Corrosive Fog/Humidity Cabinet

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1.0 Safety

This section defines safety symbols that appear throughout this manual. It also provides a list of operational precautions and guidelines to observe for safely operating the salt fog corrosion chamber.

1.1 Safety Symbols

⚠️ HIGH VOLTAGE !

HIGH VOLTAGE! Indicates that ignoring the instructions may lead to electrical shock and possible injury.

⚠️ DANGER!

DANGER! Indicates that ignoring the instructions may lead to hazardous conditions for the operator.

⚠️ WARNING!

WARNING! Indicates that ignoring the instructions may damage the cabinet or affect test results.

⚠️ NOTE!

NOTE! Indicates operational hints and useful information.

1.2 Operational Precautions.

This list contains the safety precautions that must be followed to safely operate the SALT FOG CORROSION CABINET.

- Cover – Each Salt Fog Corrosion Chamber has an exposure chamber cover. It is shipped on the cabinet in a closed position. Always open the cover by lifting the center of the handle. Failure to do so can damage the cover and void any warranty the cover may have.
- Drains – Cabinet drains must be “laid” over the facility drain and not directly connected into the facility drain. This will prevent backpressure from forcing drainage back into the exposure zone.
- Exhaust – Cabinet exhaust must be vented to the outside of the customer’s facility. NEVER directly connect multiple corrosion cabinets to the same vent. If multiple corrosion cabinets (or any other machinery) are vented together, the exhaust from one cabinet(machine) can leak into another, causing harm to the test as well as other cabinet.
2.0 SETUP – INSTALLATION GUIDELINES

Prior to the arrival (or relocation) of the Salt Fog Corrosion Cabinet, there are electrical, environmental, air, water, floor space, and accessibility considerations.

All connections and tests of service should be made prior to powering up the chamber.

2.1 What is Needed for Chamber Installation

• Qualified electrician for electrical connection
• Plumber for drain, air and water connections
• HVAC installer (or other qualified personnel) for chamber vent connection
• Level floor
• Access to the outside via a roof vent or side wall vent
• Floor drain
• Pressurized 172 – 551 kPa (25-80 psi) ASTM D1193 reagent grade type IV water. Best chamber performance is obtained at the higher-pressure ratings.
• Clean dry compressed air regulated to 207 – 345 kPa (30-50 psi).
• Customer specified electric power from a lockable disconnect with appropriate amount of electric cord and conduit for the chamber location
• 1.9 cm (3/4”) plastic (PVC) plumbing fittings and ball valve for chamber drain to connect the chamber to the floor drain
• 3.175 cm (1-1/4”) (PVC) plumbing fittings for the chamber vent
• 3.175 cm (1-1/4”) (copper or galvanized steel) plumbing fittings for the water jacket drain connection
• 1.27 cm (1/2”) O.D. (PVC) plumbing fittings for the chamber drain connection
• 9.525 mm (3/8”) O.D. poly tubing from the compressed air line source to the chamber compressed air installation fitting
• 9.525 mm (3/8”) O.D. poly tubing from the pressurized DI line to the chamber inlet

Improper installation will affect the operation of the instrument and compromise test integrity. We strongly discourage installation in a warehouse, boiler room, garage, factory floor, paint room, powder mixing room, where outside doors are frequently opened, where dust is frequently airborne, or where humidity, air pressure or temperature vary widely.

The following pages give detail for each of these fittings.
2.0 SETUP – INSTALLATION GUIDELINES

2.2. Drain Connection  (Customer supplied & installed)

There are three different drain connections to be made.
1. Chamber exposure zone (main chamber drain) 1.27 cm (1/2”) drain line
2. Solution reservoir drain  1.27 cm (1/2”) drain line.
3. Water jacket drain  3.18 cm (1 1/4”) drain line.

1. Chamber exposure zone

This chamber is equipped with a drain port on the bottom of the “vent” side of the chamber. This port is 1.27 cm (1/2”) in diameter, threaded for a standard 1/2” FNPT connection. A PVC (or suitable material) nipple, elbow, nipple and ball valve should be installed onto this connection. Then from the ball valve, a drain line must be run to a gravity feed floor drain. This chamber is not designed to drain to a location above floor level. Do not directly connect into the floor drain. Allow the chamber drain line to “lay” over the floor drain.

2. Solution reservoir drain  1.27 cm (1/2”) drain line.

The 55-gallon salt solution holding tank is equipped with a 1.27 cm (1/2”) drain line. During installation, a PVC drain line shall be run to an open floor drain.

3. Water jacket drain  3.18 cm (1 1/4”) drain line.

Locate the Bubble Tower / Control Panel side of the chamber, next locate the bottom right leg of the chamber. On the bottom of the chamber behind this leg is a 3.18 cm (1 1/4”) pipe connection. Install the necessary elbows and pipe to bring the line to the out-side edge of the cabinet. Iron, PCV or other suitable piping material may be used for this installation.

Install a shut-off valve and pipe to the nearest floor drain. Or, install a hose connection after the valve and connect a hose for draining only when needed. The water jacket should be drained annually and replenished with fresh city water (never use D.I. water here) and rust inhibitor.

When the valves are installed into these drains, set them as follows during normal operation;

1. Chamber Drain     - OPEN
2. 55 gallon Solution Tank Drain   - CLOSED
3. Water jacket Drain     - CLOSED
2.0 SETUP – INSTALLATION GUIDELINES

2.3 Vent Connection
The chamber is supplied with a 1 ¼” IPS polypropylene exhaust fitting located on the end of the chamber.

Attach PVC (or other suitable material) to this port and run a line outside of the laboratory and building. If this vent length exceeds 4.5 meters, (15 feet) then the customer should consult an expert concerning proper “power” venting methods to ensure against any possible vent backpressure into the chamber.

Once the vent line is run, it must be supported to ensure that no weight from the vent run is applied to the vent port fitting.

It is important that this vent line has no sags in it or condensate will collect and block the vent. In addition, it may be necessary to connect a customer-supplied exhaust fan to this vent tube to draw the air out of the chamber. Contact a building engineer for possible sizing.

The termination of the vent run on the outside of the building must also accomplish the following:
1. Ensure that wind cannot blow into the vent and back into the chamber,
2. Ensure that an animal or insect cannot build a nest in the vent and create backpressure,
3. Ensure that the fog will not exit near an intake for other equipment such an air conditioning system, and
4. Ensure that the fog will not exit near cars or valuable items.

Below are the most common methods of venting a corrosion chamber.

See the options section of this manual for information on the Jet Exhaust System, and the Jet Exhaust Recirculation System.

NOTE: Never vent more than one chamber into the same vent line. This could cause corrosive fog from one chamber to enter another chamber and destroy components.
2.0 SETUP – INSTALLATION GUIDELINES

2.4 Compressed Air Connection

Located on the Control/Bubble Tower side of the chamber, an air regulator/filter is installed. The customer must install a \( \frac{1}{4} \) NPT fitting into the open port of this regulator and run a line from the customer supplied compressed air supply to this fitting.

Each Uni-Fog™ or Uni-Fog II Dispersion Tower requires about \( 0.9 - 1.8 \) LPS (1.75 - 3.5 CFM) of dry, oil-free compressed air at 103 kPa (15 psi) The in-coming compressed air should be regulated to 207 – 345 kPa (30-50 psi) at the incoming airline to the cabinet to operate all components.

Because water or oil in the compressed air line will contaminate samples and invalidate a test, as well as, damage the salt fog corrosion chamber, it is very important for the customer to install a water/oil separator on the air line as close to the connection to the salt fog corrosion chamber as possible.

If using plant air, which could be shut down occasionally, we recommend installing a standby air compressor. Be certain to install a check valve between the plant air supply and the air compressor.

See the Diagram in the back of this manual.

NOTE: Compressed air must be free of oil, water and other contaminants. If it is not, the machine can be damaged, performance will suffer and the warranty can be voided. If the compressed air is not clean, the customer must install an oil/water extractor in the air line prior to connection to the chamber.
2.0 SETUP – INSTALLATION GUIDELINES

2.5 Water Supply Requirements and Connection

There are two water connections for the typical salt fog corrosion chamber.

1. **D.I. water to the Bubble Tower**
2. **City water to the water jacket**

**D.I. Water to the Bubble Tower.**

D.I./Distilled water is used in the bubble tower, and 55-gallon mixing tank for the mixing of the particular solution electrolyte (example 5% salt solution, CASS solution etc.) for corrosive fogging. The type of water used is usually specified by the test specification ASTM D1193 Type IV. Pay close attention to the type of water used. To ensure proper quality, occasional analysis is recommended.

The only type of water to be used in the Bubble Tower is deionized, distilled, or reverse osmosis water in compliance with ASTM D1193 Type IV. The use of Type I or II water can damage a pH meter as well as certain components of the test chamber. It is suggested that the user of any corrosion chamber obtain a copy of the ASTM D1193 specification and read the definition and specifications for the different types of water.

The Salt Fog Corrosion Cabinet has a compression fitting labeled #15 for the incoming water supply that will accept a 9.525 mm (3/8”) outside diameter poly tubing. This water supply pressure must be regulated to between 206 – 555 kPa (30-80 psi). Best chamber performance is obtained at the higher-pressure ratings.

**City Water for the Water Jacket**

A city water supply is needed at the cabinet site to facilitate filling of the water jacket, washing down the unit during general maintenance, cleansing of the test pieces (if prescribed in the test specification), and as a water supply for the Jet Exhaust Unit (if purchased).

A connection point for the city water supply to the cabinet is located on control panel / bubble tower side of the cabinet. It is recommended to install a ½” nipple, ½” T fitting, cap (removable on one side of the T), ball valve and city water line (to the other side of the T) to this connection port. This will allow the operator to fill the water jacket as needed with city water.

Some installations (as shown to the right) only use a valve and water connection.
2.0 SETUP – INSTALLATION GUIDELINES

2.6 Electrical Connection

The ATLAS Salt Fog Corrosion Cabinet is wired for use with the customer-specified electrical supply. The amperage draw for this set-up is listed on the electrical drawings.

It is required that **only** a qualified electrician connects wire to the chamber. The electrician will need to drill a hole through the steel electrical enclosure, and bring the power into the chamber from a customer supplied lockable fused disconnect. This connection is to be made onto the electrical panel and attached to the proper terminal strip or on/off breaker.

*For operator and technician safety, we strongly recommend that a separate, fused safety switch (wall switch) be installed for each instrument.*

The wall switch should be in full view of any person standing at the Control Cabinet and should not be attached directly to the instrument. The use of a noise/surge suppresser is suggested in areas with poor quality electrical supply. Stable voltage is necessary. Please follow local codes for the proper fuse rating according to the current draw.

Once power is brought to the chamber, connect it to the terminal strip located on the inside of the electrical panel. Connection points are labeled L1, L2, L3 (if 3 phase) and G for ground.

**WARNING:** Do not attempt to test electrical circuits until the water jacket and the humidifying tower are filled with water. Failure to do so could damage the equipment and void the warranty.
2.0 SETUP – INSTALLATION GUIDELINES

2.7 Level Floor

This chamber must be installed on a level floor. If the floor is slightly unlevel, the chamber’s leveling feet can be used to level the chamber. Improper leveling of the chamber can cause poor test results, and/or cause the instrument to malfunction.

2.8 Access

When the chamber is installed, the only access required for chamber loading and maintenance is along the front of the instrument. Choose a location that will allow proper entry to this area with at least .9 meters (3 feet) of open area in front of the chamber.

2.9 Utility Services Testing

After all utility services have been connected, they should be tested. All connections and lines should be inspected and corrected, as applicable:

1. Leaks at connections or on lines.
   Inspect connections, and test all air, water, and drain lines for leaks. Refer to Table of Figures at the front of the manual to locate the correct illustration.

2. Voltage
   Inspect connection, and test the electric service for proper voltage. Refer to the Table of Figures at the front of the manual to locate the correct illustration.

2.10 Lab Temperature and Humidity

For the Salt Fog Corrosion Chamber to function properly, it must be installed in a climate-controlled room at a consistent temperature and humidity range. The recommended temperature range is 20 to 25 °C (68 to 77 °F). Higher or lower temperatures may negatively affect proper operation and conformance to test parameters.

Never allow the temperature around the chamber to approach 0 °C (32°F).

The recommended humidity is not to exceed 60%. Humidity should be 30-50% non-condensing because higher or lower humidity will affect conformance to parameters of any possible Dry-off Cycle.

If the temperature or humidity is out of these ranges it may cause the chamber to operate out of specification for certain test cycles.

Dust should be minimized because dust will contaminate samples and the salt (or other electrolyte) solution, and interfere with cabinet components.

Under no circumstances should the exhausted air from a Salt Fog Corrosion Chamber be connected to a plenum or duct that serves another corrosion cabinet or other type of instrumentation, including ovens. Air from the other source could be forced into the exposure chamber, which will contaminate the samples, and vice versa.

⚠️ Note: Opening of the cover is ideally performed with the operator present, and only after it is certain that corrosive gases and heated air have been properly purged.
2.0 SETUP – INSTALLATION GUIDELINES

2.11 Floor Space

For operator/technician access during operation, maintenance, calibration and repair, we recommend the following minimum clearances:

- Front 32” / 0.8 meter.
- Left and Right Side 32” / 0.8 meter for opening of Solution Reservoir Cover and access to the Bubble Tower and electrical panel.
- Back 10” / 25cm, for opening Exposure Chamber Cover, for electrical and water supply lines, and vent/drain lines.
- Overhead 39” / 1 meter above the closed cover. With 56” / 1.4 meter cabinet height, the minimum ceiling height is 83” / 2.11 meter.

Floor Space, Extra Solution Reservoir
Requires an additional 24” / 0.6 meter, recommended installation at the back of the cabinet.

Floor Space, Salt Fog Corrosion Chamber, Exhaust Recirculation System
Requires 24” x 24” / 0.6 meter x 0.6 meter adjacent to cabinet. Recommended placement is behind the cabinet or on the right side for attachment of vent connections.

⚠️ Note: Please refer to floor space diagram on the following pages.
2.0 SETUP – INSTALLATION GUIDELINES

Floor Space, Salt Fog Corrosion Chamber
3.0 COMPONENTS & CONTROLS

3.1 55-Gallon Solution Storage & Mixing Reservoir

PN# C700600-A - 55-Gallon Mix & Storage Tank for Atofill

PURPOSE:
The purpose of the 208 liter (55-gallon) Solution Reservoir is to provide the customer with a reservoir that holds electrolyte (testing solutions).

LOCATION:
The Solution Reservoir is typically located to the right or back of the cabinet’s exposure zone. It is mounted onto a metal frame.

FUNCTION:
The Solution Reservoir holds the electrolyte that will be delivered to the dispersion tower to create atomized fog.

The solution is routed via a polypropylene solution line into the chamber through a plastic solenoid controlled by a float switch.
3.0 COMPONENTS & CONTROLS

3.1.1 Stand – for Solution Reservoir

PN# C262760 - Stand for Ato-fill, solution tank

PURPOSE:
The purpose of the stand is to provide a platform for the 208 liter (55-gallon) Solution Reservoir.

LOCATION: The stand is located underneath the solution reservoir.

FUNCTION:
The standard salt fog corrosion chamber is equipped with a 208-liter (55-gallon) solution reservoir. This reservoir must be located near the chamber and at a height above the chamber’s internal reservoir. This steel stand is designed to hold the weight of a full reservoir at the correct height.
3.0 COMPONENTS & CONTROLS

3.1.2 208 liter (55-gallon) Solution Tank

PN# C262290 - 208 liter (55-gallon) polypropylene tank

PURPOSE:
The purpose of the solution tank is to provide a holding reservoir for the solution to be created into a corrosive fog.

LOCATION:
The solution tank is located on top of the stand.

The tank is equipped with:

1. Solution tank cover
2. Air agitation port.
3. Solution feed port.
4. Solution drain port.

FUNCTION:
This solution holding tank acts as a reservoir to feed the atomizer nozzle(s) with the proper solution for corrosive fog generation. A full tank will provide between 8 – 11 days of solution for a single nozzle cabinet, 4-5 days of solution for a dual nozzle chamber, and 2-3 days of solution for a three-nozzle chamber. This tank can be filled with salt solution for a “salt fog” test, D.I. water for a “humidity” test, CASS solution for a “CASS” test as well as other electrolytes for different corrosive fog tests. The solution in this tank is fed into the chambers internal reservoir via a plastic solenoid that is controlled by a float switch.
3.0 COMPONENTS & CONTROLS

3.1.3 Solution Tank Drain Assembly
PN# C000129 - PVC Nipple, SCH 80 ½” x 3”
PN# C246700 - PVC Ball valve, ½” THD, Compact

PURPOSE:
The purpose of the solution tank drain assembly is to provide a means to drain the tank for cleaning or changing solution.

LOCATION:
The drain valve assembly is located on the bottom of the tank.

The assembly consists of:
Nipple – (PN C000129) installed into the ½” FNPT hole in the tank bottom.

