
**MTS Servo Hydraulic Test System (MTS Corporation)
Model: 810 system, FlexTest SE Controller – PLUS**

Location of Machine: Composites Lab, RFM 1218

Location of SOP and Machine Operating & Safety Manual: Composites Lab website under resources; Composites Lab TRACS site; and Hardcopy near machine.

Emergency Contact:

- Call 911
- Call EHS & Risk Management at 512-245-3616
- Call Head Lab Technician, Dr. Ray Cook (office 512-245-2050)
- Call Dr. Jitendra S Tate (office 512-245-4872)

Before using this machine:

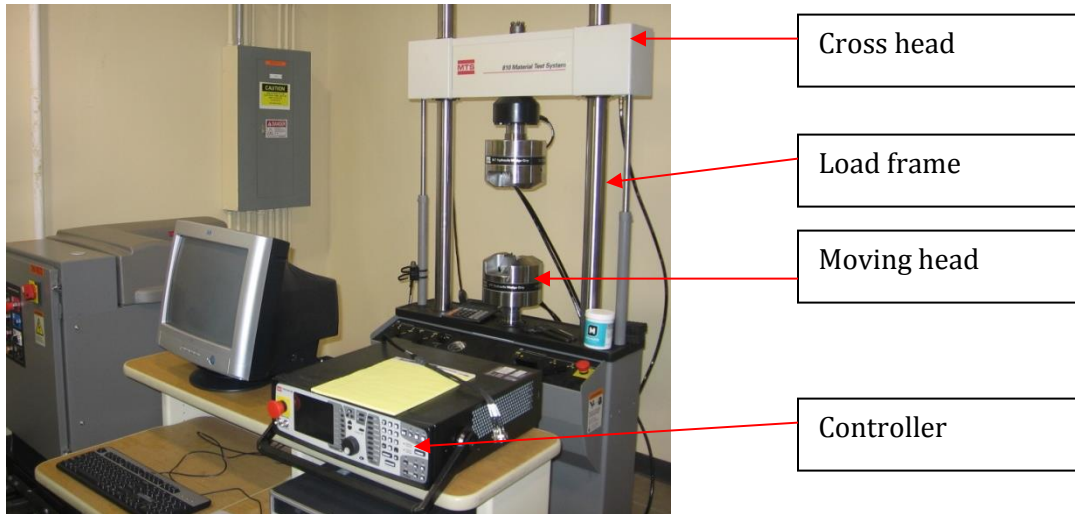
- You must have permission from Dr. Tate.
- You must have received formal training from technician or, trained research student (designated by Dr. Tate) related to machine safety and operation.
- You must read and understand **SOP and Machine Operating & Safety Manual.**
- You must use this machine under direct supervision of Dr. Tate or, Dr. Cook or, trained research student (designated by Dr. Tate).
- You must have signed “Lab Rules” document with Dr. Tate. This document must be signed every semester fall, spring, and summer (as applicable).
- If you do NOT follow above instructions you will be held responsible for your own safety and damages.

Safety Precautions:

Protective Equipment: Prior to performing this procedure, the following personal protective equipment must be obtained and ready for use: **Gloves, Safety Goggles, Lab Coat.**

Important Safeguards:

1. From lowermost position moving head moves 210 mm (~8 in) upward. Operator must make sure that, when moving head is at its extreme top position it is not touching to the crosshead.
2. Specimens can develop sharp edges as a result of testing, handling the specimens with unprotected hands can result in cuts.



MTS Machine

General information


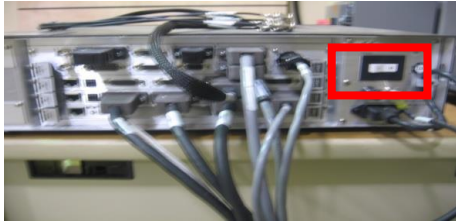
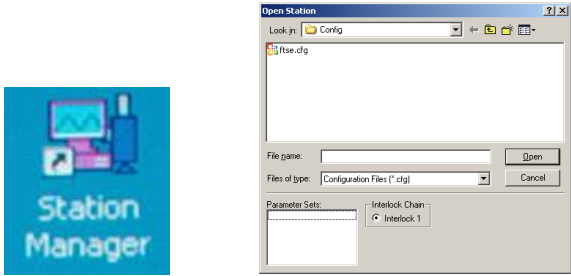
The MTS machine is used for all different types of Mechanical testing such as tension, compression, flexure, interlaminar shear strength, fatigue, fracture etc. MTS machine is controlled by advanced test design application software, **MultiPurpose Testware** (MPT). It is operated by hydraulic power unit. Different types of materials can be tested on this machine such as composites, plastics, and metals.

