

<b>LOAD CALIBRATION ROUTINE FOR INSTRON 8500 TEST STAND</b>	
Prepared by <u>Steve Lee</u>	Approval <u>Original signed by Mark J. Stuart</u> <u>Organizational Unit Manager</u>

## 1.0 Purpose

- 1.1 The purpose of this routine is to define the method for calibrating Load on Instron 8500 Test Stands

## 2.0 Equipment Required

- 2.1 The following Equipment is required to perform load calibration on the 8500 Controller. A calibrated, N.I.S.T. traceable Load Cell Standard with readout of the appropriate capacity for the range to be calibrated.

## 3.0 Inspection and Setup

- 3.1 Visually inspect the Transducer to be calibrated and record any evidence of damage on the calibration data sheet.
- 3.2 Calibration will only be done when the laboratory environmental conditions are normal (i.e. temperature, humidity).
- 3.3 Category I equipment (and category II if recalibrating an existing set-up) must have "As Found" data taken prior to making any adjustments to the calibration. "As Found" data is not required for Controllers being calibrated to a new or different transducer. "As Found" data will be collected in auto range at levels shown in Step 4.2.12. The routine for collecting "As Found" data is shown in Steps 4.0.

## 4.0 Calibration

- 4.1 The calibration will consist of up to three data runs. These data runs will be documented and labeled "As Found", "Corrected" and "As Left". Each data run will consist of ascending and descending data for tension and compression unless stated otherwise on the data sheet. In the event that the "As Found" data meets the acceptance criteria stated in Step 6.0 only an "As Left" data run must be made. If the "As Found" data is not in tolerance, then the calibration must be adjusted and the "Corrected" and "As Left" data runs must to be made. Documentation requirements are covered in Step 5.0.

### 4.2 HOW TO USE CALIBRATION EQUIPMENT TO VERIFY INSTRON LOAD READOUT

- 4.2.1 Plug load cell standard into the calibration readout and let it warm up for at least an hour.
- 4.2.2 After the standard load cell in the Instron stand, run the load cell up to the maximum load and back to zero 3 times.
- 4.2.3 Remove the lower pin and auto-cal the Instron load cell.
- 4.2.4 Press ENTER & SETUP at the same time on calibration readout panel. Press 1065, then ENTER and 0.
- 4.2.5 The readout will ask if you are using a full scale readout (**F.S.?**). Press ENTER for yes.
- 4.2.6 The readout will ask if you are using a span (**SPAN**). Press 1 for yes.
- 4.2.7 The readout will ask for (**BALANCE**). Press 0, then ENTER.
- 4.2.8 The readout will ask for (**CAL LOAD**). Press 2 for no.
- 4.2.9 Now the readout will ask for (**mV/V @ F.S.**) to set the span. It will be flashing a numerical value. Verify mV/V reading is correct from calibration certificate

(certificate is in calibration notebook on operations bench in room 114). **NOTE: Calibration signal values differ for tension and compression readouts.** Enter mV/V Cal Signal from calibration certificate. After entering new Cal Signal or if reading is correct, press ENTER.

