electro-tech systems

ETS 5532/5533 Environmental Chamber Family

Start-up Manual

Document D01042 Revision B

Start-up Manual for ETS Model 5532 and Model 5533 Chambers

The Start-up Manual is a streamlined manual designed to help the user get started quickly. For more details and step-by-step instructions, consult the 5532/5533 Operating Manual D01011.

This manual covers the ETS 5532 chamber and the ETS 5533 chamber. Operating systems and set-up are identical for these two chambers. The essential difference is the depth of the environmental chamber – 6" larger in the case of 5533.

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I. Important Safety Information

SAFETY INSTRUCTIONS

The equipment described in this Manual is designed and manufactured to operate within defined design limits. Any misuse may result in electric shock or fire. To prevent the equipment from being damaged, the following rules should be observed for installation, use and maintenance. **Read the following safety instructions before operating the instrument.**

POWER

POWER CORD: Use only the power cord specified for this equipment and certified for the country of use. If the power (mains) plug is replaced, follow the wiring connections specified for the country of use. When installing or removing the power plug, **hold the plug, not the cord.**

The power cord provided is equipped with a **3-prong grounded plug (a plug with a third grounding pin).** This is both a safety feature to avoid electrical shock and a requirement for correct equipment operation. If the outlet to be used does not accommodate the 3-prong plug, either change the outlet or use a grounding adapter.

FUSES: Replace fuses only with those having the required current rating, voltage and specified type such as normal blow, time delay, etc. **DO NOT** use makeshift fuses or short the fuse holder. This could cause a shock or fire hazard or severely damage the instrument.

OPERATION

CAUTION

DO NOT OPERATE WITH COVERS OR PANELS REMOVED. Voltages inside the equipment consist of line (mains) that can be anywhere from 100-240VAC.

DO NOT OPERATE WITH SUSPECTED EQUIPMENT FAILURES. If any odor or smoke becomes apparent turn off the equipment and unplug it immediately. Failure to do so may result in electrical shock, fire or permanent damage to the equipment. Contact the factory for further instructions.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE: Operating the equipment in the presence of flammable gases or fumes **constitutes a definite safety hazard**. For equipment designed to operate in such environments the proper safety devices must be used such as dry air or inert gas purge, intrinsic safe barriers and/or explosion-proof enclosures.

DO NOT IMPEDE THE CHAMBER FROM VENTING EXCESS PRESSURE. The humidification and dehumidification systems are open loop systems that pump external air into the chamber. If the chamber is not allowed to vent, pressure could build up and cause serious damage to the chamber.

IF YOUR UNIT INCLUDES OPTIONAL LIQUID NITROGEN COOLING CAPABILITES, REVIEW ALL SAFETY INFORMATION IN THE LIQUID NITROGEN SAFETY ADDENDUM.

DO NOT USE IN ANY MANNER NOT SPECIFIED OR APPROVED BY THE MANUFACTURER: Unapproved use may result in damage to the equipment or present an electrical shock or fire hazard.

II. Description of System Components

ETS 5532 and ETS 5533 Environmental chambers. Standard items:

Item	Qty.	Description
Chamber	1	Acrylic construction, clear and white panels, with doors, glove ports, or iris ports as requested. On the right-hand side is an equipment enclosure which houses user controls and systems for humidity control of the chamber. On the left-hand side, the controlled section of the chamber contains heating and cooling equipment, a circulation fan, and lighting, as ordered.
Controller & Sensor	1	Mounted on the front panel of the equipment enclosure, the Controller contains user controls for setting temperature and humidity setpoints and selecting or disabling operating systems. The Controller monitors chamber condition using the calibrated temperature/humidity sensor which enters the controlled section of the chamber through the right-hand wall.
Operating systems (if included)	1	A. Heating. Heating elements are mounted inside a panel at the rear of the controlled area. B. Cooling. A thermoelectric cooler is mounted at the rear of the controlled area. C. Humidification. An ETS Model 5482 humidification system is built inside the equipment enclosure and supplies humidified air to the chamber through a 1" tube. D. Dehumidification. An ETS Model 5471 dehumidification system is built inside the equipment enclosure and exchanges air with the chamber through ¼" tubing.
5 gallon water tank	1	Plastic tank with valve. NOTE: Shipped with valve inside the tank – remove valve and screw onto tank.
Desiccant column	1	2.5 lb. column filled with MS desiccant with blue indicating dots.
¼" OD opaque tubing	1	One 10-foot length of tubing is provided to be used for connecting the dehumidification system to the chamber.
Sealing Putty	1	A roll of Mortite for sealing small open ports.
Power Cord	1	AC line cord for connecting the control unit to power.
Pair of Iris Ports	1	If requested, attached to chamber and ready for use.
Pair of Glove Ports	1	If requested, Gloves attach to removable ports. Ready to exchange with Iris ports.
Pair of Glove hands	1	If requested, Extra pair of glove hands for replacement.

