AUTO-PURGER® AP

Non-Condensable Gas (Air) Refrigerant Purger

Model APWT

OPERATOR INSTALLATION & INSTRUCTION MANUAL

For Models APCWT, AP08WT, AP16WT, AP24WT

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The AUTO-PURGER is an automatic, electronically-controlled non-condensable gas (air) refrigerant purger for maintaining ideal condensing pressure. All models 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, 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.

A computerized model—APCWT—is available, which uses a separate plant computer or programmable logic controller (PLC) to operate the various remote purge point solenoid valves independently.

The internal surface area and flooded evaporator efficiency give the AUTO-PURGER 10 times the foul gas condensing capacity of purgers with small electric hermetic compressors. In a system with normal non-condensable 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 non-condensable gas 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 are the maximum practical number per purger. For example, a system with 24 points can purge for up to 20 minutes per point, which would require a 480-minute (8-hour) cycle. Each purge point can be purged 3 times a day. This may, or may not, be adequate. Therefore, a second purger could be used, and the purge points divided equally between the two purgers.

The AUTO-PURGER can operate over a wide range of condensing pressures with a minimum operating pressure of 80 psig. This is important for refrigeration systems that operate at low condensing pressures during cold ambient conditions.

MOUNTING INSTRUCTIONS

The APWT has the same install footprint as the APW (and AP). 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 in an accessible area, but away from moving equipment that could accidentally encounter 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. The APWT comes standard with a NEMA 4 enclosure for outdoor use, areas near falling or spraying water, or in constant high-humidity areas. Sealed conduit wiring is recommended.

Install the float switch assembly on the purger by removing the packaging material and metal shipping tube. Slip the float switch assembly over the enclosing tube, being sure the float switch assembly bottoms on the neck of the enclosing tube.

Warning: Tighten the retaining screw such that the screw tip is in the groove of the neck assembly. If the float switch assembly is not properly positioned and retained, the switch may not function. Only use the Hansen-manufactured float switch with the AUTO-PURGER.

