# SECTION I

ACCO | Wilson Instrument Division
929 CONNECTICUT AVENUE
BRIDGEPORT, CONNECTICUT 06602

624-1061-01

Sheet no. 1 of 2

Subject Model 60HD22 INTRODUCTION 2 Column/Hyd. Crosshead Lock INSTRUCTIONS - Riehle "HD" SERIES UNIVERSAL HYDRAULIC T.M.

DESCRIPTION - TESTING MACHINE for determining physical properties of materials.

The machine as illustrated in Figure 1, page 2, is a Universal Hydraulic Testing Machine capable of performing static Tension, compression and Transverse tests on properly prepared test specimens, completed parts or complete assemblies. The machine is normally furnished without the fixturing that would be required to perform the above tests. Therefore, the fixturing, e.g. Tension Grips, Compression plattens and/or Transverse Tools are normally considered accessories and must be supplied separately by the machine supplier or purchaser. The machine consists basically of two major units, the Loading Unit and the Electronic Control/Indicating Unit. The Loading Unit is used for applying a Load (Force) to the test specimen, part or assembly and the Electronic Unit is used for control and indication of the Load that is being applied to the test specimen, part or assembly.

The Loading and Electronic Units are free standing, self supporting, self contained, requiring only an electrical interconnection to the customer supplied electrical power quick-disconnect junction. After interconnected electrically, the units will form a completely intergrated testing system.

The Electronic Unit is furnished with a digital type indicator for Load readout, a Load signal conditioner and an operators panel for controlling all functions of the machine. These control and readout modules are considered standard on all "HD" series machines.

The Load/deformation recorder (X-Y Plotter) and the associated strain signal conditioner module are optional equipment and would be required in the event that a permanent record of the test being performed is desirable, or additional engineering data is to be obtained such as that obtained from the traditional Load/deformation (stress-strain) curve.

The testing machine, as illustrated, is basically arranged for Static testing and by integrating additional control modules, hydraulic components and suitable grip mechanism, the machine will be capable of performing dynamic alternating or fluctuating cycle type tests.

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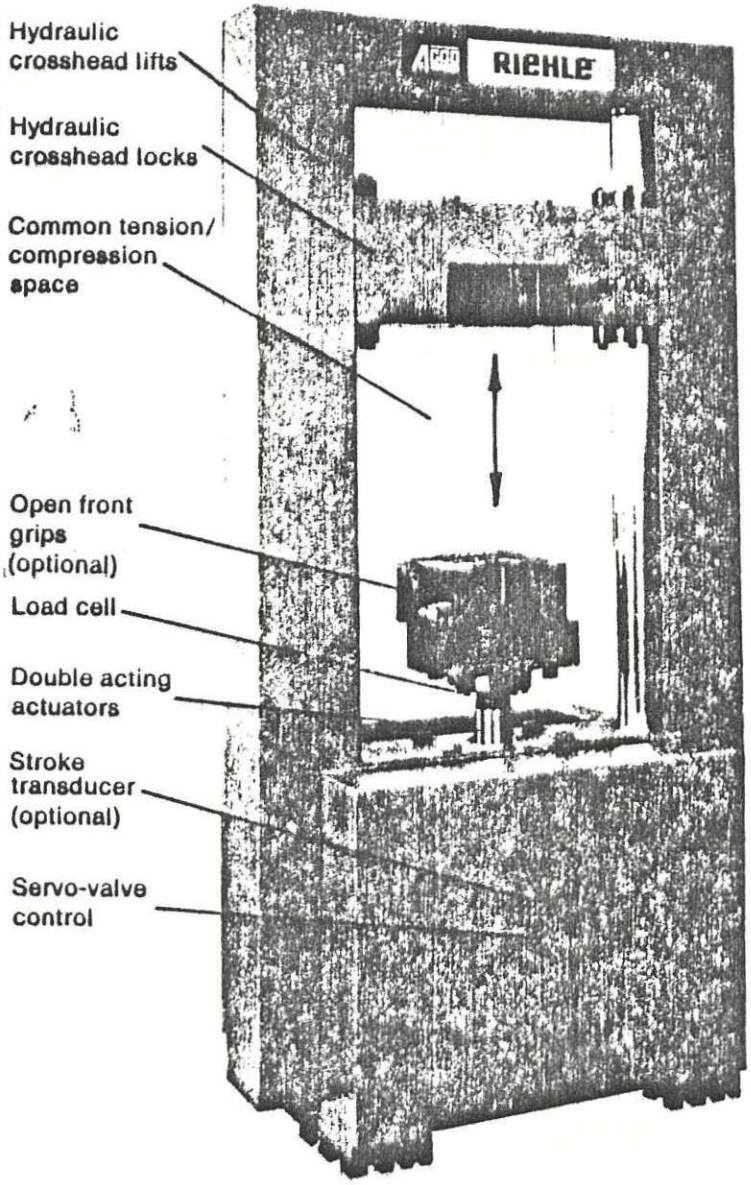
624-1061-01
Sheet no. 2 of 2

