Addendum III – 16 Bay Truss Experiment Operational Procedure

1. Confirm experimental set up is as follows:

   TRUSS: Tap the truss in several locations to vibrate and detect any loose struts. Gently place truss on support load cells. Excessive shock or impulse forces will damage load cells. If any portion of the truss hardware appears to be loose, have the TA help tighten the related B-nuts (blue). Place the truss on the load cell plates.

   INTERNAL LOADCELL: Attach strut load cell connector to mating connector of cable assembly. Take care not to loosen the load cell-strut assembly as this will lead to faulty results.

   LVDT (Linear Variable Differential Transformer): Loosely attach LVDT rod holder and rod to appropriate strut. Bottom of LVDT rod should be above nearest node ball so rod will not be damaged if truss is placed directly on floor. Position LVDT core with rod inserted into center hole. (The fine tune adjustment will be done later).

2. Confirm the data acquisition set up is as follows:

   COMPUTER: Log in to the designated lab station with your ITLL login.

   CHASSIS: Plug the power cable for the NI cDAQ-9172 chassis. Ensure the power light on the chassis turns on. Connect the USB cable to the NI cDAQ-9172 chassis and to the tower. Open NI Max from the desktop and ensure the chassis is named "cDAQ1".

   INPUT MODULE: Ensure there are no free wires coming from the main cord (i.e. all wires should be connected into the input module or to cables ending in banana connectors.

4. Locate the two U8002A DC power supplies at the lab station. Connect the grounds to the negative sides of power supplies. Labels on the banana connector cables say which set goes with which voltage. Also connect the shielding banana connector (the loose black one) to ground. Only connect the ground plugs while setting the voltages.

5. To set the power supply, press the blue "Output" button to see the current values. Press the "Voltage/Current" button above the output button once so that the V on the display is flashing. This now allows the voltage to be changed using the adjust knob. Once the desired voltage is selected, press the "Voltage/Current" button twice to set it to that level.

   Also press the "Over Current" button and set the current limit in the same manner to 0.30A to protect the load cells.

6. Set one power supply for the load cells (the red and black banana connector pair) at:

   +10.6 volts

   *Press and **hold** the Memory button to recall preset values if needed. Check these values as they may have been reset.

7. Precisely set the voltage on the other power supply for the LVDT voltage of (the yellow and black banana connector pair):

   +24.6 volts.

*Press and **hold** the Memory button to recall preset values if needed. Check these values as they may have been reset.

8. Turn OFF power supply.
9. Connect power supply to the input module using the positive sides of the banana connector pairs. See the diagram below for correct power supply set up.

   DO NOT CONNECT LIVE VOLTAGES, THE POWER SHOULD BE OFF!

   RECHECK YOUR CONNECTIONS. DO NOT REVERSE POLARITY!! PLEASE BE VERY CAREFUL!!

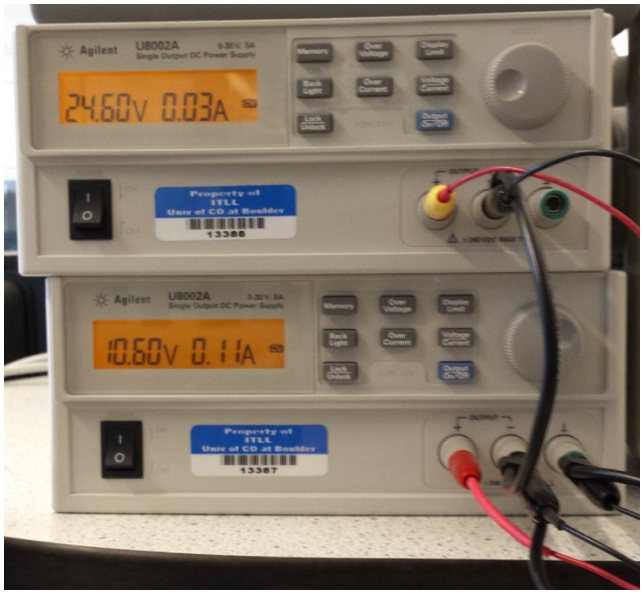

Figure 1: Power Supply Connection

10. Consult with TA to verify all connections.
11. Turn ON both power supplies. Confirm that front panel meters still indicate 10.6 and 24.6 volts. If not, turn power OFF immediately and ask for assistance.
12. Open the 16 Bay Truss cdaq.vi from the desktop. Run the VI. A Matlab window will open, do not close it as the VI uses it to do calculations while running. If the voltages seem unreasonable (extremely large values), close the VI and reopen it to get a new Matlab window.
13. Observe voltage readings for each load cell, F0, F1, F2, F3 as seen by the VI. Apply gentle forces on the truss using your hand and note corresponding voltage changes for each of the four load cells.
14. F3 Inline load cell adjustments. The initial value of the inline load cell F3 indicates the level of preload in this strut. Verify the F3 load cell reads just under -100 lbs., i.e. -120 lbs. is typical. We do not zero out F3, instead this sensor is used in its preloaded state. The value will become less negative as the truss is loaded and that member has a tension force applied to it.
15. LVDT adjustments: Position LDVT rod to vertical center of LVDT core by first loosening strut attachment and then sliding assembly to desired vertical position to achieve near 0 volts. (Make sure the rod is still in the core – outside the core registers near 0 volts also.) Then, as a method of fine tuning, adjust thumb screws for to get as close to zero as possible. But a (+/- 1 volt) reading is sufficient. It will be helpful to level the LVDT platform using the sight bubble. Apply gentle force to truss and confirm LVDT is measuring displacement.

16. The nonzero initial values of the reaction load cells F0, F1, F2 indicate the weight of the truss and electrical offsets and can be zeroed with the software. For this experiment, use the software to zero this value so relative variations in internal load can be easily recorded. To zero offsets type or cut and paste the same mV value from ”measurement” table into ”LC offset” table (include the sign!). Do not zero the F3 load.
17. The VI does NOT save all the data shown on the screen. You must enter in the loading case in lbs and the number of points to save to the datafile. Then press the “Save Data” button to write the points to the datafile. The first column of data will show the loading case you enter.
18. Test Procedure: Record the initial unloaded conditions (should all be near zero). Enter 0 lbs in the loading case and press save to file.
19. Carefully add 10 and/or 5 lb shot bags to increase load in 5 or 10 lb increments up to 50 lb. The red bags are nominally 10lb, the yellow nominally 5lb. With the exception of stacking all 10 lb bags on top of each other, distribute however you want in the center of the truss. Take notes/pictures for your lab report. Press the “Save Data” button for each loading case.
20. Take data as these incremental loads are removed. Press the “Save Data” button for each loading case. All “save data” selections will be saved to a single data file.
21. When data collected is completed, press the “Stop VI” button on the VI.

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