



Low Temperature Incubator Model 146E

Catalog Number
97-990E(115VAC)
97-995E(230VAC)

Fisher Low Temperature Incubator offers laboratories precise temperature control over the -10°C to 60°C range. Performance meets requirements for the preservation of vaccines, biologicals, incubation of bacterial cultures, and determination of bio-chemical oxygen demand of sewage. The extended operating temperature range also includes temperatures associated with drug stability projects, dairy product evaluation and entomological studies.

Features include:

- Spacious 6.1 cu ft chamber accommodates up to 114 standard BOD bottles or similar containers.
- Under the counter model with reversible door
- 2 Removable shelves
- 3 Molded door shelves
- Microprocessor based temperature controller, with temperature readout to .1°C
- Solid state relay for heater
- Over/ under temperature safety relay and alarm LED
- Over temperature thermostat
- 3 Cooling control modes: High precision with cooling, High precision without cooling and Frost free with variable cooling
- Compressor relay for energy conservation
- Compressor overload relay
- RTD temperature probe
- Protected setpoint mode to avoid accidental change
- Convenience outlet inside chamber, 2 amp



WARNING

- This manual must be carefully read and thoroughly understood before operating the unit, failure to follow directions or precautionary measures could result in serious adverse effects.
- This equipment must be used only as specified in these instructions.
- This equipment is intended for indoor use only.
- This equipment must be earth grounded for safe operation.
- Maximum ratings of accessories that may be plugged into convenience outlet: Load current 2 Amps. @ 115VAC, Leakage Current 250 micro Amps.



IMPORTANT: When operating at 100% cooling, the unit should be defrosted periodically, especially during times of high humidity. The customer will be responsible for any repair work done caused by evaporator ice build up. See "Defrosting".



CAUTION

The aluminum evaporator and other portions of these units should not be exposed to the corrosive effects of acidic or caustic materials. Extreme care must be exercised if such materials are stored within to prevent voiding the warranty. This Incubator is NOT suitable for flammable material storage.

SPECIFICATIONS

Power Requirements:

97-990E 115V, 9.5A, 60Hz

97-995E 230V. 5.8A, 50Hz

Including 2A for internal convenience outlet.

Dimensions:

Height: 34.5 in (87.6cm)

Width: 24 in (61cm)

Depth: 24.5 in (62.2cm)

Volume: 6.1 cu ft (0.173m³)

Shelf Data: 2 chamber, 3 door

Capacity: 114 BOD bottles

Shipping Weight:

126 lb. (57 kg)

Operating Environment:

Temperature Range: 10°C to 40°C

Humidity Range: 0% to 90% RH Non-Condensing

Maximum Altitude: 6600 ft (2 km)

Air clearances: Front and back, 3" minimum

Overvoltage Category II (IEC664)

Pollution Degree 2 (IEC664)

Performance Characteristics:

Operating Range: -10° to +60°C

Uniformity: ±1.0°C¹

Stability: ±0.2°C¹

Display Readability: 0.1°C

¹ Per ASTM method E 1292-94, cooling modes 00 and 100

PACKING LIST

Qty Item

- 1 Low Temperature incubator
- 1 Instructions
- 1 Latching Duct
- 1 End Cap for Duct
- 3 J Clamps
- 1 Plastic Bag containing 4 feet

UNPACKING and INSPECTION

NOTE: If damage is observed, keep the shipment intact (including the carton and all packing material) and file a claim with the final carrier.

INSTALLATION

The Low Temperature Incubator should be installed on a level, stable floor. Install the 4 adjustable feet per instructions inside package. Use the adjustable feet to level the incubator. Locate the unit so that area in front of door and kick grill is clear. To prevent heat build up within the unit, do not install it where it will be exposed to strong sunlight, nor near radiators, furnaces, or other sources of heat. Do not install the incubator where flammable or corrosive atmospheres may exist. The Low Temperature Incubator is not to be used out-of-doors or where excessive moisture or contamination could cause degrading of mechanical or electrical components.

1. Remove all protective tape from doors and shelves.
2. Clean interior and exterior with warm soap and water. Shipping tape residue can be removed using isopropyl alcohol.
3. Uncoil line cord from rear of unit. Connect the plug to a power outlet that complies with the electrical requirements specified on the unit's label and with proper safety ground connection. If line cord replacement is necessary, use CSA types: SJ, SJO or SJT, 16 GA, 3 conductor or equivalent.