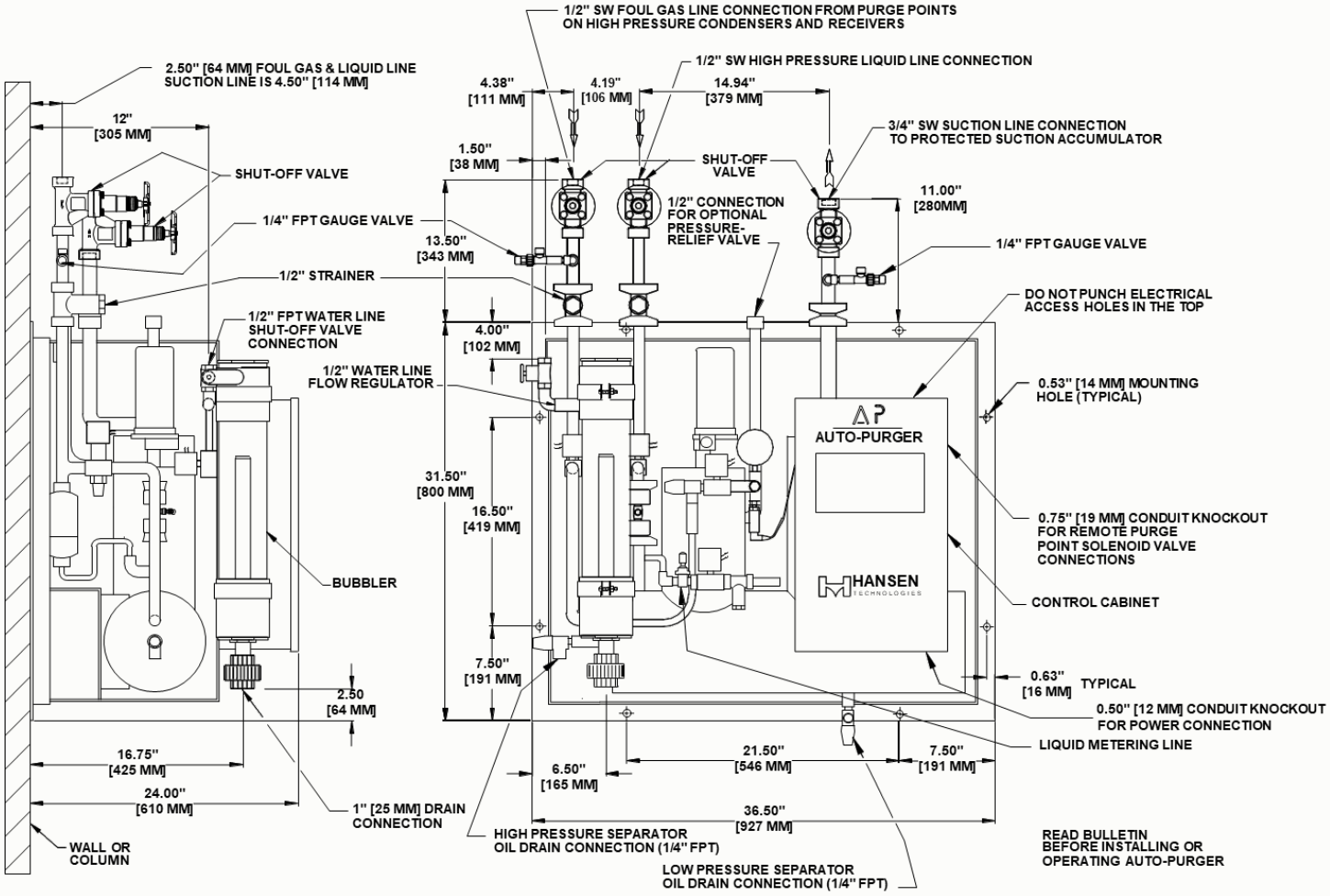


FIGURE 1. AUTO-PURGER APWT INSTALLATION DIMENSIONS.

FOUL GAS PIPING FOR MULTIPOINT PURGING

It is nearly impossible to predict where non-condensable 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.

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

For multipoint AUTO-PURGERS, the purge point solenoid valves may be manifolded into one line to the purger. However, only one purge point solenoid should be energized at a time. Connecting two purge points to one purge point solenoid may result in gas flowing from one purge point 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.

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.

One purge point solenoid valve must always be open to prevent losing the foul gas pressure to the purger.

EVAPORATIVE CONDENSER PIPING

Typically, evaporative condenser outlet liquid drain lines on each circuit must drop between 4′– 6′ (1.2m–1.8m) from the centerline of the condenser outlet to the centerline of the 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 IIAR papers on condenser piping design. Also, consult the condenser manufacturer's 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 cause liquid to back 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.

