

# AUTO-PURGER® AP

Noncondensable Gas (Air) Refrigerant Purger



Model AP08

## OPERATOR INSTALLATION & INSTRUCTION MANUAL

For Models AP01, AP08, AP16, AP24, and APC  
European Versions AP01E, AP08E, AP16E, AP24E, and APCE

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## SECTION 1 MOUNTING & PIPING INSTALLATION

The AUTO-PURGER is a totally automatic, electronically-controlled noncondensable gas (air) refrigerant purger for reducing condensing pressure. The deluxe models—AP08, AP16, and AP24—are pre-assembled, pre-wired, insulated, and include an automatic water bubbler. Installation requires piping the foul gas line, liquid line, suction line, water line, drain line, and power connection, and wiring the remote purge point solenoid valves. Purge point solenoid valves must be purchased separately and must be a minimum of ½" (13 mm) port size.

In addition, a computerized model—APC—is available where a separate plant computer or programmable logic controller (PLC) is used to start and stop the AUTO-PURGER and independently operate the various remote purge point solenoid valves.

The basic AUTO-PURGER—Model AP01—is the same construction less insulation, automatic water bubbler, water solenoid valve, 7-day time clock, and sequence timer for remote multi-point purge solenoid valves. The insulation and automatic water bubbler flush system can be factory added or field upgraded.

The internal surface area and flooded evaporator efficiency gives the AUTO-PURGER two to three times the foul gas condensing capacity of an Armstrong Purger and 10 times the capacity of purgers with small electric hermetic compressors. In a system with normal noncondensable loads, all models will handle a 750 ton (2600 kW) ammonia plant at suction pressures below atmospheric pressure or a 1500 ton (5300 kW) ammonia plant at positive suction pressures. The amount of noncondensables in the system is based on many factors including age, maintenance practices, and operating temperature.

The number of purgers required for a system depends on the number of installed purge points. Twenty-four purge points is the maximum practical number per purger. For example, a system with 24 points set to purge for 10 minutes per point requires a 240 minute (4 hour) cycle. Each purge point can be purged 6 times a day. This may, or may not, be adequate. Therefore, a second purger should be used and the purge points divided equally between the two purgers.

The AUTO-PURGER can operate over a wide range of condensing pressures. This is important for refrigeration systems that operate at low condensing pressures during cold ambient conditions.

### MOUNTING INSTRUCTIONS

Mount the AUTO-PURGER securely on a wall or sturdy steel channels capable of supporting 450 lbs (205 Kg). Eight mounting holes in the frame are provided to support the unit. See Figure 1. The unit should be located in an accessible area, but away from moving equipment that could accidentally come in contact with the purger. Elevation with respect to condensers or high-pressure receivers is not critical. Do not punch access holes in the top of the control cabinet. Unused electrical entrances to the enclosure must be sealed to protect the controls from moisture.

The AUTO-PURGER is normally installed in the compressor room where it can be monitored, but also may be installed outdoors where temperatures below freezing are not anticipated. For outdoor use, areas near falling or spraying

water, or in constant high humidity areas, an optional NEMA 4 enclosure with sealed conduit wiring is recommended.

Install float switch assembly on purger by removing packaging material and metal shipping tube. Slip float switch assembly over enclosing tube being sure the float switch assembly bottoms on the neck on the enclosing tube. **Warning:** For ammonia purgers, tighten the retaining screw such that the screw tip is in the groove of the neck assembly. Note: the freon purgers have a spacer with a set screw which is tightened on the neck assembly. If the float switch assembly is not properly positioned and retained, the switch may not function.

### PIPING INSTRUCTIONS

It is extremely important to install purge points at locations sure to be liquid free. Also, no liquid traps are desirable either before or after purge point solenoid valves. See Figure 2. The line from the purge point on the condenser to the AUTO-PURGER should not pass through cold areas where further condensing of the saturated gas can occur. If this cannot be avoided, the purge line must be insulated because flooded purge point lines will flood the AUTO-PURGER with liquid, resulting in a temporary halt of noncondensibles being removed.

The minimum line size for foul gas piping is ½" (13 mm). The line should be pitched down toward the purger to drain any refrigerant that may condense.

It is important that one purge point solenoid valve is open at all times to prevent losing foul gas pressure to the purger. An optional differential pressurestat system (DPS) can be used to safeguard against loss of foul gas pressure.

### FOUL GAS LINES

#### Model AP01

For the single point purger, Model AP01, the foul gas line is brought directly from the purge point on the condenser or receiver to the purger. During operation, the AUTO-PURGER's foul gas solenoid valve (#4) located on the purger, energizes when the purger's evaporator chamber is cooled to approximately 20°F (-7°C).

### FOUL GAS PIPING FOR MULTIPPOINT PURGING

#### Models AP08, AP16, AP24, and APC

It is nearly impossible to predict where noncondensable gases (air) will accumulate. Therefore, purging at several points on the high-pressure side of the system is the best method for removing air from the system.

For multipoint purgers, the solenoid valves may be manifolded into one line to the purger. However, only one purge point should be purged at a time. Connecting two purge points together may result in gas flowing from one condenser to another due to unequal pressure drop, even though the difference in pressure drops is very small, for example ¼ psi (0.02 bar). The result is that even in the best of circumstances, only one point is effectively purged. The best practice is to purge each condenser and receiver circuit separately.

## EVAPORATIVE CONDENSER PIPING

Typically, evaporative condenser outlet liquid drain lines on each circuit must drop between 4ϕ-6ϕ (1.2m-1.8m) for ammonia and 8ϕ-12ϕ (2.5m-3.7m) for halocarbons from the centerline of the condenser outlet to the centerline of highest elevation of the liquid line manifold to receiver. Preferably each circuit should have a P-trap to balance variations in pressure drop in each circuit and to prevent liquid from backing up into one or more condensers, flooding the purge point. A properly-sized equalizer line from the receiver will help drain condenser circuits into the receiver. Refer to ASHRAE guidelines or recent IIR papers on condenser piping design. Also, consult condenser manufacturers installation instructions for additional piping and sizing information.

Do not use one purge point solenoid valve to purge two circuits. This negates the P-trap on the condenser drain line and may back liquid up into one circuit.

## PURGE POINT CONNECTIONS

Condensers should be purged at points recommended by the condenser manufacturer. This is typically at the top of each circuit's outlet header.

In some cases a small, high-pressure auxiliary receiver is located at the outlet of one or more condensers. This receiver should have a purge point at the top.

Where a high-pressure float regulator is used to drain one or more condensers, the top of the float valve chamber should be a purge point.

Heat exchangers and horizontal shell and tube water-cooled condensers should be purged at the top, usually at the point or points furthest from the compressor discharge main inlet. Vertical condensers should be purged near the top of the vessel if possible.

For certain types of oil separators where very low velocities may exist near the top of the vessel, purging may be advisable from a top fitting.

It is not necessary to purge control pressure receivers, high pressure thermosyphon vessels, or vessels located on the low side of the system.

## SUCTION LINE

A 3/4" (20 mm) suction line should be connected to a protected main suction line or can be piped to a suction accumulator. The purger thermostat is factory set at 30°F (-1°C). To allow for temperature transfer losses between the purger evaporator and the thermostat sensor, the suction temperature should be approximately 20°F (-7°C) or below to close the thermostat. This then switches the AUTO-PURGER from its PURGER COOLING DOWN mode to its AUTOMATIC or MANUAL PURGING mode. For higher suction temperatures, consult the factory.

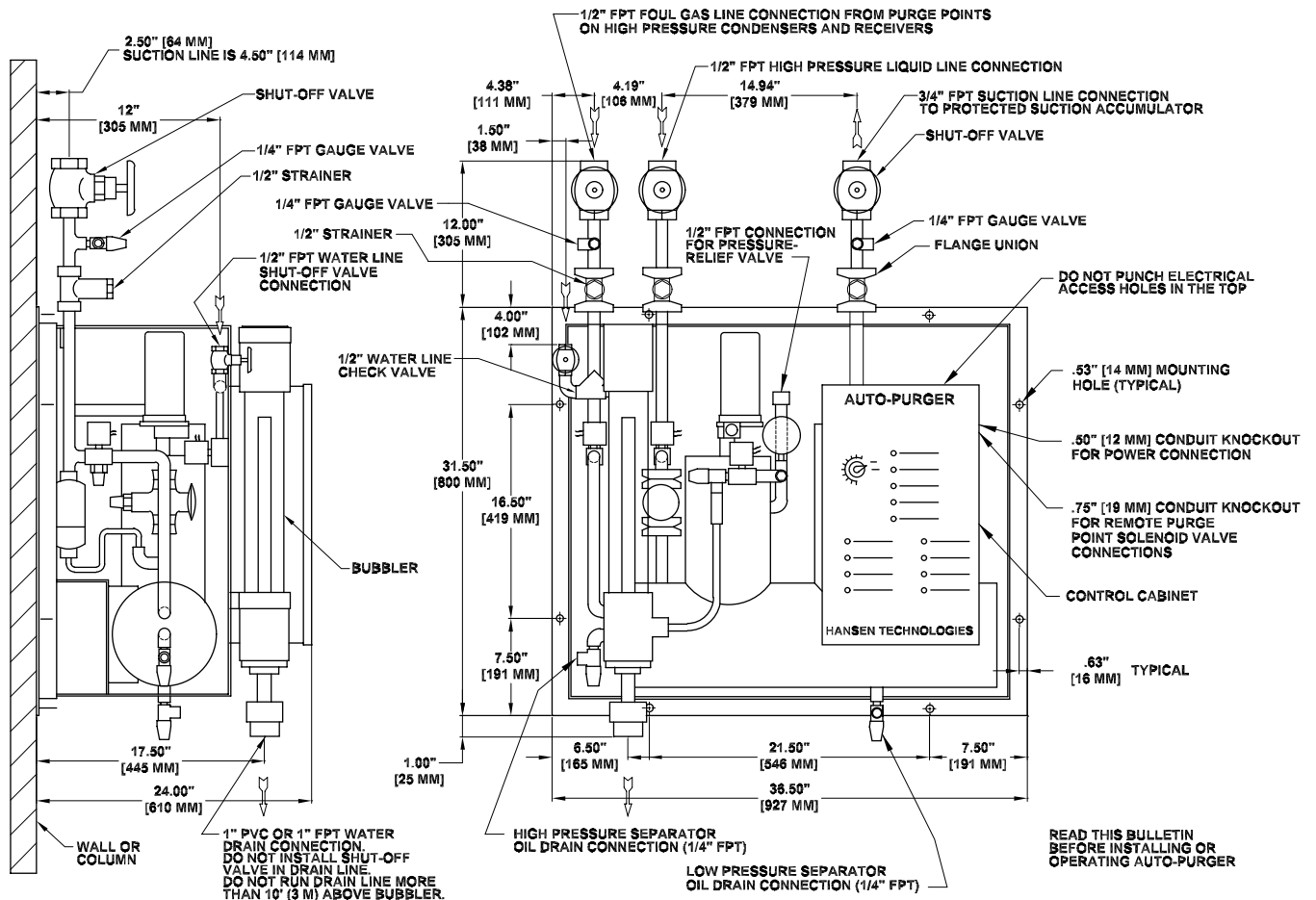


Figure 1. AUTO-PURGER AP installation dimensions.

