AEI Equipment Maintenance, Testing and Calibration

This document contains descriptions of equipment and, maintenance, testing, an calibration procedures. This is not an exhaustive list of all equipment or procedures. If there are any questions about procedures listed or unlisted, please contact the technical support department at AEI.

Fail Safe Thermostat

The fail safe thermostat (not provided by AEI) is a mechanical device that is located in each barn. It is physically set to open a circuit when the barn temperature reaches some previously decided maximum value. When this happens, all environmental control is transferred from computer control to backup systems. The fail safe thermostat should be tested and the set point should be adjusted periodically to reflect seasonal changes. For instance, depending on environmental conditions, the maximum set point in the summer may be 15° F higher than the typical winter setting. The fail safe is a line of defense against any possible computer control malfunction. *Note: All thermostats should be located away from direct drafts of air inlets or heaters.*

The fail safe thermostat completes the watch dog circuit. The fail safe opens when the barn temperature reaches the maximum allowable set point. As the fail safe opens, the WDT circuit opens. This interrupts the Automated Environments Watch Dog Timer Circuit. At this point all environmental control is handled entirely by backup systems, however, the computer will still monitor conditions and continue to process egg flow and control. This will continue until the alarm condition from the fail safe ceases.

Backup Thermostats

Backup thermostats are mechanical devices located in each barn. These thermostats operate environmental control only when the Automated Environments system goes off line. As long as the computer is controlling properly and the fail safe temperature has not been reached, these thermostats cannot effect the system. However, in backup operation, these thermostats directly control fan on/off and variable speed fan staging. In backup, the variable speed fans operate as on/off fans. *Note: All thermostats should be located away from direct drafts of air inlets or heaters.*

Fans should be staged in temperature dependent groups for backup control through the thermostats. For example: If backup T-Stat #1 is wired to turn on fan stages 1 and 2 at a predetermined temperature, backup T-Stat#2 would be wired to turn on fan stages 3 and 4 at a higher temperature, etc. The source voltage must correspond between a fan stage and its respective backup thermostat as a difference in voltage phase could cause voltage spikes when the system switches from automatic to backup control, which could damage equipment. It is recommended that at least 2 thermostats be used for on/off fan staging, however, increasing the number of backup thermostats increases the sensitivity and reliability of environmental control in backup mode. Separate backup

thermostats are required for: on/off fan stages, variable speed fans, heater staging, cool cell staging, etc.

The backup thermostats should be tested and the set points adjusted periodically to reflect the changing requirements of the flock. The following procedure should be used for testing the backup thermostats:

1. Adjust the Fail Safe thermostat dial down below the current temperature of the house. This will deactivate the computer control of the house.
2. Locate the backup thermostats and individually adjust each setting down and verify that it activates a set of fans. After verifying that the thermostat has activated a set of fans, **readjust the thermostat** to a setting at which the house should be controlling at if the computer system were to go off line.
3. Continue this process for each of the backup thermostats.
4. Adjust the Fail Safe thermostat back to it's maximum house temperature setting.

Temperature Sensor Verification and Calibration

Verify that the temperature sensor is labeled properly and wired correctly to the computer system. This is accomplished by unscrewing the temperature sensor cable from its connector box. Make sure that the rubber sealing ring does not fall out of the socket. The person at the computer should see a "N/A" or "0" appear next to the appropriate temperature sensor on the screen. After the proper sensor label and location has been established, the sensor can be calibrated.

Calibrate the temperature sensors. A hand held digital thermometer is used to calibrate each temperature sensor separately. The following procedures should be used for calibration:

1. Calibration of sensors should be done a few times a year. More frequent then this is not necessary. Any time hardware is changed, such as sensor, interface card, brick, power supply, etc. then calibration should also be done.
2. Temperature should be taken at the sensors and not more then a few inches from the sensor.
3. The sensors should be positioned so they don't touch any metal or birds, but stay near the cages to prevent damage.
4. The sensors adjust to temperature changes slowly. If conditions change in the house from fans turning on/off, then wait for temperature to settle in the house before continuing calibration.
5. Move sensors that seem to "catch a breeze" as they will change as the air moves.
6. If it appears that sensors are going out of calibration more frequently, then something else is wrong. For instance, keying of radios inject noise in the sensors that must settle out before calibrating.
7. Variable speed drives generate enormous amounts of noise, especially with fans. Certain speeds may be much worse then others. If turning off the drives makes a

change in the sensors, then filtering of the noise is necessary. This can be done with the drives and sensors. Also, some manufacturer's drives are much worse then other drives.

8. Don't rush the calibration and use a trusted temperature probe. Many probes settle much faster then the sensors, but the last degree or so takes significantly more time to settle.

We find keeping a chart of adjustment helps train people. They start thinking that sensors are drifting all over. After tracking their changes, they find that they have been adjusting sensors +/- over a couple of degrees. Once they see this, they usually pick a middle ground and find that they don't have any drift issues. Also, Systems II with bricks and Integra Ultima Controllers are more stable then the DGP boards. The DGP boards do have some drift issues that are addressed via different methods. Bricks and Ultima Controllers don't have any such issues and should remain stable. I hope this clears up calibration issues.

Water Meter Wiring and Verification

The Automated Environments system monitors water usage through a meter. This is accomplished by running an A-Cable (2 conductor #22 Ga. W/ Shield) from the appropriate counter input in the control enclosure through conduit and a junction box to each water meter. The A-Cable is then terminated in a fork or a ring lug.

Verify that the counter board is operating properly and that the wiring is correct up to this point by following this procedure:

1. On the computer system, find the water meter readings.
2. As one person touches the two ends of the A-Cable together at the meter, counts should appear on the screen for the appropriate meter.

Wiring from the meter to the counter input is verified by checking for a voltage drop at the input. This is done by checking for a drop from 5VDC to 0VDC between common and the pin that the meter is wired to. This drop will occur when the ends of the A-Cable at the water meter are touched together. If the 5V is available and no drop occurs, the meter is either wired to a different pin or a wire is broken.

Wire the meter into the system.

1. Loosen the two retaining screws and remove the plastic shield on the face of the meter. This will reveal two brass screw terminals.
2. Land the fork or ring lugs of the A-Cable on the two screw terminals. (To be wired without regard as to polarity.)
3. Break off the plastic tabs on the bottom of the shield and reattach with the two retaining screws.