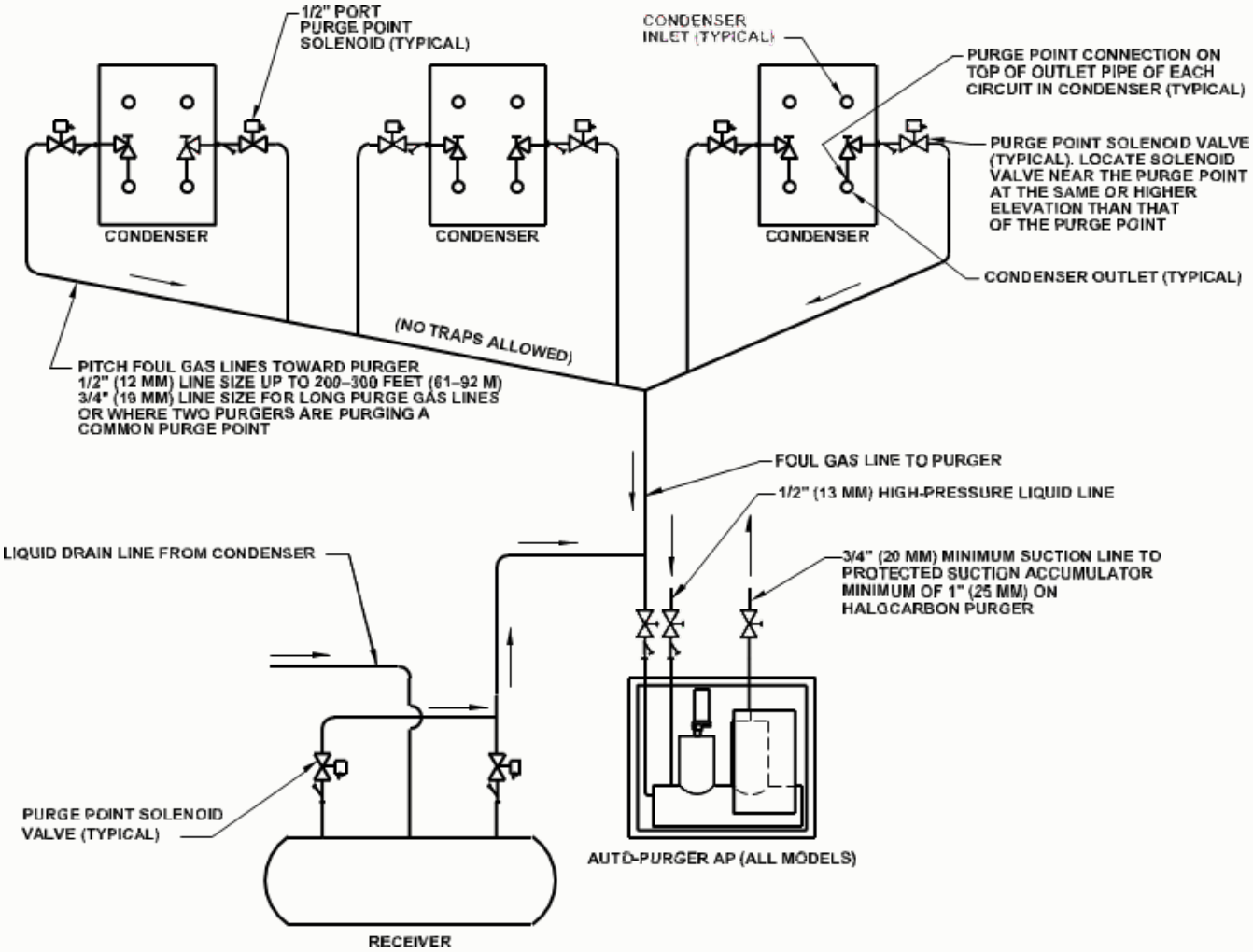


FIGURE 2. TYPICAL PURGE POINT LOCATIONS

SUCTION LINE

A ¾″ (20 mm) suction line should be connected to a protected main suction line or be piped to a suction accumulator. The default purger temperature set point to exit PURGER COOLING DOWN mode is 32°F (1°C). The set point should allow an approximate temperature difference of 10°F (5.6°C) from the suction temperature to allow temperature transfer losses between the purger evaporator and the thermistor. The temperature set point can be set to a maximum of 35°F (1.7°C), allowing the suction temperature to be approximately 25°F (–4°C) without affecting temperature transfer losses between the evaporator and thermistor. See page 20 for more information on setting the temperature set point.

WATER LINE

An automatic water bubbler flush system is provided with the purger. A water line must be connected to the water solenoid valve (V6). The connection is ½″ FPT. The water supply pressure should be 30 – 80 psig (3.1– 6.5 bar).

Over time, the water bubbler's clear tube may become coated with mineral deposits. 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.