## WATER LINE

An automatic water bubbler flush system is provided with the purger (except Model AP01). A water line must be connected to the water solenoid valve (#6). The connection is 1/2" FPT. The water supply pressure should be 30–80 psig (3.1–6.5 bar).

The clear tube of the water bubbler may become coated with mineral deposits after a period of time. These deposits can be removed by adding a cup of vinegar to the water in the bubbler and cleaning the clear tube through the top plastic fitting with the supplied brush. A water conditioning filter housing and cartridge are available for abnormally hard water.

Model AP01 comes with a plastic hose and fitting for connection to an ammonia-absorbing water reservoir (customer supplied). This reservoir should be at least one gallon (four liters) and the water must be changed regularly. The water bubbler flush system can be added to Model AP01.

## OIL DRAINS

Excess oil can reduce the purger capacity by lowering the evaporating or condensing rate. Oil is not typically a problem. However, any oil that may collect in the purger can be drained off through the two capped 1/4" valves on the purger. See Figure 1. Before draining oil, shut-off the purger and close the liquid and foul gas valves. Allow the purger to pump out, then close the suction line valve. Use normal oil draining precautions to prevent injury or property damage.

## LIQUID LINE

A high-pressure liquid source is required for the AUTO-PURGER. This connection should be at a location where oil will not be directed into the purger. The liquid line supplies refrigerant during start-up and feeds makeup liquid as required during purging. The liquid line solenoid valve (#1) on the AUTO-PURGER closes when the AUTO-PURGER is off. See Figure 11. The supply pressure must be sufficiently above the purger evaporator pressure to ensure proper operation of the level control valve. This valve supplies only 5% of the liquid refrigerant required for cooling, except at start-up. The remainder of the required refrigerant is condensed from the foul gas line. This liquid is fed to the evaporator through the metering valve located downstream of the liquid metering solenoid valve (#3).

## CHECK VALVES

There are four check valves on the purger. A 1 psid (.07 bar) check valve with a 1/32" (.8 mm) diameter metering orifice is installed on the purge gas line to prevent reverse flow of water into the purger. A 30 psid (2.1 bar) check valve is installed in the liquid line to the float chamber. This limits the liquid line pressure at the purger to 30 psi (2.1 bar) less than the foul gas pressure and allows noncondensibles into the purger. A 225 psid (15.5 bar) relief check valve from the float chamber to suction line. Older purgers have a 200 psid (13.8 bar) relief check valve. The water line has a 1/2" check valve.

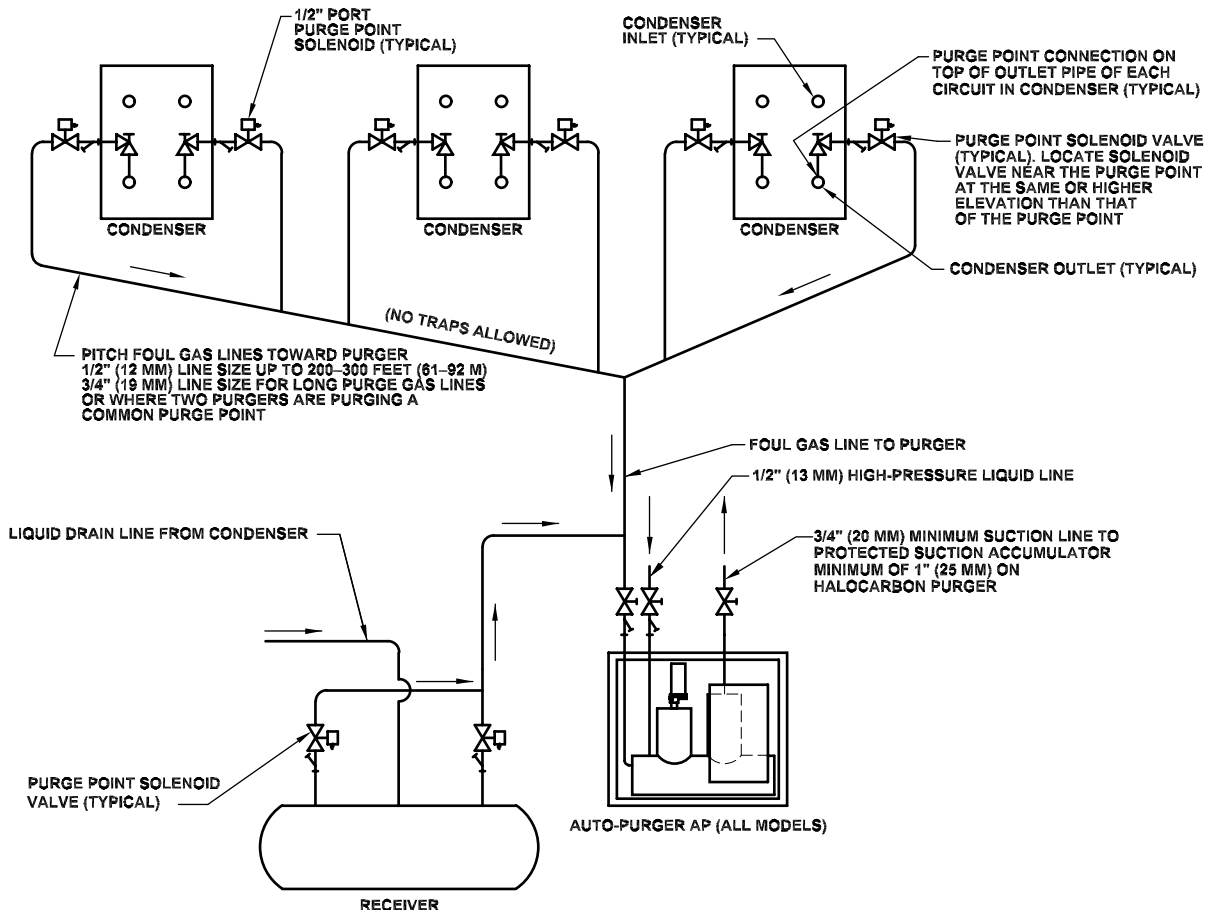


Figure 2. Typical purge point locations.

## DRAIN LINE

A 1<sup>2</sup> (25 mm) PVC socket/1<sup>2</sup> FPT water drain connection is located at the bottom of the bubbler. The water should flow to a suitable drain or container. If the drain line is run overhead, the fitting on the top of the water bubbler must be sealed, including the 1/4<sup>2</sup> NPT vent connection in the fitting, and a protective mesh installed around the clear tube. Do not run the line more than 10¢(3 m) above the height of the bubbler because the pressure on the water bubbler could be excessive. Support the drain line to prevent undue stress on the water bubbler. Also, do not install a shutoff valve in this line. Since Model AP01 comes less the bubbler, no drain is necessary on this model.

Initially, fill water bubbler with water through the 3<sup>2</sup> (75 mm) plug located on top of the tube. Keep the plug lubricated and hand tight. Check for leaks at the hose fittings.

## MODEL APF AUTO-PURGERS

Model APF AUTO-PURGERS are for use in halocarbon refrigeration systems. The installation and operation of these AUTO-PURGERS are similar to that of an ammonia AUTO-PURGER.

## PIPING HALOCARBON AUTO-PURGERS

The halocarbon liquid line and foul gas line piping and sizing details are the same as for an ammonia AUTO-PURGER. However, the suction line size for halocarbon purgers should be 1<sup>2</sup> (25 mm) for suction temperatures down to -20°F (-29°C), and 1¼<sup>2</sup> (32 mm) for -20°F (-29°C) to -60°F (-51°C) suction temperatures. Condenser drain lines on halocarbon evaporative condensers must be trapped and drop vertically 8¢-12¢ (2.5m-3.7m), or per manufacturer recommendations. This is to prevent possible backflow of liquid into one or more condenser circuits resulting in a flooded purge point.

While the air indicating column (water bubbler flush system) is included, the water line and drain line are not required. Purge points are at the same locations as for an ammonia purger. See Figure 2. For evaporative condensers, the purge points are on the top of the outlet drain line. Although noncondensable gases are lighter than halocarbon gas, they still collect at, or near, the outlet.

## FILTER-DRYER CONDITIONING SYSTEM

The special construction for APF AUTO-PURGERS includes a filter-dryer conditioning system for the foul gas and liquid line. See Figure 3. Water vapor, as well as noncondensable gas, may be present at each purge point. The filter-dryers remove this moisture before it can enter the purger. Both dryers are used to protect the purger internally from freezing water, but they also supplement water removal of the primary refrigeration system liquid line dryers. Moisture indicating sight glasses located downstream of the filter-dryers indicate when the filter-dryer cores are saturated with water and must be replaced. Isolation shut-off valves are included for change out of the filter-dryer cores, and access valves allow evacuation of the refrigerant from the filter-dryer shell. Another feature is a small filter-dryer prior to the liquid metering valve (or metering orifice on European purgers). This small filter-dryer protects the expansion orifice by capturing particles and any moisture present in the purger. It should be replaced during normal maintenance.

## AIR INDICATING COLUMN

Model APF AUTO-PURGERS are equipped with an air indicating column (ammonia models have a water bubbler). Fill the clear tube to the marked line with water or a lightweight, clear oil. Noncondensibles released from the purger bubble up through the column, indicating proper operation. As with ammonia purgers, the counter inside the control cabinet keeps a record of how many times the purge gas solenoid valve (#5) opens to release noncondensibles into the column.

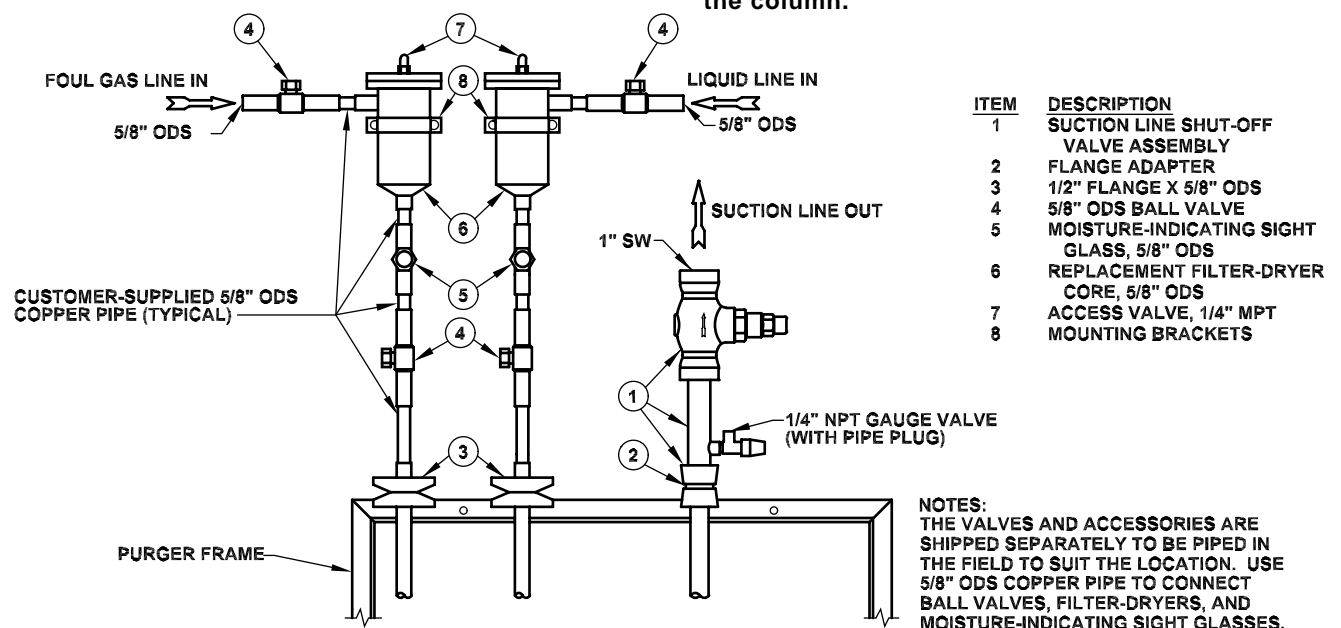


Figure 3. AUTO-PURGER APF filter-dryer conditioning system for halocarbon refrigerants.

