systems are highly inaccurate. When calibrating instruments use lb weights values only. (For optimum accuracy use weights traceable to National Standards.)

Custom Calibrations for the CX-Series of Digital Cable Tension Meters

(If you only need to verify that the calibration you’ve selected is accurate, go to the “How To Check Accuracy” section on the preceding page.)

PERFORMING A 5-POINT LINEARIZATION CALIBRATION

Step 1: From the Main Display press ↑ or ↓ arrows until you reach Setup. Press ENTER. Press the ↓ arrow button until you reach Cal Tension. Press ENTER. The screen will display: Setup, Calibrate Tension, Enter Password. Contact Tensitron for the password at service@tensitron.com Now the screen will display Setup, Calibrate Tension and you will be able to scroll down the list to select the description that you want to use for the new calibration. When this new description is highlighted, press ENTER.

Step 2: Next you will be prompted ENTER WEIGHT 1. Using the ↑ and ↓ arrows select a minimum tension value (do not use zero). Press ENTER. Select increasing weight values for WEIGHT 2 THRU 4 (No. 4 being the maximum weight value). At each weight number select your weight value using the ↑ and ↓ arrows. ENTER each selection. Next you will calibrate the instrument to the weight values you just selected. (To simulate tension loads for calibration, take a sample length of your material and suspend it from above. Next hang weights from your material in the weight values you previously selected in “enter weights 1 through 4.”) Your instrument will now prompt you PLACE WEIGHT 0. With zero tension applied to the instrument press ENTER. Next you will be prompted PLACE WEIGHT 1. Suspend the exact weight value from your material that you previously selected. Engage instrument to the tensioned material and then press ENTER. Next suspend weight value 2 from your material, engage the instrument to your tensioned material and press ENTER. Repeat procedure for steps 3 and 4. Once you have entered the value for WEIGHT 4 you have finished the calibration and will be returned to the Main Display. Your main display will now indicate the description of the calibration you’ve just entered. This indicates you have now selected the calibration you just performed. To change calibration use the ↑ or ↓ arrows until you reach SELECT MATERIAL. Follow procedures outlined in Section 3.5. To change the description or name of your new calibration, see Section 4, No. 8.
Select the time window; then select the sampling rate (adjustable from 1-100 Hz). After capturing the data, review the data on the instrument’s display or upload it using the 10’ serial interface cable.

Instruments can be configured with any or all of these options.

**HOW TO CHECK ACCURACY.** To verify the accuracy of your instrument, simulate a tension load on your cable by suspending known weights to a sample length of the material. (See Figure 1) Then verify these values with the instrument, i.e.: if a 500 lbs weight is freely suspended from a single length of cable, the cable is now tensioned to 500 lbs, and your instrument should indicate 500 lbs on the display when properly engaged to the material. To correctly obtain readings, first zero your instrument in the attitude it will be used for testing, then engage the instrument to the tensioned cable and note the reading. When performing this test make certain your cable thickness is dimensionally within tolerance.

**KEEP IT SIMPLE.** Only simulate tensions using free-hanging weights on correctly-sized cable material. Never use any device that attempts to convert rotational torque values into tension loads, as these types of interfaces cable.

The Calibration feature is password protected. In order to perform a Custom Calibration a series of key inputs are required. Warning: This procedure will erase previous calibration data. Only a qualified testing laboratory with traceable weights and standards should perform a calibration. You will be required to precisely tension a sample length of cable to 5 increasing tension loads and then to enter these values when prompted.

**Figure 1, Simulating Cable Tension**

**Sec 1. SAFETY AND MAINTENANCE.**

**WARNING:** When using cordless, electronic instruments, always follow basic safety precautions to reduce the risk of fire, electric shock and personal injury.

**READ AND SAVE ALL INSTRUCTIONS FOR FUTURE USE.** Before use, ensure all users read and understand this manual, as well as any labels packaged with or attached to the instrument.