Ball Valve – (PN C246700) installed onto the nipple on the bottom of the tank. It is the customer’s responsibility to connect the proper fittings and tubing (or pipe) to this ball valve and run it to an open drain.

FUNCTION:
The ball valve for the solution tank is normally closed holding in any solution in the tank. The customer should run drain line from this assembly to an open floor drain. Once the ball valve is opened, the tank can be drained for cleaning or changing of the solution.
3.0 COMPONENTS & CONTROLS

3.1.4 Air Agitation Regulator and Gauge

<table>
<thead>
<tr>
<th>PN#</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C260850</td>
<td>Pressure Gauge for mixing tank</td>
</tr>
<tr>
<td>C260570</td>
<td>Regulator &amp; Filter, air</td>
</tr>
<tr>
<td>C260130</td>
<td>Regulator mounting bracket</td>
</tr>
<tr>
<td>C000104</td>
<td>Poly compression fitting, male ¼”</td>
</tr>
</tbody>
</table>

**PURPOSE:**
The purpose of the air agitation regulator and gauge is to provide a means of air control to the air agitation mixing sparger located inside the solution tank.

**LOCATION:**
The air agitation regulator assembly is located near the top of the solution tank, on the side.

Customer supplied compressed air must be connected to this port.

This air regulator is equipped with a filter. This filter must be changed at least once a year, or earlier if needed. The part number for this filter is C260585.

**FUNCTION:**
During the installation process, customer supplied clean and dry compressed air must be connected to this assembly. The black top knob of this assembly can then be “lifted” to hear a “click”. Now the regulator can be used to adjust the volume and pressure of air being fed to the air agitation assembly. Turn the knob clockwise to increase the air pressure, and counterclockwise to decrease the air pressure. The pressure of the air to the mixing assembly can be read and noted on the air pressure gauge. Once the pressure is set to the desired level, the black knob can be pushed down to lock the setting in place.
3.0 COMPONENTS & CONTROLS

3.1.5 Mixing Tank Air Sparger (agitator)

PURPOSE:
The purpose of the mixing tank air sparger is to mix the salt with D.I. water to create an electrolyte for corrosive fog testing.

LOCATION:
The mixing tank air sparger is located inside of the solution tank.

This assembly consists of the following components:

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C000102</td>
<td>PVC nipple 1/4&quot; x 1 1/2&quot;</td>
</tr>
<tr>
<td>C000103</td>
<td>Poly comp. Fitting fem. 1/4&quot;</td>
</tr>
<tr>
<td>C000110</td>
<td>PVC pipe 1/4&quot;, sch 80</td>
</tr>
<tr>
<td>C000132</td>
<td>PVC cap sch 80 soc. 1/4&quot;</td>
</tr>
<tr>
<td>C000133</td>
<td>PVC elbow soc 1/4&quot;</td>
</tr>
<tr>
<td>C000134</td>
<td>PVC tee sch 80 soc, 1/4&quot;</td>
</tr>
</tbody>
</table>

FUNCTION:
During the installation process, customer supplied clean and dry compressed air must be connected to this assembly. The black top knob of this assembly can then be “lifted” to hear a “click”. Now the regulator can be used to adjust the volume and pressure of air being fed to the air agitation assembly. Turn the knob clockwise to increase the air pressure, and counterclockwise to decrease the air pressure. The pressure of the air to the mixing assembly can be read and noted on the air pressure gauge. Once the pressure is set to the desired level, the black knob can be pushed down to lock the setting in place.
3.0 COMPONENTS & CONTROLS

3.1.6 Solution Feed Assembly for Dispersion Tower - Tank End

PURPOSE:
The purpose of the solution feed assembly is to provide a means for the solution to be atomized to leave the exterior of the solution tank.

LOCATION:
This assembly is located on the side of tank by the bottom corner.

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C000129</td>
<td>PVC nipple, ½” x 3”</td>
</tr>
<tr>
<td>C246620</td>
<td>PVC elbow 90, threaded, Sch 80, 1/2”</td>
</tr>
<tr>
<td>C000108</td>
<td>PVC reducer bushing T x T ½” x ¼”</td>
</tr>
<tr>
<td>C000102</td>
<td>PVC nipple ¼” x 1 ½”</td>
</tr>
<tr>
<td>C010165</td>
<td>Lab cock 1/4F X 1/4F”</td>
</tr>
<tr>
<td>C000104</td>
<td>Poly compression fitting, male ¼”</td>
</tr>
</tbody>
</table>

FUNCTION:
During the installation process the provided polypropylene tubing must be connected to the white compression fitting on this assembly to the one located on the plastic solenoid mounted on the chamber. Once connected, the PVC needle valve can be opened to allow solution to flow to the cabinet. This needle valve can be closed if desired to isolate the solution tank from the chamber during cleaning or mixing functions.
### 3.0 COMPONENTS & CONTROLS

#### 3.1.7 Solution Tank Filter Assembly

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C000100</td>
<td>PVC Cap Threaded 1/2&quot;</td>
</tr>
<tr>
<td>C000101</td>
<td>PVC nipple 1/2&quot; X 7&quot; – slotted</td>
</tr>
<tr>
<td>C000102</td>
<td>PVC nipple ¼&quot; x 1 ½&quot;</td>
</tr>
<tr>
<td>C000103</td>
<td>Poly comp. Fitting, Female 1/4&quot;</td>
</tr>
<tr>
<td>C000105</td>
<td>End plate, plain, for filter assembly</td>
</tr>
<tr>
<td>C000106</td>
<td>End plate, threaded, for filter assembly</td>
</tr>
<tr>
<td>C260550</td>
<td>Replacement Filter Cartridge - 20 Microns</td>
</tr>
</tbody>
</table>

**PURPOSE:**
The purpose of the solution filter assembly is to prevent impurities or un-dissolved salt, that could cause a blockage to occur. Impurities must not be allowed to contaminate the solution solenoid or atomizer nozzle.

**LOCATION:**
This filter assembly is located inside the solution tank.

**FUNCTION:**
As solution exits the solution tank on the way to the atomizer nozzle(s), it must travel through this filter assembly. This 20 micron filter prevents particles larger than 20 microns from leaving the tank. This filtering ensures that the salt solution solenoid, or atomizer nozzle(s) are not blocked from contaminants or un-dissolved salts in the solution tank. This removable filter element must be changed once a year during annual maintenance. The filter should also be changed during the year, once monthly or as needed based on use.
3.0 COMPONENTS & CONTROLS

3.2 Exposure Zone – Interior

3.2.1 Chamber Vent Port

PN#  C246810 – 1 ¼” Polypropylene T x T bulkhead fitting

PURPOSE:
The purpose of the chamber vent port is to provide a path for corrosive fog to escape from the chamber exposure zone.

LOCATION:
This port is located inside of the cabinet along the left sidewall. It can be found by opening the cabinet cover, and looking to the left.

FUNCTION:
This bulkhead port serves as a pass-through port for the corrosive fog created during testing to the customer’s installed ventilation system.

NOTE!
During installation, it is important that none of the customer-installed vent piping is applying any pressure to this fitting. If this occurs, it will cause this port to deform and allow corrosive fog to get to the steel chamber behind the PVC lining. During scheduled maintenance, this fitting should be checked for tightness and proper seal.

Additionally, never vent more than one chamber directly into a vent system. If this occurs, the fog from one chamber can enter another chamber damaging the chamber and/or the test.
3.0 COMPONENTS & CONTROLS

3.2.2 Fog Dispersion Tower Assembly - Vertical

PN# C100340-A – Dispersion tower assembly SF260, 500, 850
PN# C100341-A – Dispersion tower assembly SF2000, 3600

PURPOSE:
The purpose of the dispersion tower assembly is to create corrosive fog. There are two basic types of dispersion towers, vertical and horizontal. The difference is that the vertical tower has an inverted cone on the top of it, and the horizontal has a “T” on top of the tower with two dispersion pipes attached to it.

LOCATION:
The tower is located inside of the cabinet.

This assembly consists of the following components:

<table>
<thead>
<tr>
<th>Item</th>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C000102</td>
<td>PVC nipple 1/4&quot; X 1 1/2&quot;</td>
</tr>
<tr>
<td>2</td>
<td>C000103</td>
<td>Poly comp. Fitting fem. 1/4&quot;</td>
</tr>
<tr>
<td>3</td>
<td>C000104</td>
<td>Poly comp. Ftg., male 1/4&quot;</td>
</tr>
<tr>
<td>4</td>
<td>C000111</td>
<td>Dispersion tube, 25&quot; lg, machined</td>
</tr>
<tr>
<td>5</td>
<td>C000112</td>
<td>PVC nipple 1/4&quot; X 4&quot;</td>
</tr>
<tr>
<td>6</td>
<td>C000113</td>
<td>CPVC washer 3/8&quot;th x 9/16&quot; x 1 3/8&quot;</td>
</tr>
<tr>
<td>7</td>
<td>C000147</td>
<td>PVC nipple 1/4&quot; X Close</td>
</tr>
<tr>
<td>8</td>
<td>C000160</td>
<td>Bolt, PVC hex head 5/16-18 X 1</td>
</tr>
<tr>
<td>9</td>
<td>C000213</td>
<td>PVC elbow 90, threaded 1/4&quot;</td>
</tr>
</tbody>
</table>
3.0 COMPONENTS & CONTROLS

3.2.2 Fog Dispersion Tower Assembly – Vertical (cont.)

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>C260020 Internal reservoir cover only, PVC</td>
</tr>
<tr>
<td>11</td>
<td>C260065 Internal reservoir, pvc</td>
</tr>
<tr>
<td>12</td>
<td>C260310 Cone assembly adjustable</td>
</tr>
<tr>
<td>13</td>
<td>C261731 Atomizer nozzle assembly</td>
</tr>
<tr>
<td>14</td>
<td>C262850 Filter assembly</td>
</tr>
<tr>
<td>15</td>
<td>C263295 Float switch, (normally closed)</td>
</tr>
</tbody>
</table>

**FUNCTION:**
The cabinet controller fills the internal reservoir with solution from the 55-gallon mix and storage tank using the plastic solution solenoid. Once full, the bubble tower air solenoid activates allowing compressed air into the bottom of the bubble tower. The compressed air travels through the bubble tower and exits the top of the tower and then into the side of the atomizer nozzle. When this bubble tower conditioned air enters the side of the atomizer nozzle, it creates a siphon and draws solution up and into the atomizer nozzle. The air and solution mix inside the atomizer nozzle to create a fine fog. The level switch controls the solution level in the tower during fog cycles.

The inverted cone at the top of the assembly baffles the fog into an even mist for proper fog distribution.
3.0 COMPONENTS & CONTROLS

3.2.3 Fog Dispersion Tower Assembly - Horizontal

PURPOSE:
The purpose of the dispersion tower assembly is to create corrosive fog. There are two basic types of dispersion towers, vertical and horizontal.

LOCATION:
The tower is located inside of the cabinet. It may be found by opening the cabinet cover and looking inside.

This assembly consists of the following components:

<table>
<thead>
<tr>
<th>Item</th>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C000102</td>
<td>PVC nipple 1/4&quot; X 1 1/2&quot;</td>
</tr>
<tr>
<td>2</td>
<td>C000103</td>
<td>Poly comp. Fitting fem. 1/4&quot;</td>
</tr>
<tr>
<td>3</td>
<td>C000104</td>
<td>Poly comp. Ftg., male 1/4&quot;</td>
</tr>
<tr>
<td>4</td>
<td>C000111</td>
<td>Dispersion tube, 25&quot; lg, machined</td>
</tr>
<tr>
<td>5</td>
<td>C000112</td>
<td>PVC nipple 1/4&quot; X 4&quot;</td>
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<td>6</td>
<td>C000113</td>
<td>CPVC washer 3/8&quot;th x 9/16&quot; x 1 3/8&quot;</td>
</tr>
<tr>
<td>7</td>
<td>C000147</td>
<td>PVC nipple 1/4&quot; X Close</td>
</tr>
<tr>
<td>8</td>
<td>C000160</td>
<td>Bolt, PVC hex head 5/16-18 X 1</td>
</tr>
<tr>
<td>9</td>
<td>C000213</td>
<td>PVC elbow 90, threaded 1/4&quot;</td>
</tr>
</tbody>
</table>
3.0 COMPONENTS & CONTROLS

3.2.3 Fog Dispersion Tower Assembly – Horizontal (cont.)

10 C260020 Internal reservoir cover only, PVC
11 C260065 Internal reservoir, PVC
12 C261386 PVC 3” Tee with baffle

13 C263350 Horizontal dispersion tube – for SF260
    C263351 Horizontal dispersion tube – for SF500
    C263360 Horizontal dispersion tube 20” – for SF850, SF3600
    C263361 Horizontal dispersion tube 12.5” – for SF2000

13 C261731 Atomizer nozzle assembly
14 C262850 Filter assembly
15 C263295 Float switch, (normally closed)

C263285 Float switch assembly, internal reservoir

FUNCTION:
The cabinet controller fills the internal reservoir with solution from the 55-gallon mix and storage tank using the plastic solution solenoid. Once full, the bubble tower air solenoid activates allowing compressed air into the bottom of the bubble tower. The compressed air travels through the bubble tower and exits the top of the tower and then into the side of the atomizer nozzle. When this bubble tower conditioned air enters the side of the atomizer nozzle, it creates a siphon and draws solution up and into the atomizer nozzle. The air and solution mix inside the atomizer nozzle to create a fine fog. The level switch controls the solution level in the tower during fog cycles. The horizontal tubes with slots and baffle adjustment louvers baffle the fog into an even mist for proper fog distribution.
3.0 COMPONENTS & CONTROLS

3.2.4 Exposure Zone Drain Fitting

PN# C246800 – Drain fitting bulkhead poly 1/2"

PURPOSE:
The purpose of the chamber drain port is to provide a means to remove accumulated condensate from the inside of the chamber to the customer drain.

LOCATION:
This drain fitting is located inside of the chamber on the bottom of the floor.

FUNCTION:
This drain port allows the solution on the bottom of the exposure zone to be removed. The customer must install PVC piping to this port and direct it to the facility drain. Be sure not to over tighten into this fitting, or it will crack and require a replacement.
3.0 COMPONENTS & CONTROLS

3.2.5 Dry Bulb RTD Temperature Probe

PN# C263100 – RTD – Single
PN# C010360 – RTD – Dual

PURPOSE:
The purpose of the dry bulb RTD temperature probe is to read the current temperature in the exposure zone and report that signal or value to the cabinet controller.

LOCATION:
This RTD is located inside of the cabinet along the right side wall.

The RTD is found by opening the exposure chamber cover and looking in the middle of the right hand side wall.

It can also be viewed from the outside of the chamber between the electrical panel and the bubble tower.

The single RTD (PN C263100) is used for reporting cabinet temperature only.

The Dual RTD (PN C010360) is used for reporting one signal to the chamber controller, and the second signal to the optional recorder.

These RTD probes are covered with a plastic shrink wrap to protect the probe from the corrosive environments created by the chamber.

FUNCTION:
The dry bulb RTD is constantly sending a temperature signal to the chamber controller. The controller uses this signal to determine the chambers actual temperature and compares this to the chambers set point temperature. The controller then activates the chamber heaters as needed.
3.0 COMPONENTS & CONTROLS

3.2.6 Wet Bulb RTD Temperature Probe

PN# C263100 – RTD – single
PN# C263455 – Wick for wet bulb reservoir
PN# C263450 – Wet bulb reservoir

PURPOSE:
The purpose of the wet bulb RTD temperature probe is to read the current wet bulb temperature in the exposure zone and report that signal or value to the cabinet controller.

LOCATION:
This RTD is located inside of the cabinet along the right side wall. The RTD is found by opening the exposure chamber cover and looking in the middle of the right hand sidewall.

This RTD probe (C263100) is covered with a plastic shrink-wrap to protect it from the corrosive environments created by the chamber. Additionally, this temperature probe is covered with a wick (C263455) that is directed into a wet bulb reservoir hanging from the probe (C263450). This reservoir is to be filled with D.I. water and kept full during testing that requires a relative humidity reading. To determine percent RH, the dry bulb and wet bulb temperature readings are checked against a psychometric chart.

FUNCTION:
The wet bulb RTD is constantly sending a temperature signal to the chamber controller. The controller uses this signal to report the chambers wet bulb temperature reading. This value can be used in conjunction with the dry bulb temperature to determine the percent RH.
3.0 COMPONENTS & CONTROLS

3.2.7 Purge Bulkhead Fitting

PN# C000159 – Polypropylene bulkhead, NPT 1/4"

PURPOSE:
The purpose of the purge bulkhead fitting is to provide a path of entry into the chamber for the purge air.

LOCATION:
This bulkhead is located inside of the cabinet along the right side wall. The fitting is found by opening the exposure chamber cover and looking on the bottom half of the right hand sidewall.