## SECTION 2 ELECTRICAL INSTALLATION & MECHANICAL COMPONENT OPERATION

### ELECTRICAL CONNECTIONS

The standard AUTO-PURGER requires a 115V 50/60Hz electrical supply. Also, AUTO-PURGERs requiring 230V 50/60Hz are available. The circuit should be fused to 15 amps. Model AP01 has a ½" (13 mm) knockout on the side of the control cabinet to access the power connection terminal strip. Any unused knockout holes must be sealed to prevent splashing water, dust, and debris from entering the control cabinet.

AUTO-PURGERs other than Model AP01 have an additional ¾" (20 mm) knockout for individual purge point solenoid valves. Wires from each purge point solenoid valve should be brought to the purger control cabinet. Any additional access holes should be made on the side of the control cabinet. All access holes into the control cabinet must be sealed to prevent moisture, dust, and debris entering the cabinet.

Connect one line from each purge point solenoid to the corresponding screw terminal located near the top inside the control cabinet. The numbers on the terminal strip correspond to the numbers on the lights located on the door of the control cabinet. Connect the remaining wire from each purge point solenoid to the ground terminal inside the control cabinet.

Remote purge point solenoid valves must be the same voltage as the purger. An internal transformer provides 12V DC to the electronic control circuits and the door panel wiring. This transformer normally does not need to be serviced.

### PURGE GAS SOLENOID VALVE TIME DELAY CUTOUT

The AUTO-PURGER is equipped with a one hour fixed-time-delay relay which controls the purge gas solenoid valve (#5). This valve meters noncondensable gases to the water bubbler when the purger is operating. See Figure 11. This relay closes the purge gas solenoid valve (#5) after one hour of continuous noncondensable gas release into the water bubbler. In the unlikely event of a float switch malfunction, electrical fault, or system malfunction, this prevents excess amounts of refrigerant being released. However, during start-up of a new purger or under high noncondensable removal conditions, it is sometimes advantageous for the purge gas solenoid valve (#5) to remain open continuously. The delay relay is equipped with an on/off switch to bypass the time delay function. Simply turn the relay to OFF until the high volume of noncondensable gas is removed when. When noncondensable gas is being removed at short intervals, the time-delay relay should be switched ON for normal operation.

If during normal operation the delay relay time is exceeded, the magnet will not make contact with the float switch tube and gas will not be released into the water bubbler. To reset the relay, turn the switch to OFF and back to ON. This resets the delay relay for another hour.

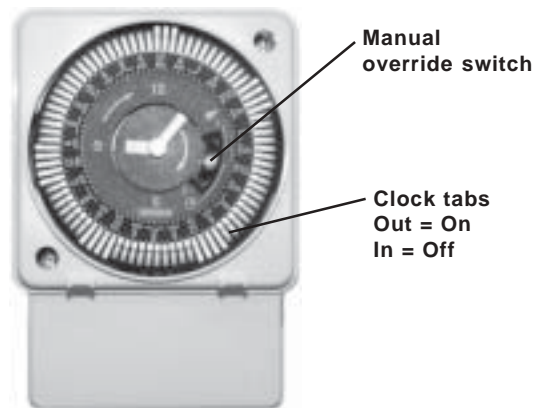
### SETTING THE GRASSLIN TIME CLOCK

A Grasslin Mil 72 Series time clock is used in the AUTO-PURGER since 2/98. To set the correct day, remove the transparent cover and rotate the outer dial until the day is aligned with the triangular marker on the inner dial. To set the time, rotate the minute hand clockwise until the time is correct. AM and PM are indicated on the outer dial. See Figure 4.

If running the purger continuously, push all clock tabs out or set the manual override switch out from the middle position (up or down). If the purger is to run intermittently, such as shutting down at night or on the weekend, set the run time by pushing the clock tabs out for each period that the purger is to be on. Make sure the manual override switch is in the middle. Each tab represents two hours. Tabs pushed to the center represent when the purger is off.

For AUTO-PURGERs shipped before 2/98, a discontinued Grasslin time clock was used. These have red and green tabs. To set the time and day on these clocks, rotate the minute hand on the circular dial. Once the correct day and time are set, the amount of run time per day must be determined and set. Set the ON time using the green tabs and the OFF time using the red tabs. Use a green tab and red tab for each day of the week. To run the purger 24 hours per day, pull all the red pins from the circular dial or turn the small knob in the upper-right corner of the time clock to the on position.

The purger should not operate when the refrigeration compressors are stopped. Terminal connections are provided for an interlock to shut down the purger while the Grasslin Time Clock continues to operate.



**Figure 4. Grasslin Time Clock, Mil 72 Series. (Hansen Part# 20-2226)**

### MANUAL PURGE POINT OPERATION

There is a switch on the front panel of the control cabinet (except AP01) to manually select the current purge point, and to turn the purger to AUTOMATIC and OFF. If it is desired to purge from only one point, turn the switch to that purge point. The purger will go through automatic start-up with the switch in either the AUTOMATIC or MANUAL position. However, air must be present for the purger to purge.

## OPERATION OF THE METERING VALVE

Note: European AUTO-PURGERS do not have a metering valve. Instead, a metering orifice is used. See the next section.

The metering valve meters condensed liquid refrigerant from the high-pressure side of the purger into its flooded evaporator. The flow to the metering valve, part number 20-1714, is controlled by the ¼" liquid metering solenoid valve (#3). This valve is energized when the purger is in AUTOMATIC or MANUAL operation. The refrigerant is filtered through a small flanged strainer prior to the metering valve, which removes any particles that might block the orifice.

An indication of proper operation of the metering valve is a frosted liquid feed line from the float switch chamber through the solenoid valve, strainer, and metering valve to the evaporator. If the stainless steel line is not frosted when the purger is in AUTOMATIC or MANUAL operation, then the flow of refrigerant through the line may be blocked due to dirt in the metering valve, strainer, or solenoid valve.

The metering valve is set and held in place by a locking knob. Unlock this knob using the .035" hex key wrench provided inside the purger control cabinet. To clean the orifice of the metering valve, fully open the metering valve to flush out any particles. Then, close the valve and reopen six turns. This is the proper operating setting for both the ammonia and halocarbon metering valve. On halocarbon purgers shipped prior to 1/91, the metering valve setting is 2 turns open. These older valves are easily recognized by their green metering knobs.

If the line still does not frost, check the liquid metering solenoid valve (#3) for operation. If the solenoid valve appears to be operating normally, then pump out the purger and inspect the solenoid, strainer, and metering valve.

## OPERATION OF THE METERING ORIFICE ON EUROPEAN AUTO-PURGERS

The metering orifice meters condensed liquid refrigerant from the high-pressure side of the purger into its flooded evaporator. The flow to the metering orifice, part number 70-0213, is controlled by the ¼" liquid metering solenoid valve (#3). This valve is energized when the purger is in AUTOMATIC or MANUAL operation. The refrigerant is filtered through a small flanged strainer prior to the metering orifice which removes any particles that might block the orifice.

An indication of proper operation of the metering orifice is a frosted liquid feed line from the float switch chamber through the solenoid valve, strainer, and metering orifice to the evaporator. If the stainless steel line is not frosted when the purger is in the AUTOMATIC or MANUAL operation, then the flow of refrigerant through the line may be blocked due to dirt across the orifice or in the strainer or solenoid valve.

## OPERATION OF COUNTER

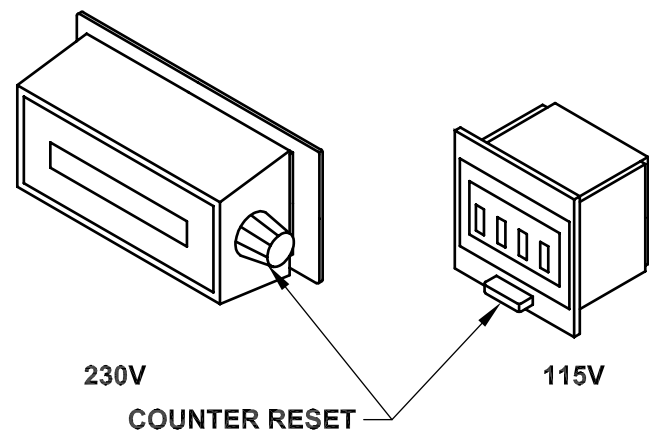
The counter inside the control cabinet displays the number of times the purge gas solenoid valve (#5) opens. This valve bleeds noncondensibles into the water bubbler. The counter does not monitor the *duration* of the purge time, only the number of times the purger has been emptied of air.

The counter can be used to measure noncondensable gas activity. If a daily or weekly record is logged, any abnormal changes in the number of times the purge gas solenoid valve (#5) is operated can be noted. This directly relates to the amount of noncondensable gases released. An abnormal increase may indicate a problem with the system, such as a leak. An abnormal decrease in the operation of the purge gas solenoid valve (#5) may indicate a problem with the purger. In either case, action can be taken to correct the problem.

### Resetting the counter to zero

On 115V AP purgers, the counter has a push-button reset. In order for the counter to reset, the purger must be OFF. When the purger is off, push the knob on the face of the counter to reset to zero.

On 230V AP purgers, the counter has a thumb wheel reset. The purger can be either ON or OFF. To reset the counter, simply turn the thumb wheel until the counter displays zero. See Figure 5.



**Figure 5.** Resetting the purge gas solenoid valve counter.

## LEAK TEST

Use standard refrigeration procedures to check the AUTO-PURGER for leaks before placing it in service. To confirm a leak-free AUTO-PURGER, manually open the foul gas solenoid valve (#4) on the purger by removing the lower seal cap and turning the stem in (clockwise). Next, manually open one remote purge point solenoid valve, if there is one. Manually open the foul gas shut-off valve and allow pressure inside the purger to build to condensing pressure, as shown on the pressure gauge. Then, turn the foul gas valve off. Turn the purger switch on the front panel to AUTOMATIC. This opens the vent solenoid valve (#2) and pressurizes the evaporator section of the purger. Check for leaks. Return all solenoid manual-opening stems to the automatic position.