Door Reversal:

1. Disconnect unit from power source. On inside of door, directly behind controller, open snapped conduit and remove controller cable.
2. Remove screw that secures cable clamp holding controller cable, then replace screw.
3. Remove controller cable from J clamps that run along inside chamber side and back walls.
4. Place 3 J clamps (Provided) at approximately the same spacing (on opposite side) as existing J clamps.
5. Support door with one hand remove screw securing door to upper hinge, then lift door off bottom hinge.
6. Remove the three screws securing each hinge to chassis.
7. Remove three plug screws covering holes on left side, then install them in holes on right side,
8. Install hinges on left side using screws removed in step 6. Position hinge with door screw on bottom.
9. Position door on hinge then insert screw previously removed in step 5.
10. Attach supplied latching duct to inside on door, in line with controller cable toward opposite side on door from other duct.
11. Route cable using J clamps and latching duct.
12. Remove screw on left front of enclosure and install cable clamp with removed screw.
13. Adjust size of loop in cable where door is hinged to ensure door can fully open and close without interference.

CONTROLS

Power ON/OFF Switch: Located inside chamber area, is used to turn power (1) ON or (0) OFF to entire unit.

Keys: Located on front panel.
MENU Used to access menus.
SET Used to display setting.

△ INCREASE setting.
▽ DECREASE setting.

DISPLAY and INDICATORS

DISPLAY: (On front panel)

Displays chamber and set point temperatures in °C and prompts from menu.

INDICATORS: (Front panel)

DELAY: Lights when delay start timer for compressor is timing. Will begin timing when power is first applied or when cooling is first turned off.

ALARM: Indicates that chamber temperature is not within limits and the safety relay is opened.

COOL: Lights when cooling compressor is on.

HEAT: Lights when controller demands heat.

GENERAL FUNCTIONAL CHECKS

1. Turn power on to unit by placing the Power ON/ OFF Switch to I (ON) position. The Controller (mounted on front of door) will display S, then, 88.8 (to test display), then begins reading actual chamber temperature.

Note: When power is first applied, if display indicates an L instead of an S, a switch setting on the controller must be changed. Refer to Replacing Temp Controller (TC1).

2. After 3 seconds, the alarm LED on the controller should extinguish and the safety relay should close applying power to the heater, fan, compressor relay and convenience outlet.

3. Press and hold MENU key, after 3 sec. the display will indicate CAL. Release and press MENU again to display Pct, press SET, display should indicate 100. Press and release MENU again to indicate Pro, press SET, display should indicate 00, press and release MENU to return to normal control mode. Press SET to display control setpoint, display should read 25.0. If the control setpoint or any of the other parameters aren't set correctly, use the △ or ▽ keys while pressing SET to change the setting.

4. The DELAY LED will be lit for 7 minutes after power is first applied, the COOL LED will be out during this delay period. When the DELAY LED goes out, the COOL LED will light and the compressor relay will close starting the compressor.

5. Allow unit to stabilize for 1 hour at 25°C, to ensure that all systems are functioning.

OPERATION

Perform the procedure under General Functional Checks if incubator is new or hasn't been operated for a long time.

Controller operation:

Usually the only controller setting that is necessary to change is the chamber temperature control setpoint. Other parameters of the controller may be changed by accessing them through the MENU key, covered later.

Changing Chamber Temperature Control Setpoint

1. The chamber temperature is continuously displayed, unless a key is pressed.

2. To display the setpoint temperature, press the SET key. The setpoint temperature will remain on the display for 1 sec. after the SET key is released.
3. To change the setpoint temperature, press and hold SET while pressing the Δ or ∇ keys to change the setting. (Note that when either Δ or ∇ keys are first pressed, the display will begin to change slowly at first, then increase change rate after a few seconds.)
4. Select the desired chamber setpoint then release all keys. The controller display will revert back to actual chamber temperature after a few seconds. Allow up to an hour for unit to stabilize at the new setpoint temperature.

After the incubator temperature has stabilized, place samples into incubator chamber. For best results, arrange samples evenly throughout the chamber. Liquid samples should be covered to prevent evaporation and eventual frost build up on evaporator coils, particularly when operating below ambient. Note that frost build-up is normal when unit is being operated below 35°C with cooling set to 100% mode.

The Low Temperature Incubator has an internal 2 amp. convenience outlet inside chamber to operate devices such as: shakers, rotators, photosynthesis lights, recording thermometers etc. **Accessing Controller Menus:** The temperature controller has three menu selections that can be accessed by pressing and holding the MENU key for 3 sec. To access menu parameter, press and hold the SET key. To change the parameter, use the Δ or ∇ keys.