III. Set-Up Guide

Part 1: Unpacking Chamber

The standard Model 5532/5533 Controlled Environment Chamber is shipped in 2 separate cartons. The chamber is double boxed in a double-wall custom carton, and the accessories, shown in Figure 3-1, are packed in a second double-walled carton.

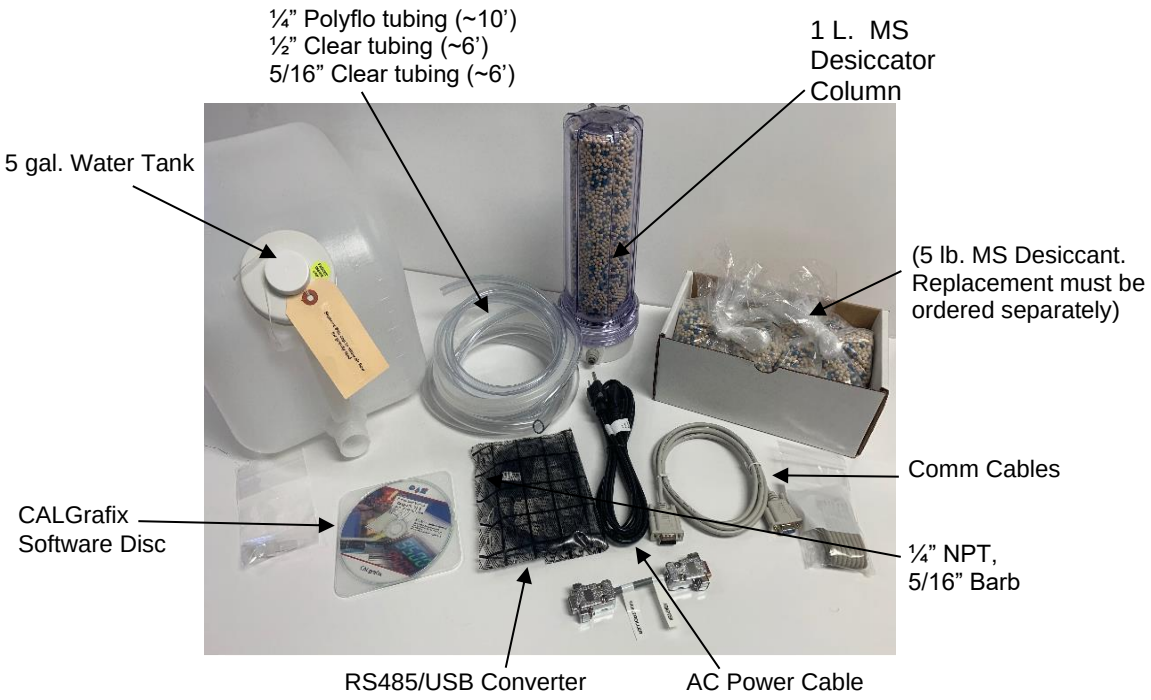


Figure 3-1 Accessory box contents

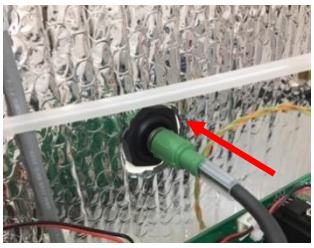
Upon receipt, immediately inspect the cartons for any visible damage. If any shipping damage is noticed, unpack the chamber and inspect it for damage. Take pictures of any abnormalities observed. Save all cartons until it is certain that they will no longer be needed. If the Chamber has to be returned to ETS for any reason, the original packaging must be used.