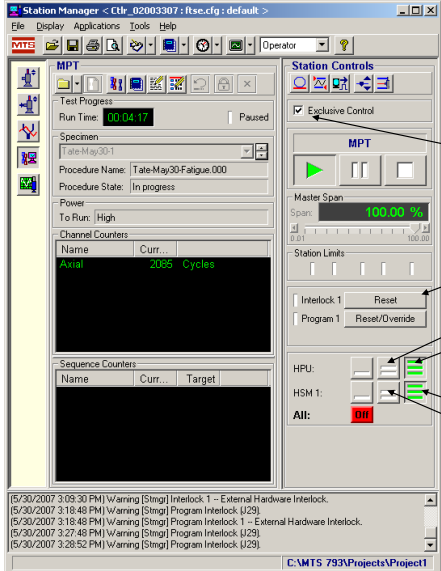


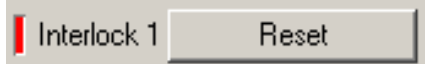


Specifications:


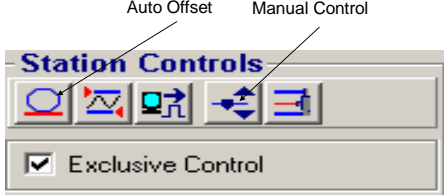
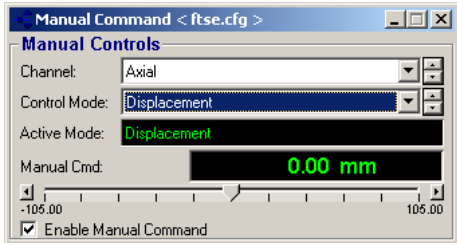
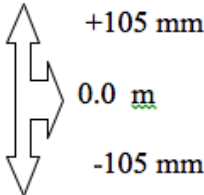
- Loading Capacity-100KN (22 kips)
- Clamping Pressure- 3000psi
- Range of Frequency- 0-100 Hz

Accessories:

- **Fixtures:** ASTM Test Fixtures: Tension D3039; 1. Compression D6641; 2. V-notch rail shear D7078; 3. Flexure D790; Short Beam D2344; 4. Boeing Compression after Impact D7137; 5. Boeing Open Hole Compression D6484; 6. Climbing Drum Peel Test D1781.
- **Flat Grips:** 0-7.6mm; 7.1-14.2mm; and 11.7-19.1mm
- **Round Grips:** 12mm; 15mm; and 20mm
- **Extensometers:**
 - 0.5" gage length; Strain Range: +/- 9%
 - 1" gage length; Strain Range: 0 to 100 %

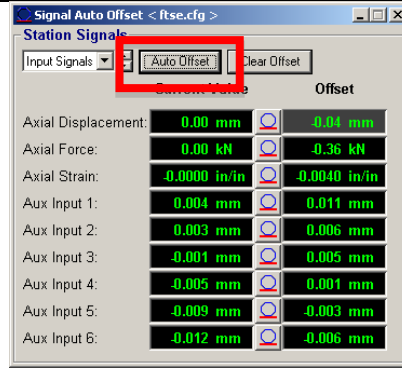
Turning and preparing the MTS for instrumented operation	
<p>On the pump panel:</p> <ol style="list-style-type: none"> 12. Locate the red circular switch and turn it on. 12. Locate and press the blue button label Reset. These 3 switches should turn off. 12. Verify that this switch is in LOW position 	
<p>On the controller:</p> <ol style="list-style-type: none"> 12. Locate and turn on the white power switch located on the back of the controller. 	
<p>On the computer:</p> <ol style="list-style-type: none"> 12. Turn on the machine. 12. Locate "Station Manager" icon on desktop and double click on it. 12. Select file ftse.cfg and click open 12. The 	

<p>12. You should be able to see this window</p>	 <p>Check "Exclusive Control" box</p> <p>"Reset" at Interlock 1</p> <p>Low High } HPU power</p> <p>High Low } HSM 1 power</p>
<p>12. The mode should be in the "Operator" mode.</p>	
<p>12. Check "Exclusive Control" box. It means now the control of the machine is acquired by software.</p>	
<p>12. Click "Reset" at Interlock 1</p>	
<p>On HPU: 12. Click low power wait for 10 sec and then click high power</p>	
<p>On HSM 1: 12. Click low power wait for 10 sec and then click high power</p>	