OIL DRAINS

Excess oil can reduce the purger capacity by lowering the evaporating or condensing rate. Oil that may collect in the purger can be drained off through the two capped ¼″ valves on the purger. See Figure 1. Before draining oil, use good engineering practice to pump out and isolate the purger from the foul gas and liquid lines. Once the purger is completely pumped out, close the suction line. 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 located where oil will not be directed into the purger. The liquid line supplies refrigerant during start-up and continues to feed makeup liquid with the metering valve. The liquid line solenoid valve (V1) on the AUTO-PURGER closes when the AUTO-PURGER is off. See Figure 13. The supply pressure must be at least 100 psid above the purger evaporator pressure to ensure proper operation of the liquid feed valve. The remainder of the required refrigerant is condensed from the foul gas line, and the condensed liquid is fed to the evaporator through the metering valve located downstream of the liquid metering solenoid valve (V3).

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 non-condensable gas into the purger. A 225 psid (15.5 bar) relief check valve from the float chamber to the suction line. Older purgers have a 200 psid (13.8 bar) relief check valve. The water line has a 0.5 GPM flow control valve.

DRAIN LINE

A 1" (25 mm) PVC socket/1" FPT water drain connection is located at the bottom of the bubbler. The water should flow to a suitable drain or container. 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.

Initially, fill the bubbler with water through the 3" (75 mm) cover located on top of the tube. Keep the plug lubricated and hand-tight. Check for leaks at the hose fittings.