Subject INTRODUCTION

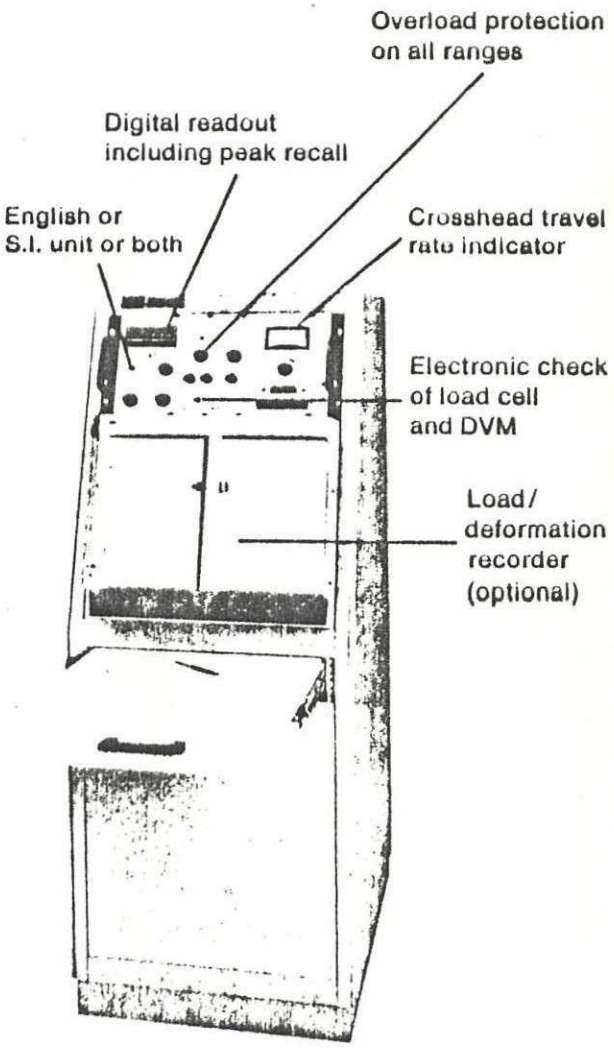
INSTRUCTIONS - Riehle "HD" SERIES UNIVERSAL HYDRAULIC T.M.

FIGURE 1




LOADING UNIT

(HYDRAULIC)




CONTROL/INDICATING UNIT

(ELECTRONIC)

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624-1062-01



Subject THEORY OF OPERATION

INSTRUCTIONS - RIEHLE "HD" SERIES UNIVERSAL HYDRAULIC T.M.

The Universal Testing machine as illustrated in Figure 1, on page 2 of instruction series 624-1061 operates on the principals of hydraulic force amplification for applying a force to the test specimen at a constant rate and electronics for both rate control and readout of the applied force. The electronic rate control and force feedback signals are totally independent of the hydraulic force amplifier (hydraulic cylinder) and therefore are uneffected by any errors that may be inherent or develop in the hydraulic pressure system.

The method used here for applying the load to a test specimen at a constant rate is a "High-Gain" inherently closed loop position or displacement control receiving an error signal that is constantly being generated uniformally.

A force applied to a test specimen is accomplished by the operator generating a command signal at the operators panel on the control console. The command signal causes a D.C. motor to rotate and mechanically drive the spool of a hydraulic servovalve (or slave valve), the body of which is attached to the hydraulic force amplifier ram (cylinder rod.) for providing the inherent feedback signal.

The servovalve spool in return directs hydraulic flow to one side of the force amplifier ram (cylinder piston) which moves in a direction and sense corresponding to the continuously generated command signal. As long as the command signal is generated, the hydraulic force amplifier ram (cylinder piston) will continue to apply a force to the test specimen at a rate consistant with the rate of the D.C. motor.

