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## American Hakko Products, Inc.

### Answering calibration questions regarding the FM-202, FM-203, FM-204, FM-205 and FX-951 soldering stations

#### Do the FM-202, FM-203, FM-204, FM-205 and FX-951 require calibration?

The FM-202, FM-203, FM-204, FM-205 and FX-951 Soldering Stations do not require calibration.

#### Why do they not require calibration?

First, the processor program is so devised as to make the circuitry as self-compensating as can be for any predictable drift in component characteristics. Everything that goes on inside the subject products is under processor control.

Second, the heating element properties have been designed in, and are controlled at the factory, so the element itself is consistent within  $\pm 15^{\circ}\text{C}$  (unless otherwise indicated). In all conceivable cases the tip will wear out before the element does (and if the element happens to get broken, the tip is useless anyway). The tip design and manufacturing process take into consideration not only variations in the thermal characteristics of the tip because of surface area and mass, but also variations between the heating elements themselves, within the limits already established. No compensating data entry is required.

No external calibration is necessary; hence no procedure therefore is provided to the operator.

#### What about "offsetting" the tip temperature?

The FM-202, FM-203, FM-204, FM-205 and FX-951 Soldering Stations have an internal software feature that allows the temperature accuracy to be adjusted tighter than  $\pm 15^{\circ}\text{C}$  on an individual tip. After measuring the tip temperature with a soldering iron thermometer the offset can be increased or decreased to obtain tighter tip accuracy than the original specification. The offset would need to be accomplished each time a new tip was used.

#### What about verification?

Verification can be performed on any soldering station by using a Hakko FG-100 thermometer or Hakko FG-101 soldering tester. It is then a simple matter to set a temperature into the station and verify the tip is at that temperature (within, of course, the specified accuracies of the station and the thermometer). When using any measuring device tolerances must be figured into the measuring process. In the case of measuring a soldering iron tip temperature one will find that the tolerances of the station and the thermometer will add - not arithmetically, but as the root sum square of the specified accuracies: thus the tolerance of a temperature read on, say, a Hakko FG-100 will be:

$$\begin{aligned} & \sqrt{(\text{solder station tolerance})^2 + (\text{thermometer tolerance})^2} \\ &= [\sqrt{(15^{\circ}\text{C})^2 + (3^{\circ}\text{C})^2}] + 1^{\circ}\text{C} \\ &= [\sqrt{(234^{\circ}\text{C})}] + 1^{\circ}\text{C} \\ &= \pm 16.3^{\circ}\text{C} (\pm 29.3^{\circ}\text{F}) \end{aligned}$$