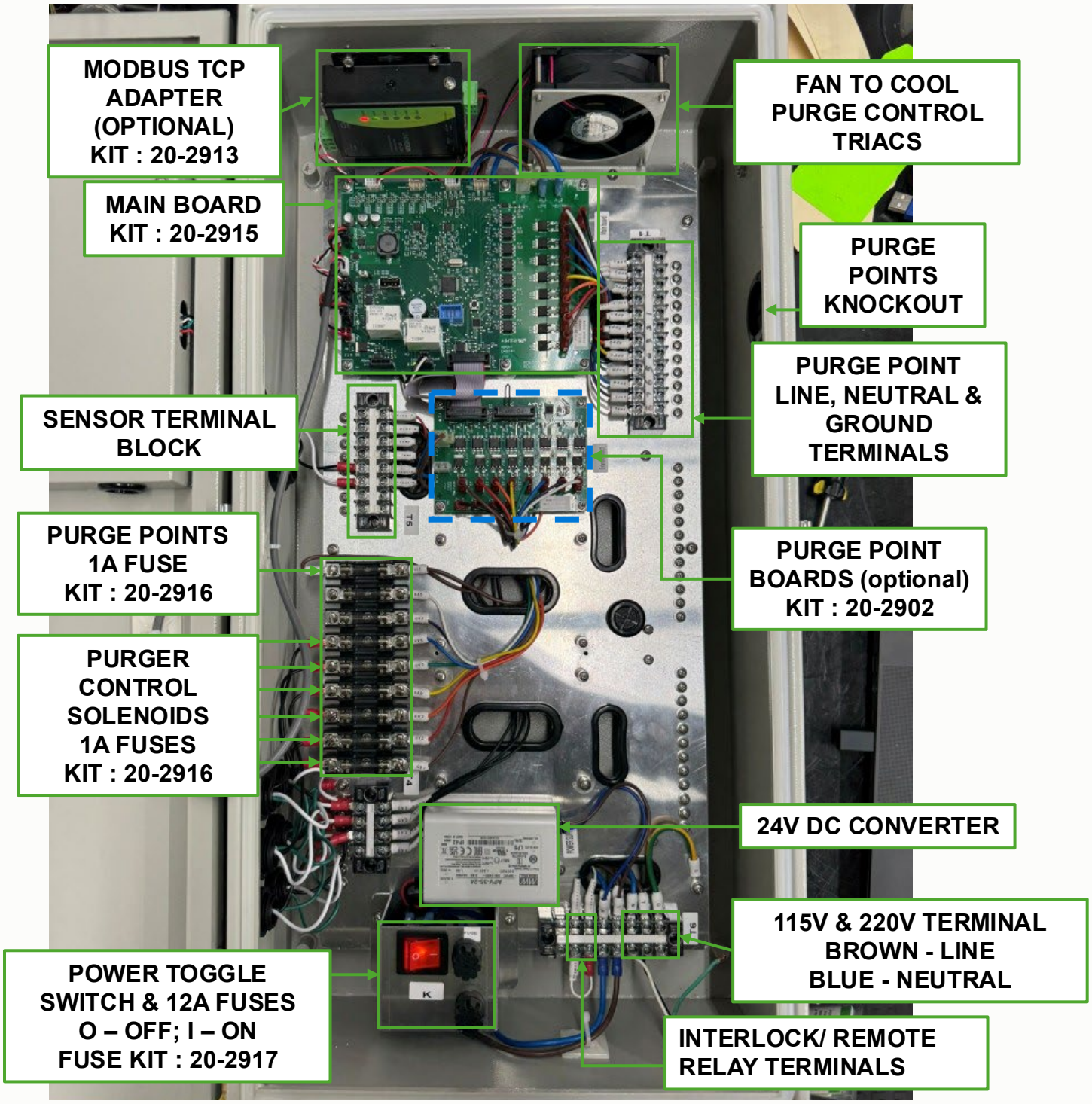


FIGURE 3. APWT CONTROL CABINET DIAGRAM

ELECTRICAL CONNECTIONS

The APWT requires a 115V 50/60Hz or a 230V 50/60Hz electrical supply. The circuit should be fused to 12 amps. Any unused knockout holes must be sealed to prevent splashing water, dust, and debris from entering the control cabinet. To cycle power to the control cabinet, flip the toggle switch located at the lower left of the control box to the right. See Figure 3.

AUTO-PURGERs have a 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. Access holes made on the side of the control cabinet must be sealed to prevent moisture, dust, and debris from entering the cabinet.

Connect one wire from each purge point solenoid to the corresponding screw terminal located on the right side of the control box. The numbers on the terminal strip correspond to the purge point number on the PURGE POINT CONFIGURATION screen. The unlabeled terminals are for neutral wires. Connect the remaining wire from each purge point solenoid to the ground terminal inside the control cabinet.

Remote purge point solenoid valves must have the same voltage as the purger. The internal 24V DC power supply is only used for the internal electronic control circuits for the AUTO-PURGER.

MAIN BOARD

The APWT main board controls the inputs and outputs of the purger as well as the control logic, which replaces components such as time relays, counters, and the purge point timer. The board is powered by the line voltage going into the purger and works with both 115V and 230V inputs. The board also includes a USB connector to update the firmware of the purger.

The TRIACS on the main board energize and de-energize the purger control solenoids. The TRIACS are labelled V1 – V6 on the main board. These labels match the solenoids in Figure 13. For example, TRIAC V1 controls the liquid line solenoid V1; TRIAC V3 controls the liquid metering solenoid V3.

The main board uses LED lights to represent different operational states. Located in the middle of the board is the main board status LED. The LED shows the current state of the main board software. The **Good/Operational** state is indicated by the LED flashing once every *2 seconds*. This means the board is functioning properly, the software is receiving signals from the display, and there are no errors. The **ALARM** state is indicated by the LED flashing once per second. If any of the following alarms are active, the board will be in this state: LOSS OF FOUL GAS PRESSURE, PURGER COOLING DOWN, NO ENABLED POINTS, and NO MICRO-SD CARD DETECTED. The **INTERLOCK OPEN** state is indicated by the LED flashing twice per second. The purger will be in this state if the jumper wire across the interlock terminals is disconnected or the external device's remote relay contact is open. When the system is in this state, the purger cannot be started by pressing ON via the HOME PAGE until the connection is closed. The **ERROR!** state is indicated by the LED flashing ~4 times per second. Two situations can cause the purger to enter this state: if either the pressure transducer or thermistor is disconnected or malfunctions, or the Single Purge Event Time Limit Exceeded alarm is triggered. The **SYSTEM FAILURE** state is indicated by the LED being off or flashing ~4 times per second. This can be caused by a disconnected display or the software getting stuck/frozen on a screen. To fix this state, the purger must be power cycled by flipping the toggle switch in the control cabinet. See the Alarms section on pages 19 and 24.