The force applied to the test specimen is weighed or measured by a strain-gage type Load Cell which is mounted in series with and between the hydraulic force amplifier ram and the test specimen force applying fixture. The strain-gages inside the Load Cell are very fine electrical resistance elements that are cemented to the mechanical strain member of the Load Cell and therefore will deform in the same manner as the strain member of the cell when an external force is applied.

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624-1062-01

Sheet no. 2 of 2

Subject THEORY OF OPERATION

INSTRUCTIONS - RIEHLE "HD" SERIES UNIVERSAL HYDRAULIC T.M.

There are four (4) strain-gage elements arranged in the form of a Wheatstone Bridge and excited with a fixed voltage (15-20v) at two opposite corners. When the Load Cell is subjected to an external force, the internal strain member and strain-gages will deform an equal amount resulting in an electrical resistance change in the gages. This resistance change will cause an unbalance in the Wheatstone Bridge and generate an output voltage proportional to the applied force.

The output voltage (0-60/80 MV F.S.) from the Load Cell is then transmitted to a signal conditioner at the control console where it is then amplified to the required voltage level which is dependent on the level of the scale range; e.g. The 100% scale range may require a two volt level, and the 50% scale range would require one volt, etc. This higher level output signal is then transmitted to a digital type voltmeter on the readout module, the display of which represents the force applied to the Test Specimen.

The Strain-Gage Weighing System being free from inherent friction losses; so common with electro-hydraulic weighing, and independent of the hydraulic force amplifier will result in a highly accurate and stable force measuring system.

The applied force Rate Control System being independent of hydraulic system characteristics will result in a reliable and accurate constant velocity control system under all loading conditions up to the full load capacity of the machine.

NOTE: The voltage levels indicated above are for the purpose of discussion only and are not representative of all machines. Therefore, refer to electrical instructions for specific voltage levels.

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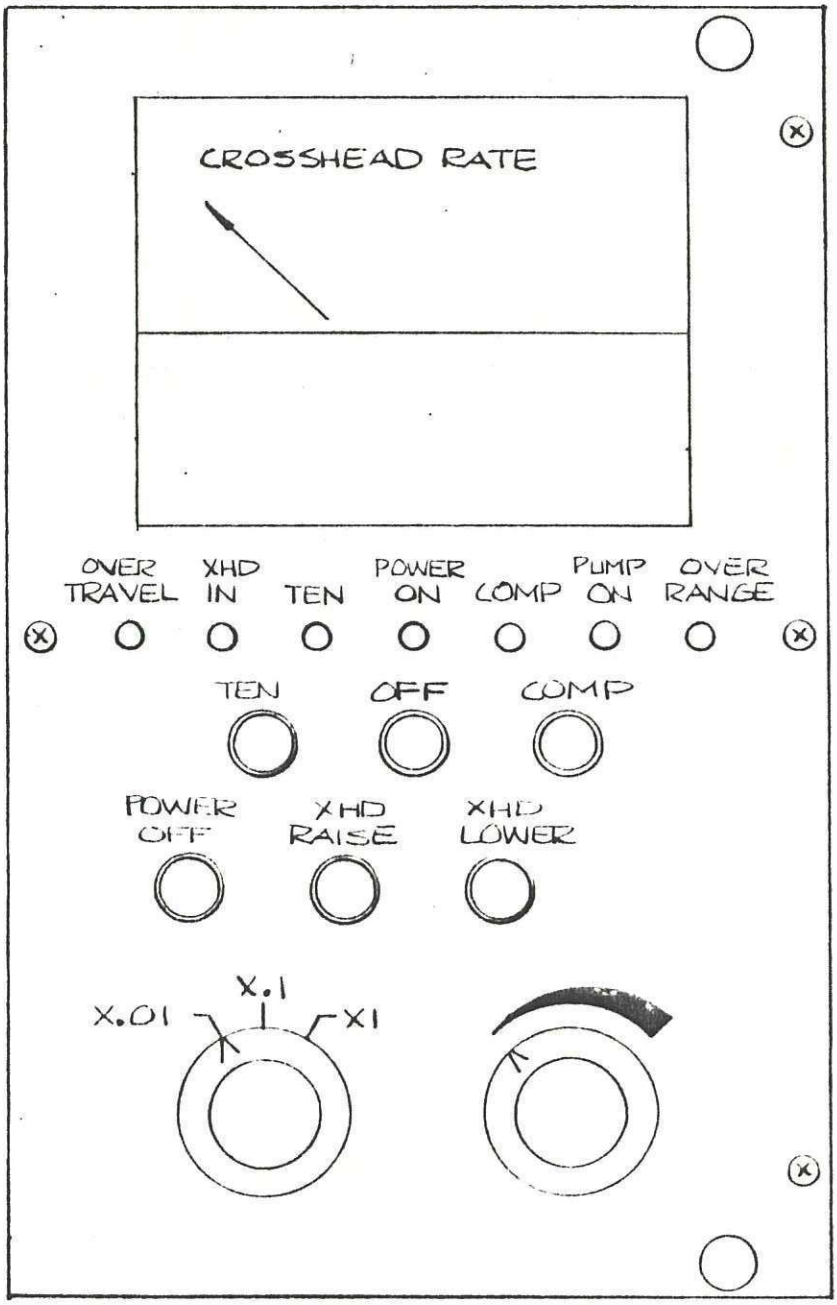
624-1005-01A