## SETTING PURGE POINT TIMER

Each purge point timer board contains eight relays which energize the remote purge point solenoid valves. These relays operate in sequence when the AUTO-PURGER is set to AUTOMATIC PURGING. Wire the remote purge point solenoids in sequence. Do not skip any purge point terminals.

The amount of time each purge point relay is active can be adjusted from 1 to 60 minutes. To adjust the time, rotate the screw on the timer clockwise to increase or counterclockwise to decrease. The screw rotates approximately 270° with a linear time increase/decrease with rotation. See Figure 6. These are factory set at approximately 1 minute.

When on AUTOMATIC PURGING, the purge sequence begins at purge point #1, continues to purge point #2, and so on. When the final purge point is completed, the timer circuit returns to purge point #1 and repeats the sequence. This continues as long as the purger front panel switch is set to the AUTOMATIC position.

The Jumper Select connector indicates the final purge point. See Figure 7a. In Figure 7a, only six of eight purge points are desired. With the Jumper Select connector installed as shown, the purge point sequence returns from purge point #6 to purge point #1 and repeats the purge cycle, omitting purge points #7 and #8. To change the final purge point, simply move the Jumper Select connector to the numbered pins corresponding to the final purge point. All purge points up to and including the one where the Jumper Select connector is installed are included in the sequence. All purge points after the one where the Jumper Select connector is installed are omitted from the sequence. See Figure 8. If changing the

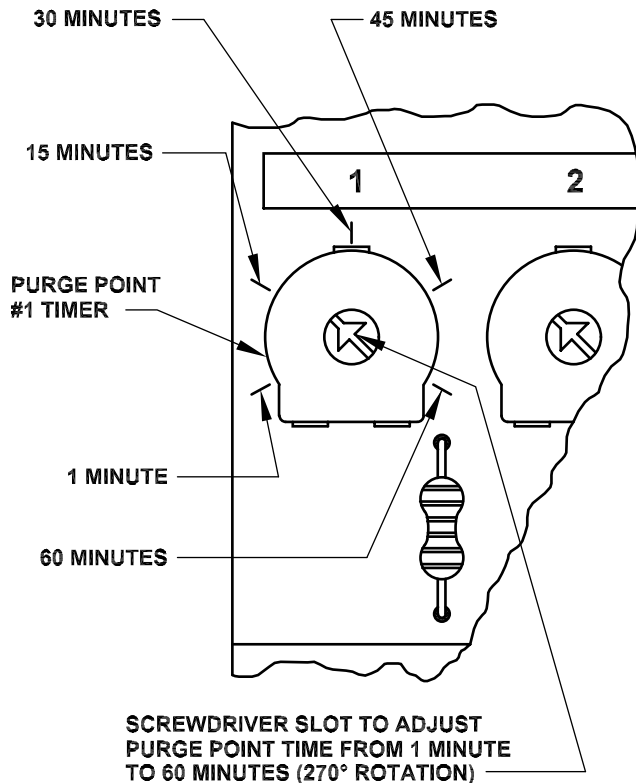


Figure 6. Setting the purge point timer.

number of purge points is expected, keep this in mind when wiring the added purge point solenoids.

Model AP08 has one purge point timer board. Model AP16 has two purge point timer boards electronically tied together. Model AP24 has three purge point timer boards electronically tied together. For models AP16 and AP24, jumpers A and B are used to electronically tie the purge point timer boards together. On Model AP08, the jumpers remain in both the A and B positions.

On Models AP16 and AP24, jumper A is located on the final timer board to return the purge point sequence to the initial timer board. Jumper B is located on the initial timer board. When jumper A returns the sequence to the initial timer board, jumper B resets the solid state electronics to the beginning of the sequence. The purge timer boards automatically cascade from one board to the next board. Therefore, the middle board on an AP24 (points 9 through 16) has neither the A nor B jumper installed. See Figure 7b and 7c.

If the number of active purge points is decreased so that one or more of the purge point timer boards are not used, move jumper A to the last board in the sequence. This may also be the initial board. Install the Jumper Select connector on the pins corresponding to the purge point that is the last in the sequence. Also, disconnect the timer cable, part number 20-1349, from the unused timer board(s).

By temporarily disabling one or more purge point timer boards, in effect an AP24 becomes an AP16 or AP08 and an AP16 becomes an AP08. This may be useful when planning for future system expansion.

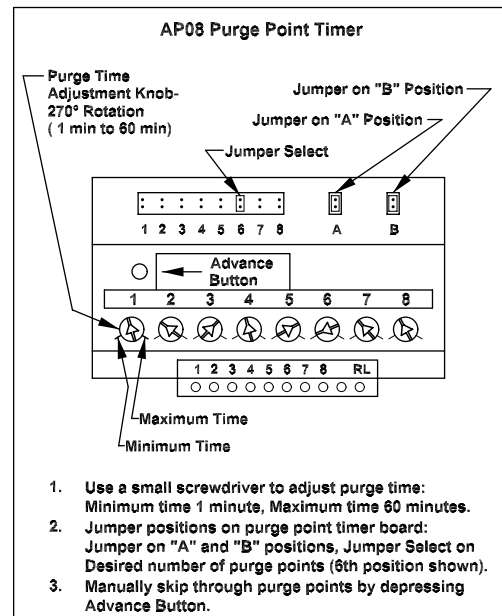
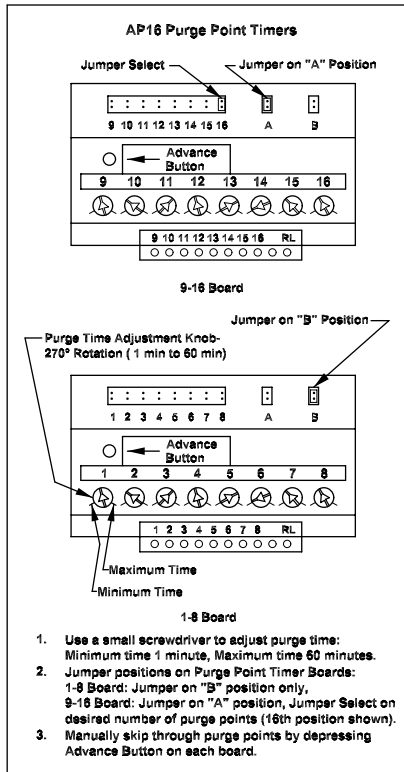
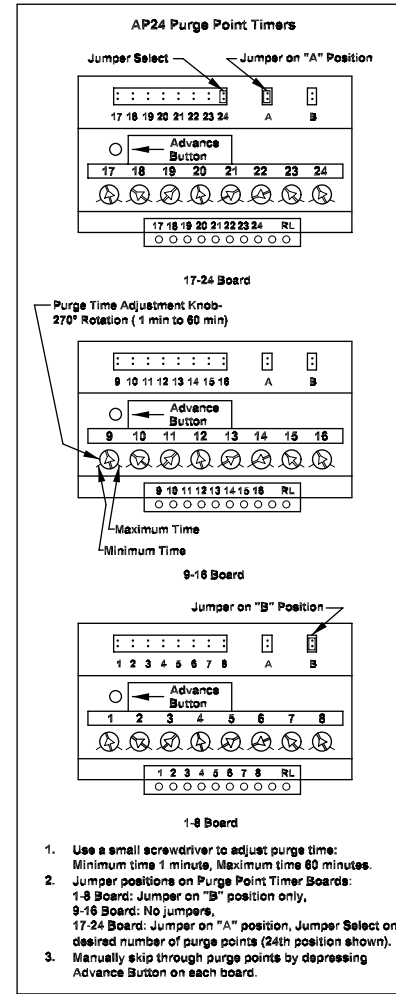


Figure 7a. AP08 purge point timer board.





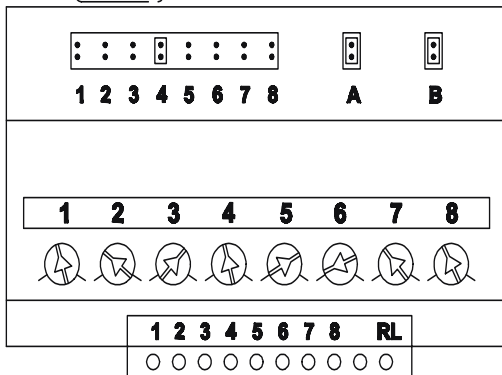
**Figure 7b.** AP16 purge point timer boards.



**Figure 7c.** AP24 purge point timer boards.

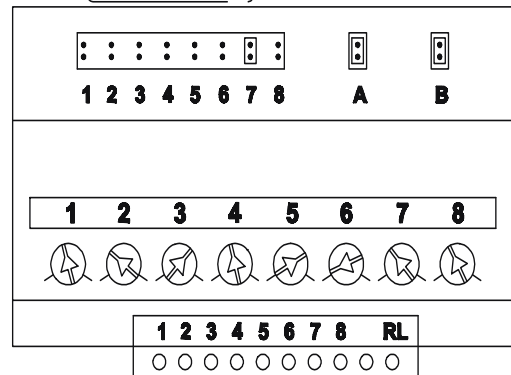
These purge points will be energized in the purge sequence.

These purge points will be omitted from the purge sequence.



These purge points will be energized in the purge sequence.

These purge points will be omitted from the purge sequence.



**Figure 8.** Changing the final purge point.

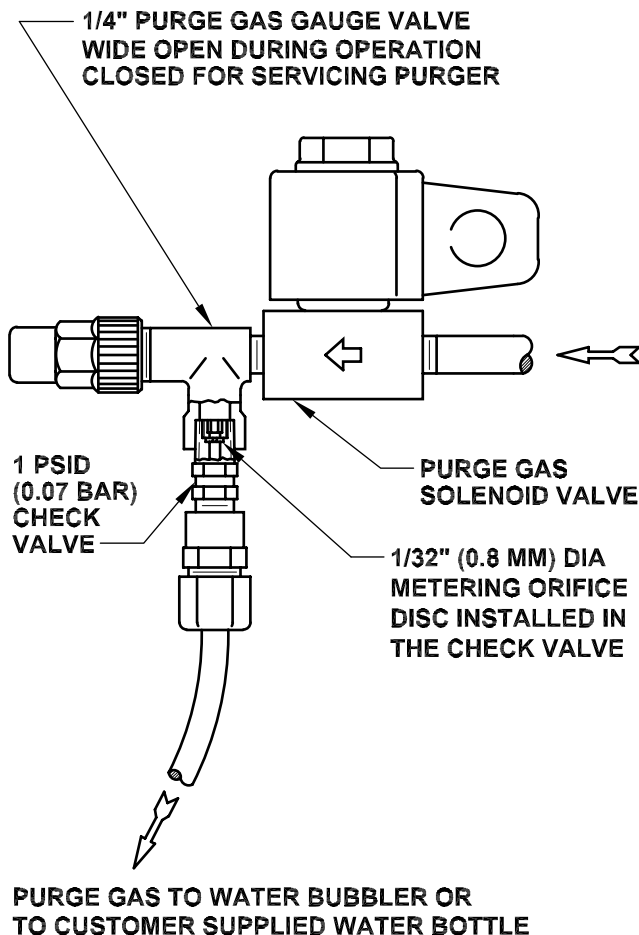
## OPERATION OF PURGE GAS ORIFICE

Purgers shipped after January 3, 1989 incorporate a metering orifice disc inside the 1 psid (0.07 bar) check valve in the purge gas line to the water bubbler. See Figure 9. This 1/32" (0.8 mm) diameter orifice meters the noncondensable gas into the water bubbler to prevent over or under feeding. The 1/4" NPT gauge valve should be fully open during operation and closed for pump out or maintenance. The orifice is sized to remove approximately 2 ft<sup>3</sup> (0.06 m<sup>3</sup>) of noncondensable gas per minute.