There are two other LEDs on the main board: the **interlock status** and **float ball status** lights. The **interlock status** LED will illuminate brightly when a jumper is wired across the terminal or the external device interlock/remote relay connection is closed. The LED will be dimmed if the interlock is open. When the interlock connection is open, the purger cannot be started by pressing ON via the HOME PAGE until the connection is closed. The **float ball status** LED indicates whether the float ball is in the UP or DOWN position. The LED will illuminate brightly when the float ball is DOWN. If the float ball is UP or disconnected from the terminal, the LED will be dimmed.

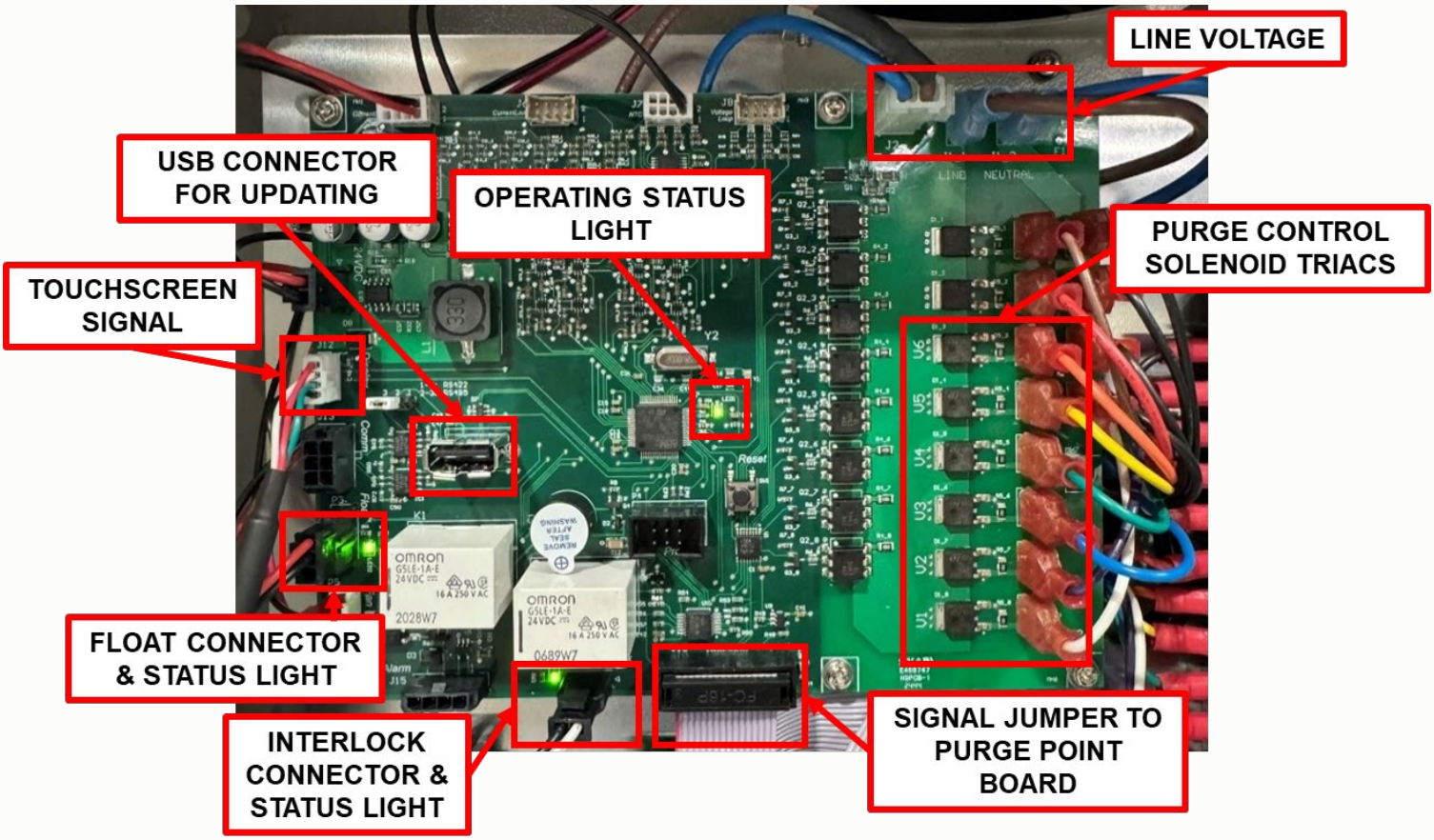


FIGURE 4. MAIN BOARD

PURGE POINT BOARDS

The APWT incorporates purge point boards to control purge points. Each purge point board allows up to 8 possible purge points. The maximum number of purge point boards is 3, which would provide a maximum of 24 points. Purgers can be upgraded in the field to increase the number of purge points. The purger will automatically detect the number of purge point boards installed and does not require a different program to use additional boards. The purge point expansion kit includes a purge point board, harnesses, and a terminal block. Refer to the kits section for the Purge Point Expansion kit part number. These boards work with both 115V and 230V coils. The purge point coils must match the input voltage to the purger control cabinet. Line voltage to the purge point board is supplied via the two-pin connector on the left side of the board. The main board sends control signals to the