<p>At the right side on the Load frame:</p> <ol style="list-style-type: none"> Unlock the upper head (cross head) by turning right lever to this position. Turn left lever to upper position and crosshead will move upward. 	
<p>In “Station Control” window:</p> <ol style="list-style-type: none"> Click on Manual control. Click on Auto Offset Two dialogue boxes will pop up. 	
<p>In Manual Controls</p> <ol style="list-style-type: none"> Check ‘enable manual command’. Select the control mode displacement. Bring the “Moving Head” to the zero position 	
<p>Now the “Moving Head” can be moved.</p> <p><i>Note: If you give the negative value then the “Moving Head” goes up and if you give the positive value then the “Moving Head” goes down.</i></p>	

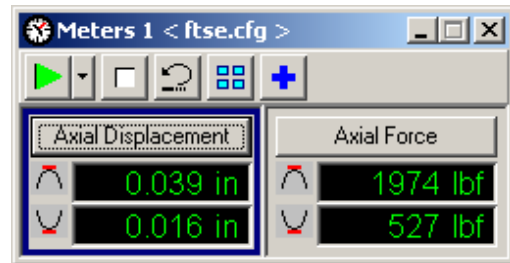
In Auto Offset


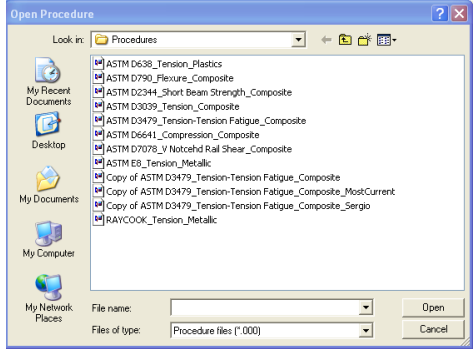


12. Click on “Auto Offset” to make all readings zero.


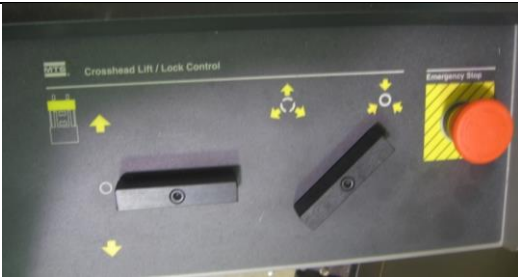
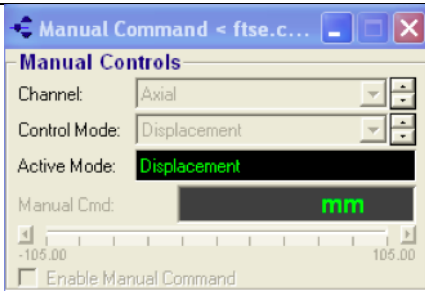
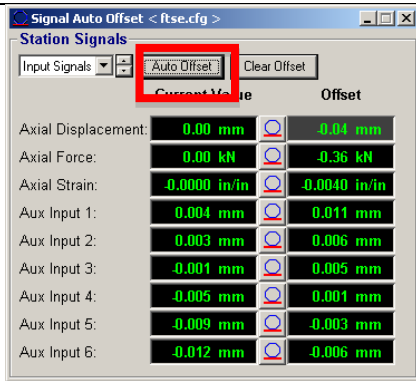
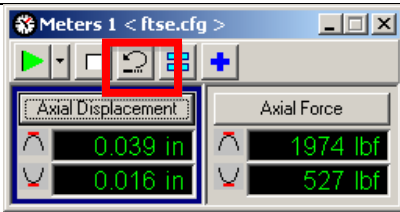







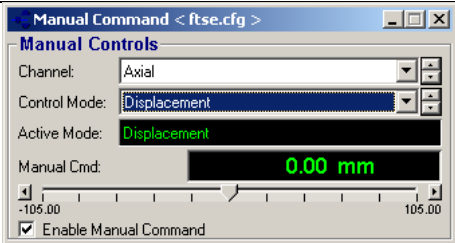
In the station manager:

12. Open the meters. In this meter you can add Time, Axial displacement, Axial Force etc., and also you can change the dimensions here accordingly by clicking the ADD button (+).