Sheet no. 1 of 1

Subject

# FRONT PANEL, OPERATORS MODULE

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624-1063-01

Sheet no. 1 of 1

Subject 60HD22 Std. SPECIFICATIONS 2 Col./Hyd. Crosshead Lock
INSTRUCTIONS - Riehle "HD" SERIES UNIVERSAL HYDRAULIC T.M.

| LOADING UNIT | ENGLISH | METRIC |
|---|---|---|
| Load Weighing System | Strain-Ga. | Strain-Ga. |
| (Independent of hyd. system) | Load Cell | Load Cell |
| Load (Force) Capacity | 60,000 lbs. | 250,000N |
| Dimensions: Width | 40.5 in. | 1030mm |
| Depth | 41.62 in | 1087mm |
| Height | 88.75 in. | 2254mm |
| Maximum Compression Space (Between crossheads or grip surfaces, but less compression fixture) | 26 in. | 660mm |
| Maximum Tension Specimen | 32 in. | 813 mm |
| Number of Load Columns | 2 | 2 |
| Horizontal Clearance (between columns) | 22 in. | 559 mm |
| Loading Stroke (Hyd. ram) | 6 in. | 152 mm |
| Loading Speed (Hyd. ram) | 3 in/min. | 76mm/min. |
| Adjusting Speed (Upper Crosshead) | 15 in/min. | 381mm/min. |
| Horsepower Requirement | 3 | 3 |
| Foundation, Special Requirement | None | None |
| Approx. Domestic Shipping Weight | 3000 lbs. | 1360 KG |
| CONTROL/INDICATING UNIT | | |
| Dimensions: Width | 21 in. | 533 mm |
| Depth | 25.5 in. | 648 mm |
| Height | 58 in. | 1473 mm |

DIGITAL INDICATOR MODULE:

| | |
|---|---|
| Digital Meter | DVM Zero Check |
| Ten./Comp. Selector | Track/Recall Selector |

| | | |
|---|---|---|
| SIGNAL CONDITIONER: (Load Readout) | Range Selector | English/Metric Selector |
| | Zero Adjust | Calibration Check |

| | |
|---|---|
| SIGNAL CONDITIONER (Optional) (Strain Readout) | Range Selector |
| | Zero Adjust |

OPERATOR PANEL:

| | |
|---|---|
| Crosshead Rate Indicator | Hyd. Pump-Start/Stop |
| Speed Control (single knob) | Crosshead-Lock, In/Out |
| Tension/Off/Compression Button | Crosshead-Raise/Lower |

D.C. POWER PANEL: On/Off Switch

| | | |
|---|---|---|
| Load Readout Accuracy | 0.5% of indicated load | |
| | OR 0.1% of Scale Range | |
| Strain Readout Accuracy (when finished) | 0.5% of indicated strain | |
| | OR 0.2% of Range | |
| Approx. Domestic Shipping Weight | 350 lbs. | 159 KG |