CAL Menu- Calibration Menu is used to change the temperature offset value to correct for differences in chamber temperature and the displayed temperature. Range -5° to 5°C. See Calibration Procedure.

Pct Menu- (Percent Cooling Menu) Used to select one of three cooling modes:

100% Mode- Compressor runs continuously which provides high precision control (+/- .2°C Stability) over entire temperature range. Requires manual defrost.

50% Mode- Compressor runs approximately half the time, which conserves power and also reduces the amount of frost buildup on the evaporator. This method greatly reduces the frequency of manual defrosting but provides less temperature stability (+/- 1.5°C).

00% Mode- Compressor is completely off. This mode is ideal for incubating samples at temperatures 10°C or higher above ambient (35°C to 60°C). It provides the greatest power savings yet still maintain the advertised stability. No defrosting required.

Pro Menu- Protection Menu - Used to select the Protection mode of operation that determines when the alarm is activated and if the control setpoint can be changed. Range 0.0 to 0.2.

0.0 Mode- Normal mode that allows the user to change setpoint. Alarm activates if chamber temperature (chamber) and setpoint temperature (setpoint) are as follows:

chamber \leq 15.0°C and chamber $<$ (setpoint - 3) or
chamber \geq 40.0°C and chamber $>$ (setpoint+3)

While ALARM is activated, the safety relay is opened interrupting power to the heater, fan, convenience outlet and compressor. When chamber temperature returns to acceptable limits, the ALARM will automatically terminate and power is reapplied. In order to allow changing of setpoint and eliminate nuisance alarms, an alarm by-pass takes effect when the setpoint is changed or when power is first applied. The alarm by-pass works as follows: Present chamber temperature is stored as a nominal alarm temperature (nominal). If chamber $<$ setpoint then alarm temperature (alarm) = nominal -3. If chamber $>$ setpoint then alarm = nominal +3. If chamber should go beyond alarm or $<$ -13 or $>$ 63 then the ALARM will activate. This alarm by-pass is active until chamber reaches setpoint \pm 1°C.

0.1 Mode- Same as 0.0 Mode, except that the setpoint is locked and can't be changed.

0.2 Mode Setpoint is locked, plus, the ALARM will activate and the safety relay will open as follows:

chamber $<$ (setpoint -3) or chamber $>$ (setpoint +3)

In order to use this mode of protection, modes 0.0 or 0.1 will have to be used to reach the setpoint temperature. Once the chamber temperature reaches the setpoint and is stable, protection mode 0.2 can be set.

Note! If the chamber temperature falls outside the setpoint by \pm 3°C, the ALARM will activate and safety relay will interrupt power. This mode can only be used if the door is to remain shut and other disturbances don't effect the chamber temperature.

As an added safety feature, the incubator has a thermostat in the heater compartment that limits the upper chamber temperature to 65°C.

MAINTENANCE



WARNING

To reduce the risk of electric shock, disconnect from power source before servicing.

Before re-applying power, after maintenance is complete, check to ensure that safety ground is intact and making a good connection.

CLEANING

Disconnect incubator from power source. Immediately clean all spilled materials from the incubator and wipe dry. If necessary, moisten a cloth with soap and water and clean inside and out. Do not use any harsh chemical cleaners.

DEFROSTING

Periodic defrosting may be necessary. The time between defrosts depends on operating temperature, ambient humidity and moisture from samples. Time between defrosts may be from 30 days to years. Defrosting may be necessary when operating at 50% mode as well, especially for control temperatures less than 15.0°C.

Suggested defrost methods.

Method I: For control setpoint down to 10°C, this method is the least disruptive, if samples can withstand temperature stability of +/- 1.5°C for 24 hours. Samples may remain in chamber during this procedure.

1. (Refer to Accessing Controller Menus) Press and hold MENU key until CAL is displayed, then release and press MENU again until Pct is displayed.
2. Select 50 in the Pct menu then press MENU key twice to return control mode.
3. Allow incubator to remain in this mode for about 24 hours or until frost disappears.
4. Use the MENU key to re-establish the previous selection for Pct (i.e. 100).