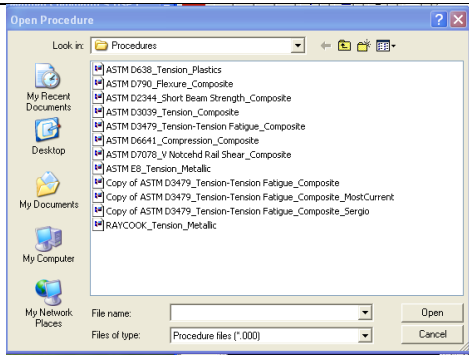
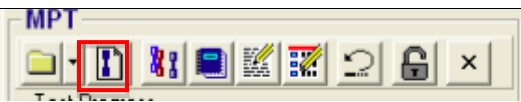




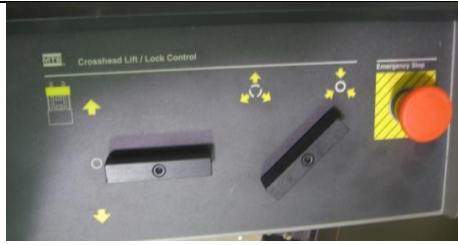

TENSION TEST	
<p>In MPT window:</p> <ol style="list-style-type: none"> 1. Go to open procedure 	
<ol style="list-style-type: none"> 2. Select appropriate ASTM procedure based on the type of material being tested. These procedures are labeled '<u>ASTM D638 Tension Plastics</u>', '<u>ASTM E8 Tension Metallic</u>', '<u>ASTM D3039 Tension Composite</u>'. 	
<ol style="list-style-type: none"> 3. Click on new specimen, and name the specimen. 	
<p>On MTS:</p> <ol style="list-style-type: none"> 4. Fix the desired grips onto the heads, according to the thickness of the specimen. 	
<ol style="list-style-type: none"> 5. Fix the specimen 	

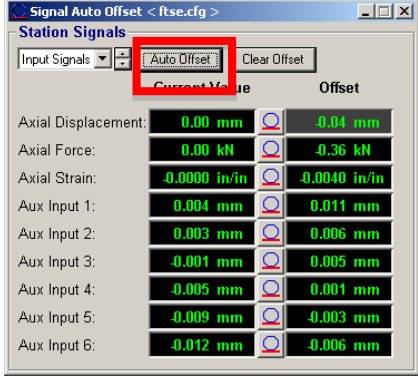
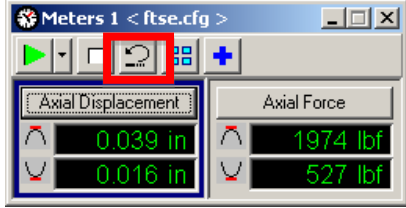



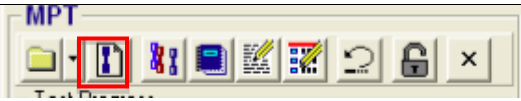

<p>6. Locking the grips with hydraulic grip control.</p>	
<p>7. Lock the upper head (cross head)</p>	
<p>In Manual Control window: 8. Disable the manual command.</p>	
<p>In Auto Offset window: 9. Click on auto offset</p>	
<p>In Meters window: 10. Click on reset procedure.</p>	
<p>In Station Manager Window: 11. Click on program run</p>	
<p>12. A dialog box will pop up. 13. Complete all data and click save.</p>	

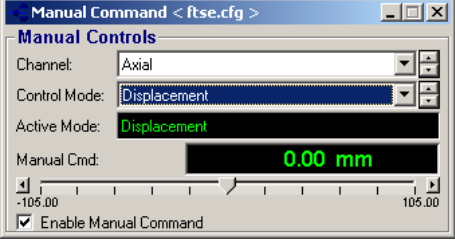
<p>14. Graph window will pop up.</p>	
<p>15. After specimen breaks click the stop button</p>	
<p>16. Unlock specimen to break the test</p>	
<p>17. Click New Specimen to save data.</p>	
<p>On MTS: 18. Unlock the grips. 19. Remove the specimen.</p>	
<p>In the Manual Control Window: 20. Enabling manual command. 21. Bring moving head to neutral position.</p>	