1. **KNOW YOUR INSTRUMENT.** Read this manual carefully to learn your tension meter’s applications and limitations, as well as the potential hazards associated with this type of instrument.
2. **AVOID DANGEROUS ENVIRONMENTS.** Do not use your instrument in the presence of explosive atmospheres (gaseous fumes, dust or flammable materials). Do not submerge your instrument in liquids. Guard against electric shock when connecting power supply to voltage source.
3. **USE THE RIGHT TOOL OR INSTRUMENT.** Do not use this instrument to do a job for which it is not recommended.
4. **CHECK FOR DAMAGED PARTS.** Inspect instrument before use. Check for any binding of moving parts, improper mountings, broken parts and any other condition that may affect operation. Do not use a damaged instrument. Tag damaged instrument “DO NOT USE” until repaired. For repair, send instruments directly to Tensitron.
5. **MAINTAIN INSTRUMENT CAREFULLY.** Keep handles dry, clean and free from oil and grease. Do not lubricate. All roller bearings are sealed.
6. **DO NOT USE INSTRUMENT IF** it has received a sharp blow, been dropped or damaged in any way. Do not disassemble. Incorrect reassembly may result in the risk of electric shock, fire or exposure to battery fluids. If instrument is damaged return it to Tensitron for repair.
7. **STANDARD POWER SUPPLY IS RATED FOR 100-240 VAC** and includes several “blades” allowing use with European, US, Australian and other plug configurations.
8. **DO NOT USE INSTRUMENT WHEN TEMPERATURE** is below 35°F or above 115°F. Charging in direct sunlight or near a heat source will not produce a full charge and may permanently damage battery pack.
9. **STORE INSTRUMENT AND CHARGER** in a cool, dry place. Do not store where temperatures may exceed 120°F or fall below 35°F for storage times less than one month. Never let LCD display or battery pack assembly freeze.
10. **WARNING:** Only use battery pack assemblies provided by Tensitron with your meter (Other types of batteries may leak or explode, causing personal or property damage if charged in this device.
11. **CALIBRATE INSTRUMENT** yearly or sooner if meter is worn, damaged, or reading incorrectly.

**Sec 2. CHARGING INSTRUMENT BATTERIES.**

1. **Use only a Tensitron power supply to avoid damage to instrument.** Connect power supply cable to instrument. Plug the power supply into a 100 – 240 VAC outlet.
2. **Full charge of battery assembly takes approximately eight hours.**
3. **Battery pack assembly cannot be overcharged,** however instrument will remain on while plugged into power supply.
4. **Fully charged battery assemblies will operate approximately six hours - +/- 20% depending upon usage and backlighting intensity. Battery charge level is indicated in upper, right-hand corner of display.**
Sec. 3. OPERATION: QUICK START.

1. TURN UNIT ON by pressing ON button. Display shows: Tension (Lbs, Newtons, or Kilograms), Cable size selected and battery charge level.

2. MEMORY FUNCTION. Depress the MEMORY button to store and display up to five separate tension readings, plus the average (AVG) of these stored values.

3. MOVE BETWEEN SCREENS by pressing either the ↑ or ↓ arrows. To make, or enter a selection, depress the ENTER key. To exit a setting, depress the ESCAPE key.

4. ZERO THE INSTRUMENT before taking readings by holding the instrument in the attitude in which it will be used, and with no load applied press the button marked ZERO.

5. READING OF TENSION. Variations in materials and sizes affect tension readings. It is essential to select the correct material and size from the calibration menu before use, or values may be incorrect.

6. SELECT MATERIAL. From the Main Display (first screen seen when unit is turned on) use the ↑ or ↓ keys until SELECT MATERIAL is displayed. Press ENTER. Next toggle through the various selections using the ↑ or ↓ arrows until correct cable size is highlighted, and press ENTER to make your selection. If your specific material is not listed, follow the calibration instructions included at the end of these instructions, or send a sample and the instrument to Tensileon for a custom calibration.

7. SELECTING TENSION UNITS IN LBS, KILOGRAMS or daN. Press the ↑ or ↓ keys until TENSION UNITS is displayed. Press ENTER. Next, select: Lbs, Kilograms or Decanewtons and ENTER selection.

8. ENGAGE INSTRUMENT TO TENSIONED MATERIAL. For best accuracy hold the instrument in the attitude the measurement will be taken in and press ZERO. Next, engage the instrument to the tensioned cable so the cable runs under the two outer rollers and over the center roller. Then pull the engagement lever down until it is parallel with the stationary hand grip, and note the tension reading on the display. To remove the instrument from the cable, reverse the above procedure so that the engagement lever rests parallel with the instrument’s body.