FUNCTION:
This bulkhead provides a path for the purge air to enter the chamber exposure zone. It also serves to hold the fitting that the purge air tubing travels through. When the manual purge air ball valve is turned to the ON position by the user, compressed air travels through the tube, the fitting, and this bulkhead to enter the chamber’s exposure zone. The purge air is used to exhaust the corrosive fog from the exposure zone prior to opening the chamber cover.
3.0 COMPONENTS & CONTROLS

3.2.8 Bulkhead Union, Polypropylene, 3/8” Tube x 3/8” Tube

PN# C000261 – Polypropylene bulkhead union, NPT 3/8”

PURPOSE:
The purpose of the bulkhead union fitting is to provide a path of entry into the chamber for different 3/8” tubing lines. This union is used for the salt solution, the bubble tower compressed air, and the electrical connection for the internal reservoir float switch.

LOCATION:
This bulkhead is located inside of the cabinet along the right side wall.

The fitting is found by opening the exposure chamber cover and looking on the bottom half of the right hand side wall.

This is a polypropylene bulkhead with no fittings attached to it on the inside of the exposure zone. On the exterior of the exposure zone a fitting is installed to allow the tubing to direct the air through the bulkhead.

FUNCTION:
This bulkhead provides a path for the 3/8” polypropylene tubing to enter the chamber exposure zone. When the tubing is inserted into the fitting, the compression nut is used to compress the tubing and seal the connection. Periodically, this connection should be checked to ensure a proper seal. If there is a leak, replace the tubing and the fitting. These fittings are used to transfer compressed air from the bubble tower, purge air from the compressed air line, electrical wire for the float switch, and condensate for the optional external condensate collection package.
3.0 COMPONENTS & CONTROLS

3.2.9 Racks, Support Racks, Plastisol Coated

PN# C262960 – Support Rack, Plastisol coated 21"W
  2 of these are used in a model SF260
  4 of these are used in a model SF850
  6 of these are used in a model SF2000
  8 of these are used in a model SF3600
  10 of these are used in a model SF4200
PN# C262970 – Support Rack, Plastisol coated 27"W
  2 of these are used in a model SF500

PURPOSE:
The purpose of these racks is to provide a ledge for various support bars, trays and shelves to span the chamber’s width and to have a location to rest.

LOCATION:
These racks are located inside of the cabinet and hang on the front and back walls.

![Image of racks inside cabinet]

The racks are made of ridged welded steel, and then coated with a durable plastisol protective coating. This coating protects the steel from the corrosive environment.

FUNCTION:
Hang the racks on the top lip of the chambers exposure zone wall. Then install support bars, racks or other sample holding devices of the proper length to span the distance between these rack ledges.
3.0 COMPONENTS & CONTROLS

3.2.10 Support Bar, Plastisol Coated

PN# C262910 – Support bar, Plastisol coated 29" long for model SF260, SF500 and SF850
PN# C262930 – Support bar, Plastisol coated 41" long for model SF2000
PN# C262940 – Support bar, Plastisol coated 47" long for model SF3600 and SF4200

PURPOSE:
The purpose of these bars is to provide support for holding trays, shelves or parts in the chamber. These bars span the chamber width from the front to the back of the chamber.

LOCATION:
These racks are located inside of the cabinet and hang on the front and back walls.

These bars are made of ridged welded steel, and then coated with a durable plastisol protective coating. This coating protects the steel from the corrosive environment.

FUNCTION:
Place the bars inside the chamber spanning the chamber interior from the support racks that hang on the top lip of the chamber’s exposure zone wall.
3.0 COMPONENTS & CONTROLS

3.3 Chamber – Exterior

3.3.1 Humidifying Tower Assembly

PN# C240000-A – Humidifying tower assembly for ATOFILL

PURPOSE:
The Bubble Tower is also referred to by other names – Humidifying Tower, Saturator Tower. Throughout Atlas documents it is referred to as a Bubble Tower, or BT. The purpose of the Bubble Tower is to provide conditioned (hot and humid) air to the atomizer nozzle/s. Conditioning the air before using it to atomize an electrolyte is an integral portion of many corrosion specifications, such as ASTM B117 and ISO9227.

LOCATION:
The Bubble Tower is normally located on the side of the chamber to the right of the electrical panel. Sometimes, in the case of custom built chambers this tower will be to the left of the electrical panel.
3.0 COMPONENTS & CONTROLS

3.3.1 Humidifying Tower Assembly (cont.)

The Bubble Tower is an assembly with many different parts.

- C263100 RTD temperature probe
  A dual RTD can also be used.
- C010360 RTD – Dual output
- E000156 Conn-liq tite, non-met, 90 deg 1/2"
- C260110 Humidifying tower bracket, top
- C000137 PVC coupling, threaded 1/2"
- C260870 Pressure gauge, humid. tow, 0-30PSI
- C262010 Top plate-digital-CPVC
- C260590 Air relief valve
- C249410 Brass Tee 1/4", FPT
- C000104 Poly comp. Ftg., male 1/4"
- C262470 O-Ring, 6"
  Located between the top plate and acrylic tube
- C263330 Condensate baffle tube
- C704000 Float Switch assembly
3.0 COMPONENTS & CONTROLS

3.3.1 Humidifying Tower Assembly (cont.)

- Humidifying tower tube 23 ¼"
- Threaded rod assembly 26 1/2"
- Tubing clear 5/16" ID
- 7/16" OD
- Humidifying tower heater – 1000 watt
- Standard heater assembly
  - C261240 – 120/240 v – LCQ2-1011X
  - C261280 – 240/480 v – LCQ2-1051X
- Waterproof J-box heater assy.
  - C261250 – 120 v – LCQ2-1011X WP
  - C261270 – 240 v – LCQ2-1041X WP
  - C261290 – 480 v – LCQ2-1051X WP
  - C261050 – 550 v – LCQ2-1561WP

- Switch, low-water cut-off
- Poly comp. fitting fem. 1/4"
- Brass check valve 1/4"
- Brass plug valve M/F, 1/4"
- Solenoid valve - brass
3.0 COMPONENTS & CONTROLS

3.3.1 Humidifying Tower Assembly (cont.)

- C000124  Brass nipple 1/4" X 1 1/2"
- C249410  Brass Tee 1/4", FPT
- C249460  Brass plug valve M/F, 1/4"
- C000269  Brass elbow 1/4"
- 720340  Plate, bottom, 6" bubble tower
- 720575  Brass reducer Dbl. thread I/S/4"x1/4"
- C000269  Brass elbow 1/4"
- C260100  Humidifying tower bottom bracket
- C263300  Bubbler, air, stainless steel 1/4"
- C249450  Brass check valve 1/4"
- C249460  Brass plug valve M/F, 1/4"
- C212630  Solenoid valve - Brass
3.0 COMPONENTS & CONTROLS

3.3.1 Humidifying Tower Assembly (cont.)

- C000104 Poly comp. ftg., male 1/4"
- C249410 Brass Tee 1/4", FPT
- C000124 Brass nipple 1/4" X 1 1/2"
- C000269 Brass elbow 1/4"
- C260570 Regulator & filter, air

C704000 Float Switch Assembly, Humid. Twr. – std. – *made up of the following parts*…

- C263290 Float switch, (normally Open)
- C000136 PVC cap sch 80 threaded 1/4"
- C246730 Nipple 1/4" X 6"
- C000121 PVC nipple 1/2 " X close
- C000137 PVC coupling, sch 80 threaded 1/2"
- E000220 Cord grip (gray) for cable
3.0 COMPONENTS & CONTROLS

3.3.1 Humidifying Tower Assembly (cont.)

**FUNCTION:**
The bubble tower is a self-contained unit with three control loops.

1. **Temperature control**

   The temperature of the bubble tower is set by the user in the cabinet controls. The controls compare the actual temperature to the setpoint, and turn the bubble tower heater ON and OFF as needed to maintain the setpoint.

2. **Water level control**

   The water level of the bubble tower is controlled by the bubble tower float switch. During a FOG cycle, Solenoid #5 allows compressed air to enter the bottom of the bubble tower. As long as the bubble tower float detects a FULL condition, Solenoid #5 remains ON. When the bubble tower float reads a LOW condition, then Solenoid #5 is temporarily turned OFF to depressurize the bubble tower. At the same time, Solenoid #1 turns ON to allow the customer supplied pressurized DI water to enter the bubble tower. When a FULL condition is detected, an internal timer starts counting to slightly over-fill the bubble tower by X seconds (the time of X is set by the factory on the password-protected OEM set-up page; this is typically 3-5 seconds). When the timer has expired, Solenoid #1 turns OFF stopping DI water flow, and Solenoid #5 is reactivated to an ON position to allow compressed air to enter the bubble tower. This sequence of events usually takes 5-10 seconds, depending on DI water pressure. The lower the DI water pressure, the longer this fill will take.

3. **Air relief**

   The air relief valve is a safety device to prevent the bubble tower from overpressurizing and potentially bursting. This valve is usually set for 25 – 30psi / 172-207kPa at the factory. To adjust the relief valve, turn on the air to the bubble tower. Using the bubble tower air regulator, increase the air pressure to 25psi / 172kPa. If air is heard “hissing” from the air relief valve, it is properly relieving the pressure. If air escapes at a lower pressure, lift the cap on the air relief valve and adjust the knob until the hissing has just stopped. If air does not escape from the air relief valve when the bubble tower air regulator is set to 25psi / 172kPa, lift the cap on the air relief valve and adjust the knob until the hissing has just started.
3.0 COMPONENTS & CONTROLS

3.3.2 Chamber Heaters

PURPOSE:
The purpose of the cabinet heater is to heat the exposure chamber from ambient up to 50ºC.

LOCATION:
The heaters are located on the control side of the chamber, near the bottom at the corners.

These heaters screw into flanges that are welded onto the chamber shell. The heaters extend into the water jacket of the chamber and heat the water in this jacket.

These are immersion heaters, and should never be run in open air. The water jacket must be full prior to turning these heaters on.

The heater wattage and voltage is determined by the cabinet size and voltage requirements. The list below provides the proper part number and description of each heater.

Model SF260 – SF850 chamber – non-waterproof chamber heaters
- C261070 Heater, AQ2-1511L, 1500 watt, 120/1/60
- C261080 Heater, AQ2-1541LV5, 1500 watt, 240/480/1/60

Model SF260 – SF850 chamber – waterproof chamber heaters
- C261060 Heater, A-1561WP, waterproof, 1500 watt, 550/1/60
- C261220 Heater, AQ2-1511WP, waterproof, 1500 watt, 120/1/60
- C261230 Heater, AQ2-1541LV5WP, waterproof, 1500 watt, 240/480/1/60

Model SF2000 – SF4200 chamber – non-waterproof chamber heaters
- C260990 Heater, A-5043, 5000 watt, 240/3/60
- C261000 Heater, A-5053, 5000 watt, 480/3/60

Model SF2000 – SF4200 chamber – waterproof chamber heaters
- C261130 Heater, A-5043WP, waterproof, 5000 watt, 240/3/60
- C261140 Heater, A-5053WP, waterproof, 5000 watt, 480/3/60
- C261150 Heater, A-5063WP, waterproof, 5000 watt, 575/3/60

FUNCTION:
When heat is required during a cycle, the cabinet heater contactor is energized to send power to the heater. The chamber controller compares the actual chamber temperature to the set point, and activates the heaters as needed.
3.0 COMPONENTS & CONTROLS

3.3.3 Sight Gauge Fittings

PN# C260880 – Sight Gauge, Fittings

PURPOSE:
The purpose of these fittings is to hold the sight gauge.

LOCATION:
These fittings are located on the control side of the chamber, near the side of the chamber.

FUNCTION:
These fittings screw into flanges in the steel shell of the chamber. The sight gauge tube fits into these fittings with a compression connection. These fittings serve as a transition of fluid from the chamber water jacket to the sight gauge tube.

NOTE: There are no protective guide rods on either side of this tube in the fittings since the tube is now plastic (rather than glass). The sight gauge tube is flexible and no longer needs this protection.
3.0 COMPONENTS & CONTROLS

3.3.4 Sight Gauge

PN# C260881 – Sight Gauge Tube – 24” long

PURPOSE:
The purpose of the sight gauge is to provide the user a visual indication of the water jacket level.

LOCATION:
This tube is located on the control side of the chamber, near the side of the chamber.

The sight gauge is a clear plastic tube.

FUNCTION:
The sight gauge holds solution from the water jacket. Due to the transparent nature of this tube, the user is able to see the height of the solution level in the water jacket.

NOTE: There are no protective guide rods required on either side of this tube in the fittings since the tube is now plastic (rather than glass). The sight gauge tube is flexible and no longer needs this protection.

Unless the test specification calls for a variation, ensure that the water level is always full with the correct mixture of rust inhibitor and city water. Never use D.I. water in the water jacket!
3.0 COMPONENTS & CONTROLS

3.3.5 Water Jacket Fill Fitting

PN# C249400 – Brass street elbow 1/2"

PURPOSE:
The purpose of the water jacket fill fitting is to provide a location for the user to fill the water jacket with city water and rust inhibitor.

LOCATION:
This fitting is located above the bubble tower.

This is a brass fitting that is usually painted to match the chamber color.

FUNCTION:
The water jacket fill fitting serves as a point of entry for city water and rust inhibitor into the chamber water jacket.

NOTE: Never put deionized water into the water jacket. Only fill the water jacket with city water and rust inhibitor. Using deionized water can damage the chamber beyond repair.
3.0 COMPONENTS & CONTROLS

3.3.6 Water Jacket Treatment

Rust Inhibitor – Part number C261562

All salt fog and humidity corrosion chambers with a steel construction must have rust inhibitor in the water jacket to ensure proper operation and longevity. Auto Technology rust inhibitor has a specific formulation for this type of application. Substitutes such as antifreeze will not protect the equipment, and will void any warranty.

This rust inhibitor is a concentrate that is to be mixed with standard tap water in the water jacket. It is very important to use only tap water, as other types of water such as deionized water will damage the steel structure of the equipment. The different size chambers require a different amount of rust inhibitor based on the size of the space in the water jacket. The table listed below gives the proper usage recommendations.

<table>
<thead>
<tr>
<th>Chamber model #</th>
<th>Chamber Description</th>
<th>Approx. water jacket volume</th>
<th># of gallons of Rust Inhibitor</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF260</td>
<td>Salt fog/Humidity cabinet</td>
<td>55 gallons</td>
<td>1</td>
</tr>
<tr>
<td>SF500</td>
<td>Salt fog/Humidity cabinet</td>
<td>78 gallons</td>
<td>1.5</td>
</tr>
<tr>
<td>SF850</td>
<td>Salt fog/Humidity cabinet</td>
<td>103 gallons</td>
<td>2</td>
</tr>
<tr>
<td>SF2000</td>
<td>Salt fog/Humidity cabinet</td>
<td>165 gallons</td>
<td>3</td>
</tr>
<tr>
<td>SF3600</td>
<td>Salt fog/Humidity cabinet</td>
<td>213 gallons</td>
<td>4</td>
</tr>
<tr>
<td>SF4200</td>
<td>Salt fog/Humidity cabinet</td>
<td>250 gallons</td>
<td>5</td>
</tr>
</tbody>
</table>

One gallon of rust inhibitor treats approximately 50 gallons of city water. Adding more rust inhibitor than listed in this chart will not damage the equipment or void the warranty.

Rust inhibitor should be added to the water jacket of the chamber as it evaporates. This solution level should be checked on a monthly basis using the water jacket sight gauge.

Additionally, the water jacket water and rust inhibitor must be emptied once per year and replenished with fresh tap water and rust inhibitor to protect the steel construction of the chamber. Rust inhibitor can be purchased directly from Atlas (773-327-4520) using part number C261562.
3.0 COMPONENTS & CONTROLS

3.3.7 Salt Solution Solenoid

PN# C212641 – Solenoid, 2-way plastic valve, 110 volt

PURPOSE:
The purpose of the salt solution solenoid is to allow salt water to travel into the dispersion tower internal reservoir from the external 55-gallon mixing tank.

LOCATION:
The solenoid is located on the “window” area of the chamber between the electrical panel and bubble tower.

The inlet on this solenoid is marked with a “P” on the white base of the solenoid. Additionally, there is a gray override on the side that can be manually actuated to allow solution to travel through the solenoid. If the override is pushed in and turned, it will lock the solenoid into a ON position. Normally, the solenoid is closed.

FUNCTION:
This solenoid is normally closed, stopping the flow of solution through it. When the internal reservoir float switch (C263290 Float switch, normally open) reads a low condition, this solenoid will open. When open, solution in the 55-gallon mix/storage tank will gravity feed through the solenoid and into the internal reservoir. Once the float switch inside the internal reservoir reads a full condition, this solenoid closes, stopping the flow of solution. NOTE: this solenoid is rated for low pressure; never connect high-pressure lines to it.
3.0 COMPONENTS & CONTROLS

3.3.8 Electrical Panel

PURPOSE:
The purpose of the electrical panel/control box is to control the chambers electrical functions such as float switches, solenoids, heaters, temperatures and electrical safeties.

LOCATION:
The panel is located on the side of the chamber where the bubble tower is located.

