

1 **Set up.** Turn on MTS flex test controller (a large black box) via power strip and switch on back, back right corner of room. Do not trip over the hoses and cables.

2 **Turn on computer** next to 12,000 pound frame. There is a delay. Log in students, enter password. **Click Station Manager.** This loads Flex Test 5.6B. There is a delay. Click 12 kip load frame: no strain option. After a delay, windows appear including (depending on prior settings) a scope module on the right and a set of meters. Total delay is about 4 minutes. Do not mount a specimen until you have practice in controlling the motion of the test frame in displacement control. **Warning:** the grips may **move suddenly** when the hydraulics are turned on. Keep hands and other body parts away.

3 In station manager, click reset interlock 1 on the middle right. Click exclusive control, left window upper right, or use hand piece. **Zero channels** first (item 7) or grips will move abruptly. **Turn on hydraulics** as follows. In left window lower right hit two bar icon; mouse over, it says HSM power low, then hit three bar icon, mouse over shows power high. Do not leave hydraulics at a partial setting. When hydraulics come on, the bars turn green and you can hear the driver motor in the back room. **Warning:** the grips may move suddenly when the hydraulics come on. Keep hands and other body parts away. Use **Basic Test Ware** initially. It might start in multi purpose test ware (**MPT**) depending on the prior user. To go between these modes, check exclusive control on the right. Then look at small icons on the left. Mouse over the icons to get details. Multi purpose test ware (bottom left icon) allows the user to do programming of complex waveforms and other functions.

4 **Scope** module window might be on right. If prior user turned it off, activate it via top right icon in station manager. The 12,000 pound frame is channel 1. If the 100,000 pound frame is also used, it is channel 2; also both computers must be on. Set y1 rescale, go left, auto range. Set y2 Ch1, force. There are buttons at top to run and stop the trace; also to automatically scale the axis sensitivity. Click on scope face to bring up cursors. Cursors provide digital output point by point. Scope module can also export an image via Print but this does not suffice as a Result. **Remark:** + corresponds to down motion of grip and tension; - corresponds to up motion of grip and compression.

5 Practice controlling the motion of the test frame in displacement control before mounting a specimen.

6 **Grips.** Hydraulics must be on for the grips to work. Use levers to control open and close of grips. Grip force is large. Keep hands away when engaging grips. When installing compression or bending fixtures, use a metal spacer so the metal tang does not go into the grip all the way, otherwise it may stick. Install the lower fixture first, then place the upper one on it to align, then install the upper one; tighten the grip on the protruding tang.

7 **Zeroing.** Channels can be zeroed. This is done by station control buttons, upper right; left button, **auto offset.** Move the grips where you want them to be, then zero the channels. Recall that the convention is negative for compression, so a negative input raises the grip. **Warning:** if you later begin a test starting at zero, with zero mean, this is the zero! If the set zero does not correspond with the actual position of the grips, they will **move suddenly** when the test is started.

8 **Safety and limits.** If your specimen is brittle, use a plastic shield to prevent injury from flying fragments. Use safety glasses to prevent injury from broken pieces. Only one person should mount a specimen. **Everyone else keep away from**

the control computer. If the system starts to move before everyone is clear, hit the red panic button. One can set limits to the allowable force or displacement.

9 A preliminary test can be done via **function generator** controls in the left window; tap triangle icon on left to activate it. The square on right indicates off. Before turning it on, recognize that unless system has been zeroed, the grips may move suddenly when the test is started. To turn it on, click the triangle, which turns green as it comes on. Key in the desired waveform, amplitude, frequency and offset. Waveforms should appear on the scope module. Settings may be changed while function generator is running. Click the square to stop.

10 **Testing: digital output.** Approach 1: scope cursors. Scope cursors provide digital output point by point. Write down, either on paper or your laptop, a table of force and displacement vs. time. Depending on the waveform shape, ten or perhaps twenty points will suffice.

Approach 2: full data file of waveform. For digital data output, go to Station Manager, Applications, **Basic Test Ware.** Click it once, then icon appears at left. Turn off function generator first. One can also click on icons at left to activate function generator or basic test ware; mouse over reveals what they are. Basic test ware allows the user to specify waveforms including the number of cycles. Use test set up window to set test parameters. Key in the desired waveform, amplitude, frequency and offset. Also specify it to save the data file on the desktop via destination file, user specified, browse. Give the data file a sensible name so that you can recognize it and distinguish it from similar data. **Further details.** Hit test setup, top left icon. Hit data acquisition in test setup window. For type, it says disabled; switch it to timed. Click ch1 displacement, ch1 force, hit right arrow to move them to right column. Hit data file button at top of test setup window. Switch from destination default to user specified. Then name the file, e.g. 1Hz.dat. Hit browse to specify to put it on the desktop. It replies that location `c:\users\students\desktop` is not default. That is OK. Hit the green triangle start button to start the test, then the red square stop button to stop it. Even though you may have specified a time duration for your test, it is still necessary to manually stop it.

11 Check your saved digital data by opening the file with a text editor such as note pad. Plug in a USB flash drive, and copy the data to your drive.

12 **Shut down procedure.** To shut down, click one bar icon HSM 12 kip to turn off hydraulics. **Shut down computer:** go to file menu, left window, hit exit to turn off station manager. Go, start menu at bottom to shut down computer. **Turn off MTS flex test controller,** a large black box, back right corner of room. Do not trip over the hoses and cables. Write the time you have used the frame on the paper sheet on the clipboard. If you are using the 100 kip frame, turn off the hydraulic valve in the back. Otherwise, oil may leak.

13 In contrast to the analog frame, the flex test controller does not provide an error signal meter by default. That means the machine will move quickly if you start a test without first zeroing the channel via auto offset. A safety hazard is therefore built in to the flex test system. In contrast to the analog frame, flex test does not provide obvious buttons for haversine or haversquare waveforms. Extra effort is needed to offset the waveform to prevent loss of contact in compression. The scope module in flex test does not allow digital export of data in contrast to a real digital scope.