<u>NOTE:</u> Report any damage immediately to the common carrier delivering the System and to ETS. <u>All damage claims must originate from the recipient.</u> Failure to report damage in a timely manner may result in the claim not being paid. ETS will not be responsible for damaged or lost components if not reported to ETS within 30 days of shipment.

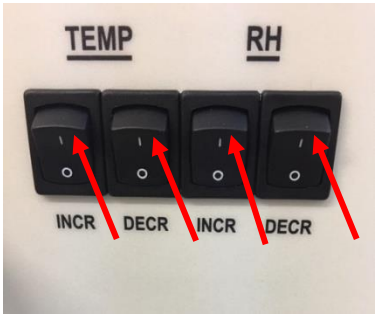
Save all cartons and packing material in case the Model 5532/5533 System needs to be shipped to a new location.

Part 2: Connect all Operating Systems

Tools Needed: Adjustable wrench

IMPORTANT! REVIEW ALL SAFETY PRECAUTIONS AND INSTRUCTIONS	**Switches OFF** Before applying power to the system, verify that all controller switches on the front panel are in the OFF (0) position.
 	**Step 1 – Verify sensor position** The sensor should be inserted into the environmental chamber from the equipment enclosure until the metal portion extends beyond the fitting as shown. If necessary, loosen the nut, adjust the sensor position, and then tighten the nut to hold the sensor in place.
	**Step 2 – Connect the controller** Make sure this power switch is OFF.
	**Step 3 – Connect main power** 1. Plug in the AC cable to the chamber. 2. Plug in the to an electrical outlet. **Note: Using 10A 120VAC 60Hz service.**

IV. Quick Start Guide

IMPORTANT! REVIEW ALL SAFETY PRECAUTIONS AND INSTRUCTIONS	**Step 1 – Switches OFF** Before applying power to the system, verify that all controller switches on the front panel are in the OFF (0) position.
	**Step 2 – Turn on Power** Turn on Power (I = on). Do NOT turn on "COOL" switch on front panel.
	**Step 3 – Set Temperature** Set your set point by pressing and holding the * key and using increase/decrease buttons to adjust to your desired temperature.
	**Step 4 – Turn on Operating Systems** Flip ONLY the operating system needed to the ON position (I = on): Heating: TEMP INCR ON Cooling: TEMP INCR & DECR ON Humid.: RH INCR ON Dehumid.: RH DECR ON

V. Functional Description

The Model 5532/5533 Microprocessor Controlled Environmental Chamber is a completely integrated system providing a controlled environment for testing, fabricating or storage.

The controllers, pumps and the humidifier operating system are housed in a separate compartment on the right side of the Chamber as shown below.

Figure 5-2: Model 5532 Controlled Environment Chamber

All systems are accessible via the removable white acrylic panel on the right side of the Chamber. Controllers and operating systems that are available with the Model 5532/5533 are as follows:

1. Microprocessor Temperature Controller (multi ramp/soak, set point display; Std.)
2. Model 556 Temperature compensated RH and Temperature Sensor (Std.)
3. Integrated 500 Watt Heater (Std.)
4. Choice of Cooling Systems: (5473-150W - Std.)
   a. Model 5473-(150W-400W) 510-1360 BTU Thermoelectric Cooling System
   b. Model 5463 Liquid CO_2 Cooling System
   c. Model 5466 Liquid Nitrogen Cooling System
5. Microprocessor Humidity Controller (multi ramp/soak, set point display, Std)
6. Model 5482 Ultrasonic Humidification System (Std)
7. Choice of Dehumidification Systems:
   a. Model 5471 Desiccant/Pump Dehumidification System, 2.5 lbs. of MS Desiccant (Std.)
   b. Model 5478 Self-Regenerating Dehumidification System (requires external air compressor or house air at 50-100 psi)
   c. Model 5465 Dry Gas Dehumidification System
8. CALGrafix Computer Software/Interface Package. Allows remote monitoring, charting and reprogramming of the Microprocessor Controllers from a PC (Std).