FUNCTION:
It is difficult to explain all four functions of this panel in one paragraph. The main function is to use “off-the-shelf” temperature controllers to control the temperature in the bubble tower and the chamber. These controllers actuate the chamber heater contactors, which in turn supply voltage to the heaters. The fuses act as protection for each electrical circuit. The relays are used to control the solenoids and safety functions. The switches are used to turn the heater circuit on or off as well as display dry or wet bulb temperatures. Part numbers and descriptions of these components are included below.
3.0 COMPONENTS & CONTROLS

3.3.8 Electrical Panel (cont.)

ZB4BA8234  ON/OFF actuator
C305400  1-Channel temperature controller
ZB4BK1243  Heater ON/OFF actuator
ZB4BD4  Dry bulb/wet bulb actuator
ZBE1026  Normally open contact
ZBE1016  Normally closed contact
ZB4BZ009  Switch actuator mtg. bracket
ZB4BWOG41  Selector switch mount
ZB4BZ105  Wet/dry bulb contact block
3.0 COMPONENTS & CONTROLS

3.3.8 Electrical Panel (cont.)

- E000720   Relay, 2 pole, 120 volt
- E000730   Base for 2-pole 120 vac relay
- 30323     Fuse block

- C205310   Fuse, ATMR 1/4
- C205320   Fuse, ATMR 1/2
- C205330   Fuse, ATMR 1
- C205340   Fuse, ATMR 2
- C205350   Fuse, ATMR 2 1/2
- C205360   Fuse, ATMR 3
- C205370   Fuse, ATMR 3 1/2
- C205371   Fuse, ATMR 4
- C205380   Fuse, ATMR 5
- C205390   Fuse, ATMR 6
- C205400   Fuse, ATMR 7
- C205410   Fuse, ATMR 8
- C205420   Fuse, ATMR 9
- C205430   Fuse, ATMR 10
- C205440   Fuse, ATMR 12
- C205450   Fuse, ATMR 15
- C205460   Fuse, ATMR 20
- C205465   Fuse, ATMR 25
- C205470   Fuse, TRM 1

- C204310   Heater Contact, 30 amp
- C204311   Heater Contact, 25 amp
- C204312   Heater Contact, 15 amp
3.0 COMPONENTS & CONTROLS

3.3.8 Electrical Panel (cont.)

- E000735 Relay base, 4 pole, 120V
- E000725 Relay, 4 pole, 120 volt
- C205311 Surge suppressor
- E000530 Relay timer for ATOFill
  Set the timer for 1-3 seconds
- E000540 Base for ATOFill timer
3.0 COMPONENTS & CONTROLS

3.3.8 Electrical Panel (cont.)

- C204295  Transformer, step down 240/480vac to 110vac  
  #50-0075-053

- C204290  Transformer, step down 208vac to 110vac  
  #50-0075-054

- SC110    Alarm buzzer

- C000258  Lamp bulb 120PSB-5 (bayonet removal)  
  Gel tel/120psb 120v .025A, T2 lamp

- C000259  Lamp bulb 120MB (push & twist rem)  
  Gel tel/120mb 120v .025A, minbay lamp
3.0 COMPONENTS & CONTROLS

3.4 Chamber Cover Assembly

3.4.1 PVC Cover

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
<th>to fit:</th>
</tr>
</thead>
<tbody>
<tr>
<td>C260630</td>
<td>PVC cover, transparent</td>
<td>SF260</td>
</tr>
<tr>
<td>C260640</td>
<td>PVC cover, transparent</td>
<td>SF500</td>
</tr>
<tr>
<td>C260650</td>
<td>PVC cover, transparent</td>
<td>SF850</td>
</tr>
<tr>
<td>C260660</td>
<td>PVC cover, transparent</td>
<td>SF2000</td>
</tr>
<tr>
<td>C260670</td>
<td>PVC cover, transparent</td>
<td>SF3600</td>
</tr>
<tr>
<td>C260680</td>
<td>PVC cover, transparent</td>
<td>SF4200</td>
</tr>
</tbody>
</table>

PURPOSE:
The purpose of the Cover Assembly is to keep the corrosive fog inside the exposure zone in accordance to ASTM B117. The cover is designed to prevent condensed solution from dripping onto the components being tested.

LOCATION:
The cover is located on top of the chamber.

FUNCTION:
The cover is designed in accordance with the stringent requirements of the ASTM B117 salt fog test. The angle of the cover is strictly held to the B117 standard. This cover closes into the water trough to keep the corrosive fog from escaping the chamber exposure zone. As condensation collects on the cover interior, it rolls down the cover walls and into the water trough rather than on the parts being tested.
3.0 COMPONENTS & CONTROLS

3.4.2 Hinge Hardware

PURPOSE:
The purpose of the hinge hardware is to connect the chamber cover to the chamber shell.

LOCATION:
The cover hinge hardware is located on the back hinge points of the chamber and on the cover hinge arms.

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C280090</td>
<td>Backup plate for SF hinges</td>
</tr>
<tr>
<td>C280070-complete</td>
<td>Swivel bracket w/ insert &amp; painted</td>
</tr>
<tr>
<td>C280100</td>
<td>Hinge shaft 3&quot;</td>
</tr>
<tr>
<td>C280080</td>
<td>Hinge mounting bracket (welded to cabinet)</td>
</tr>
<tr>
<td>B224000</td>
<td>Bakelite washer, 1/8” thick</td>
</tr>
<tr>
<td>B224010</td>
<td>Bakelite washer, 1/4” thick</td>
</tr>
</tbody>
</table>

FUNCTION:
The hinge shaft is placed through the hinge mounting bracket (hat is welded to the steel shell) and the plastic bushing of the swivel bracket. The swivel bracket is bolted to the backup plate using standard fasteners with the PVC cover hinge arm sandwiched in between these two painted steel plates. The Bakelite washers are used as spacers on an as needed basis to keep the cover centered between the welded hinge mounting brackets.
3.0 COMPONENTS & CONTROLS

3.4.3 Lid Safety Switch Assembly

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>740400</td>
<td>Switch, cover open/close</td>
</tr>
<tr>
<td>740405</td>
<td>Actuator for cover position switch</td>
</tr>
<tr>
<td>740420</td>
<td>Connector for lid switch</td>
</tr>
</tbody>
</table>

PURPOSE:
The purpose of the lid safety switch assembly is to shut off the chamber controls when the cover is not closed.

LOCATION:
The cover hinge lid safety switch is located on the cover hinge bracket nearest the bubble tower.

FUNCTION:
The lid safety switch assembly is made up of three components, the switch, the actuator, and the connector. The switch is fastened to the hinge-mounting bracket that is welded to the chamber. The actuator is fastened to the cover swivel bracket that moves when the cover is opened. The connector supplies voltage to the switch from the electrical panel. When the cover is opened, the actuator moves away from the switch creating an OPEN condition that shuts off the chamber controls, heaters and solenoids. When the cover is closed, the actuator moves toward the switch creating a CLOSED condition allowing the chamber controls to operate. After closing the cover, push the ON button to reactivate the controls, and restart the chamber.
3.0 COMPONENTS & CONTROLS

3.4.4 Cover lifters – Gas Shocks

C261320  Gas shock, 30# with hardware and spring, for model SF260
C261330  Gas shock, 60# with hardware and spring, for model SF500
C261340  Gas shock, 90# with hardware and spring, for model SF850
C261345  Gas shock, adjustable with hardware and spring, for model SF2000

PURPOSE:
The purpose of the cover lifters is to assist the user in opening the cover, and to keep the cover open once lifted.

LOCATION:
The cover lifters are located on the back corners of the chamber.

FUNCTION:
The gas filled cover lifters apply force between the cover sides and the steel chamber. This force is enough to assist in lifting the cover when the user manually opens the cover, and enough to keep the cover in an open position once it is put in that position. Over time, the gas can leak out of lifter, deteriorating its ability to keep the cover open or assist in the opening of the cover. If this occurs, both lifters must be replaced. To change a lifter, open the cover, remove the springs from the ball ends, pull the shock off of the balls, and reinstall the new lifters and lock springs.
3.0 COMPONENTS & CONTROLS

3.4.5 Air Cover Lifter Assembly for SF2000, SF3600 AND SF4200

PURPOSE:
The purpose of the air cover lifters is to assist the user in opening the cover, and to keep the cover open once lifted.

LOCATION:
The cover lifters are located on the sides of the chamber.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C260400</td>
<td>Air cylinder w/base &amp; clevis</td>
</tr>
<tr>
<td>C000262</td>
<td>S.S Chain</td>
</tr>
<tr>
<td>C263550</td>
<td>Cover lifter Valve with 1/4&quot; ports</td>
</tr>
<tr>
<td>C249470</td>
<td>Brass flow control valve</td>
</tr>
<tr>
<td>C263300</td>
<td>Bubbler, air stainless steel 1/4&quot;</td>
</tr>
<tr>
<td>C000124</td>
<td>Brass nipple 1/4&quot; X 1 1/2&quot;</td>
</tr>
<tr>
<td>C249405</td>
<td>Brass street elbow 1/4&quot;</td>
</tr>
</tbody>
</table>
3.0 COMPONENTS & CONTROLS

3.4.5 Air Cover Lifter Assembly for SF2000, SF3600 AND SF4200 (cont.)

- C000124 Brass nipple 1/4" X 1 1/2"
- C000269 Brass elbow 1/4"
- C249470 Brass flow control valve
- C249410 Brass tee 1/4", FPT
- C249405 Brass street elbow 1/4"
3.0 COMPONENTS & CONTROLS

3.4.5 Air Cover Lifter Assembly for SF2000, SF3600 AND SF4200 (cont.)

- C261420   Airline connector, brass, male
- C261400   Airline black 1/4"
- C000267   Cotter pin, 3/16" X 2"
- C261410   Air line connector, brass, female
- C000124   Brass nipple 1/4" X 1 1/2"
3.0 COMPONENTS & CONTROLS

3.4.5 Air Cover Lifter Assembly for SF2000, SF3600 AND SF4200 (cont.)

**FUNCTION:**
These air cover lifters apply force between the cover sides and the steel chamber when the air is directed to the cylinders. This force is enough lift the cover when the user manually operates the cover control valve.

During installation, the customer must install an air line to the cover control valve.

To open the cover, move the cover control handle to the OPEN position.

To close the cover, move the cover control handle to the CLOSED position as shown in the picture below.

NOTE: As the cover closes, ensure that there are no personnel in the chamber, or that there are no body parts such as arms or hands reaching into the path of the closing cover. If care is not taken, injuries can occur.
4.0 OPERATION

4.1 Startup – Quick-Startup Procedures

One Page - Quick Start Guide

1. Pre-start Utility Checks
   1.1 Air pressure to unit ON – 30-50 psi. Be sure that is it clean, dry, oil free air. Check to ensure that any customer supplied and installed oil water separator is drained and has a clean filter in place.
   1.2 Pressurized deionized water (conforming to ASTM D1193 type IV only) to unit ON - 25 – 80 psi
   1.3 Water Jacket is full to within 1 inch of the top of the sight glass with rust inhibitor and city water.
   1.4 Power to the unit ON – turn on customer supplied wall switch.
   1.5 Ventilation fan (if installed) ON – turn on any customer supplied and installed exhaust fan.
   1.6 If a jet exhaust system is installed, ensure that the city water supply turned ON and adjust to about 5 p.s.i.
   1.7 Exposure chamber drain OPEN – open the customer supplied & installed drain valve.
   1.8 Drain line from chamber exposure zone must be routed to an OPEN drain, and that no valves or distortions in the line to impede the flow of fluid through this drain.
   1.9 Solution reservoir drain CLOSED – close the customer supplied and installed 55-gallon (208 liter) salt solution reservoir drain valve.
   1.10 Salt solution reservoir is prepared. OPEN the valve from the tank to the corrosion chamber.

2. Instrument Checks
   2.1 Close the bubble tower drain ball valve, labeled Ball Valve #2 – located on right front bottom corner of the bubble tower
   2.2 Salt solution reservoir prepared – 55-gallon reservoir filled with desired solution for corrosive fogging.
   2.3 CLOSE purge ball valve
   2.4 Check the position of all other manual ball valves as listed in the operation manual.
   2.5 Adjust fogging tower cone (or louvers) to the proper location. If a cone is present, it is suggested to adjust the bottom tip of the cone to be even or slightly below the top of the vertical dispersion tube. The throttle holes are normally left open.
   2.6 CLOSE cover.

3. Start-up
   3.1 If unfamiliar with the operation of this instrument, REVIEW the operator manual prior to starting an actual test.
   3.2 Place parts into the exposure zone of the cabinet.
   3.3 Close the cabinet cover. Cover switch needs to be closed to turn power on.
   3.4 Push the start button.
   3.5 Turn the cabinet and bubble tower switch to the ON position. (The bubble tower heater will not turn on until the float switch is activated.)
   3.6 Adjust bubble tower air pressure to 15 psi (1.03 bar) if the test requires a fogging cycle.
4.0 OPERATION

4.2 Basic Operation – Salt Fog Cycle

During the Salt Fog Cycle, salt solution is atomized into a fog. This is the same setup that normally would be used when running the ASTM B117 specification. Hot, humid air is created by bubbling compressed air (usually at 1.03 Bar or 15 psi) through a tube (bubble tower, or humidifying tower) that is about 3/4 full of hot (usually 48°C / 118°F) deionized water.

Salt solution is moved from the 55-gallon solution reservoir to the atomizer nozzle by a gravity feed system using a float switch and plastic solenoid. When the hot humid air and the salt solution mix at the atomizer nozzle, it is atomized into a corrosive fog. The cabinet is usually heated during this cycle at 35°C (95°F) by the rod heater. The cabinet temperature is set by the user and controlled by the PLC or PC-based control system. Fog distribution is controlled by the Uni-Fog™ dispersion system.

The salt solution can be replaced with other solutions to create a corrosive fog with different properties.

SALT FOG CORROSION CABINET COMPONENTS

The following sections provide brief notes on major components of the salt fog corrosion cabinet.

A. CHAMBER CONSTRUCTION

Interior lined with inert white PVC sheet lining. Exterior painted with blue finish coat. Smoke-gray transparent PVC lid with gas-cylinder lifting (Models SF3600 & SF4200 are equipped with air-cylinder lifting). Cabinet is heated by a water jacket on all four sides and the bottom.

B. CONTROLLER:

Two simple, and easy to use 16th din temperature controllers control the chamber. One is used for the cabinet heater circuit, and one is used for the bubble tower circuit.

C. HEATERS

Water immersion heaters maintain the chamber exposure zone temperature during testing by heating the water in the water jacket. A similar heater heats the water in the bubble tower. All heaters are protected by over temperature safeties.
4.0 OPERATION

SALT FOG CORROSION CABINET COMPONENTS (CONT.)

D. CABINET HEATER ALARM CUCUIT

The cabinet is equipped with over temperature alarm circuits and horn. If an alarm condition occurs, only when the temperature in the cabinet or bubble tower exceeds the alarm set point temperature of the controllers, the external horn will sound and shut down the control circuit.* Please note that the stop push button, mounted on the side of the electrical enclosure, will not disable the horn if an alarm condition exists. To shut off electrical power to the horn, turn the power off at the main disconnect.

If an alarm condition occurs, the cabinet should be checked to determine the probable cause and repairs should be made accordingly.

Once the problem has been corrected, restart the cabinet by depressing the "start button" mounted on the side of the electrical enclosure.

During operation, should the alarm sound when switching from dry to wet bulb temperature, confirm that the alarm temperature setting is ten degrees higher than the set point temperature of the cabinet controller.

* PLEASE NOTE: ELECTRICAL CONTROL COMPONENT TERMINALS WITH YELLOW WIRES INDICATE THAT THERE IS 110V CONTROL VOLTAGE PRESENT TO THE TERMINALS EVEN THOUGH THE STOP PUSH BUTTON IS DEPRESSED OR THE CABINET AUTOMATICALLY SHUTS OFF BECAUSE OF AN ALARM CONDITION. TO DISCONNECT ALL POWER TO THE CABINET, TURN POWER OFF AT THE MAIN DISCONNECT.

THE CABINET ALARM CIRCUITS ARE SAFETY FEATURES OF THE CABINET AND SHOULD IN NO WAY BE TAMPERED WITH, DISABLED OR MODIFIED IN ANY WAY.

E. PURGE VALVE

A purge valve is installed to allow the user to purge the chamber of corrosive fog prior to opening the cover.
4.0 OPERATION

SALT FOG CORROSION CABINET COMPONENTS (CONT.)

F. BUBBLE TOWER

1. The function of the bubble tower (synonymous with “saturation tower” or “humidifier”) is to saturate the air with moisture, and heat the air before it reaches the spray nozzle, where it mixes with solution to create a fog. Air must be saturated at temperatures that are higher than the temperatures within the test chamber.

2. This tower is filled about ¾ full of DI water. The water level is maintained by a float switch and a water solenoid. When the float switch indicates a low water condition, the chamber controller turns off the tower heater, turns off the tower air, and turns ON (opens) the DI water solenoid. The tower fills until the float switch indicates a full condition. When a full condition is reached, the tower continues to fill for \(X\) seconds, the water solenoid closes, and the heater and air are turned back ON. The reason for this “overfill” for \(X\) seconds is to prevent the tower from turning the water on and off too frequently. The time it takes the tower to fill is dependent on the incoming DI water pressure.