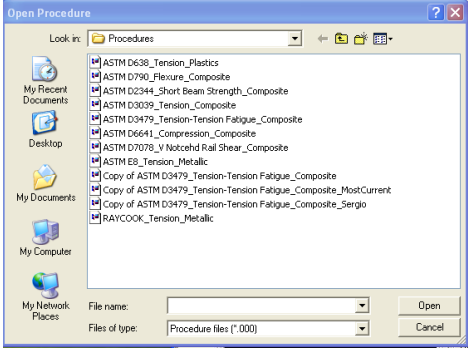

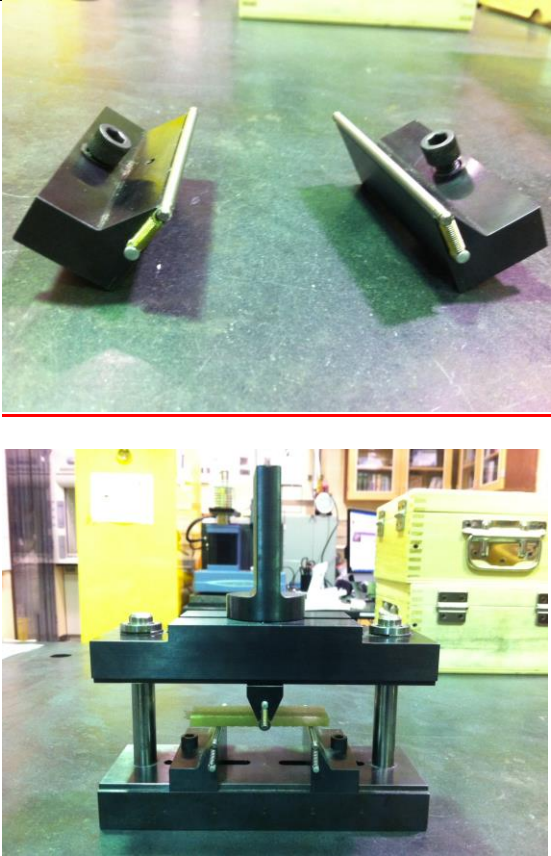
COMPRESION TEST



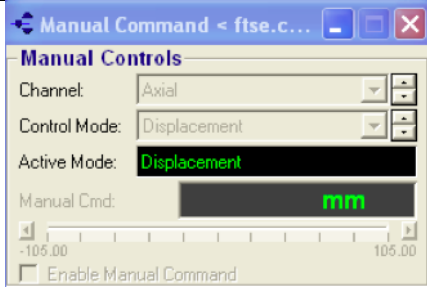
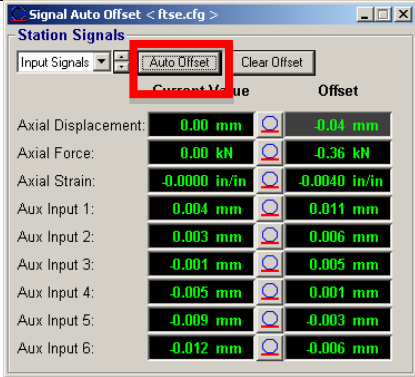
<p>In MPT window: 1. Go to open procedure</p>	
<p>2. Select appropriate ASTM procedure based on the type of material being tested. <u>'ASTM D6641 Compression Composite'</u>.</p>	
<p>3. Click on new specimen, and name the specimen.</p>	

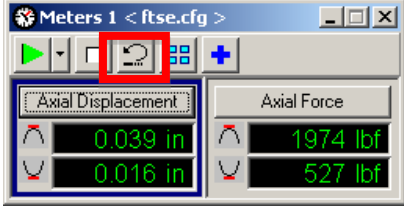





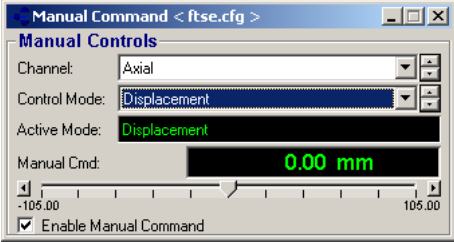
<p>Fixing the specimen in the compression fixture:</p> <ol style="list-style-type: none"> 4. Insert one side of the specimen in the bottom half of the fixture until it touches at the bottom. 5. Tighten screws evenly. 6. Keep the distances between the two halves of the fixture as 12.5-25 mm as per the test. 7. Fix the specimen in the upper half. 8. Tighten screws evenly. <p><u>Note: Tighten screws accordingly with standard.</u></p>	
<p>On MTS:</p> <ol style="list-style-type: none"> 9. Place grips 10. Fix the cylindrical bases into the grips of moving head and cross head to support compression fixture. 11. Lock the grips with hydraulic grip control. 	
<ol style="list-style-type: none"> 12. Fix the fixture on the cylindrical base. 13. Lock the upper head (cross head) 	
<p>In Manual Control window:</p> <ol style="list-style-type: none"> 14. Disable the manual command. 	