Method II:

1. Remove any samples that may be damaged by temperatures up to 35°C.
2. Refer to Accessing Menu section of manual and set Pct parameter to 00.
3. Place Setpoint to 35.0°C.
4. Allow temperature to stabilize, for 1 hour.
5. After 1 hour, remove power from unit. Open door and wipe up any excess moisture on floor of chamber with paper towels or sponge.
6. Apply power and set desired operating parameters back into controller. After chamber temperature stabilizes, place samples previously removed back into unit.

CALIBRATION

If it becomes necessary to calibrate temperature controller, perform the following:

1. Place an accurate temperature-measuring device in the geometric center of the chamber.
2. Set the controller to the desired operating temperature in 100% cooling mode and allow 2 hours for stabilization.
3. Note the chamber temperature on the controller display and the temperature at the geometric center.
4. Subtract the chamber display reading from the geometric center reading.
5. Enter into the Calibration Mode as described in Accessing Menu.
6. Press and hold SET key, using the Δ or ∇ keys, set the calibration parameter to the value determined in step 4.
7. Allow unit to stabilize for 1 hour and check that controller value and geometric center value agree $\pm 2^\circ\text{C}$. Repeat calibration if necessary.

Replacing Temp. Controller:

1. Disconnect incubator from power source.
2. Remove front panel bezel by removing four screws in top and bottom of bezel.
3. Remove four screws that mount controller to mounting bracket.
4. Note wire colors and positions on TB1 and TB2, then remove all wires from TB1 and TB2 and remove old controller.
5. Locate switch DS1 on lower left corner of new controller and set the switches as follows:
 - Set DS1-1 (A) to off (up).
 - Set DS1-2 (B) to off (up).
6. Attach wires previously removed from old controller to new controller.
7. Mount new controller and bezel, then apply power.
8. Refer to Calibration section of this manual, to calibrate new controller.

Replacing RTD Temp. Sensor:

1. Disconnect incubator from power source.
2. Refer to Replacing Temp. Controller, but only remove sensor wires from TB2.
3. Open incubator door, remove Sensor on door bracket.
4. Remove old sensor, then place new sensor on bracket.
5. Connect new sensor wires to controller then mount controller and bezel.
6. Apply power, then refer to Calibration section.

Replacing SSR1, K1, K2 or T1:

1. Disconnect incubator for power source.
2. Remove screws from lower back panel then tilt back panel out.
3. Locate device to be replaced on back panel then remove mounting screws.
4. Unplug quick connect terminals, noting positions.
5. Place quick connects on new device and mount on back panel.
6. Replace back panel, then apply power.
7. Refer to General Functional Checks to ensure that new device is operating.

Replacing FAN2, THM1, HTR1:

1. Disconnect incubator from power source.
2. Remove shelves from chamber area.
3. Remove heater cover at top back of chamber by removing 2 screws on either side.
4. Replace the THM1 or HTR1, if necessary, then coat electrical connections with RTV102 or other electrical insulator. To replace Fan, remove HTR1, then remove 4 screws that hold Enclosure, then replace Fan.
5. Re-assemble in opposite order as previously described.
6. Apply power, refer to General Functional Checks to ensure that new device is operating.

TROUBLE SHOOTING and REPAIR

Symptom	Possible Cause	Possible Solution to Condition
Incubator controller isn't functioning, no lights etc.	Power switch isn't ON or no power to unit.	Place Power ON/ OFF switch inside chamber to ON. Check power outlet by plugging a known good device into it.
Erratic temperature display readings above or below set point.	Frost buildup. Look for frost inside chamber around evaporator.	Defrost per instructions. If possible operate in 50% Cooling Mode to reduce defrosting cycles.
Temperature uniformity in chamber above specified limit.	Frost buildup or airflow blocked by samples.	Defrost per instruction. If airflow blocked by sample containers, remove some to allow top to bottom airflow.
Temperature readings too high or too low compared to thermometer.	Controller may need calibrated.	Refer to CALIBRATION section of this manual
Control goes into power on reset sequence while operating.	Inadequate line power. Test Line voltage of outlet to Incubator while unit is operating.	If line voltage is < 106 VAC while unit is running, then a higher capacity AC line is required.
Compressor not operating while COOL LED is lit.	Compressor stalled and thermal overloads opens. Test line voltage of outlet while unit is operating.	If line voltage is < 106 VAC while unit is running, then a higher capacity AC line is required.
Temperature readings go far below setpoint and trigger alarm at 15°C.	Open heater or heater control relay SSR1.	Unplug unit from power then refer to replacing HTR1. Check heater with OHM meter, about 29 ohms (97-995E 60 ohms).
Temperature readings go far above setpoint and triggers alarm at 40°C or above.	Defective cooling relay, compressor or shorted heater SSR1. Check if compressor is running, if so touch evaporator in chamber, it should be cold.	If compressor isn't running while Cool led is on then replace K2 relay. If compressor is running and evaporator isn't cold then cooling system needs repair. If evaporator is cold then SSR1 may be shorted.
Controller display works but heater, compressor and chamber fan don't.	Safety relay K1 not closing.	K1 relay may need replaced.
Display EEE/99.9 & Alarm 1	Open sensor or sensor connection.	Check sensor connection at controller. Check sensor with ohm meter, 100 ohms at 0°C and 110 ohms at 25°C.
Display EEE/99.8 & Alarm 1	Shorted sensor or connection.	Check sensor connection at controller.
Display EEE/temp & Alarm 1	Incubator needs defrosted.	See erratic temperature display readings.