- 4.2.10 The readout will ask for a setup (**SETUP**). Press ENTER & SETUP at the same time. The display should read 0.
- 4.2.11 Replace pin.
- 4.2.12 Now you can begin your calibration.
  - Use the following verification test loads ascending and descending for **20 kip** load cells: 0, 200, 400, 800, 1400, 2000, 4000, 8000, 14000, 20000, 22480.
  - Use the following verification test loads ascending and descending for **50 kip** load cells: 0, 500, 1000, 2000, 3500, 5000, 10000, 20000, 35000, 50000, 56200.
  - Use the following verification test loads ascending and descending for the **100 kip** load cell: 0, 1000, 2000, 4000, 7000, 10000, 20000, 40000, 70000, 100000, 112400.
- 4.2.13 At each comparison point, record the Instron load reading and the standard load cell reading on the calibration sheet in the “**As Found**” columns.
- 4.2.14 If the “**Error % Reading**” criteria listed in Step 6.0 are met, then go to step 4.2.21.
- 4.2.15 If the “**Error % Reading**” criteria listed in Step 6.0 are not met, go to step 4.2.16.
- 4.2.16 The potentiometer located within the transducer load cell cable can be adjusted to meet the accepted criteria.
- 4.2.17 Turn test stand off.
- 4.2.18 Remove cover to load cell relay located at the lower end of transducer cable. Locate variable resistor (VR1). The screw on the end of VR1 is the potentiometer that can be adjusted to correct load cell readout. Clockwise adjustment increases load cell readout and counter clockwise decreases load cell readout. Each full screw turn affects the load cell readout approximately 50 pounds. Adjust screw at the end of the resistor to obtain accurate load cell reading (i.e. If the Instron load cell readout is 250 pounds under the standard readout, turn the screw 5 turns clockwise to compensate for the error). Replace cover on load cell relay.
- 4.2.19 Turn test stand on.
- 4.2.20 Repeat Steps 4.2.4 through 4.2.11 and then verify change is acceptable by going between zero and approximately 80% of full scale. If further adjustment is required repeat Steps 4.2.17 through 4.2.20 until the standard load cell readout is within the accepted criteria for the “**Error % Reading**” listed in step 6.1. If adjustments are acceptable proceed to Step 4.2.12 and record the readings in the “**Corrected**” columns listed on the calibration sheet.
- 4.2.21 Perform Steps 4.2.3 through 4.2.13 again and record in the “**As Left**” column on the calibration sheet.
- 4.2.22 Verify the “**Repeatability Error %**” criteria listed at the end of the routines are met. If the criteria are not met, go back to Step 4.2.17.
- 4.2.24 If all criteria listed in the routines are met, then the calibration is complete. Proceed to Step 5.X

## 5.0 Documentation

- 5.1 All Data will be documented using the Calibration Sheet. Obtain a blank copy of the Calibration Sheet from the Calibration Database Coordinator.
- 5.2 All information slots must be completed as shown below:

Test Stand No:	# for stand being calibrated
Mode:	Load/Tension or Compression
Calibration Task No:	X
Ex Voltage:	n/a

NIST Traceable Standard ID:	ECN/MCN of Standard Used
V/FS:	10
mV Sensitivity:	X
Xducer/ Controller SN:	Serial, ECN or Metrology Numbers
Cal. Range:	Test Stand Full Scale
Cal SW:	n/a
Sh Cal:	n/a
Note:R5=	n/a
Note:R8=	n/a
Cal. By:	Your Name
Cal. Date:	Date calibration was performed
Next Cal. Date:	Check frequency on EMIT

- 5.3 The program will automatically calculate the "Error % of Reading" for each set of data as they are entered. The program must be told which columns to use to calculate the "Repeatability Error %".
- 5.4 Save the completed spreadsheet
- 5.5 Provide electronic copy of calibration data to the Calibration Database Coordinator.
- 5.6 Print final results and enter in the Test Stand Calibration Log.
- 5.7 Place calibration sticker on equipment with due date.

## 6.0 Calibration Acceptance Criteria

- 6.1 The Error % of reading will be calculated for each set of data points for each data run. Error % of reading for data points of 0 to 10% of full scale must be less than +/-2%. Error % of reading for data points of 10 to 100% of full scale must be less than +/-1%.
- 6.2 Formula for computing Error % of reading:  $(\text{Standard reading} - \text{Machine reading}) / \text{standard reading} \times 100$ .
- 6.3 The Repeatability Error % of reading for each set of corresponding data points between the final two data runs will be computed. The acceptance criteria are the same as those listed in Step 6.1.
- 6.4 Formula for computing Repeatability Error % of reading:  $(\text{Error \% of reading run 1}) - (\text{Error \% of reading run 2})$