General Specifications.

Chamber:
- **Construction:**
  - **Enclosure:** 3/8" (6mm) clear & white acrylic PS30 polished welded seams
  - **Doors**: 1/2" (13mm) clear acrylic, ½-turn latches
  - **Seal**: ¼" (6mm) Poron, non-setting gasket
- **Access:**
  - **Ports:**
    - 2x ¼" (6mm) Quick disconnect (right side)
    - 1x 1" (25.4mm) Hose barb (right side)
    - 1x 1½" (31.4mm) cable pass through (left side)
  - **Gloves**: (optional) 2x 8" (20.3cm) ports. Gloves 018" (0.5mm) thick, replaceable hands, natural rubber, accordion sleeves
  - **Circulating Fans:** 2x 110 cfm (6230 l/min), ON/VARIABLE/OFF control
  - **Lighting:** Enclosed LED lighting
- **Dimensions:**
  - 5532: External: 54"Wx25.5"Dx22"H (137x65x56cm)
  - Internal usable working space: 39"Wx20"Dx21"H (99x51x54 cm)
  - 5533: External: 54"Wx31.25"Dx22"H (137x80x56cm)
  - Internal usable working space: 39"Wx26"Dx21"H (99x66x53 cm)
- **Weight:** 5532: 120 lbs. (54 kg) 5533: 136 lbs.(62 kg)
- **Operating Range**:
  - **Humidity:** <10 to >98%
  - **Temp**: (Std) 64-135ºF (18-55ºC)

Controllers:
- **Control unit:** 2x CAL 9500, multiple ramp/soak cycle (Optional): 1x CAL 9500, 3rd parameter, linear input
- **Display Resolution**: 0.1%/0.1º
- **Recorder Out**: 0-1vdc, 0-20ma, or 4-20ma
- **Computer Interface**: MODBUS proto. via RS485-PC with W98, NT, W Pro 7, or higher
- **Software**: (optional) CALGrafix PC chart & data collect.

Sensor:
- Probe, Temperature Compensated RH/Temp
  - RH: Capacitive film, 0 to 100%, non-condensing
    - Accuracy: ±1.5 %RH @ 72ºF (22 ºC)
  - Temperature: RTD, -40 to +140 ºF (-40 to 60 ºC)
    - Accuracy +0.5 ºF (+0.3ºC)

Operating Systems: (If included)
- **Dehumidify**: Desiccant/Pump system, including 2x 1 lb bag of Molecular Sieve desiccant if requested.
- **Humidify**: Ultrasonic micro-mist generation
  - Capacity: Tap water or 5 gal (19 l) ext. tank
  - Flow rate – 0.06 cfm (max)
- **Heat**: Electric, 500W
- **Cool:** 150W Thermoelectric (Standard), 300W (Optional)

Power:
- Voltage: 115/230VAC, 50/60Hz
- Current: 8-10 Amps
- Dual North American GFI AC outlet inside chamber

NOTE: The entire humidity range cannot be obtained at all temperatures due primarily to dew point considerations as shown below.