1. Temp Limit = Temp (+/-3°C or more from setpoint) & (> 40°C or <15°C), safety relay opens.

Replacement Parts

Description	Spare Part Number	Description	Spare Part Number
TC1 Controller	SPN102214	S1 Switch	SPN83373
Sensor, RTD	SPN88613	HTR1 Heater (115V)	SPN102079
SSR1 Relay	SPN88616	HTR1 Heater (230V)	SPN102080
K1 Safety Relay	SPN102260	FAN2 (115V)	SPN30580
K2 Comp. Relay	SPN102259	FAN2 (230V)	SPN39854
T1 Transformer	SPN88678	THM1 Thermostat	SPN88612
Compressor (97-990E)	SPN105501		

Technical Assistance: 1-800-926-0505

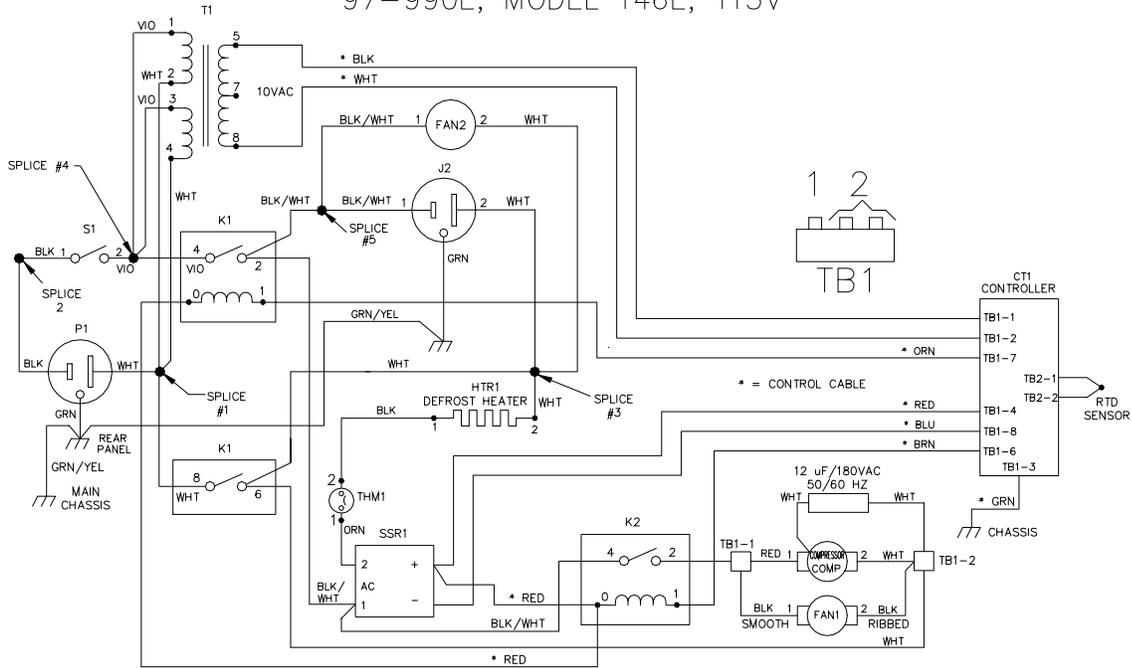
Customer Service: 1-800-766-7000

Fisher Scientific
2000 Park Lane
Pittsburgh, PA 15275 USA

Instruction Manual
Part # 95525 Rev. J

Schematic Diagram

97-990E, MODEL 146E, 115V



97-995, MODEL 146E, 230V