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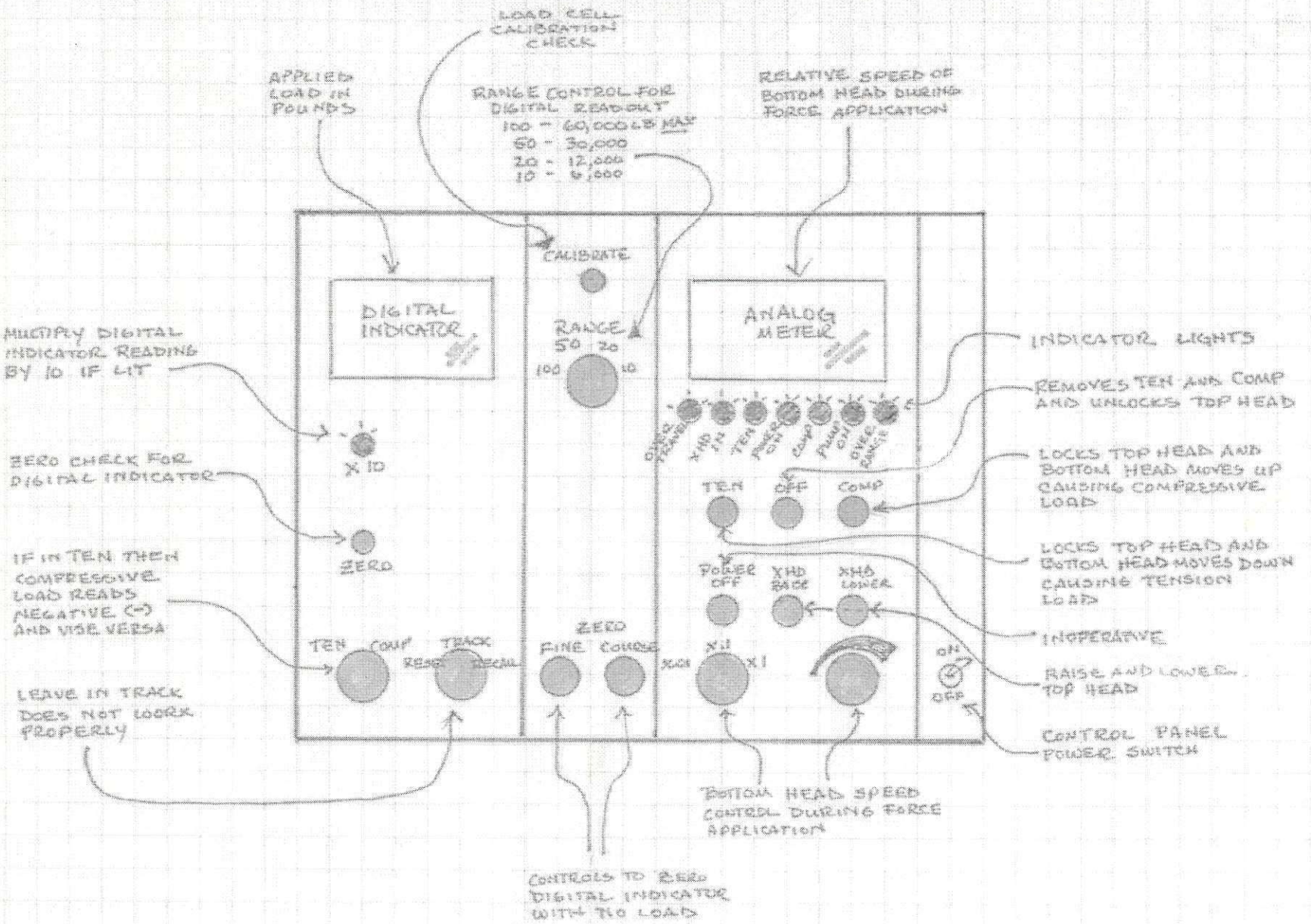


PAGE WILSON TENSIL TEST MACHINE

Operation of Page-Wilson Tensile Test Machine for a TENSILE TEST

***** All students MUST wear safety glasses during Tensile test labs.*****

Note: *Read each numbered item completely before taking any action listed in that* item!!!!!

Preparation: Use the 2" double punch and hammer to mark the specimen.

1) Verify that the **control panel power switch is off** to prevent transient electrical shock. This is the tan panel located to the right of the machine. The power switch is a toggle switch located in the lower right corner marked ON/OFF.

2) Locate the **main power switch** for the machine. It is located on the left side of the machine along with the **switch for the pump**, on a blue control panel. Turn on the main power and the power to the hydraulic pump.

*3)* Return to the tan control panel. **Do not** turn the power switch on this panel to **ON** yet. Note: *The XHD RAISE, XHD LOWER, TEN, and COMP buttons WILL OPERATE WITH THE CONTROL PANEL POWER OFF. If the control panel power is ON you will not be able to operate the XHD RAISE and XHD LOWER buttons to install the sample.*

*4)* Use the **XHD RAISE** button to raise the top head. Move it initially about 12". ***Caution: you need to have the top head moved up high enough so that when you move the bottom head, the heads will not come into contact.*** The final height of the top head will be determined by the position of the bottom head, and the type of sample you are pulling, see step 5.