3. The tower water is heated by an immersion heater at an operator defined set point. As stated earlier, the normal set point is 48\(^\circ\)C (118\(^\circ\)F). This can be varied depending on specific test cycles. The temperature of the tower is measured by an RTD temperature probe located in the top of the tower. The actual temperature is read by the cabinet controller and compared to the set point. If the actual temperature rises above the set point, the heater is turned off. If the actual temperature is below the set point, the heater is turned on.

4. When the bubble tower is running, a compressed air solenoid is opened and air enters the bubble tower through an aerator, breaking the air into small bubbles. These bubbles travel through the hot water and out of the top of the tower past a pressure regulator to the atomizer nozzle.

5. In the top of the bubble tower is a pressure relief valve. The purpose of this valve is to prevent pressure build-up in the tower.

6. The tower has two over-temperature protections:
   a) Set point at the controller.
   b) Temperature sensor with a reset built into the heater.
4.0 OPERATION

SALT FOG CORROSION CABINET COMPONENTS (CONT.)

G. INTERNAL SALT SOLUTION RESERVOIR
The salt fog chamber reservoir holds 55 gallons of solution, sufficient to perform 6 - 10 days of continuous salt fog testing.

1. Water: Use ASTM D1193 Type IV Deionized or distilled water to make the solution.

2. Filtration: Large particles and contaminants are prevented from entering the system by the 20 micron filter in the salt solution reservoir, which needs to be replaced periodically (see Maintenance section in this manual for details).

H. FOG (ATOMIZER) NOZZLE
The fog nozzle appears to be a simple plastic nozzle, but it is a critical part in the proper functioning of the chamber and in obtaining accurate test results. Constructed of a clear, non-corroding, acrylic resin, it is carefully crafted to specification. Hole diameters of the nozzle are very small and precision fabricated, and it must be kept clear and free of salt, crystalline buildup or obstruction (do not scrape or use rough tools). To keep the nozzle free of blockage, the whole system should be flushed with warm, clean water for an hour at the end of each test period to remove all residual salt, preventing crystallization.

I. CHAMBER COVER OPENING AND CLOSING
The cover on a salt fog chamber can only be opened in one of two ways.

1. Automated cover lifters. If this option is installed, the cover can be opened and closed from the control panel. These cover lifters will open and close the cover in an even manner. If the controls that regulate the speed at which the cover opens and closes ever gets out of adjustment, the cover will open/close in an uneven manner. This could cause the cover to break. If this happens, the chamber should not be used, and the factory should be called immediately.

2. Manual opening/closing. If the automated system is not purchased, then the cover is opened and closed manually. This is accomplished by grasping the cover handle in the center for lifting or closing. If this cover is opened from the corners or places other than the center of the handle, the cover can twist and break. The Atlas warranty will not replace a broken cover due to improper handling.

J. CHAMBER COVER INTERLOCK SYSTEM
This is a fancy way of saying, “When the cover is lifted, everything stops.” In a laboratory or industrial setting, the purpose is to stop corrosive fog from being released into the room, or to prevent overheating if the cover is accidentally left open during a test. Lift the cover and everything pauses (stops). Close the cover, and the salt fog corrosion chamber is ready to return to its previous state. The user must now press the start button to restart the test.
4.0 OPERATION

4.3 Intermediate Operation

4.3.1 Chamber Capabilities

Temperature: Ambient to 50°C (122°F)
Humidity: 95-100% during fogging Humidity,

Solution Consumption: SF260 – SF850 approx. 10 gal. / day for D.I. and salt solution
SF2000 – SF4200 approx. 15 gal. / per day for D.I. and salt solution

Chamber size:

<table>
<thead>
<tr>
<th>Model #</th>
<th>Part #</th>
<th>Chamber Capacity</th>
<th>Inside Dimensions</th>
<th>Outside Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF260</td>
<td>C100015</td>
<td>15 cu. ft.</td>
<td>22” x 30” x 39” deep</td>
<td>37” x 42” x 60” high</td>
</tr>
<tr>
<td>SF500</td>
<td>C100021</td>
<td>20 cu. ft.</td>
<td>29” x 30” x 39” deep</td>
<td>48” x 42” x 60” high</td>
</tr>
<tr>
<td>SF850</td>
<td>C100022</td>
<td>30 cu. ft.</td>
<td>45” x 30” x 39” deep</td>
<td>64” x 42” x 60” high</td>
</tr>
<tr>
<td>SF2000</td>
<td>C100023</td>
<td>68 cu. ft.</td>
<td>72” x 42” x 39” deep</td>
<td>96” x 54” x 63” high</td>
</tr>
<tr>
<td>SF3600</td>
<td>C100024</td>
<td>100 cu. ft.</td>
<td>93” x 48” x 39” deep</td>
<td>118” x 60” x 63” high</td>
</tr>
<tr>
<td>SF4200</td>
<td>C100041</td>
<td>130 cu. ft.</td>
<td>120” x 48” x 39” deep</td>
<td>150” x 60” x 63” high</td>
</tr>
</tbody>
</table>

* The inside dimensions, capacities, and space given here are “available testing space.” They include only usable space, excluding volume below the false floor (where the heaters are located) and within the cover.

Venting: 1-1/4” Diameter - Never vent multiple cabinets into the same vent stack. Each cabinet must have its own vent.

Drain: Main drain is 1/2” pipe drain that must be free flowing and open at all times. There may be multiple drain lines depending on options.

Voltage & Phase:

<table>
<thead>
<tr>
<th>Model #</th>
<th>120/1/60</th>
<th>208/1/60</th>
<th>208/3/60</th>
<th>240/1/60</th>
<th>240/3/60</th>
<th>440/3/60</th>
</tr>
</thead>
<tbody>
<tr>
<td>SF260</td>
<td>34.3 amps</td>
<td>20.2 amps</td>
<td>20.2 amps</td>
<td>17.8 amps</td>
<td>17.8 amps</td>
<td>9.5 amps</td>
</tr>
<tr>
<td>SF500</td>
<td>34.3 amps</td>
<td>20.2 amps</td>
<td>20.2 amps</td>
<td>17.8 amps</td>
<td>17.8 amps</td>
<td>9.5 amps</td>
</tr>
<tr>
<td>SF850</td>
<td>34.3 amps</td>
<td>20.2 amps</td>
<td>20.2 amps</td>
<td>17.8 amps</td>
<td>17.8 amps</td>
<td>9.5 amps</td>
</tr>
<tr>
<td>SF2000</td>
<td>not available</td>
<td>not available</td>
<td>33.6 amps</td>
<td>not available</td>
<td>29.2 amps</td>
<td>15.1 amps</td>
</tr>
<tr>
<td>SF3600</td>
<td>not available</td>
<td>not available</td>
<td>33.6 amps</td>
<td>not available</td>
<td>29.2 amps</td>
<td>15.1 amps</td>
</tr>
<tr>
<td>SF4200</td>
<td>not available</td>
<td>not available</td>
<td>33.6 amps</td>
<td>not available</td>
<td>29.2 amps</td>
<td>15.1 amps</td>
</tr>
</tbody>
</table>

These amperage ratings are the actual amperage draw for the cabinet. The fuses and wiring to be supplied to the cabinet should be at least sized to these values. It is, however common to size the supply and provide larger fuses; typically 30 amp, 60 amp, 100 amp, 200 amp and 400 amp are used. Pay careful attention to ensure that the wire size is correct for the fuses, and it is sized at or above the values on the matrix. Single phase wiring is not available for immersion cabinets.
4.0 OPERATION

4.3.2 Component Manual Ball Valves

The salt fog corrosion chamber is equipped with several “Ball Valves” for ease of operation and maintenance. They are listed as follows.....

1  Bubble Tower Water Fill (BV #1) - OPEN
   Used to allow D.I. water to enter the bubble tower

2  Bubble Tower Water Drain (BV #2) - CLOSED
   Used to drain bubble tower for cleaning

3  Compressed Air to Bubble Tower (BV #3) - OPEN
   Used to allow compressed air to enter the bubble tower

4  Purge Air Valve (BV #4) - CLOSED
   Used to purge the exposure zone of corrosive fog

5  Salt Solution Valve (BV #5) - OPEN
   Used to allow salt solution to travel from the 55 gallon Solution tank to the internal reservoir

6  External. Condensate Collection Valve #1 - CLOSED
   Used to allow condensation to collect in the black tubing.
   Open when taking collection rates, then close.

7  External. Condensate Collection Valve #2 - CLOSED

8  External. Condensate Collection Valve #3 - CLOSED

9  External. Condensate Collection Valve #4 - CLOSED

10 Chamber Drain Valve (customer supplied) - CLOSED
    Used to drain the exposure chamber during testing

11 Salt Solution Reservoir Drain Valve (customer supplied) - CLOSED
    Used to drain the 55 gallon tank

12 Water Jacket Drain Valve (customer supplied) - CLOSED
    Used to drain the water jacket once a year

The OPEN and CLOSED status listed above are usually preset at the factory (with the exception of #10, 11 & 12), and they should remain in these positions during testing. Prior to testing it is important that the user verify that these valves are in the correct position. They can be changed for chamber cleaning and maintenance.
4.0 OPERATION

4.3.3 Solenoid Valve Assignments

The salt fog corrosion cabinet is equipped with several “Solenoid Valves” for automatic operation and delivery of air, D.I. water, and salt solution to chamber components. They are listed as follows.....

1  D.I. Water to Bubble Tower  (Solenoid # 1)
   When opened, it will allow D.I. water into the bubble tower.
   This solenoid is controlled by the bubble tower level switch.

2  Air to Bubble Tower (Moist Air Solenoid)  (Solenoid # 2)
   When opened, it will allow compressed air into the bubble tower. This solenoid is controlled by the items selected by the operator for a specific test interval.

3  Salt Solution to Dispersion Tower Reservoir  (Solenoid # 3)
   When opened, it will allow salt solution to fill the fog nozzle feed reservoir. This solenoid is controlled by the dispersion tower reservoir float switch.

4  Purge (OPTIONAL)  (Solenoid # 4)
   When opened, it will take the air exiting the bubble tower and send it down the drain rather than to the atomizer nozzles in the dispersion tower. This is part of the cycling control option.

4.3.4 Dispersion Tower Assembly Installation

The dispersion tower is dependent on the size of the cabinet and options purchased. The models F260, 500 and 850 use one tower that is located in the center of the exposure chamber, and sits on the floor. The models SF2000 and SF3600 use two towers that are located in a way to split the chamber into thirds. Model SF4200 has three dispersion towers.

In addition to placement, there are three connections that need to be made from the front inside wall of the exposure zone to the dispersion tower assembly. These three connections are for 1) air to the fog tower, 2) salt solution to the internal reservoir, and 3) float switch power lead. Connect the poly tubing supplied with the cabinet to the three couplings in the wall and connect the other ends of these lines to the dispersion tower assembly as shown in the previous pages.
4.0 OPERATION

4.4 Advanced Operation – Temperature Controls

Two digital temperature controllers are located in the control box. The controller marked "Cabinet Temperature" has been preset to 35°C. The controller marked "Humidifying Tower Temperature" has been preset to 48°C. They have been configured to operate in the on/off mode, degrees C, with alarm presets. A protective cover keeps salt fog from damaging the controllers.

To read the wet bulb temperature, be sure temperature display switch is on "Cabinet" and hold the spring-loaded switch to "Wet Bulb". (Always return switch to "Dry Bulb").

To change the set point,

i. Press the \( \text{SP} \) key, the letters SP should appear in the display data identifier just above the key. The main display will register the current set point.

ii. Press the \( \text{Up} \) or \( \text{Down} \) keys to either scroll up, or down to the new set point.

iii. Press the \( \text{Setpoint} \) key twice and the new set point will take effect. (Note: after pressing the key once, an AL will appear in the display window. This is the alarm set point, which can be changed in the same manner.)

For further information, reference the Omron Temperature Controller section of the manual.
5.0 CALIBRATION

Purpose
The purpose of this procedure is to outline the procedure to be followed during the calibration of a standard corrosion chamber.

Equipment Required
- Properly calibrated RTD reading device
- Calibrated RTD
- Properly calibrated Pressure Gauge 0-30psi

Procedure
Verify with customer contact the chamber is set to 35°C for the cabinet and 48°C for the tower or to the customer desired temperature for each. Confirm chamber is in operations made at least eight hours before scheduled calibration.

Verify chamber is operational and functional through customer contact. Check with contact regarding any known nuances or unusual features.

Identify chamber and record:

A. Manufacturer of chamber
B. Model number of chamber
C. Serial number of chamber
D. Customer identification system if required

1) Record environmental conditions.

2) Install Standard RTD in the chamber within close proximity to the Temperature Probe feeding back to the cabinet temperature controller. Closed lid. Once stabilization has occurred, make temperature reading of Feedback Probe and the Standard Probe and record as before calibration data.

3) If adjustment is necessary, adjust offset or the controller may need to be linerized, or it may require both. The controller is operating typically as a single point-on/off controller. Allow for stabilization and take temperature reading of feedback probe and the Standard Probe. If no adjustment required record as after calibration data. If adjustment is required repeat this step.

4) Install Standard RTD in the bubble tower within close proximity to the Temperature Probe feeding back to the tower temperature controller. Turn tower on and allow for stabilization. Once stabilized take temperature measurement of the Feedback Probe and the Standard Probe.

5) If adjustment is necessary, adjust the offset or the controller may need to be linerized or it may require both. The controller is operating typically as a single point-on/off controller. Allow for stabilization and take temperature reading of Feedback Probe and the Standard Probe. If no adjustment required record as after calibration data. If adjustment is required repeat this step.
5.0 CALIBRATION

6) Ensure tower pressure is set to 15psi using the tower pressure gauge for reading. Turn air off, remove tower pressure gauge and install standard pressure gauge. Turn air pressure on; take pressure reading of standard gauge. Record as before calibration data. If standard pressure gauge does not read between 15psi +/- 1.5 psi adjust pressure to 15 psi and recommend calibration or replacement, or both of the tower pressure gauge. Install tower pressure gauge and record value as after calibration data.

7) Once calibration is complete, remove any equipment used to calibrate and label device as the customer instructs or use the standard calibration labels.
6.0 MAINTENANCE

Regular maintenance is necessary for proper operation, and some maintenance topics and considerations follow. Like any piece of laboratory equipment, the Salt Fog Corrosion Cabinet should have a regular maintenance program to keep it operating properly. Please follow the maintenance recommendations.

6.1 Check Before Each and Every Test

Like any piece of laboratory equipment, your cabinet must be subject to a regular maintenance program to keep it operating properly. To do this, follow the recommended maintenance program below:

Filter Cartridge Replacement

1. Check the Dispersion Tower Filter Cartridge every one (1) to two (2) months. Always rinse the new cartridge in deionized water before using. Check the filter cartridge in the mixing tank (if purchased).

2. Check the filter located in the Humidifying Tower Air Regulator every month and replace if dirty. Specify make and model of air regulator when ordering.

Tubing & Fittings

1. Check white poly tubing for signs of oil which may have entered the lines through the air regulator. If the tubing is green or yellow, have compressor checked. Discoloration is typically a sign of oil within the air lines.

2. Check all tubing and fittings for wear. Replace as needed.

Atomizer Nozzle Maintenance and Replacement

1. If clogging of the atomizer occurs, remove, and with an air gun, blow air into the face of the nozzle blowing any dirt out the back of the nozzle. Avoid using any instrumentation to clean the nozzle. Over-cleaning may enlarge the air holes and change the operating characteristics of the nozzle.
6.0 MAINTENANCE

6.2 Routine Monthly Maintenance

1. Rinse down the interior of the cabinet. Be certain that all accumulated salt is cleaned off walls, specimen racks, etc.

2. Wipe off temperature probes.

3. Rust stains, which may occur from dripping condensation, should be removed with a mild cleanser.

4. Nozzle should be inspected for salt build-up, which can occur in the orifice. 
   **NOTE:** The atomizer nozzle and filter cartridge are the heart of the cabinet and must be kept clean and free from obstructions.

5. Wipe down the exterior of the cabinet and 55 gallon reservoir.

6.3 Annual Service

1. Drain the cabinet water jacket and refill with fresh tap water and 1 to 5 gallons of rust inhibitor, depending on cabinet size.

2. Check atomizer nozzle and replace if needed.

3. Drain 55-gallon reservoir, disassemble and clean the interior. Remove any algae build-up and reassemble.

4. Reassemble and refill reservoirs with fresh solution.

5. Replace the air bubbler at the base of the Humidifying Tower.

6. Replace Humidifying Tower O-Rings (2).

7. Check Calibration.
7.0 TROUBLESHOOTING

7.1 Collection Rates

Testing Rule: Always verify uniformity of fog fall out or dispersion before every test, as uniformity and consistency is a key to accuracy in results.

Maintenance-Troubleshooting Tip: Verify uniformity of fog fall out as an important part of your regular maintenance schedule, and to indicate potential problem areas. The key indicator for maintenance is variations in collection rates that are not corrected by normal adjustments to control flow and pressure.