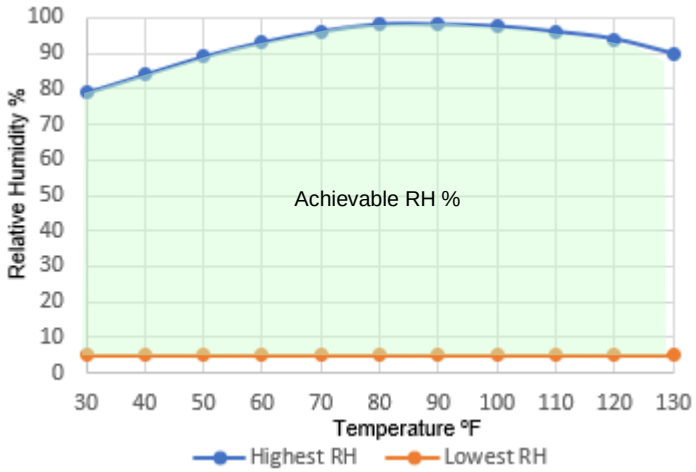


Figure 5-1: Model 5532 Dew point performance chart

Controller

Button	Description	Functionality
1	POWER	This switch disconnects all power going to the Chamber Systems. “I” is “ON”, “O” is “OFF”.
2	COOL (TEMP DECR)	Allows the user to manually disable the Temperature Cooling System. Pushing this switch to the (‘0’) is “Off”
3, 4, 5	TEMPERATURE CONTROLLER	The temperature controller includes a * button along with down and up arrows to allow selecting and changing settings.

Operating Systems: Heating

The Model 5532/5533 Chamber contains two (2), 250 Watt Electric Heaters (500 Watts total). The Heater is an integral part of the Chamber, located inside the chamber workspace. Since the Heater is already installed, there is no additional set-up required.

After turning “on” the “TEMP INCREASE” switch, the Microprocessor Temperature Controller governs the operation of the Heating System.

1. The Microprocessor will determine the amount of heat needed to maintain the desired set point. Power will be applied to the heater as a series of time proportioned pulses. .
2. The electric heating element and indicator light are located on white metal panel containing the Fans located on the inside, rear wall (the heater is hidden from view).
3. The Heater Indicator Light will illuminate to indicate when power is being applied to the Heater. (The Microprocessor LEDs will illuminate at the same time.)

   A thermal safety switch (also on the panel) is connected in series with the heater. Power to the heater will be cut off if the temperature within the chamber exceeds 135°F (58°C)

Operating Systems: Cooling

The Model 5532/5533 Chamber includes the *ETS Model 5473-150W, 510 BTU/hr Thermoelectric Cooling System* as standard. Other cooling options include:

ETS Model 5473-300	1020 BTU/hr Thermoelectric Cooling System
ETS Model 5463	Liquid Carbon Dioxide Cooling System
ETS Model 5466	Liquid Nitrogen Cooling System

The Model 5473 Series of thermoelectric cooling systems utilize the Peltier effect to reduce the temperature of a large heat sink. One or more 110 cfm fans circulate the air within the workspace through the heat sink to continuously reduce the temperature. Very precise temperatures can be maintained with this system by the microprocessor temperature controller. The standard Model 5473-150 is capable of removing up to 510 BTU/hr (150 Watts/hr) from the Chamber. The Model 5473-300 is capable of removing up to 1020 BTU/hr (300 Watts/hr) from the Chamber.

Operating Systems: Humidification

The Model 5532/5533 accomplishes humidification using an ETS Model 5482 Ultrasonic Humidification System. The Humidifier is located inside the Chamber Equipment Enclosure. To access the Humidifier, remove the large white acrylic panel on the right hand side of the Chamber. The panel is held in place with eight (8) Phillips screws.

The Ultrasonic Humidifier is an open loop system that produces a fine water mist through ultrasonic action. A blower fan forces the fine mist from the humidifier into the chamber.

Operating Systems: Dehumidification

The Model 5532/5533 Chamber includes a Desiccant-Pump Dehumidification System as standard. As an option, the ETS Model 5478 Self-Regenerating Dehumidification System is available.

Desiccant/Pump Dehumidification System

The Dehumidification System is closed loop designed to reduce the relative humidity in the Model 5532/5533 Chamber to less than 10%. When paired with the Microprocessor Humidity Controller, the humidity inside the chamber can be controlled, without disturbance, to within +/- 0.2% RH of the set point at the sensor.

The Dehumidification System includes a small air pump (located inside the Chamber Control Cavity), 1 liter of Molecular Sieve (“MS”) desiccant in a clear plastic column (sits outside the chamber), and ¼” O.D. tubing to interface the drying column with the pump. The tubing connects to the chamber through the quick-connect fittings on the right side of the Chamber. The desiccant column may be placed on top of, or next to, the Chamber.

The air pump is already connected to the Model 5532/5533 Microprocessor Humidity Controller. All the user needs to do is connect the Desiccant Column into the system using the provided ¼" OD Tubing.