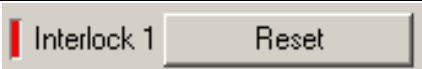
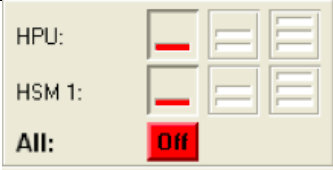
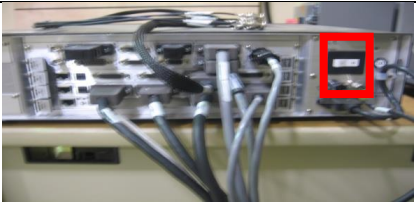
<p>In Auto Offset window: 15. Click on auto offset</p>	 <p>Signal Auto Offset < ftse.cfg ></p> <p>Station Signals</p> <p>Input Signals: [Dropdown] [Auto Offset] [Clear Offset]</p> <table border="1"> <thead> <tr> <th>Current Value</th> <th>Offset</th> </tr> </thead> <tbody> <tr> <td>Axial Displacement: 0.00 mm</td> <td>0.04 mm</td> </tr> <tr> <td>Axial Force: 0.00 kN</td> <td>-0.36 kN</td> </tr> <tr> <td>Axial Strain: -0.0000 in/in</td> <td>-0.0040 in/in</td> </tr> <tr> <td>Aux Input 1: 0.004 mm</td> <td>0.011 mm</td> </tr> <tr> <td>Aux Input 2: 0.003 mm</td> <td>0.006 mm</td> </tr> <tr> <td>Aux Input 3: -0.001 mm</td> <td>0.005 mm</td> </tr> <tr> <td>Aux Input 4: -0.005 mm</td> <td>0.001 mm</td> </tr> <tr> <td>Aux Input 5: -0.009 mm</td> <td>-0.003 mm</td> </tr> <tr> <td>Aux Input 6: -0.012 mm</td> <td>-0.006 mm</td> </tr> </tbody> </table>	Current Value	Offset	Axial Displacement: 0.00 mm	0.04 mm	Axial Force: 0.00 kN	-0.36 kN	Axial Strain: -0.0000 in/in	-0.0040 in/in	Aux Input 1: 0.004 mm	0.011 mm	Aux Input 2: 0.003 mm	0.006 mm	Aux Input 3: -0.001 mm	0.005 mm	Aux Input 4: -0.005 mm	0.001 mm	Aux Input 5: -0.009 mm	-0.003 mm	Aux Input 6: -0.012 mm	-0.006 mm
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<p>In Meters window: 16. Click on reset procedure.</p>	 <p>Meters 1 < ftse.cfg ></p> <p>Axial Displacement: 0.039 in, 0.016 in</p> <p>Axial Force: 1974 lbf, 527 lbf</p>																				
<p>In Station Manager Window: 17. Click on program run</p>	 <p>MPT Master Span</p>																				
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<p>22. Unlock specimen to break the test</p>	 <p>MPT Test Process</p>																				
<p>23. Click New Specimen to save data.</p>	 <p>MPT Test Process</p>																				
<p>On MTS: 24. Unlock the upper head (cross head) 25. Remove the Compression Fixture. 26. Loosen the screws and release the specimen</p>	 <p>Crosshead Lift / Lock Control</p>																				