Purgers shipped prior to 1989 use the gauge valve, set at 1/8 turn open, as an orifice to bleed adequate noncondensibles to the water bubbler. More than 1/8 turn open causes excessive action.

## OPERATION OF LEVEL CONTROL VALVE

The purpose of the level control valve is to maintain the liquid level in the evaporator chamber. During start-up, the liquid line solenoid valve (#1) energizes to feed liquid refrigerant to the level control valve, which feeds the purger until the level in the flooded evaporator reaches the level of the sensor. During operation of the purger, the level control valve acts as a makeup device to maintain the liquid level. However, approximately 95% of the liquid used in the evaporator is liquid condensed from the foul gas line and recirculated through the liquid line metering valve.



**Figure 9.** The purge gas solenoid valve (#5).

## LIQUID DRAINER

The liquid drainer separates any liquid condensed in the purge point piping. This liquid is fed into the purger's flooded evaporator. Therefore, only foul gas—no liquid—enters the condensing section of the purger. However, if too much liquid comes down the foul gas line due to improper piping, corrective action must be taken. Too much liquid is indicated by continuous frost on the stainless steel line running from the outlet of the liquid drainer into the purger's flooded evaporator. During normal operation, this line should frost and defrost as small amounts of liquid are released into the flooded evaporator. If the line is continuously frosted, one or more purge points are flooded with liquid.

## WATER BUBBLER

Models AP08, AP16, AP24, and APC AUTO-PURGERs are equipped with a water bubbler. Noncondensable gas from the AUTO-PURGER flows through the water bubbler where residual ammonia is absorbed into water. The water, with absorbed ammonia, flows to a drain. The water solenoid valve (#6) opens to automatically replenish water to the bubbler each time the purge gas solenoid valve (#5) energizes. The water solenoid valve (#6) remains energized for 30 seconds after the purge gas solenoid valve (#5) de-energizes (float switch magnet pulls in). Small, 1" (25 mm) diameter bubbles in the water bubbler indicate proper operation.

## START-UP

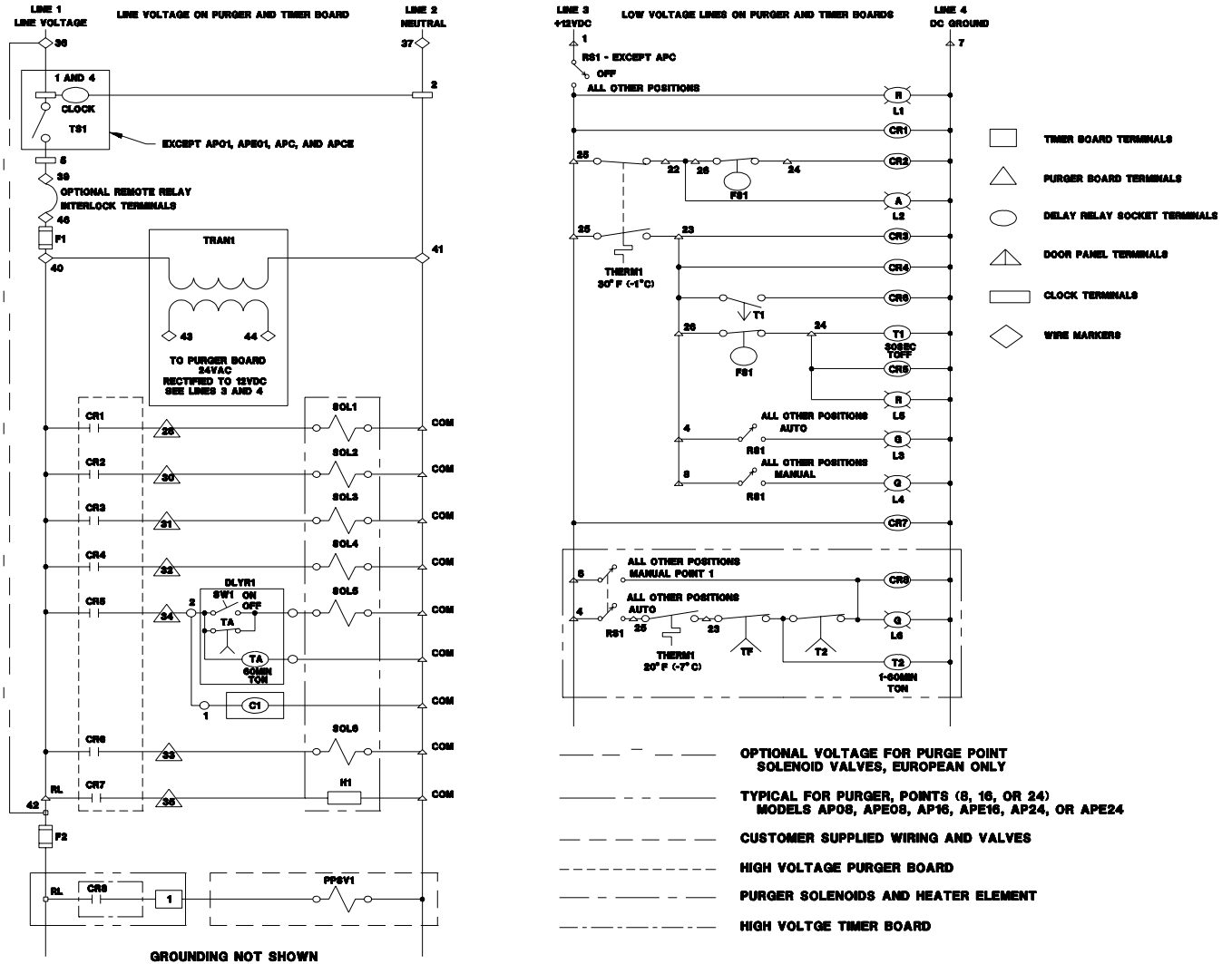
Make sure all piping, electrical connections, and settings are complete as described in this bulletin. Open the foul gas, liquid, and suction line shut-off valves. Open the purge gas gauge valve and water shut-off valve. On Models AP08, AP16, and AP24, turn the purger switch located on the front panel of the control cabinet to the AUTOMATIC position. Be sure the Grasslin 7-Day Time Clock is ON.

The AUTO-PURGER begins with a COOL DOWN stage. The PURGER COOLING DOWN light illuminated on the front panel indicates correct operation. This stage cools the purger to a temperature where efficient separation of noncondensable gas and refrigerant can occur. The AUTO-PURGER will not condense nor allow any foul gas into the water bubbler until the temperature of the purger evaporator reaches approximately 20°F (-7°C). This should take 5 to 15 minutes, depending on suction line temperature.

## PURGER PUMP OUT PROCEDURE, WITH AUTO-PURGER ON

- 1) Close the purge gas gauge valve to the water bubbler.
- 2) Close the liquid line shut-off valve.
- 3) Close the foul gas line shut-off valve.
- 4) Close the water line valve.

The purger will pump down in several hours. To accelerate the process, attach ammonia hoses to the oil drain valves and pump out into a suction line. Close the suction line to isolate the purger. With electricity on, the pressure in the purger should remain at zero. This process should be completed only by knowledgeable refrigeration technicians.



TS1 7-DAY TIME CLOCK

F1 FUSE, MAIN

F2 FUSE FOR REMOTE PPSV

TRAN1 TRANSFORMER, LINE TO 24VAC

SOL1 LIQUID LINE S.V.

SOL2 VENT S.V.

SOL3 LIQUID METERING S.V.

SOL4 FOUL GAS S.V.

SOL5 PURGE GAS S.V.

SOL6 WATER S.V. - OPTIONAL AP01

H1 SPORLAN HEATER ELEMENT

DLTR1 60 MINUTE TIME DELAY RELAY

C1 COUNTER

THERM1 THERMOSTAT, SET AT 30° F (-1°C), FIELD ADJUSTABLE

FS1 FLOAT SWITCH

T1 TIMER WATER S.V., TIME OFF DELAY, 30 SECONDS

T2 TIMER POINT 1, TIME ON DELAY, 1-60 MINUTES

TF FINAL PURGE POINT TIMER, TIME ON DELAY, 1-60 MINUTES

PPSV1 PURGE POINT S.V. 1

L1 LIGHT FRONT PANEL, ON

L2 LIGHT FRONT PANEL, PURGER COOLING DOWN

L3 LIGHT FRONT PANEL, AUTOMATIC PURGING

L4 LIGHT FRONT PANEL, MANUAL PURGING

L5 LIGHT FRONT PANEL, NONCONDENSIBLE GASES TO ATMOSPHERE

L6 LIGHT PURGE POINT 1

SW1 SWITCH TIME DELAY RELAY

TA DELAY ON, 60 MINUTE FIXED DELAY RELAY

RS1 ROTARY SWITCH FRONT PANEL 3 LEVELS, 1 LEVEL ON AP01

**Figure 10.** Ladder diagram for AUTO-PURGER AP operation. Also, refer to the wiring schematic supplied with the purger for the purger control cabinet.

## SECTION 3 AUTO-PURGER OPERATION

The AUTO-PURGER is designed to automatically start-up and operate without the assistance of plant personnel. Beginning at start-up, the following is a description of the refrigerant flow through a purger when all connecting shut-off valves are open. Refer to Figure 11.

### START-UP

On start-up, the AUTO-PURGER enters a COOLING DOWN stage. In this stage, liquid refrigerant fills and cools the purger. Both the flooded evaporator and high-pressure air separator chamber are filled simultaneously. The liquid line solenoid valve (#1) energizes to feed refrigerant to the liquid level control valve, which opens to fill the low-pressure flooded evaporator. The liquid level sensor located in the suction separator chamber senses when the flooded evaporator is full and closes the liquid level control valve.

At the same time the flooded evaporator is filling, liquid refrigerant fills the float ball chamber and the air separator chamber through the liquid line and the 30 psid (2.1 bar) check valve. The refrigerant gas that is formed is vented to suction through the vent solenoid valve (#2). When the float switch chamber fills with liquid refrigerant, the float ball rises and pulls in the float switch magnet, de-energizing the vent solenoid valve (#2).