7.1.1 Fog Dispersion Control and Controllers

The SF Series delivers excellent fog dispersion control by providing independent controls for the volume of liquid and the amount of air pressure used to disperse it. These controls make it easy for the operator to set, test, and adjust flow and dispersion.

a. Control of amount/volume of fog or corrosive solution: To increase or decrease the amount of solution.

1) Open or close the Throttle Holes; open providing more solution, closing providing less.

2) Change the height of the inverted cone assembly.

3) Adjust the air pressure using the air pressure regulator.

b. Control of dispersion/distance of fog - To increase or decrease the projection - also referred to as “the throw” - of the solution.

1) Adjust the air pressure using the air pressure regulator.

2) Open or close the Throttle Holes; open providing more solution, closing providing less.

3) Change the height of the inverted cone assembly.
7.0 TROUBLESHOOTING

7.1.2 Determining & Measuring Collection Rates

The best measure of cabinet performance is the fall out figure, also called the fall out rate or collection rate. Please refer to ASTM B117, or other applicable procedure, for detailed instructions or specific requirements. The collection rate is determined by measuring the amount of solution collected in two collection vessels located inside the chamber during a given period of time.

a. Place a minimum of two (2) condensate collector funnels (80 sq. cm.) and two (2) graduated cylinders (100 ml) in the cabinet so that the horizontal plane of the top of the funnel is at test level. Locate one as close to the dispersion tower as possible and one as far away as possible (do not place the funnel so close to the dispersion tower that it collects condensation which may drip from the adjustable cone). For cabinets with two dispersion towers, four collection funnels and four graduated cylinders will be needed.

b. Rotate the vertical tube of dispersion tower until the four (4) 1" holes at the base of the tube are fully open. The holes are used to control the velocity and quantity of the fog. Open holes will result in higher collection rates. Closed holes will lower the collection rate.

c. Adjust the dispersion cone at the top of the tower so that the bottom tip of the cone is even with the top edge of the vertical tube. It may be adjusted later to suit testing needs.

d. A collection rate reading of between 1.0 and 2.0 milliliters of solution each hour (averaged over 16 hours) per 80 cm$^2$ of area should be the correct reading. Note: The fall out figure is the best measure of cabinet performance. Consult the test method for actual collection rate requirements.

e. To vary the collection rate, adjust the air pressure (air pressure regulator), the throttle holes, the inverted cone assembly, and the temperature set point for the bubble tower. Each will have an impact on the collection rate. Keep in mind the objective when making adjustments.

f. Make sure that the tower and cone assembly is perpendicular to the cabinet floor. For cabinets with horizontal dispersion, the horizontal tubes must be parallel to the cabinet floor.
7.0 TROUBLESHOOTING

7.2 Basic Troubleshooting Guide

7.2.1 General

Please note that the controller is the major source of information regarding the status of the unit.

*Check the basics first*, as with any piece of equipment. Is there power to the unit or circuit breaker? Is there water to the unit? Is there compressed air to the unit?

7.2.2 Special Note on Solution Purity: Filter, Spray Nozzle

Attention must be paid to the purity of the chemicals and salt used for various test solutions. A clogged filter or a clogged spray nozzle can be the result of impurities. Interruption of the spray, uneven collection rates, and improper flow can be caused by these impurities.

7.2.3 Troubleshooting Contents

These follow in the order shown below.

- No Fog
- Low Collection Rates
- High Collection Rates
- Uneven Collection Rates
- Low Relative Humidity
- No Heat in Humidifying Tower
- Cover Bounces
- Cloudy Humidifying Tower
- Incorrect pH Level
- Inconsistent Air Pressure in Humidifying Tower
- Humidifying Tower Fills Up with Water Over Float Switch
- Salt Settles in Bottom of Salt Solution Reservoir
7.0 TROUBLESHOOTING

7.2.4 No Fog

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clogged atomizer nozzle</td>
<td>Clean or replace nozzle</td>
</tr>
<tr>
<td>Clogged solution filter cartridge</td>
<td>Replace filter</td>
</tr>
<tr>
<td>No solution in the internal reservoir</td>
<td>Fill reservoir</td>
</tr>
<tr>
<td>Inadequate air flow to the nozzle</td>
<td>Check air flow to nozzle</td>
</tr>
<tr>
<td>Bubble tower air solenoid failure</td>
<td>Check/replace solenoid</td>
</tr>
<tr>
<td>Customer supplied compressed air failure</td>
<td>Check for proper air supply</td>
</tr>
<tr>
<td>Chamber in a pause mode due to a fault</td>
<td>Check &amp; correct faults</td>
</tr>
</tbody>
</table>

7.2.5 Low Collection Rates

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clogged atomizer nozzle</td>
<td>Clean or replace nozzle</td>
</tr>
<tr>
<td>Clogged solution filter cartridge</td>
<td>Replace filter</td>
</tr>
<tr>
<td>Air pressure set too low</td>
<td>Check air pressure setting</td>
</tr>
<tr>
<td>Out-of-calibration pressure gauge</td>
<td>Check gauge calibration</td>
</tr>
<tr>
<td>Improper placement of collector funnels</td>
<td>Probably located too high</td>
</tr>
<tr>
<td>Improper positioning of adjustable cone</td>
<td>Centrally locate cone height</td>
</tr>
<tr>
<td>Throttle holes of dispersion tower closed</td>
<td>Open throttle holes</td>
</tr>
<tr>
<td>Inadequate airflow to the nozzle</td>
<td>Check airflow to nozzle</td>
</tr>
<tr>
<td>Customer supplied compressed air failure</td>
<td>Check for proper air supply</td>
</tr>
<tr>
<td>Empty nozzle feed reservoir</td>
<td>Check floats, solenoids &amp; tubing</td>
</tr>
</tbody>
</table>

7.2.6 High Collection Rates

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worn atomizer nozzle</td>
<td>Replace nozzle</td>
</tr>
<tr>
<td>Air pressure set too high</td>
<td>Check air pressure setting</td>
</tr>
<tr>
<td>Out-of-calibration pressure gauge</td>
<td>Check gauge calibration</td>
</tr>
<tr>
<td>Improper placement of collector funnels</td>
<td>Probably located too high</td>
</tr>
<tr>
<td>Improper positioning of adjustable cone</td>
<td>Centrally locate cone height</td>
</tr>
<tr>
<td>Throttle holes of dispersion tower opened</td>
<td>Close throttle holes</td>
</tr>
<tr>
<td>Bubble tower temperature improper</td>
<td>Check &amp; correct bubble tower temp</td>
</tr>
</tbody>
</table>
7.0 TROUBLESHOOTING

7.2.7 Uneven Collection Rates

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worn or clogged atomizer nozzle</td>
<td>Clean and/or replace nozzle</td>
</tr>
<tr>
<td>Air pressure setting not accurate</td>
<td>Check air pressure setting</td>
</tr>
<tr>
<td>Out-of-calibration pressure gauge</td>
<td>Check gauge calibration</td>
</tr>
<tr>
<td>Improper placement of collector funnels</td>
<td>Probably located too high</td>
</tr>
<tr>
<td>Improper positioning of adjustable cone</td>
<td>Centrally locate cone height</td>
</tr>
<tr>
<td>Throttle holes of dispersion tower opened</td>
<td>Close throttle holes</td>
</tr>
<tr>
<td>Bubble tower temperature improper</td>
<td>Check &amp; correct bubble tower temp</td>
</tr>
<tr>
<td>Funnel collecting condensation from test specimen</td>
<td>Check &amp; correct funnel placement</td>
</tr>
<tr>
<td>Empty fog nozzle feed reservoir</td>
<td>Check floats, solenoids &amp; tubing</td>
</tr>
</tbody>
</table>

7.2.8 Low Relative Humidity

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty fog nozzle feed reservoir</td>
<td>Check floats, solenoids &amp; tubing</td>
</tr>
<tr>
<td>RTDs are out of calibration</td>
<td>Check and calibrate RTDs</td>
</tr>
<tr>
<td>Controller is out of calibration</td>
<td>Check and calibrate controller</td>
</tr>
<tr>
<td>Wet bulb wick &amp; reservoir empty</td>
<td>Clean and fill wick &amp; reservoir</td>
</tr>
<tr>
<td>Solid state RH sensor out of calibration</td>
<td>Calibrate RH sensor</td>
</tr>
<tr>
<td>Air pressure setting not accurate</td>
<td>Check air pressure setting</td>
</tr>
<tr>
<td>Out-of-calibration pressure gauge</td>
<td>Check gauge calibration</td>
</tr>
<tr>
<td>Throttle holes of dispersion tower closed</td>
<td>Open throttle holes</td>
</tr>
<tr>
<td>Bubble tower temperature improper</td>
<td>Check &amp; correct bubble tower temp</td>
</tr>
</tbody>
</table>

7.2.9 No Heat in Humidifying Tower

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activation of the low water cut-off feature</td>
<td>Reset switch on the bubble tower heater</td>
</tr>
<tr>
<td>Bubble tower RTD is out of calibration</td>
<td>Check and calibrate RTD</td>
</tr>
<tr>
<td>Controller is out of calibration</td>
<td>Check and calibrate controller</td>
</tr>
<tr>
<td>Bubble tower set point too low</td>
<td>Check &amp; correct set point</td>
</tr>
<tr>
<td>Bubble tower is not full of water</td>
<td>Check &amp; correct water level</td>
</tr>
<tr>
<td>Blown fuse for the bubble tower heater</td>
<td>Check and replace fuses if needed</td>
</tr>
<tr>
<td>Bubble tower heater is damaged</td>
<td>Check and replace heater if needed</td>
</tr>
</tbody>
</table>

7.2.10 Cover Bounces

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back pressure in the exhaust line</td>
<td>Check exhaust line</td>
</tr>
<tr>
<td>Back pressure in the drain line</td>
<td>Check drain line</td>
</tr>
<tr>
<td>Wrong size cover lifters installed</td>
<td>Check the cover lifter size</td>
</tr>
</tbody>
</table>
## 7.0 TROUBLESHOOTING

### 7.2.11 Cloudy Humidifying Tower

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water is contaminated</td>
<td>Check &amp; clean water source</td>
</tr>
<tr>
<td>Water inlet filter is full</td>
<td>Check &amp; replace filter</td>
</tr>
<tr>
<td>Bubble tower water cylinder is etched</td>
<td>Check &amp; replace cylinder</td>
</tr>
</tbody>
</table>

### 7.2.12 Incorrect pH level

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water may not meet specification</td>
<td>Check water to ASTM D1193</td>
</tr>
<tr>
<td>Salt may not meet specification</td>
<td>Check salt to ASTM B117</td>
</tr>
<tr>
<td>Algae build up in fog nozzle feed reservoir</td>
<td>Check &amp; clean reservoir</td>
</tr>
<tr>
<td>Algae build up in salt or water in line filters</td>
<td>Check &amp; replace filters if needed</td>
</tr>
<tr>
<td>Algae build up in the solution reservoir</td>
<td>Check &amp; clean reservoir</td>
</tr>
</tbody>
</table>

### 7.2.13 Inconsistent Air Pressure in Humidifying Tower

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air bubbler may be clogged</td>
<td>Check &amp; replace if needed</td>
</tr>
<tr>
<td>Air pressure setting not accurate</td>
<td>Check air pressure setting</td>
</tr>
<tr>
<td>Out-of-calibration pressure gauge</td>
<td>Check gauge calibration</td>
</tr>
<tr>
<td>Customer supplied air filter may be clogged</td>
<td>Check &amp; clean if needed</td>
</tr>
<tr>
<td>Air regulator may be defective</td>
<td>Check &amp; replace if needed</td>
</tr>
</tbody>
</table>

### 7.2.14 Humidifying Tower Fills up with Water Over the Float Switch

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak in the bubble tower (B.T.) O-rings</td>
<td>Replace O-Rings</td>
</tr>
<tr>
<td>Leak in one of the other fittings in the B.T.</td>
<td>Check for leaks &amp; correct</td>
</tr>
<tr>
<td>Spikes in the air water pressure</td>
<td>Check &amp; correct water regulator</td>
</tr>
<tr>
<td>Incoming water pressure set too high</td>
<td>Reduce water pressure</td>
</tr>
<tr>
<td>Float switch has malfunctioned</td>
<td>Check or replace float switch</td>
</tr>
<tr>
<td>Bubble tower water fill solenoid stuck open</td>
<td>Check, clean or replace solenoid</td>
</tr>
</tbody>
</table>

### 7.2.15 Salt Settles in Bottom of Salt Solution Reservoir

<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect salt</td>
<td>Check salt to ASTM B117</td>
</tr>
<tr>
<td>Insufficient mixing time</td>
<td>Increase mixing time</td>
</tr>
</tbody>
</table>
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X
## TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)

<table>
<thead>
<tr>
<th>Specifications</th>
<th></th>
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<tbody>
<tr>
<td><strong>Part number</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Sensor input type</strong></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Supply voltage</strong></td>
<td></td>
</tr>
<tr>
<td>100 to 240 VAC, 50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>Operates on 85 to 110% of rated voltage</td>
<td></td>
</tr>
<tr>
<td><strong>Power consumption</strong></td>
<td></td>
</tr>
<tr>
<td>Approx. 7 VA</td>
<td></td>
</tr>
<tr>
<td><strong>Control module</strong></td>
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</tr>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Alarm output</strong></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Control modes</strong></td>
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</tr>
<tr>
<td>Type</td>
<td></td>
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<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Display range</strong></td>
<td></td>
</tr>
<tr>
<td>–999 to 999 (limited to input type)</td>
<td></td>
</tr>
<tr>
<td><strong>Proportional band</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Reset time</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Rate time</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Proportional period</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Sampling period</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Humidity</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Enclosure ratings</strong></td>
<td></td>
</tr>
<tr>
<td>Front panel</td>
<td></td>
</tr>
<tr>
<td>IP50, NEMA 4 with optional Y92A-48N waterproof cover</td>
<td></td>
</tr>
<tr>
<td>Rear panel</td>
<td></td>
</tr>
<tr>
<td>IP30</td>
<td></td>
</tr>
<tr>
<td>Terminals</td>
<td></td>
</tr>
<tr>
<td>IP00</td>
<td></td>
</tr>
<tr>
<td><strong>Approvals</strong></td>
<td></td>
</tr>
<tr>
<td>UL</td>
<td></td>
</tr>
<tr>
<td>Recognized, File Number E8481</td>
<td></td>
</tr>
<tr>
<td>CSA</td>
<td></td>
</tr>
<tr>
<td>Certified, File Number LR59623</td>
<td></td>
</tr>
<tr>
<td>CE</td>
<td></td>
</tr>
<tr>
<td>Conforms to EN61010-1</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient temperature</strong></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td></td>
</tr>
<tr>
<td>–10°C to 55°C (14°F to 131°F)</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
</tr>
<tr>
<td>–25°C to 65°C (–13°F to 149°F)</td>
<td></td>
</tr>
<tr>
<td><strong>Insulation resistance</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Dielectric strength</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Vibration</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Shock</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td></td>
</tr>
<tr>
<td>E5CS-C1KJX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1PX</td>
<td></td>
</tr>
<tr>
<td>E5CS-C1GX</td>
<td></td>
</tr>
</tbody>
</table>
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main display sequentially displays the present temperature, set temperature, and an alarm value each time the return key is pressed.</td>
<td>7</td>
<td>The hidden write protection key provides protection against unauthorized setting of temperature and is used in conjunction with the internal “protection” switch. If the internal protection switch is set to ON, then to obtain Up and Down operation, the hidden key must be pressed simultaneously with the Up and Down keys. If the internal protection switch is set to OFF, changes can be made simply by pressing the Up and Down keys.</td>
</tr>
<tr>
<td>2</td>
<td>Control output indicator lights when the output is ON.</td>
<td>8</td>
<td>Display data identifier lights SP when the set temperature is displayed on the main display and AL when an alarm value is displayed.</td>
</tr>
<tr>
<td>3</td>
<td>Alarm indicator lights when the alarm output is ON.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Up key increases the set temperature or alarm value when pressed. Increases the value quickly when held down.</td>
<td>9</td>
<td>Red deviation indicators light up an arrow when the present temperature is higher than the set temperature and light a down arrow when the present value is lower than the set temperature. The green block indicates the temperature deviation is within ±1% of the full scale.</td>
</tr>
<tr>
<td>5</td>
<td>Down key decreases the set temperature or alarm value when pressed. Decreases the value quickly when held down.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Return key changes the value displayed on the main display each time pressed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dimensions

Panel Cutout

Side-by-side Mounting of Several Temperature Controllers

Note: 1. Recommended panel thickness is 1 to 8 mm (0.04 to 0.31 in).
2. Because mounting brackets are attached to the top and bottom of a temperature controller, tight side-by-side mounting is possible.
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)

---

**Operation**

**SETTINGS BEFORE APPLYING POWER**

Note: Always turn off the power supply to the temperature controller before changing any switch settings.

Before applying power to the temperature controller, set the following selector switches to specify the temperature range, functions and alarm mode.