<p>In the Manual Control Window:</p> <ul style="list-style-type: none"> 27. Enabling manual command. 28. Bring moving head to neutral position. 	 <p>The screenshot shows a software window titled "Manual Command < ftse.cfg >". Inside, there is a section for "Manual Controls" with the following settings: Channel is "Axial", Control Mode is "Displacement", and Active Mode is "Displacement". Below these is a "Manual Cmd:" field displaying "0.00 mm" in green text, with a slider below it ranging from -105.00 to 105.00. At the bottom, there is a checked checkbox labeled "Enable Manual Command".</p>
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FLEXURE TEST	
<p>In MPT window:</p> <ol style="list-style-type: none"> 1. Go to open procedure 	
<ol style="list-style-type: none"> 2. Select appropriate ASTM procedure based on the type of material being tested. <u>'ASTM D790 flexure.'</u> 	
<ol style="list-style-type: none"> 3. Click on new specimen, and name the specimen. 	
<p>Fixing the specimen in the flexure fixture:</p> <ol style="list-style-type: none"> 4. First select appropriate roller size from ASTM standard. 5. Find support span for the specimen from ASTM standard. 6. Fix the supporting rollers evenly on the both sides of loading nose at appropriate positions. <p><u><i>Note: There is mark in the center on the base plate to fix the supporting rollers.</i></u></p>	

<p>On MTS:</p> <ol style="list-style-type: none"> 7. Place grips 8. Fix the cylindrical bases into the grips of moving head to support flexure fixture. 9. Mount upper plate into the crosshead. 10. Lock the grips with hydraulic grip control. 																															
<ol style="list-style-type: none"> 11. Fix the specimen 12. Lock the upper head (cross head) 																															
<p>In Manual Control window:</p> <ol style="list-style-type: none"> 13. Disable the manual command. 																															
<p>In Auto Offset window:</p> <ol style="list-style-type: none"> 14. Click on auto offset 	 <table border="1" data-bbox="899 1457 1289 1745"> <thead> <tr> <th></th> <th>Current Value</th> <th>Offset</th> </tr> </thead> <tbody> <tr> <td>Axial Displacement:</td> <td>0.00 mm</td> <td>0.04 mm</td> </tr> <tr> <td>Axial Force:</td> <td>0.00 kN</td> <td>-0.36 kN</td> </tr> <tr> <td>Axial Strain:</td> <td>-0.0000 in/in</td> <td>-0.0040 in/in</td> </tr> <tr> <td>Aux Input 1:</td> <td>0.004 mm</td> <td>0.011 mm</td> </tr> <tr> <td>Aux Input 2:</td> <td>0.003 mm</td> <td>0.006 mm</td> </tr> <tr> <td>Aux Input 3:</td> <td>-0.001 mm</td> <td>0.005 mm</td> </tr> <tr> <td>Aux Input 4:</td> <td>-0.005 mm</td> <td>0.001 mm</td> </tr> <tr> <td>Aux Input 5:</td> <td>-0.009 mm</td> <td>-0.003 mm</td> </tr> <tr> <td>Aux Input 6:</td> <td>-0.012 mm</td> <td>-0.006 mm</td> </tr> </tbody> </table>		Current Value	Offset	Axial Displacement:	0.00 mm	0.04 mm	Axial Force:	0.00 kN	-0.36 kN	Axial Strain:	-0.0000 in/in	-0.0040 in/in	Aux Input 1:	0.004 mm	0.011 mm	Aux Input 2:	0.003 mm	0.006 mm	Aux Input 3:	-0.001 mm	0.005 mm	Aux Input 4:	-0.005 mm	0.001 mm	Aux Input 5:	-0.009 mm	-0.003 mm	Aux Input 6:	-0.012 mm	-0.006 mm
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Aux Input 6:	-0.012 mm	-0.006 mm																													

<p>In Meters window: 15. Click on reset procedure.</p>	
<p>In Station Manager Window: 16. Click on program run</p>	
<p>17. A dialog box will pop up.</p>	
<p>18. Complete all data and click save.</p>	
<p>19. Graph window will pop up.</p>	
<p>20. After specimen breaks click the stop button</p>	
<p>21. Unlock specimen to break the test</p>	
<p>22. Click New Specimen to save data.</p>	
<p>On MTS: 23. Unlock the upper head (cross head) 24. Remove the specimen.</p>	
<p>In the Manual Control Window: 25. Enabling manual command. 26. Bring moving head to neutral position.</p>	

TO QUIT PROGRAM	
1. Bring the cross head to appropriate position.	
2. Disable the manual command .	
3. Uncheck the exclusive station control .	
4. Lock the upper head (cross head) by turning lever to this position.	
5. Click on ' Reset ' if interlock signal is red.	
6. Click on HPU1 LOW...to... OFF.	
7. Wait for 10 seconds and then click on HSM 1 LOW ...to... OFF	
8. Go to File , and then click on Exit .	
9. Turn OFF Controller	
10. Turn OFF the pump switch.	