purge point boards via the 16-pin flat cable located at the top of the purge point boards. The cable must connect to the main board and the purge point board. A separate cable is connected to each board. There is a 16-pin jumper connector on the last purge point board. This jumper must be connected to the purger to display the correct number of available purge points. The colored wires on the bottom of the purge point board are connected to the purge points' terminal on the right side of the control box. The black wires are the neutral lines for the purge point solenoids. See Figure 5.

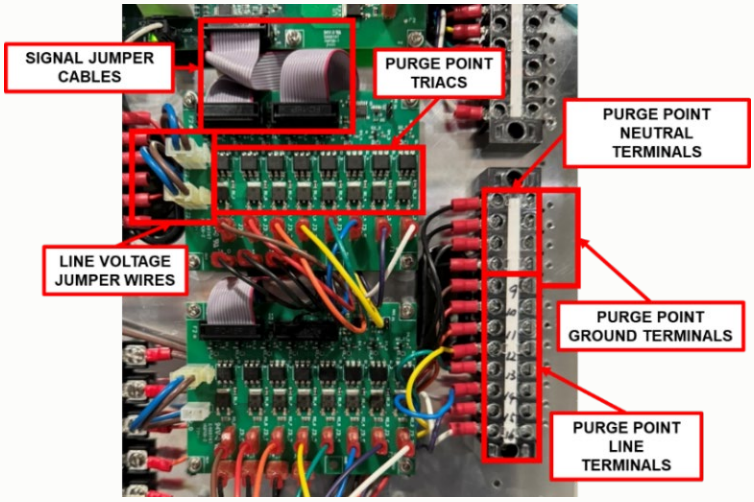


FIGURE 5. PURGE POINT BOARDS

PRESSURE TRANSDUCER

The AUTO-PURGER now uses a pressure transducer to control the purging sequence. The pressure transducer adds a safety feature by checking the pressure on the AUTO-PURGER's foul gas/ high side. The pressure must be greater than 80 psig to enter the PURGING state. This ensures that there is an active purge point and that the purger is not purging ammonia vapor. If the foul gas pressure from an active purge point falls below 80 psig, the LOSS OF FOUL GAS alarm will activate. The pressure transducer sends a 4-20 mA signal to the main board. If this signal is disconnected or the transducer is incorrectly wired, the main board status LED will blink, indicating an ERROR state. The purger cannot be started by pressing ON via the HOME PAGE if the pressure transducer or thermistor reads -ERROR. If the pressure transducer or thermistor reads -ERROR while the purger is ON, all solenoids will de-energize, and the purger must be reset by pressing the OFF button on the HOME PAGE.