Sec. 4. ADDITIONAL TECHNICAL INFORMATION.

1. SPEEDING UP OR SLOWING DOWN DISPLAY LCD REFRESH RATES - DAMPENING ADJUSTMENT. To either speed up or slow down the rate at which tension values refresh on the display. Use the ↑ or ↓ keys, select SETUP, and press ENTER. Next select DAMPENING and after entering this selection, choose the refresh rate from: 1Hz, 2Hz or 5Hz. When new rate is highlighted, press ENTER.

2. AUDIO. Turn on or off audio beep (with key inputs) by selecting: SETUP, then select Audio, and finally either select ON or OFF.

3. BACKLIGHT INTENSITY. Increase or decrease backlighting intensity by selecting: SETUP, then BACKLIGHT, and finally intensity level.

4. DATA LOGGING. (Optional feature). From the Main display use the UP or DOWN keys until Data Logging is displayed. Press ENTER. Next, select Logging Rate and select Hz rate which your data will be collected in (choices are from 1Hz to 100Hz). Next select Duration and select the time period the data will be collected over by using the UP or DOWN keys. Finally select Begin Logging when you are ready to collect your data. Note: You can stop collecting data at any time by simply depressing ESC (escape). Collected data will remain in memory, regardless if instrument is turned off, and will only be overwritten once new data is collected. To view collected data select View Data Log and press

Input Real-Time Serial Data into any Windows® application using any number of software wedge programs, such as WinWedge Pro® for Windows, or configure your Window’s® operating system to capture the data via Hyper Terminal®.

### STANDARD INSTRUMENTS

<table>
<thead>
<tr>
<th>MODEL</th>
<th>RANGE</th>
<th>RESOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CX-1000</td>
<td>50 - 1,000 lb</td>
<td>5 lb</td>
</tr>
<tr>
<td>CX-2000</td>
<td>100 - 2,000 lb</td>
<td>10 lb</td>
</tr>
</tbody>
</table>

### SPECIFICATIONS:

- Approximate weight is 7 lbs (Weight varies depending upon instrument configuration).
- Re-chargeable NIMH battery with power supply provided. Approximately 6 hours of operation per battery charge depending upon backlighting intensity.
- Power Supply operates with input voltages from 100 – 240V and includes several, interchangeable “blades” allowing use with European, US, Australian, and other plug configurations.
- Automatic shutoff after 10 minutes of non-use.
- Instruments may be operated continuously while connected to power supply.
- Durable, lightweight carrying case with protective foam inserts.
- CE Certification complying with heavy, industrial immunity standards.

### FEATURES:

* Large, easy to read, graphic display with adjustable backlighting and contrast.
* Display shows Tension, Battery Charge Level, name of Calibration selected, and minimum and maximum tension values.
* Select cable size from the menu. Instrument automatically adjusts calibration to the correct setting.
* Up to 10 calibrations can be programmed into instrument. (All calibrations are password protected to provide due diligence against unauthorized changes).
* Adjustable LCD refresh rates allow for stable, digital readings.
* All models typically available from stock.
* All models factory calibrated and ready for use.
* All calibration values traceable to National Standards. Calibration certificate included.
adjusting the value of the dampening rate with the \( \uparrow \) and \( \downarrow \) buttons and then pressing the ENTER button.

D. The units output serially will be the same units that are selected in the "Tension Units" menu. The currently selected tension units (such as Lbs, Kilograms or Newtons) are also displayed on the main tension screen.

E. Perform the following steps in order to log serial data from the instrument using Hyper Terminal on a PC and put it into a Microsoft Excel spreadsheet:

1) Ensure that the dampening rate is set to "1 Hz + Serial", "2 Hz + Serial" or "5 Hz + Serial".

2) Connect the serial cable from the instrument to a serial port on your PC.

3) Go to the Windows\textregistered Start Menu and choose Programs->Accessories->Communications->HyperTerminal\textregistered.

4) In the Connection Description dialog box that pops up, type in a name for the new connection (you can use any name you wish to describe this file) and press the OK button.

5) In the Connect To dialog box that pops up next, go to the drop down menu labeled "Connect Using:" and select the serial port you connected the cable to in step 2. It is most likely that you are connected to COM1.