---

**ACCESS TO INTERNAL SWITCHES AND SELECTORS**

Push the tab on the underside of the front panel as you draw out the internal mechanism from the housing. The temperature range selector, and the alarm mode selector must all be set. A protection switch can also be set to protect settings. The following diagrams show the locations of these switches on the internal mechanism.

---

Select the desired temperature range by using the temperature range selector switch (rotary DIP type). The other rotary DIP switch is used to select one of eight alarm functions. Be sure the set temperature and alarm values are within the new range. Otherwise, the temperature controller automatically shifts these values to the maximum or minimum of the newly-set temperature range.

The protection switch may be used in conjunction with the front panel “hidden key” to prevent unauthorized changes to temperature settings. The switch is ON when it is pushed inwards in the direction of the white arrow.

The function selector switch is a 8-pin in-line DIP switch on the other side of the internal mechanism. Use it to select ON/OFF or P/P control action, proportional period, control output, input shift function, temperature sensor input standard and scale indication for dual-scale temperature ranges.
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)

![Diagram](image)

**Auto-tuning of Proportional Band**

Upon the initial power-up the proportional band is set to 3%. The optimum proportional band width, however, is automatically calculated and set within the range of 3 to 20%, according to the changes in the temperature of the controlled system. This automatic adjustment of the proportional band is performed regardless of whether the controlled system is a heating or cooling system.

When the power is turned OFF once, and the ON again, the control action starts with the previous proportional band. However, the new proportional band is automatically calculated and set.

The calculation of the proportional band, however, is not carried out if the temperature of the controlled system changes at a rate greater than 7.5% of full scale per 2 seconds (e.g. faster than 3.75% per second with full scale of 100°C). In this case, the previously calculated and set proportional band is used.

The temperature controller has an overshoot suppression function that reduced second and subsequent overshoots to a level less than the initial overshoot.

**INPUT SHIFT FUNCTION**

The temperature indication can be shifted by setting switch 4 of the function selector DIP switch to ON, and pressing the mode key repeatedly until the message "H0" (indicating input shift) is displayed on the main display. Then set the shift value by using the Up or Down key.

**MATCHING THE CONTROLLER TO SENSOR STANDARD**

Use switch 5 of the function selector DIP switch to match the controller to the thermocouple or RTD sensor to be used. With switch 5 ON, the controller will accept DIN standard sensors. With switch 5 OFF, the controller accepts JIS standard sensors.

**SELECTING SCALE INDICATION**

Some dual-scale (°C/°F) temperature scale ranges may be selected by rotary DIP switch. To specify the scale indication to be displayed, use switch 6 on the inline function selector DIP switch.

With switch 6 set to ON, the controller displays Fahrenheit scale. With switch 6 set to OFF, the controller displays Celsius scale.
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)

■ SELECTING A SCALE RANGE

Use the rotary DIP switch to select the temperature scale range. The tables below show the switch setting number for each range. The temperature indication range is the set temperature range (full scale) ±10%, unless otherwise noted.

If the set temperature is shifted outside of changing the scale range, the set temperature is displayed. It is then automatically changed to the maximum or minimum value of the newly set temperature scale range.

If the alarm value is shifted outside the temperature scale range as a result of changing the scale range, it is automatically changed to the maximum value of the newly set scale range.

<table>
<thead>
<tr>
<th>Switch setting</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>0 to 200</td>
<td>0 to 300</td>
<td>0 to 400</td>
<td>0 to 500</td>
<td>0 to 600</td>
<td>0 to 999</td>
<td>0 to 200</td>
<td>0 to 300</td>
<td>0 to 400</td>
<td>0 to 500</td>
</tr>
<tr>
<td>Scale indication</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
</tr>
<tr>
<td>Unit of measure</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
</tr>
</tbody>
</table>

Platinum RTD Type

Platinum RTD input models are factory-set to switch position 3 for a temperature range of 0.0°C to 99.9°C.

<table>
<thead>
<tr>
<th>Switch setting</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>−50 to 50</td>
<td>0.0 to 50.0</td>
<td>−20 to 80</td>
<td>0.0 to 99.9</td>
<td>0 to 200</td>
<td>0 to 300</td>
<td>0 to 400</td>
<td>0 to 600</td>
<td>0 to 800</td>
<td></td>
</tr>
<tr>
<td>Scale indication</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Unit of measure</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. Do not set the selector switch to position 9. This will cause error message “FFF” or “——” to be displayed.
2. When changing scale ranges where the unit of measure changes 1°C to 0.1°C or vice versa, the set temperature also changes to reflect the unit of measure. For example, with a set temperature of 100°C, a change from a scale range with 1°C resolution to 0.1°C makes the set temperature 10°C; with a set temperature of 15°C, a change in scale range resolution from 0.1°C to 1°C makes the set temperature 15°C.

Thermistor Input Type

Thermistor input models are factory-set to switch position 0 for a temperature range of −50°C to 50°C.

<table>
<thead>
<tr>
<th>Switch setting</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp. range</td>
<td>−50 to 50</td>
<td>0 to 100</td>
<td>50 to 150</td>
<td>100 to 200</td>
<td>150 to 300</td>
<td>−50 to 100</td>
<td>0 to 200</td>
<td>100 to 300</td>
<td>200 to 400</td>
<td>300 to 600</td>
</tr>
<tr>
<td>Scale indication</td>
<td>°C</td>
<td>°F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit of measure</td>
<td>°C or °F</td>
<td>°C or °F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1. The temperature indication range for a setting scale of −50°C to 50°C is −50°C to 60°C. It is the full scale ±10% with the other setting scale ranges.
2. With a temperature range, such as 50°C to 150°C, exceeds the factory-set range, the indication unit is automatically adjusted to the minimum value. The set temperature is displayed upon power application.
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)

### SELECTING ALARM MODES

Select one of the eight alarm modes by using the rotary DIP switch located next to the rotary DIP switch for temperature scale range selection. The following table shows alarm functions. The selector switch is factory-set to position 2, upper-limit alarm.

<table>
<thead>
<tr>
<th>Switch setting</th>
<th>Mode</th>
<th>Alarm output</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0, 9</td>
<td>No alarm</td>
<td>OFF</td>
<td>When the alarm mode selector switch is 0 or 9, neither the alarm value is displayed nor the AL indicator lights even when the return key is pressed.</td>
</tr>
<tr>
<td>1</td>
<td>Upper- and lower-limit alarms</td>
<td>X</td>
<td>Alarm value setting range X may be 0 to full scale.</td>
</tr>
<tr>
<td>2</td>
<td>Upper-limit alarm</td>
<td>X</td>
<td>If the alarm value is shifted outside the temperature scale range as a result of changing the scale range, it is automatically changed to the maximum value of the newly set scale range.</td>
</tr>
<tr>
<td>3</td>
<td>Lower-limit alarm</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Upper- and lower-limit range alarm</td>
<td>X, X</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Upper- and lower-limit alarms with standby sequence</td>
<td>X, X</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Upper-limit alarm with standby sequence</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Lower-limit alarm with standby sequence</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Absolute-value alarm</td>
<td>Y</td>
<td>Alarm value setting range Y must be within the temperature scale range.</td>
</tr>
</tbody>
</table>

### Standby Sequence

Alarm functions with standby sequence suppress nuisance alarms when the controller is first powered up. As shown in the temperature charts at right, the alarm output is suppressed until the temperature exceeds the alarm band or alarm limit one time.

When temperature rises from the set temperature

- Upper-limit alarm
- Set temperature
- Lower-limit alarm

Alarm output

### SETTING KEY PROTECTION

Protect against unauthorized changes in temperature values by disabling the operation of Up and Down keys. Set function selector DIP switch “P” to ON. To enable changes from the front panel, simultaneously press the hidden write protection key (lower left corner) with the Up and Down keys. If the internal protection switch is set to OFF, changes can be made simply by pressing the Up and Down keys.
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)

Precautions

The E5CS-X temperature controller has self-diagnostic functions that display the following error messages to simplify troubleshooting.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Display</th>
<th>Control output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouple sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break in sensor</td>
<td>FFF blinks</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platinum RTD sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break in sensor</td>
<td>FFF blinks</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>− − − blinks</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disconnection of two or three wires</td>
<td>FFF blinks</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermistor sensor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break in sensor</td>
<td>− − − blinks</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short-circuit</td>
<td>FFF blinks</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Note: *Key operations are disabled. When the alarm outputs are used, an alarm output occurs when the “FFF” and “−−−” messages appear in the display. These displays indicate when the temperature has risen beyond or fallen below the temperature scale range.

SENSOR FAILURE INDICATION
7.0 TROUBLESHOOTING

7.3 Temperature Controller Data Sheet – OMRON E5CS-X (cont.)

Installation

MOUNTING
All E5CS-X models conform to DIN 43700 standard. Recommended panel thickness is 1 to 4 mm (0.04 to 0.16 in).
Insert the temperature controller, back end first, into the panel cutout. Mount the adapter (Y92F-30) supplied with each unit by pushing it forward from the back of the temperature controller. Push the adapter as close as possible to the front panel of the temperature controller to eliminate the gap between them. Then, secure the adapter with screws as shown.

Removal
Loosen the screws on the adapter and push the hook open to remove the adapter.

Precautions

ENVIRONMENT
Do not install the temperature controller in a location where there is a lot of dust or corrosive gases. Also avoid a location where the temperature controller is subjected to heavy vibration, shock, splashes of water or oil, and high temperatures.
Separate the temperature controller from equipment that generates strong, high-frequency electrical noise such as welding equipment.

Sensor Input Connections
The lead wires connecting the platinum RTD to the temperature controller must be separated from the power lines and other load lines, wherever possible, to prevent them from being induced by electrical noise.
Use the specified compensating conductors for the thermocouple input type temperature controllers.

Connections

Connection Examples
Use M3.5 solderless terminals with the temperature controller’s M3.5 self-rising pressure plate screws.
For solder-dipped leads, strip the lead wire 6 to 12 mm (0.24 to 0.47 in) and carefully insert the wire tip. Do not tighten the terminal screw with excessive force.

Use lead wires having a small resistance for the platinum RTD type temperature controllers.

Sequence Circuit
Several seconds are required until the relay is turned ON after the power has been applied to the temperature controller. Be sure to take this time lag into consideration when designing a sequence circuit which incorporates this temperature controller.

Recalibration
The E5CS-X temperature controller can be recalibrated by a factory-authorized repair service. Contact Omron for the location near you.
Unauthorized recalibration of the controller will void the warranty and may lead to erratic operation.
8.0 SPARE PARTS

To reduce down time in the event of an unexpected component failure, it is prudent to maintain a certain quantity and content of Spare Parts on hand for the corrosion chamber.

Below is a list of suggested parts based on chamber size.

<table>
<thead>
<tr>
<th>P/N</th>
<th>Description</th>
<th>SF260 Qty</th>
<th>SF500 Qty</th>
<th>SF850 Qty</th>
<th>SF2000 Qty</th>
<th>SF3600 Qty</th>
<th>SF4200 Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C262470 O-Ring, 6&quot;</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>C263300 Air Bubbler</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>C704000 Bubble Tower float switch assembly</td>
<td>1</td>
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<td>C263455 Wick for Wet Bulb Reservoir 9&quot;</td>
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<td>C261731 Atomizer nozzle</td>
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* The code number for this item will vary based on the size, voltage and phase of the chamber being maintained. Check the proper section of this manual for these heaters to choose the correct part number.

**Note:** Environmental regulations prohibit air shipments of rust inhibitor; therefore, each customer must plan ahead and have sufficient quantities of rust inhibitor in stock for regular and preventative maintenance.
9.0 PRINTS AND DRAWINGS

9.1 Electrical

<table>
<thead>
<tr>
<th>Description</th>
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<tbody>
<tr>
<td>Models SF260, SF500, SF850</td>
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<tr>
<td>120 volt 1 phase</td>
<td>A-03-110</td>
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<td>Models SF2000, SF3600, SF4200</td>
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9.2 Plumbing

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<td>SF2000, SF3600</td>
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<td>SF4200</td>
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9.3 Layout

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<tr>
<td>ATO-Fill layout</td>
<td>LC-7</td>
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<tr>
<td>Jet Exhaust Recirculation System</td>
<td>LC-5</td>
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<tr>
<td>Layout Drawing for All Models</td>
<td>4-201-41</td>
</tr>
</tbody>
</table>

The above listed drawings are on the following pages.
10.0 GLOSSARY

Words in *italic* have a separate entry.

**AASS**   see *Acetic Acid Salt Spray*

**Access Ports**  holes that can be placed in the side walls of a corrosion exposure cabinet through which compressed air lines, water or hydraulic lines, electrical lines, or mechanical connections can be routed to be used to create environmental conditions for samples being tested.

**Acetic Acid**  a mild acid chemical formula C₂H₄O₂ used as a corrosive fluid in some test methods, such as ASTM G85 Annex 1 and GM 4466-P. Also used in conjunction with *sodium chloride* in test methods BS7479 and ISO9227.

**Acetic Acid Salt Spray (AASS)**  a test method requiring a corrosive solution of *acetic acid* and *sodium chloride*, such as BS7479 and ISO9227.

**Acid Rain Test**  a test method that is intended to duplicate the conditions of outdoor exposure in an industrial area, where rain rinses chemicals from the atmosphere.

**Acrylic Cover**  a clear cover for Atlas corrosion exposure equipment that is designed to prevent condensation from dripping onto samples, and which allows for viewing of ongoing test conditions.

**Adjustable Cone**  an inverted (point down) cone, which deflects the upward-rising fog from the *atomizer nozzle*, inside the *Omni-Fog Tower*. Also catches any drops or droplets and allows them to drip back into the *Internal Reservoir*, thus preventing splattering of test samples.

**Adjustable Humidity**  see *Controlled Humidity*, also called *Variable Humidity*.

**Air Actuated Cover**  A larger cover raised by compressed air and cylinders

**Air Actuated Cover Lifters**  Pneumatic cylinders activated by compressed air.

**Air Bubbler**  a component for percolating incoming compressed air located at the base of the *Bubble Tower*. When air passes through it, the air is separated into small bubbles, which increases the surface area of air in contact with the heated *DI water*, thus increasing both the temperature and the humidity of the air.

**Air Compressor**  a mechanical device that is used to create pressurized air.

**Air Powered Cover Lifter**  see *Air-Actuated Cover*.

**Air Regulator**  a device which allows a specific volume of air to pass, so that air pressure is maintained at a desired level.

**Air Relief Valve**  a safety device located on top of the *Bubble Tower* with a set point to about 5 psi / 34 kPa above the desired air pressure, which will open and allow air to escape if the air pressure exceeds the set point.

**Air-actuated Cover**  an option which allows for opening or closing of the clear *acrylic cover* by touching the appropriate button on the *Control Panel* of Salt Fog Corrosion cabinets, or by opening/closing the appropriate valve on other corrosion exposure cabinets.

**Alarm**  an error condition that cause a corrosion cabinet to stop operation; these are usually removed through manual action by the operator after problem correction.

**ASS**  see *Acetic Salt Spray*.

**Atomizer Nozzle**  a small cylinder, made of acrylic resin, that combines compressed air and a fluid (salt solution, water, electrolyte) and ejects the mixture as a fog.

**Automatic Solution Level Control**  a system of level switches, solenoids, supply lines and a reservoir that maintains a set level of fluid (salt solution, water, electrolyte) in the *internal reservoir*.
10.0 GLOSSARY

**Back Pressure** in a drain line or fluid supply line, pressure that causes movement of fluid in the opposite direction than which desired.

**Bubble Tower** a vertical cylinder that is 3/4 full of heated water, through which compressed air is forced to make the air humid. This allows the compressed air to atomize fluid (salt solution, water, electrolyte).

**Bubble Tower Heater** a resistance heater, submerged in the water in the Bubble Tower, that heats the water.

**Building Drain** a hole in the floor of a room, such as a laboratory, connected to a sewer system, which is intended to remove fluids by gravity from the room or building. Also called Gravity Drain.

**C\textsubscript{2}H\textsubscript{4}O\textsubscript{2}** see *Acetic Acid*

**Cabinet Heater** a resistance heater used to achieve and maintain temperatures in the exposure zone. In an SF cabinet, heaters are located in the water jacket. In the BCX and Salt Fog Corrosion cabinets, heaters are located below the diffuser plate.

**Canadian Wiring Package** the proper wiring and electrical parts to allow the CSA label to be affixed to a corrosion cabinet operated in Canada.

**Carbon Dioxide** a colorless, odorless gas, chemical formula CO\textsubscript{2}, that dissolves readily in water to make a weak acid.

**CASS** see *Copper Accelerated Acetic Acid Salt Spray*

**Casters** Wheels located on the bottom of a corrosion cabinet, which allow it to be rolled across a floor.

**CCT** see *Cyclic Corrosion Test.*

**CE Label** the proper wiring and electrical parts to allow the CE (European Conformity) label to be affixed to a cabinet operated in many European countries.

**Chart Recorder** a device that prints, on paper, current conditions of various pre-determined test parameters such as temperature, humidity, and pressure.