*5)* Visually check the bottom head. For metal samples you will need to have 2-4" of the bottom ram showing. (That is 2-4" of shinny silver shaft below the bottom head.) For Plastic specimens you need 9-12" of the bottom ram showing. *If you don't have the* ***bottom*** *head raised high enough during the tensile test, the bottom ram will retract all of the way, and you will get an* ***OVER TRAVEL*** *light* causing the machine to shut down. To remedy this situation you must turn the power off on the tan control panel and use XHD

raise or lower to take the load off. Once the panel has been turned off your meter readings are lost and the test is over.

*6)* To move the bottom head up into position set the two **bottom head speed controls** to their maximum position. These are the black knobs located on the lower right of the tan control panel, see the panel drawing. These knobs should both be in their right most position, X1 and the widest part of the wedge. Then use the **COMP** button to move the bottom head up. You must use the **OFF** button *between* **TEN** and **COMP** to stop the rise of the bottom head. ***When you use the COMP button it locks the top head. The OFF (between TEN and COMP) unlocks the top head if there is no load on it.***

*7)* Mount the test specimen in the mounting blocks by sliding the mounting blocks towards you, out of the fixture. The test specimen has threaded ends, which need to be fully engaged in the mounting blocks. There is a ¾-10 die, mounted in a die stock, in the tool box if you need to clean the threads up on the test sample so that they screw in for full engagement.

8) Load mounting blocks, with sample, back into the fixture. Use **XHD RAISE** and **XHD LOWER** to raise or lower top head to get the height you need to get the blocks and specimen back into fixture.

9) Read this entire step before proceeding. Locate the extensometer. Locate the attached sheet from Laboratory Devices. (Mounting the extensometer should be done by the instructor since the device is delicate and expensive.) Follow the mounting directions except ***NOTE: for our purposes the extensometer should be fully retracted when installed or you will run out of length.*** Reminder: the extensometer dial indicator takes its reading as the "V" grips move away from each other, as elongation of the sample occurs.

10) Push **XHD Raise** to adjust the top head position to a point just before a load is applied (just before specimen is tight).

11)**Turn the control panel power on now**. The power switch is a toggle switch located on the lower right hand corner of the tan panel.

12)Zero the digital meter (if necessary) using the **zero fine and course knobs** located in the center bottom of the tan control panel.

*13)*Set the **Range** setting, using the knob located in the center top portion of the tan control panel. *Range is defined as a percent of maximum machine capacity. A load of 105% to 115% above range will stop the ram and the* ***over range light*** *will come on. To restart the ram, a direction opposite to that which caused the overload must be used, i.e. if you are in tension use the compression button. You should use the lowest range possible, which means you need to calculate how much load will cause failure before you start the pull.*

14) Push **TEN**, top head will lock in position.

*15)*Use **bottom head speed controls** to control the speed of the bottom head (these are the two black knobs located on the lower right of the tan control panel). In a tensile pull, the downward motion of the bottom head applies increasing force to the test specimen. This force is read on the **digital indicator located in the upper left corner** of the tan control panel. The speed of the bottom head is read on the **analog meter located in the upper right corner** of the tan control panel. ***The meter reading on the analog meter gives only the approximate speed of the bottom head. The position of the multiplier knob determines how the analog meter is read, i.e. if the multiplier knob is in the X1 position the analog meter is read directly. If the knob is in the X.01 or X.1 the reading on the panel is multiplied by the setting. For a reading of .3 inches/min. on the meter and the multiplier knob is set at .01X the meter will be read as .003 inches/min. If the knob is set at .1X the reading will be .03 inches/min.*** Recommended initial pulling speeds, Metal approx .003 in/min, Plastic .015 in/min. As the test proceeds the pulling speed may be increased.

16) To stop and measure the specimen, or remove the Extensometer **turn the Multiplier Control to X.01 and Speed Control to the slowest position. Turn the controls back up to continue the pull.**

17)When the tensile test specimen breaks, push **OFF,** located between the **TEN and COMP BUTTONS.** This will unlock the **TOP HEAD.**

18) Remove the sample. Use **TEN** to lower the bottom head, until the shiny silver shaft is just down inside the machine. Push **Off** between **TEN** and **COMP** when it is in position. Place a piece of wood on top of lower head. Use **XHD lower** to move the upper head down until it just touches the wood.

Shut down in this order: 1) CONTROL PANEL POWER, 2)PUMP, 3)MAIN POWER. If the pump is already shut down turn off the control panel power then the main power.