The purger continues to cool down. A thermostat with a sensor bulb attached to the flooded evaporator senses temperature. At approximately 20°F (-7°C) evaporator temperature, the thermostat switches the purger from the COOLING DOWN stage to AUTOMATIC or MANUAL, as indicated by the purger switch and lights on the control cabinet.

### OPERATION

When the purger is in AUTOMATIC operation, the foul gas solenoid valve (#4) and liquid metering solenoid valve (#3) are energized, allowing a mixture of noncondensable gas and refrigerant into the purger. In addition, the thermostat energizes the timer board to operate the first purge point solenoid valve. The thermostat also allows solenoid valves (#5) and (#6) to open when the float ball is down (magnet away from tube).

If the switch on the front panel of the control cabinet is set to MANUAL (*single purge point*), then that purge point solenoid valve energizes. The purger purges only from that point as long as the switch is positioned to that purge point.

The foul gas carries a certain amount of condensed refrigerant, which is captured by the liquid drainer before it enters the purger's condenser coil. From the liquid drainer, the liquid is fed directly into the flooded evaporator chamber. If this separation does not occur, liquid refrigerant will fill the purger's condenser and limit the condensing capacity of the purger.

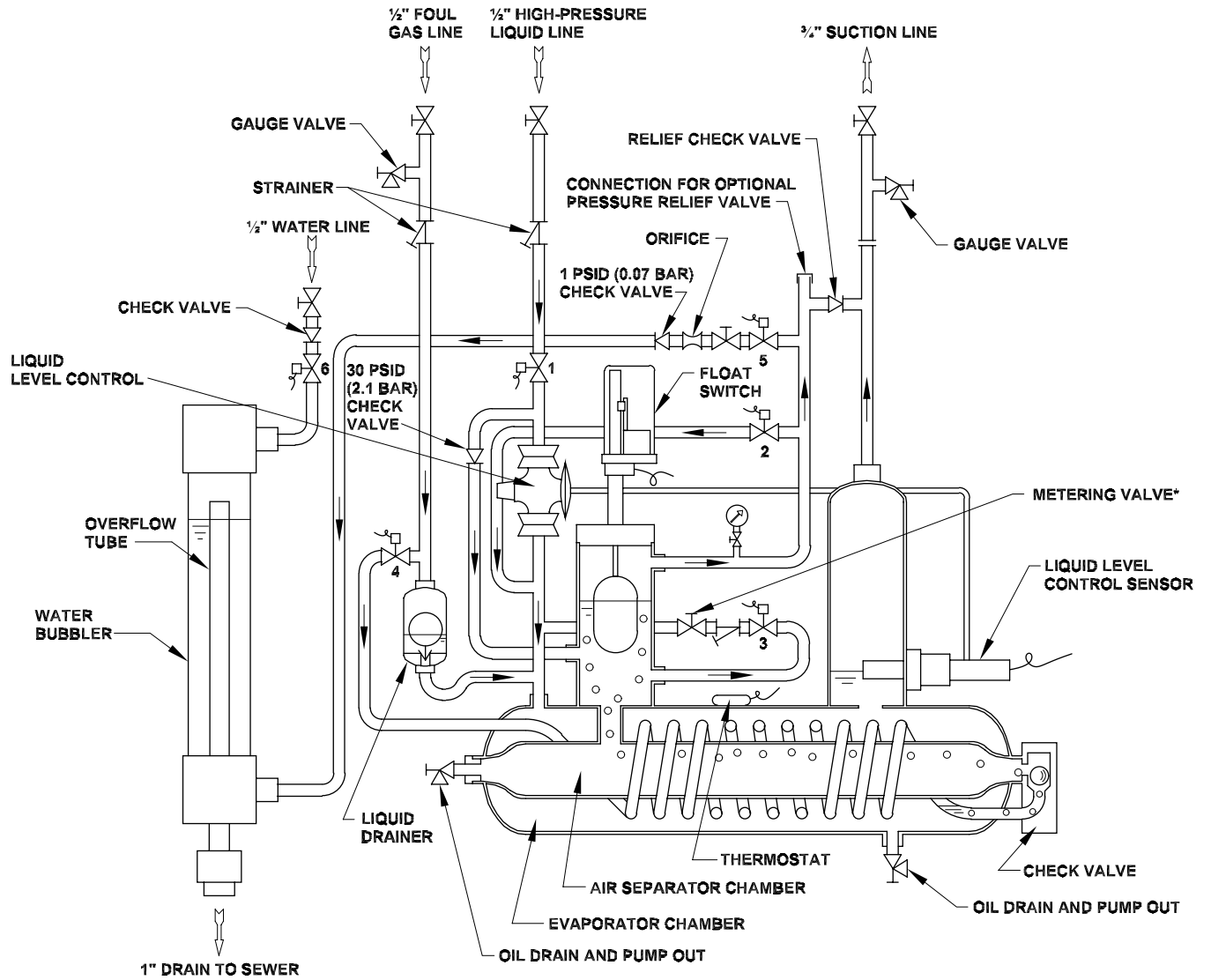
The liquid-free foul gas enters the purger condensing coil, which is submerged in the flooded evaporator. The refrigerant condenses inside the coil. The condensed refrigerant and noncondensable gas then flow through a check valve and back into the air separator chamber. The condensed liquid refrigerant is removed from the high-pressure air separator chamber through the liquid metering solenoid valve (#3), strainer, metering valve (located in the liquid feed line), and then into the flooded evaporator. Note: European purgers have a metering orifice instead of the metering valve.

Meanwhile, the noncondensable gas travels along the top of the air separator chamber and into the float ball chamber where it collects. As more noncondensable gases collect, the liquid level gradually falls, causing the float ball to fall. This changes the SPDT switch position of the liquid level float switch and energizes the purge gas solenoid valve (#5) and the water solenoid valve (#6), allowing noncondensable gas to bleed through the orifice plate into the water bubbler (except Model AP01). As air is released into the water bubbler, the liquid refrigerant level in the purger float ball chamber rises.

The purger timer board operates each specified remote purge point solenoid valve in sequence, as long as the purger switch on the front control cabinet is on AUTOMATIC and the 7-day time clock is on. See the Setting Purge Point Timer section on page 8 for details.

### WATER BUBBLER FLUSH SYSTEM

The water flush system consists of the water bubbler, water solenoid valve (#6), water check valve, and shut-off valve. This is an option that can be added to the AP01. Water is automatically fed to the water bubbler through the water solenoid valve (#6). Noncondensable gas and water mix, absorbing residual amounts of ammonia into the water. The ammonia-laden water is flushed to the drain through the overflow tube. The water solenoid valve (#6) remains energized an additional 30 seconds after the float switch magnet pulls in. This fills the water bubbler with fresh water for the next purge cycle.



\*EUROPEAN PURGERS (APxxE) HAVE A METERING ORIFICE IN PLACE OF THE METERING VALVE

Figure 11. **AUTO-PURGER AP** flow diagram.

**Solenoids:** #1 Liquid Line  
 #2 Vent  
 #3 Liquid Metering

#4 Foul Gas  
 #5 Purge Gas  
 #6 Water

## SECTION 4 TROUBLESHOOTING PURGER OPERATION

### Problem

***Noncondensibles are not being released from the purger***

#### REASON 1

The 30 psid (2.1 bar) check valve is stuck open.

#### CHECK

Close the liquid line shut-off valve. The pressure gauge on the purger should read close to system condensing pressure and should not change when the liquid line is closed. Leave the foul gas line open. Next, open the liquid line shut-off valve and close the foul gas line. The pressure should drop 20–30 psi (1.4–2.1 bar). If not, the 30 psid (2.1 bar) check valve is stuck open.

#### ACTION

Pump out the purger and clean or replace the 30 psid (2.1 bar) check valve (20-1184).

#### REASON 2

The relief check valve is leaking or stuck open.

#### CHECK

Look for frost on the check valve. If operating properly, there should be no frost.

#### ACTION

Replace or repair the check valve.

#### REASON 3

The vent solenoid valve (#2) is leaking or stuck open.

#### CHECK

Look for frost on the outlet of the solenoid valve. If operating properly, there should be no frost.

#### ACTION

Repair or replace the solenoid valve.

#### REASON 4

The metering orifice in the 1 psid (0.07 bar) check valve inside the purge gas solenoid valve (#5) is plugged. See Figure 9.

#### CHECK

Make sure the purge gas solenoid valve (#5) is energized, then look for noncondensable gas release.

#### ACTION

If noncondensibles are not released, then clean or replace the 1 psid (0.07 bar) check valve (20-1183).

#### REASON 5

The foul gas line is not open.

#### SYMPTOM

The pressure gauge on the purger is reading 20–30 psi (1.4–2.1 bar) below system condensing pressure.

#### CHECK

Close the foul gas line shut-off valve. If the reading on the purger pressure gauge falls 20–30 psi (1.4–2.1 bar), the foul gas line was open. If the pressure remains the same, then:

#### ACTION

Check for individual purge point solenoids not energized or stuck closed. Check for closed shut-off valves. Verify proper operation of the foul gas solenoid valve (#4). To check for a sticking solenoid valve, use the manual-opening stem to temporarily open the valve. Observe if the pressure increases to condensing pressure. Also, ensure that the plastic shipping cap has been removed from the foul gas line flange.

#### REASON 6

The time-delay relay time limit has been exceeded.

#### SYMPTOM

The magnet on the float switch is away from the steel tube, the water solenoid is energized, and the NONCONDENSIBLE GASES TO ATMOSPHERE light is illuminated.

#### CHECK

Verify that the one hour time delay limit for the purge gas solenoid valve (#5) has been exceeded.

#### ACTION

Turn the delay relay off momentarily to reset the time delay. For more information see Section 2, Purge Gas Solenoid Valve Time Delay Cutout.

#### REASON 7

No noncondensibles are present in the system.

#### CHECK

Compare the refrigerant liquid temperature from the condenser with the condensing pressure. The pressure/temperature relationship should be within 2 to 3 psi (0.14 to 0.21 bar) to indicate no noncondensibles present.

#### REASON 8

The liquid feed line is plugged.

#### SYMPTOM

The purger appears to be operating properly, but the liquid feed line is not frosted

#### CHECK

Look for a restriction in the metering valve (metering orifice on European purgers).

#### ACTION

Unlock the metering valve knob using the .035" hex key wrench provided inside control cabinet. Open the valve wide to clear any dirt plugging the orifice. Close the metering valve and reopen 6 turns (2 turns for halocarbon purgers shipped prior to 1/91; these have a green knob).

#### CHECK

Make sure the liquid line solenoid valve (#3) is energized and frosted.

#### ACTION

No frost means the strainer or line is plugged. Disassemble and remove the blockage. See Purger Pump Out Procedure on page 10.

#### REASON 9

The foul gas line is flooded with liquid.

#### SYMPTOM

The stainless steel line from the bottom of the liquid drainer to the inlet of the purger evaporator is always frosted. During proper operation, this line should periodically frost and defrost.

#### CHECK

Refer to Piping Instructions in Section 1.

#### REASON 10

The liquid line pressure at the purger is 20 psi (1.4 bar) or more higher than the condensing pressure.