**Chromasoft\textsuperscript{TM} Software** in the SF cabinets, software that performs two-way functions- it communicates information to the user via a PC, and communicates instructions from the operator that are input to the PC.

**Circular Chart Recorder** see *Chart Recorder.*

**CO\textsubscript{2}** see *Carbon Dioxide*

**Collection Rate** see Condensation Rate.

**Combination Oil and Water Extractor** a device that removes moisture and oil from pressurized air; usually found on the compressed air supply line just before the supply line is routed to a corrosion cabinet.

**Compression Fitting** a connector for tubing, used in all Atlas SF corrosion cabinets. Connection is made by pushing the proper size tubing into an open end of the fitting. These fittings have been tested at 80 psi / 552 kPa.

**Condensation Rate** the rate at which humidity condenses from air and falls by gravity through the exposure zone.

**Connectors, Quick, for Tubing** see *Quick Connectors.*

**Control Panel** see *Standard Display Panel, or Computer Monitor.*

**Controlled Humidity** see Variable Humidity.

**Copper-Accelerated Acetic Acid Salt Spray (CASS)** a test method that combines copper chloride, acetic acid and salt solution; found in ASTM B368, ISO 9227, GM4476P, Ford BQ5-1.

**Corrodkote\textsuperscript{©}** a test that involves coating samples with a chemical slurry which is allowed to dry before placing the samples in a humidity cabinet; ASTM B380.
10.0 GLOSSARY

Corrosion  the degradation of a material, usually the oxidation of iron or other metal, caused by interaction with its environment.
Corrosion Control  the attempt to neutralize destructive environmental attacks.
Corrosion Testing  the most important aspect of corrosion control, includes laboratory and outdoor exposure.
Cover Interlock  in the corrosion cabinet with gas injection, a device that prevents opening of the cover prior to venting of corrosive gasses.
Cover Open  a message on the display panel that indicates the cover is not completely closed.
CSA  see Canadian Wiring Package.
Cycle  a specified sequence of events. In cyclic testing, where samples are exposed to various environmental conditions in a pre-set sequence.
Cyclic Corrosion Test  a sequence of environmental conditions that are intended to simulate real-world conditions.
Datalogging Software  software that performs two-way functions- it communicates information to the user from the controller via a PC, and communicates instructions from the operator to the controller that are input at the PC.
Deionized Water  see DI Water.
Deionizer Resin Sack  a quantity of resin for ion exchange that comes in a blue sack and is placed in the Atlas Aquanizer™ in pairs.
DI Holding Tank, 25 gallon  in SF cabinets, a horizontally mounted cylindrical reservoir, used to supply DI water to the Bubble Tower when no pressurized source of is available.
DI Tank, 60 Gallon, with Pressurizing Pump  in a Salt Fog Corrosion cabinet, a separate reservoir for DI Water, on a stand with castors, which includes a pump that pressurizes the water.
DI Water  for Atlas Co. corrosion cabinets, water that meets ASTM D1193 Type IV. This water may be created through reverse osmosis, distillation, or filtering with ion exchange.
Diffuser Plate  in a BCX or Salt Fog Corrosion cabinet, the bottom of the exposure zone; it contains holes for the upward movement of air and the downward movement of drips and condensate, and beneath which the heaters are located. Note: not intended for sample support.
Dispersion Rate  see Condensation Rate.
Dispersion Tower  see Omni-Fog Tower.
Display Panel  see Standard Display Panel, Computer Monitor.
Drain  an opening at or very near the bottom of the exposure zone through which condensate and rinse water is routed to the building drain. See also Drain/Vent and Vent.
Drain/Vent  in BCX and SF corrosion cabinets an opening through which both fluid and gas exit the exposure zone.
Dry Bulb  an RTD sensor that measures the ambient temperature within an enclosure.
Dry-off  an environmental cycle during which heaters are energized and the air blower moves air into the exposure zone to remove moisture.
Dual Magnetic Seals  on the top of the exposure chamber of the BCX and SF corrosion cabinets, and on the bottom of the clear cover where it touches the top of the exposure chamber, rubber strips with embedded magnets that attract one another to prevent conditions in the exposure chamber from escaping to the laboratory; consisting of rubber strips mounted to both the top of the exposure chamber and the bottom of the cover, so that, when closed, the rubber strips are magnetically attracted and clamped.
Duo-gas  an environmental chamber that has valves and connections to allow two gasses to be used in testing.
10.0 GLOSSARY

Dwell  a period of time during which no environmental cycles are activated.
Electrolyte  a fluid containing a chemical that allows electrical conductance.
Environmental Chamber  those test cabinets that are designed to simulate variable conditions that are encountered in the real world, such as temperature, humidity, etc.
Environmental Cycle  a condition created in an exposure zone to simulate a real-world condition, such as solution fog, high humidity, high temperature, solution spray, immersion, and variable humidity.
Exhaust Recirculation System  a vertically mounted cylinder containing a porous material to which corrosive molecules become attached and are then rinsed off by water that is sprayed from above and collects in a reservoir, which water is then recirculated again as spray water.
Exposure Chamber  the part of a corrosion exposure instrument that includes the exposure zone, cover, rack supports, and Omni-Fog Tower.
Exposure Zone  the volume of space inside the exposure chamber in which samples are exposed to environmental conditions; the top of the exposure zone is the horizontal plane of the entry of vapor, fog, mist, or spray; in BCX and SF corrosion cabinets the bottom is the diffuser plate; in SF cabinets the bottom is the floor of the cabinet.
External Condensate Collection Package  a system of collection funnels, tubing, and valves that allows a pre-test check of the condensation rate from outside the exposure chamber; that is, with the cover closed.
Extra Solution Reservoir  a second or subsequent holding tank for a mixed chemical solution, connected by gravity lines to the Solution Reservoir.
Fall-out Rate  see Condensation Rate.
Fiberglass Bracket  see support bracket.
Fiberglass Rod  see support rod.
Filter Cartridge  in SF corrosion cabinets, a wound filter that is placed in the internal solution reservoir that prevents precipitates or other non-dissolved chemical from reaching the atomizer nozzle.
Flow Meter  a meter on a fluid line that measures the volume of fluid that has passed that point.
Fog  fluid particles in the air as molecules.
Fog Collection  see condensation rate.
Fungus Test  an environmental test using various forms of fungi to attack coatings.
Gas Shocks  see Air Actuated Cover Lifters.
Type IV Water  DI water according to ASTM D1193 for Type IV.
Graduated Cylinder  a cylinder, closed on the bottom, that has markings for accumulated volume, usually fluid; in corrosion cabinets used to check the condensation rate.
Gravity Drain  see building drain.
Grayscale Touch screen Display  see Premium Display Panel.
High Humidity Cycle  a test cycle in which the air in the exposure zone is saturated with moisture.
Horizontal Dispersion System  a horizontally-mounted set of pipes that disperses fog, mounted in place of the inverted cone at the top of the Omni-Fog Dispersion Tower; used when sample size or operator preference requires movement of the dispersion tower from being located toward the middle of the cabinet to (usually) the back.
Humidifying Tower  see Bubble Tower.
Humidity Pipe Assembly  a plastic pipe, mounted along the floor of SF corrosion cabinets, through which compressed air is forced through standing water, to make humidity for certain tests such as ASTM B380.
Pneumatic Cover Lifting System  see Air-actuated cover.
10.0 GLOSSARY

Mist A term for fluid suspended in a gas that is often mis-used in corrosion testing in place of fog. Mist particles are larger than fog particles.

**NaCl** see Sodium Chloride.

**Nitric Acid** a corrosive fluid, chemical formula HNO₃, used as an oxidizing agent in corrosion tests.

**Nitric Oxide** a colorless, poisonous gas, chemical formula NO.

**NOₓ** see Nitric Acid, Nitric Oxide.

**O Ring, Bubble Tower** replaceable seals, about 5-1/2”- 6” / 14-15 mm in diameter, used at the top and bottom of the Bubble Tower.

**O Ring, Internal Reservoir** a replaceable seal, about 14” / 36mm in diameter, used at the top of the Internal Reservoir in the SF System.

**Omni Fog™ Dispersion Tower** an Auto Technology Co. Trademark; a vertical plastic assembly, with velocity ports, Atomizer Nozzle, and inverted cone, that distributes fog created at the Atomizer Nozzle.

**Panel Rak** a sample support device, consisting of vertically-oriented slots for holding samples.

**Panel Tray** a sample support device; consisting of a double row of slots, 40 in all at .5” spacing, at a 15º angle.

**Perspiration Test** see Synthetic Perspiration Test.

**pH Meter Kit** a kit consisting of a pH Meter and solutions for adjusting the pH of the chemical solution.

**Plastisol-coated support Bar** see Support Bar.

**Plastisol-coated Support Rack** see Support Rack.

**PLC** Programmable Logic Controller.

**Pneumatic Cover Lifter** see Air-Actuated Cover.

**Power Exhaust Kit** in the SF corrosion cabinets, a venturi style pump with pipe and connectors to assist in removing exhaust from the exposure zone.

**Precision Air Regulator** an air pressure regulator that is graduated at .1 psi intervals.

**Precision Control Package** see Chromalox Controller.

**Premium Controls** in the SF corrosion cabinets, a notebook (laptop) computer used for cabinet controls.

**Prohesion™** a trademark of Mebon Paint Company (England) for their cyclic test involving repeated episodes of exposure to corrosive fog followed by dry-off; this test has been adopted as ASTM G85 Annex 5.

**Quick Connectors, Tubing** in corrosion cabinets, tubing connectors that have a moveable collar that allows the tubing to be pulled out, usually without tools.

**Recorder** see Chart Recorder.

**Reinforced Cabinet** in the SF corrosion cabinets, a metal basket that is embedded within the exposure chamber so that the weight of immersion solution does not burst the walls.

**Resistance Temperature Device** see temperature probe.

**RTD** Resistance Temperature Device; see temperature probe.

**Rust Inhibitor** a fluid that is added to water to suppress deterioration by oxidation of the surface in contact with water; in the SF corrosion cabinets, rust inhibitor is added to the water that is placed in the water jacket.

**Safety Switch** an electrical switch that open to stop a test procedure and/or close to cause an alarm.

**Salimeter** see salinity hydrometer.
10.0 GLOSSARY

Salinity Hydrometer a hydrometer (q.v.) for the specific purpose of measuring the specific gravity of a saline solution.

Salt see sodium chloride.

Salt Fog Adder, Model 300 a set of valves, tubing, nozzles, switches, relays and solenoids that allows the Model 300 to be used for salt fog testing.

Salt Spray a remnant term, from the original ASTM B117, which was intended to mean salt fog.

Salt Spray Chamber a cabinet of specific internal volume in which samples are placed and salt solution is sprayed in order to later check for penetration of seals due to the presence or absence of chemical precipitates; see also salt fog chamber.

Saturation Tower see bubble tower.

SF Start-up Kit see start-up kit.

Sight Gauge on the SF System, a vertically-oriented, transparent tube mounted on the outside of the cabinet that is used to indicate the level of water in the water jacket.

SO₂ see sulfur dioxide.

Sodium Chloride a crystalline compound, chemical formula NaCl, which readily dissolves in water and promotes surfaced oxidation of many metals, especially iron.

Solution Collection Funnel a funnel that is used to measure the collection rate of a corrosive fog.

Solution Reservoir in the SF corrosion cabinets an attached tank of 55 gallon capacity; in the SF a separate tank of 55 gallon capacity; that holds a mixed chemical solution for supply to the atomizer nozzle.

Solution Tank see Solution Reservoir.

Specific Gravity Hydrometer a device used to measure the specific gravity of a fluid, with pure water at standard temperature and pressure having a specific gravity of 1 by definition.

Spray a pattern of fluid distributed by a tiny opening, which fluid is driven by pressure on it and contains droplets.

Spray Nozzle a device that dispenses water in droplets due to water pressure.

Spring Cylinder Cover Lifting System in the SF Salt Fog and Humidity cabinets, spring-loaded cylinders that assist in lifting the cover and holding it open.

Standard Control Panel in the SF corrosion cabinets, an operator message and input device through which communication with the Koyo Direct Logic 205 controller is maintained, with two lines of text display and 4 LED lights.

Start-up Kit includes 100 pounds /45.4 pounds of ASTM grade salt, a specific gravity hydrometer, a salinity hydrometer, two 80 cm² funnels and two 100 ml graduated cylinders.

Strip Chart Recorder see Chart Recorder.

Sulfur Dioxide a yellowish, foul-smelling gas, chemical formula SO₂; a by-product of industrial processes which can create a type of acid precipitation (acid rain); used in test methods that simulate polluted atmospheres, such as ASTM G87, DIN 50017, DIN 50018. Note: cabinets using this gas MUST be vented to the outdoors.

Support Bar a device, made from fiberglass or other inert plastic, placed within the exposure zone on which samples are placed for testing.

Support Rod a device, made from fiberglass or other inert plastic, placed at the top of the exposure zone and from which samples are suspended for testing.

Support Rack a device, made from fiberglass or other inert plastic, placed within the exposure zone on which either samples are placed for testing, or on which support rods are placed.

Synthetic Perspiration Test a test specification that exposes samples to synthetic perspiration according to ISO3160-2.
10.0 GLOSSARY

Tap Water  water suitable for drinking.
Temperature and Humidity Recorder  see Chart Recorder.
Temperature Probe  a device that measures temperature as a function of electrical resistance.
Temperature Recorder  see Chart Recorder.
Test Panel Holder  see Panel Rack, Panel Tray, Support Bar, Support Rack, Support Rod.
Tubing  flexible, hollow, polypropylene piping used to route fluid and air.
Tubing Connectors  hollow pieces of plastic that are used to connect sections of tubing.
Two Line Display  in the SF corrosion cabinets, the operator message area of the standard Display Panel.
UL  see Underwriter’s Laboratories.
Underwriter’s Laboratories  an independent testing laboratory that, among other activities, inspects and approved electrical items used by consumers.
Variable Humidity  the ability to achieve and maintain a level of humidity between ambient and saturated. Also called Adjustable Humidity, Controlled Humidity.
VCU  Video Control Unit, see Display Panel.
Video Control Unit  see Display Panel.
Water Fog  a fog that is comprised of water (usually de-ionized) only.
Water Jacket  in salt fog and humidity cabinets, the space between the outer wall and inner wall that is filled with water and heater.
Water Trap  in the SF corrosion cabinets, a U-shaped section of pipe in the duct leading from the air blower to the exposure chamber which, when filled with water, blocks the backward movement of air from the exposure chamber to the inside of the control cabinet.
Wet Bottom Drain Assembly  a series of pipes and valves that allow water to accumulate in the bottom of an exposure chamber. In the SF corrosion cabinets, it includes float switches and solenoids.
11.0 WARRANTY

Equipment manufactured by Atlas Material Testing Technology LLC is warranted to be free from defect in materials or workmanship for a period of twelve months from the date of the BUYER’S receipt of the equipment. This warranty is only valid if the equipment is installed, operated, and maintained in accordance with the instructions furnished by the SELLER to the BUYER. However, no warranty is given with respect to items that have a normal useful life of less than twelve months. The SELLER’S obligation under this warranty is expressly limited to supplying the replacement part to the BUYER, or replacing the part at the SELLER’S factory.

Items furnished by the seller, but manufactured by others, are warranted by the seller only in accordance with the warranty extended by the manufacturer.

Parts covered under this warranty will be supplied (but not installed) without charge, except for shipping and handling, upon receipt and inspection of the parts at our factory. No parts may be returned without our approval. This limited warranty covers all defects incurred in normal use of the equipment, and does not apply in the event of loss or damage to the equipment due to abuse, mishandling, accident, or failure to follow operating instructions.

No implied warranty, including merchantability, applies to this equipment, and no other express warranty or guarantee applies, except as mentioned above.

*Under no circumstances will the SELLER be liable for any loss damage, expenses or consequential damage of any kind arising in connection with the use of, or inability to use, this product.*

The following do not constitute warranties; 1. Specification, other than that provided by the SELLER, 2. Results of test and recommendations set forth in technical service reports furnished by the SELLER. All such information and recommendations, though based on the SELLER’s research and believed to be reliable, are furnished and the product is sold upon the understanding that purchasers will independently determine the suitability of the product for the BUYERS purpose. No agent or representative of the SELLER is authorized to change the warranty or to give any other warranty, expressed or implied; and no such agent or representative is authorized to make any representations concerning the SELLER’s product which are not subject to qualifications and to the limitations of liability hereinafore expressed.

ATLAS MATERIAL TESTING TECHNOLOGY LLC does not insure delivery or safe carriage of goods. The SELLER’s responsibility ceases after delivery to the transportation company in good order. Claims on account of unsuitability of the goods for any particular purpose are waived unless such unsuitability results solely from the SELLER’S failure to deliver goods meeting specification, if any, agreed upon, or if none, to deliver goods of merchantable quality. **Claims against the carrier must be made by the customer.**

Please contact ATLAS if you would like us to service your equipment, calibrate gauges, or supply replacement parts.