is achieved. Be sure all pins are seated firmly in upper and lower bend test fixture.

4. Rotate upper locking collar to left and gently release LVC (LVDT) and extensometer rods, so they come in contact with specimen.

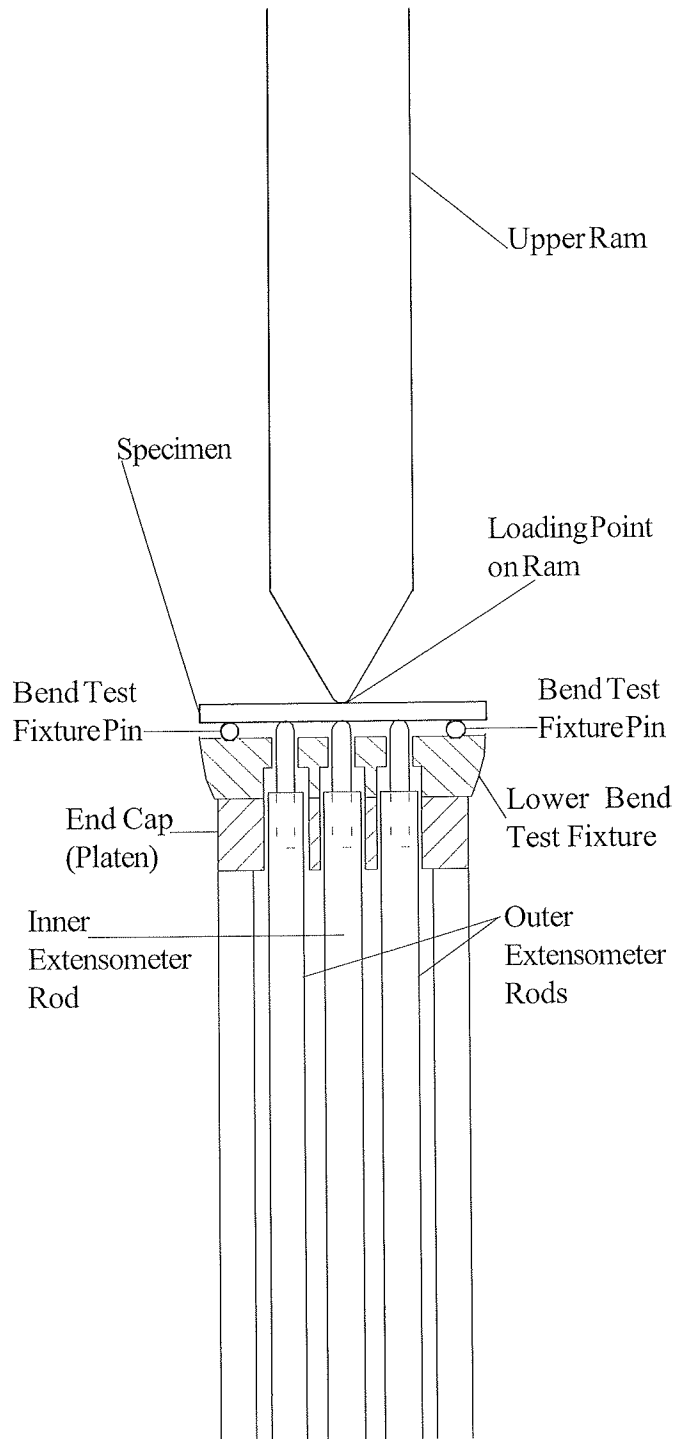
5. Rotate micrometer to achieve zero volt DC output.

6. Begin Testing

**Caution:** Due to close proximity of upper and lower ram, extreme care must be taken not to damage the extensometer upon specimen failure.

### 5.2 3-Point Bend Test Fixture (Illustrated on The Right)

1. Lower locking collar and rotate to right. This enables removal of two outer extensometer rods.



**Drawing#5**  
Close Up of 3  
Point Bend  
Test Fixture

## Section 5. Operation & Section 6. Furnace Installation and Alignment

### 5.2 3-Point Bend Test Fixture Continued . . . (Illustrated on The Previous Page)

2. Install upper ram.
3. Install the specimen.
4. Gently lower upper assembly until contact or slight positive load is achieved. Be sure all pins are seated firmly in lower bend test fixture.
5. Rotate Micrometer to achieve zero Volt DC output.
6. Begin Testing

**Caution:** Due to close proximity of upper and lower ram, extreme care must be taken not to damage extensometer upon specimen failure.

## 6.0 FURNACE INSTALLATION AND ALIGNMENT

1. Install furnace mounting bar in furnace brackets with height adjusting collar below furnace bracket.
2. Install frame clamps on furnace bar at each end.
3. Install furnace assembly on machine frame and tighten securely.
4. Check fitting of furnace end bores to upper and lower rams. To align furnace with load frame, loosen frame clamps and move in or out, or move laterally with shim placed between frame and clamps. Insulation may be scraped, sanded, or filed to provide additional clearance.
5. Check furnace hot zone and view port (if included) for proper placement to specimen.
6. Check for free movement of upper compression ram with furnace closed before installing fixture and starting test.
7. Install port plugs or blanket insulation around upper and lower compression rams to help prevent heat loss.





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