6) In the COMx Properties dialog box that pops up next, set the "Bits per second:" to 9600, the "Data bits:" to 8, the "Parity:" to None, the "Stop bits:" to 1 and the "Flow Control:" to None.

7) Click the Apply button and then click the OK button.

8) You should now see tension values appearing in the Hyper Terminal window.

9) When you are finished collecting data, close Hyper Terminal.

10) To save the data in Microsoft\textregistered Excel\textregistered format, use Microsoft\textregistered Excel\textregistered to open the file you saved using the ENTER key. Logged Data can also be uploaded to your computer via the RS-232, serial port. Refer to Sec 4.12, Uploading logged data, for specific instructions.

5. DISPLAY CONTRAST. Increase or decrease LCD display contrast by selecting: SETUP, then select CONTRAST, and finally manipulate contrast using the \( \uparrow \) or \( \downarrow \) keys. Remember to ENTER your new setting.

6. VERSION. Instrument Model No. along with software version information can be viewed under SETUP and then selecting Version.

7. CUSTOM CALIBRATIONS. Calibrations are password-protected to prevent unintended changes. See Page 9 for step-by-step instructions, or contact your Metrology Department or Tensitron for assistance. If you only want to verify your Instrument’s accuracy refer to: How To Check Accuracy, on Page 8.

8. CUSTOM CALIBRATION NAMES. Custom Calibrations (usually listed as Custom 0 - 9) can be renamed so that the Main Display indicates your name for the calibration instead of Custom 1, 2, etc. From the Main Display use the \( \uparrow \) and \( \downarrow \) keys until SETUP is selected. Press ENTER. Using the \( \uparrow \) and \( \downarrow \) keys select Custom Names. Press ENTER. Next, using the \( \uparrow \) and \( \downarrow \) keys select calibration number, or previous name you wish to rename. Press ENTER. Using the \( \uparrow \) and \( \downarrow \) keys select the number, letter or character for the beginning of your new name. Press ENTER. Follow the same procedure for each sequential letter or space of your new description. Continue pressing ENTER until all spaces in the description have entered. Once your new name has been entered you will be returned to the SETUP screen. To select your new calibration follow the procedures outlined in Sec.3.6.

9. MONITORING TENSION THROUGH THE ANALOG OUTPUT (Optional feature). Output values are: 0 – 5 VDC or 4 – 20 mA. Connect Analog Output Cable to receptacle located on the bottom side of instrument. Connect output cable leads to the analog input of your measurement or control device. The RED lead is Voltage \(+\), the WHITE lead is mA, and the BLACK lead is ground. From the main display use the \( \uparrow \) and \( \downarrow \) keys until you reach SETUP. Press ENTER. Next using the \( \uparrow \) and \( \downarrow \) arrows select ANALOG OUTPUT. Press ENTER. Using the \( \uparrow \) and \( \downarrow \) arrows select from ANALOG TENSION CURRENT or ANALOG TENSION VOLTAGE. Once correct selection is made press ENTER.

10. CALIBRATION OF ANALOG OUTPUT. (Optional feature) From Main Display press the \( \uparrow \) and \( \downarrow \) keys until you reach SETUP. Press ENTER. Press the \( \uparrow \) and \( \downarrow \) keys until you reach CALIBRATE ANALOG. Press ENTER. Using the \( \uparrow \) and \( \downarrow \) keys adjust display to show the value at which the instrument reads maximum current or voltage. Press ENTER.

11. SERIAL DATA COLLECTION (RS-232 option). (Optional feature) Instruments outfitted with the optional RS-232 feature (designated with a –E in the part number) support serial communications as follows:

A. The baud rate is 9600 with no parity bit, 8 data bits and 1 stop bit (9600 8N1).

B. Serial communications will work with most PCs with a cable up to 15 feet long.

C. Collected data will remain in memory, regardless if instrument is turned off, until overwritten with new data.

D. Setting the dampening rate on the instrument to "5 Hz + Serial", "2 Hz + Serial" or "5 Hz + Serial" will cause the instrument to output the tension values at a rate of once, twice or five times per second, respectively. The dampening rate can be set by going to the SETUP menu, selecting DAMPENING,
FLOW CHART
Model: CX-SERIES DIGITAL TENSION METER

Use ↑ and ↓ keys to navigate main screens
Use ENTER to reach subscreens and ↑ and ↓ keys to make selections.