**CHECK**

Verify the pressure at the liquid line and the foul gas line using pressure gauges. Check for a high static head of liquid and/or a pump boosted liquid line pressure.

**ACTION**

For a high static head, install a pressure reducing differential pressure regulator (Hansen's HA2BL) in the liquid line. For a pump boosted liquid line, install the liquid line before the pump.

**REASON 11**

The purge point solenoid coil is shorted.

**SYMPTOM**

The 2 amp (1 amp on 230V purgers) fuse is blown. *Do not increase the amperage of the fuse.*

**CHECK**

Verify the resistance in each coil to find the shorted coil.

**QUICK CHECK**

Replace the blown fuse. Advance purge points with the advance button until the new fuse blows. The faulty coil or wiring is now pinpointed.

**ACTION**

Replace the faulty coil or repair the wiring. Install a new fuse.

**Problem*****Ammonia instead of noncondensibles released from the purger*****SYMPTOM**

Small bubbles are present in the water bubbler and the water bubbler assembly is violently shaking.

**REASON 1**

The foul gas line is not open.

**SYMPTOM**

The pressure gauge on the purger is not reading within 2–5 psi (0.14–0.34 bar) of system condensing pressure.

**CHECK**

Close the foul gas line shut-off valve. The pressure should fall 20–30 psi (1.4–2.1 bar), as indicated on the pressure gauge on the purger.

**ACTION**

Check for a blown 2 amp fuse (1 amp for 230V purger) in the control cabinet. This indicates a burned out purge point solenoid coil. Next, check for a closed valve and a plugged strainer in the foul gas line. Ensure that the plastic shipping cap has been removed from the foul gas line flange.

**REASON 2**

The purge gas solenoid valve (#5) seat is leaking.

**SYMPTOM**

Bubbles are slowly being released in the water bubbler with the NONCONDENSIBLE GASES TO ATMOSPHERE light not illuminated and the float switch magnet pulled in against tube.

**CHECK**

Look for dirt or a worn seat in the purge gas solenoid valve (#5).

**ACTION**

Lift the float switch assembly momentarily to open the valve. This may clear any dirt on the seat. If not, pump out the purger and repair the valve.

**REASON 3**

Oil in the purger.

**SYMPTOM**

No frost is present around the bottom oil drain valve. Normally, liquid is present here and the valve frosts.

**ACTION**

Drain any oil through the valves located on the bottom and left end of the purger, as described in the Oil Drains section on page 4 of this bulletin.

**REASON 4**

The relief check valve is leaking or stuck open.

**CHECK**

Look for frost on the check valve. If operating properly, no frost should be present.

**ACTION**

Repair or replace the check valve.

**REASON 5**

The vent solenoid valve (#2) is leaking or stuck open.

**CHECK**

Look for frost on the outlet of the solenoid valve. If operating properly, there should be no frost.

**ACTION**

Repair or replace the solenoid valve.

**REASON 6**

The liquid level control valve is not operating.

**SYMPTOM**

The suction line and the outlet flange of the liquid level control valve are not frosted.

**CHECK**

Verify the resistance of the heater. Proper resistance of the 115V heater is 900 ohms, for the 230V heater 3,600 ohms, both  $\pm 10\%$ .

**ACTION**

Replace the heater if the circuit is open.

**CHECK**

The power element charge may be lost. Check the capillary tube for breaks.

**ACTION**

Replace the power element. The purger must be isolated from the refrigeration system and the purger pumped out before replacing the power element. Follow the pump out procedure described on page 10.

**REASON 7**

The foul gas solenoid valve (#4) is not open.

**SYMPTOM**

The foul gas line is frosted or cold where the line enters the insulated purger vessel.

**CHECK**

Verify the voltage to foul gas solenoid coil (#4) at terminal 32.

**CHECK**

Manually open the foul gas solenoid valve (#4). The pressure should rise 20–30 psi (1.4–2.1 bar), as indicated on the pressure gauge on the purger.

**ACTION**

If the pressure does not rise, pump out the purger and clean or replace the foul gas solenoid valve (#4).

### REASON 8

A purge point or purge point solenoid is not connected.

#### SYMPTOM

Foul gas pressure is being lost.

#### CHECK

Examine the physical connections to each purge point. Verify proper wiring to the purge solenoid valve remote line connections in the control cabinet. Verify continuity of all wiring to coils.

#### ACTION

Properly install the purge point. Refer to Purge Point Connections in Section 1. Properly connect the purge point solenoid. Refer to Electrical Connections in Section 2.

### REASON 9

Float switch is not properly installed.

#### CHECK

Check to see if float switch is positioned properly. (Refer to mounting instructions.) Loosen retaining screw and lift float switch and remove any ice accumulation that may have pushed float switch up.

#### ACTION

Position float switch assembly on neck of the enclosing tube and tighten retaining screw such that the screw tip is in the groove of the neck assembly.

#### Problem

***Purger does not switch from PURGER COOLING DOWN to AUTOMATIC or MANUAL PURGING***

### REASON 1

The suction temperature is above 20°F (-7°C).

#### CHECK

Verify the suction temperature at the purger suction line connection.

#### ACTION

If not cold enough, move the suction line to lower temperature suction, or reset the thermostat to a higher temperature. *Call the factory before changing the thermostat setting.*

### REASON 2

The evaporator is not filled with refrigerant.

#### CHECK

The float switch magnet should make contact in 5 to 15 minutes after turning the purger on.

#### ACTION

If the magnet does not pull in, check for a restriction at the liquid line shut-off valve, verify voltage at the liquid line solenoid valve (#1) (115V at terminal 28 or 230V for 230V purger), verify continuity of the liquid line solenoid coil, check for a blockage in the liquid line strainer, and ensure that the plastic shipping cap has been removed from the liquid line flange.

### REASON 3

The liquid level control is not working.

#### CHECK

Verify frost at the outlet flange of the liquid level control valve. If no frost is present, check for 115V at terminal 35 (or 230V for 230V purger). Check continuity of the heater. Proper resistance of 115V

heater is 900 ohms, 3600 ohms for the 230V heater, both  $\pm 10\%$ . Check for broken or pinched capillary tube.

#### ACTION

Replace the power element 20-1441 (115V) if the capillary tube is damaged. Replace the heater if the resistance is incorrect (115V heater, 20-1752; 230V heater, 20-1753).

### REASON 4

A restriction in the suction pressure.

#### CHECK

Verify the line size and shut-off valves. The suction line should be a minimum of  $\frac{3}{4}$ " (20 mm) for ammonia and 1" (25 mm) for halocarbons. On new installations, ensure the plastic shipping cap has been removed from the suction line flange.

#### ACTION

Remove restriction or install the correct line size.

#### Problem

***Purge point solenoid valve is not operating properly***

### REASON 1

Solenoid valve faulty.

#### CHECK

Verify coil is operation or look for dirt in the valve.

### REASON 2

No voltage to the timer board.

#### SYMPTOM

The red LED on the timer board is not illuminated.

#### CHECK

Verify 12V DC on cable 20-1197 leading from the purger board. The white wire is neutral and the black and gray wires should have 12V DC when the purger is in the AUTO position.

#### ACTION

Repair the cable. If 12V DC is present, go to the next CHECK step.

#### CHECK

If cable 20-1197 is OK, check for 12V DC at terminal 4 on the door panel. Terminal 7 on door is neutral.

#### ACTION

If no voltage is present, check wire 4 for continuity and repair if necessary.

### REASON 3

A fault in the timer board cable 20-1196.

#### SYMPTOM

In AUTOMATIC, the purge point lights do not operate but the purge point solenoids are operating.

#### CHECK

Verify the continuity of each lead from the timer cable, 20-1196.

#### ACTION

Repair the fault.

### REASON 4

A fault in the purger board to timer board cable 20-1197.

#### SYMPTOM

In AUTOMATIC, either all purge point lights are dimly illuminated or no lights are illuminated.



**CHECK**

Verify the continuity of each lead.

**ACTION**

Repair the fault.

**REASON 5**

A purge point solenoid valve is not operating.

**CHECK**

Verify continuity through the two amp fuse (one amp for 230V purger).

**ACTION**

If faulty, replace the fuse.

**CHECK**

Verify the voltage at terminal RL. The voltage should be 115V (230V for 230V purger). If no voltage is present, check the continuity of lead 42.

**Problem**

***Control cabinet appears to have no power (does not enter COOLING DOWN when switched on)***

**REASON 1**

No power to the purger.

**SYMPTOM**

The ON and PURGER COOLING DOWN lights are not illuminated.

**CHECK**

The LINE and NEUTRAL terminals inside the control cabinet should have 115V (230V for 230V purger) across the terminals.

**REASON 2**

The 7-Day timer is not on.

**CHECK**

Verify the time setting on the timer.

**ACTION**

Set the time according to the instructions on page 6 of this bulletin.

**REASON 3**

No power to the purger board 20-1773.

**SYMPTOM**

The red LED on the purger board is not illuminated.

**CHECK**

Verify voltage to the board. The voltage between terminals RL and COMMON should be 115V (230V for 230V purger).

**REASON 4**

A fault in the wiring to the purger board.

**CHECK**

Verify continuity between leads 36, 37, 39, and 46.

**ACTION**

Repair if defective.

**REASON 5**

The transformer is faulty.

**SYMPTOM**

The red LED on the purger board is not illuminated but there is power at terminal RL.

**CHECK**

Verify 24V AC between leads 43 and 44.

**ACTION**

If no voltage between the leads, replace the transformer. If voltage is present, go to reason 6.

**REASON 6**

A short in the 12V DC circuit.

**SYMPTOM**

The red LED on the purger board 20-1773 is not illuminated if there is a short. On purgers shipped between 7/88 and 11/91, the purger board has a built-in fuse. If the fuse is blown, replace it after completing the following CHECK step.

**CHECK**

Disconnect purger cables 20-1195 and 20-1197, and terminal plug connections 22 through 26. The red LED should now be illuminated.

**ACTION**

If the LED does not illuminate, replace the purger board 20-1773. If the LED illuminates, plug in each cable separately until the red LED goes out to determine which circuit has a ground short.

**REASON 7**

A fault in the purger cable 20-1195.

**SYMPTOM**

The ON light not illuminated but the red LED on purger board is illuminated.

**CHECK**

Verify 12V DC between terminal 1 and terminal 7 (neutral) on the door.

**ACTION**

If no voltage between the terminals, check the continuity of cable 20-1195 and repair. If voltage is present, go to reason 8.

**REASON 8**

A faulty rotary switch (purger switch).

**SYMPTOM**

Look for no voltage at door terminal 2 when the rotary switch is set to the AUTOMATIC position.

**ACTION**

If no voltage is present, check wiring leads 1 and 2, and the rotary switch for faults. If voltage is present, go to reason 9.

**REASON 9**

A fault in the purger cable 20-1195.

**SYMPTOM**

The ON light and red LED on the purger board are illuminated but the purger is not operating.

**CHECK**

Verify the voltage between lead 2 and neutral on the purger cable 20-1195.

