Calibration Procedure for Thermocouples Using MIU 10X/98 Analog Input Card

J and K type thermocouples both use 182 ohm 50 PPM high precision resistor.
Please allow sufficient time for internal temperature of MIU to stabilize.
Be certain as to whether the thermocouples in use are grounded or ungrounded. (See #2 below)
Be certain that JX2 is ON.
Each channel must have gain and offset set in order to compensate for slightly differing DC offset and gain
properties in the individual instrumentation amplifiers and differences between individual thermocouples.
Use an Altek model 322 thermocouple calibrator or equivalent and adhere to the following procedure:
For a 10X/98 use the MIU information screen: (22) , calibrate analogs (1), calibrate(function key).

1. Set gain on channel to 1.000 and offset to 0.
2. If you are unsure whether the thermocouples are grounded use an ohmmeter and test for continuity
   between the casing and the negative pin. If the circuit is open it is ungrounded. The ohmic value will
   vary with individual grounded thermocouples, but will generally be less than 25 ohms.
3. For ungrounded thermocouples make sure that the grounding jumpers (JA1 – 14) on the MIU are ON for
   each individual ungrounded thermocouple channel.
4. For grounded thermocouples make sure that the grounding jumpers (JA1 – 14) on the MIU are OFF for
   each individual grounded thermocouple channel.
5. The grounding jumper (JA1-14) must be ON for an individual channel to correctly read the thermocouple
   calibrator. To facilitate accurate calibration of grounded thermocouples it is good practice to first
   remove the ground jumpers for those channels, keep the door closed to allow thermal stabilization, and
   inject the calibration signal at the external junction box. In doing so, you must properly ground the
   negative terminal of the calibrator to the machine to assure a correct reading.
6. Set calibrator to a temperature that represents the lowest value you would expect for your process.
7. Note and record reading.
8. Set calibrator to a temperature that represents the highest value you would expect for your process.
9. Note and record reading.
10. If the higher setting is too high (eg. calibrator set for 1000^{0} F. but MIU reads 1004^{0} F.) reduce gain until
    offset necessary for low reading is the same as offset necessary for high reading and increase gain for
    readings that are too low. This may require a few passes to get completely correct. Repeat this process
    for each channel.
11. Take a reading of the actual thermocouple with the calibrator. At the calibration screen, add positive or
    negative offset to make the channel on the MIU accurately reflect the reading at the calibrator.
    Alternatively, you may wish to set the MIU to reflect the reading given by the press controller. Do not
    automatically assume the reading at the press controller to be correct, it must be checked and calibrated
    as any other electronic measuring device must be. Refer to the manufacturer's documentation or service
    personnel to assure proper configuration and adjustment.

Example:
I remove the jumper (JA1) within the MIU to correctly configure the first channel for the grounded
thermocouple I am going to use. I close the door to the MIU and allow the internal temperature to stabilize
(approx. 15 – 30 min.). I use an alligator clip to ground the negative terminal of the calibrator to the press. I
plug the calibrator into the channel and set it for 32 degrees f. The MIU reads 33 as the current value. I note
that and then set the calibrator for 1000 degrees f. The MIU reads 1004 degrees in the current value screen. I
then put in a gain of .996. The MIU now reads 1000 degrees f. I set the calibrator to 32 degrees and the MIU
reads 30 degrees. I return to the 1000 degree setting and change the gain to .998. The current value is now
1002. I return to the 32 degree setting and the current value is now 34 degrees. I add an offset of –2 and the
MIU now reads 32 degrees. I return the calibrator to the 1000 degree setting and the MIU reads 1000
degrees. I now remove the alligator clip and measure the output of the thermocouple with the calibrator. The
thermocouple reads 36 degrees at the calibrator. I add an additional –4 degrees of offset to make the MIU
read the same as the calibrator. At this point some people prefer to set the MIU reading to match that of the
press control. While there is technically nothing wrong with this approach, you may wish to calibrate the
press control to read in accordance with the calibrator. Due to differences in individual hardware and
circuitry there might be slight variations in readings between a calibrated MIU and a calibrated press control.