The desiccant removes any moisture that is in the air. This dried air is then forced back into the chamber.

VI. Calibration / Maintenance / Troubleshooting

Calibration

The only components of the Model 5532/5533 Controlled Environment System that require periodic calibration are the Microprocessor Controllers and Temperature/Humidity sensor. It is recommended that this section be returned to ETS for calibration. However, system calibration can be checked by the user.

Place the sensor of a known, calibrated temperature and humidity meter as close as possible to the System sensor. After the temperature and humidity within the chamber has stabilized, compare the readings. They should be within the combined tolerance of the two measuring devices.

To return equipment to ETS for calibration or repair it is first necessary to obtain a RMA number. **Call 215-887-2196.**

To remove the Control Panel and sensor, first turn off and unplug the chamber, then gain access to the operating systems compartment by removing the 8 screws holding the right side panel in place. Unplug all connections to the front Control Panel. Loosen the 4 captive screws holding the Control Panel and remove. Remove the sensor by loosening the compression fitting inside the controlled environment section. Return both the Control Panel and sensor to ETS.

Maintenance

The Model 5532/5533 requires very little maintenance. If the procedures in the previous sections are followed the operating systems should operate trouble free. If the dehumidification desiccant blue indicator dots turn a darker blue, that indicates the molecular sieve material needs to be changed. After 500 hours of 5482 humidifier operation, we recommend the basin maintenance procedure shown in the 5482 manual.

Troubleshooting.

1. Chamber not operating – controllers not illuminated.

   Is the main chamber fuse blown?

   Check the AC Power source. Is it switched ON? Is a breaker tripped?

2. Insufficient Humidification – unable to reach target RH% level:

   Has maintenance been done regularly on the humidifier unit?

   Is the tank empty or is water source turned off?

   Is the temperature high or low, creating a dew point limit?

   Is there enough venting?

3. Unstable RH% level.

   Review controller setup

4. Insufficient Dehumidification – unable to reach target dry level:

   For Desiccant Systems:

   - Are all tubing connections properly connected?
   - Is desiccant used up?
   - Is there a moisture source being used in the chamber?

   For dry gas dehumidification:

   - Are all tubing connections properly connected?
   - Is the tank empty or gas source turned off?
   - Is there proper pressure and flow?

   For Self-regenerating dehumidification:

   - Are all tubing connections properly connected?
   - Is a compressor connected to the system?
   - Is there proper pressure and flow from the compressor?
   - Is the compressor spraying water due to lack of maintenance?

5. Insufficient Heating

   - Review controller setup and connections.
   - Is the lab ambient temperature lower than expected?
   - Does the light on the heater panel illuminate when the temperature microprocessor green indicator light illuminates?

6. Insufficient Cooling

   - Review controller setup and connections.
   - Is the lab ambient temperature higher than expected?
   - Is there a heat load inside the chamber?

Is the fan on the back outside of the chamber running?

Is there 2’ of clearance behind the chamber with good air flow?

7. Excessive noise / vibration

Check for sources such as an item contacting fan blades.

If the problem persists, contact ETS for support.

VII. Warranty

Limited Warranties. Seller warrants that all goods manufactured and delivered hereunder shall (a) conform to any samples, drawings, specifications or other written documents provided to Seller by Buyer, or approved by Buyer to Seller and (b) be free from all defects in workmanship and material. Buyer's sole remedy against Seller for breach of either of the specifically mentioned warranty shall be the repair or replacement, at Seller's sole option, of the defective workmanship or material. Seller expressly disclaims all other warranties, express and/or implied, including but not limited to those of merchantability and fitness for a particular purpose.

In no event shall Seller be liable, under either warranty or otherwise, to Buyer in excess of the purchase price of the products paid to Seller by Buyer. In no event shall Seller be liable for any loss or damage arising directly or indirectly from the use of the product or for consequential or incidental damages. Seller's specified warranties will expire and lapse (i) for renewable items (such as gloves, iris ports and desiccants), sixty (60) days from date of shipment and (ii) for all standard equipment and otherwise nonrenewable items, one year from date of shipment.