**ACTION**

If no voltage is present, then replace the purger cable 20-1195. If voltage to the purger board through lead 2 on the door panel is 12V DC, then there is a fault on the purger board. Replace the purger board 20-1773.

**Problem**

***Water bubbler develops excessive mineral coating***

**REASON**

Hard water in the water bubbler.

**ACTION**

Switch the water line to softened water or install the optional water conditioning housing and cartridge.

## Parts List

Mechanical			
Part Number	Description	Standard (US)	European
20-1179	Level Control Valve w/Power Element (115 Volt)	✓	✓
20-1647	Level Control Valve w/Power Element (230 Volt)	✓	✓
20-1441	Power Element, Level Control (115 Volt)	✓	✓
20-1739	Power Element, Level Control (230 Volt)	✓	✓
20-1752	15 Watt Heater for Level Control (115V)	✓	✓
20-1753	15 Watt Heater for Level Control (230V)	✓	✓
HLLSW	Float Switch Assembly	✓	
HLLSWE	Float Switch Assembly		✓
20-1738	Float Ball Assembly Kit, includes: 20-1142 Float Ball Assembly 20-1212 Gasket-Top Adapter 77-0037 Screws (2)	✓	✓
20-1772	Water Bubbler Assembly, antisiphon (w/end connections)	✓	✓
20-1186	Metering Valve	✓	
20-1198	Metering Valve Seal Kit	✓	
70-0213	Metering Orifice		✓
20-1648	Metering Valve Strainer	✓	
20-1648	Metering Orifice Strainer		✓
20-1737	Screen Assembly Replacement Kit for above strainers, includes: 20-1535 Screen Assembly 78-0016 Strainer Gasket	✓	✓
70-1059	Plunger Kit for all purger solenoid valves	✓	✓
20-1183	Check Valve, 1 psid (.07 bar)	✓	✓
20-1184	Check Valve, 30 psid (2.1 bar)	✓	✓
20-1185	Check Valve, 225 psid (15.5 bar)—Replaces older 200 psid (13.8 bar) check valve	✓	✓
20-1214	Check Valve Seal Kit, for 1, 30, and 200/225 psid (.07, 2.1, and 13.8/15.5 bar) check valves	✓	✓
20-1776	Air Indicating Column for halocarbon purger	✓	✓
20-1311	Liquid Drainer	✓	✓

### PURGE POINT SOLENOID VALVES

For the customer-supplied purge point solenoid valves, Hansen recommends our HS8 with close-coupled strainer. This is a 1/2" port, heavy-duty, pilot-operated solenoid valve with stainless steel piston. The purge point solenoid valve must be a minimum of 1/2" port size to avoid excess pressure drop across the valve.



**HS8ST 1/2" Solenoid Valve with Close-Coupled Strainer**

The standard molded coil is for 115V, 208/230V, or 24V. Flange connections available are 1/2", 3/4", and 3/8" FPT, socket weld, and weld neck. Also available is 5/8" ODS. To order, specify catalog number HS8ST, required connection style and size, and volts. Specify DIN plug solenoid connection if needed.



**HS8ST 1/2" Solenoid Valve with DIN Plug Connection and Close-Coupled Strainer**

## Parts List

Electrical				
Part Number	Description	Standard (US)	European	
20-1202	LED Light—Red	✓	✓	✓
20-1203	LED Light—Yellow	✓	✓	✓
20-1204	LED Light—Green	✓	✓	✓
70-1064	Solenoid Coil, Junction Box—115V, 50/60 Hz, 16 Watt	✓		
70-1063	Solenoid Coil, Junction Box—230V, 50/60 Hz, 16 Watt	✓		
70-1055	Solenoid Coil, Din Plug—115V, 50/60 Hz, 16 Watt			✓
70-1054	Solenoid Coil, Din Plug—230V, 50/60 Hz, 16 Watt			✓
20-2226	7-Day Time Clock (115 Volt, 50/60Hz)	✓	✓	✓
20-2227	7-Day Time Clock (230 Volt, 50/60Hz)	✓	✓	✓
20-1773	Purger Control Board Less Plug-in Connector, 115 Volt or 230 Volt Replaces 20-1130 & 20-1536	✓	✓	✓
20-1499	Purger Control Board with Plug-In Connectors (Replaces Older Boards with Screw Terminals)	✓	✓	✓
20-1131	8-Point Timer Board, Less Plug-In Connectors	✓	✓	✓
20-1500	8-Point Timer Board with Plug-In Connectors (Replaces Older Boards with Screw Terminal)	✓	✓	✓
20-1205	Transformer, 115V/24VAC	✓	✓	✓
20-1602	Transformer, 230V/24VAC	✓	✓	✓
20-1307	Thermostat	✓	✓	✓
20-1498	Time-Delay Relay, 1 Hour Fixed, Off Switch (115 Volt)	✓	✓	✓
20-1528	Time-Delay Relay, 1 Hour Fixed, Off Switch (230 Volt)	✓	✓	✓
20-1280	4-Digit Counter with Reset, 115 Volt	✓	✓	✓
20-1473	6-Digit Counter with Reset, 230 Volt	✓	✓	✓
HS2B(10)	HS2 (Brass) Water Solenoid Valve Only (Less Coil), 1/4" FPT (#6)	✓	✓	✓
HS2(10)	HS2 Solenoid Valve Only (Less Coil), 1/4" FPT (#2 and #3)	✓		
70-0208	HS2 Flanged Solenoid Valve Only (Less Coil), (#2 and #3)			✓
HS2(30)	HS2 Liquid Line Solenoid Valve Only (Less Coil), 1/2" FPT (#1)	✓		
70-0208	HS2 Flanged Liquid Line Solenoid Valve Only (Less Coil), (#1)			✓
HS2N(10)	HS2 Purge Gas Solenoid Only (Less Coil) with Neoprene Seat 1/4" FPT (#5)	✓		
70-0208	HS2 Flanged Purge Gas Solenoid Only (Less Coil), (#5)			✓
HS8(10)	HS8 Foul Gas Solenoid Valve Only (Less Coil) (#4)	✓	✓	✓
20-1182	Asco Solenoid #8262C80N, 1/4" Connection 115 Volt (Older model, indicated by a green coil housing)	✓	✓	✓
20-1538	Repair Kit for Asco Solenoid, Asco Part #302-020 (Older model, indicated by a green coil housing)	✓	✓	✓
20-1349	Cable, Timer to Timer Board	✓	✓	✓
20-1197	Cable, Purger Board to Timer Board	✓	✓	✓
20-1195	Cable, Purger Board	✓	✓	✓
20-1279	Fuse, 2 amp, 115V Purger	✓		
20-1281	Fuse, 5 amp, 115V Purger	✓		
20-1694	Fuse, 1 amp, 230V Purger	✓		
20-1695	Fuse, 3 amp, 230V Purger	✓		
20-1697	Fuse, 2 amp, 115V Purger			✓
20-1699	Fuse, 5 amp, 115V Purger			✓
20-1696	Fuse, 1 amp, 230V Purger			✓
20-1698	Fuse, 3 amp, 230V Purger			✓

Replacement control cabinets are available for both standard (US) and European purgers. Contact the factory for selection.

## CAUTION

Hansen purgers are for refrigeration systems only. These instructions and related safety precautions must be read completely and understood before selecting, using, or servicing these purgers. Only knowledgeable, trained refrigeration technicians should install, operate, or service these purgers. Stated temperature and pressure limits should not be exceeded. Purger components should not be removed from the purger unless the system has been evacuated to zero pressure. See also the Safety Precautions in the current List Price schedule and the Safety Precautions Sheet supplied with this product. Escaping refrigerant can cause injury, especially to the eyes and lungs.

## WARRANTY

Electrical and electronic components are guaranteed against defective materials and workmanship for 90 days F.O.B. our plant. All other components are guaranteed against defective materials or workmanship for one year F.O.B. our plant. No consequential damages or field labor is included.

## STANDARD (US) AUTO-PURGER AP CONSTRUCTION VERSUS EUROPEAN AUTO-PURGER APE CONSTRUCTION

The standard (US) AP and European APE operate in the same manner, except as noted in this bulletin. The basic differences in construction between the two versions are outlined in the chart below.

Component	Standard (US) Construction	European Construction
Piping	NPT Threaded Pipe	Welded Pipe
Valves	1/4" NPT Threaded Connections (except #4, 1/2" Flanged)	Welded/Flanged
Electrical	US Electrical Standards	European Electrical Standards
Solenoid Coils	Junction Box	DIN Connection
Float Switch	1/2" NPSM Connection	DIN Connection
Expansion Device	Metering Valve	Metering Orifice

## DEFINITIONS

**Noncondensable gases:** These gases, primarily air, cannot be condensed by the normal system operating temperature and pressure. They cause higher-than-necessary head pressure. Noncondensable gases can enter a refrigeration system through vacuum leaks, break down of oil and refrigerant, and during service repairs and system charging.

**Foul gas:** A vapor mixture of noncondensable gases and refrigerant gas.

**High-pressure liquid:** Refrigerant liquid source from a condenser or receiver.

**P-trap:** A piping arrangement, typically in condenser drain lines, to prevent passage of gas while enabling liquid to proceed.

**Purge point:** A location on the refrigeration system above the liquid level where foul gas is taken from and piped to the purger.

**Purge gas:** The noncondensable result of the separation of refrigerant gas from the foul gas by the purger. Normally passed into a water bubbler or water reservoir.

## SELECTING AN AUTO-PURGER®

In addition to the AUTO-PURGER® AP, Hansen Technologies offers two other versions—the compact AUTO-PURGER® APM and the Nonelectrical AUTO-PURGER® (NEAP). Use the following descriptions to help select the best AUTO-PURGER for your needs. For additional assistance, contact the factory.

### AUTO-PURGER AP

This is the original AUTO-PURGER. It has solid-state control and is ideal for larger systems, up to 1500 tons (5300 kW) ammonia. This is two to three times the air removal capacity of the Armstrong purger. With models available to purge up to 24 points, the AP features automatic start-up with electronic control. The purge cycles can be individually adjusted to meet system requirements. The AP includes an automatic water bubbler. An optional NEMA 4 rated enclosure is available. A European option is available that features all-welded construction and conformance to European electrical standards. For ammonia and halocarbon refrigeration systems. Assembled, tested, and ready to run.



### AUTO-PURGER APM

A more compact version of the original AP, the AUTO-PURGER APM is ideal for medium-size systems, up to 200 tons (700 kW). Like the AP, the APM features automatic start-up with electronic control. Designed for up to four purge points, an electronic "brain" searches for noncondensable gases in the system and purges at those points when air is present. The APM includes an automatic water bubbler and comes standard with a NEMA 12,13 control cabinet. For use with ammonia refrigeration systems. Assembled, tested, and ready to run.



### NONELECTRICAL AUTO-PURGER (NEAP)

The Nonelectrical AUTO-PURGER (NEAP) is ideal for small systems, up to 100 tons (350 kW). The nonelectrical design also makes the NEAP ideal for explosion proof applications. The simple design of the NEAP features easy start-up and is generally used to purge a single point. For use with ammonia refrigeration systems. Assembled, tested, and ready to run.

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