INTERLOCK

The purger should not operate when the refrigeration compressors are stopped. Terminal connections are provided for an interlock to shut down the purger. The green LED on the main board verifies whether the interlock is connected. When this LED is bright, the interlock is connected. A dimmed LED indicates the interlock is disconnected, and the purger cannot be started by pressing ON via the HOME page.

MANUAL PURGE POINT OPERATION

There are buttons on the HOME PAGE of the purger that allow manual selection of the current purge point, and the ability to select whether the purger will run in AUTOMATIC or MANUAL mode. If it is desired to purge from only one point, turn on MANUAL mode by clicking the AUTOMATIC/MANUAL button. Then press the ADVANCE PURGE POINT button until the display shows the desired purge point. Once the purger exits the PURGER COOLING DOWN state, the purger will go through the 5-minute start-up in either AUTOMATIC or MANUAL mode. However, air must be present for the purger to purge.

OPERATION OF THE METERING VALVE

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 20-1186, is controlled by the ¼" liquid metering solenoid valve (V3). This valve is energized once the purger exits the PURGER COOLING DOWN stage. The refrigerant is filtered through a small, flanged ultra-fine strainer before the metering valve, which removes any particles that might block the orifice.

A properly functioning metering valve is indicated by a frosted metering valve and tubing on the outlet of the metering valve. 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 **.05" 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 it six turns.

If the line still does not frost, check the liquid metering solenoid valve (V3) for operation. If it appears to be operating normally, then pump out the purger and inspect the solenoid, strainer, and metering valve.

OPERATION OF THE LIQUID FEED VALVE

The purpose of the liquid feed valve is to meter liquid refrigerant from the liquid line into the flooded evaporator to make up potential deficits in the evaporator chamber. During start-up and operation, the liquid line solenoid valve (V1) energizes to feed liquid refrigerant to the liquid feed valve. A small amount of liquid could overfeed the protected suction line at low air loads or when not purging.

The Solenoid valve (V1) is energized when the purger is in

AUTOMATIC or MANUAL operation. The refrigerant is filtered through a small flanged ultra-fine strainer in the valve package before the liquid feed valve, which removes any particles that might block the orifice. A frosted liquid feed line from the outlet of the liquid feed valve to the evaporator indicates proper operation of the liquid feed valve. In the absence of frost, 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 liquid feed valve, strainer, or solenoid valve. The liquid feed valve is factory set and held in place by a locking knob. Unlock this knob using the .05" hex key wrench provided inside the purger control cabinet. To clean the orifice of the liquid feed valve, fully open the liquid feed valve to flush out any particles. Then close the valve and reopen six turns for the liquid feed valve. If the line still does not frost, check the liquid line solenoid valve (V1) for operation. If the solenoid valve appears to be operating normally, pump out the purger and inspect the solenoid, strainer, and liquid feed valve.

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 (V4) 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. Press the ON button on the HOME PAGE. This opens the vent solenoid valve (V2) and pressurizes the evaporator section of the purger. Check for leaks. Return all solenoid manual-opening stems to the automatic position.

OPERATION OF PURGE GAS ORIFICE

Purgers utilize a metering orifice disc inside the 1 psid (0.07 bar) check valve in the purge gas line to the water bubbler. See Figure 6. This 1/32″ (0.8 mm) diameter orifice meters the non-condensable gas into the water bubbler to prevent high flow rates of gas. The ¼″ 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^3 (0.06 m^3) of non-condensable gas per minute.

LIQUID DRAINER

The liquid drainer separates any liquid condensed in the purge point piping. This liquid is fed into the AUTO-PURGER's flooded evaporator. Therefore, only foul gas—no liquid— enters the condensing section of the purger. However, corrective action must be taken if too much liquid comes down the foul gas line due to improper piping. Too much liquid is indicated by continuous frost on the outlet of the liquid drainer. 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.

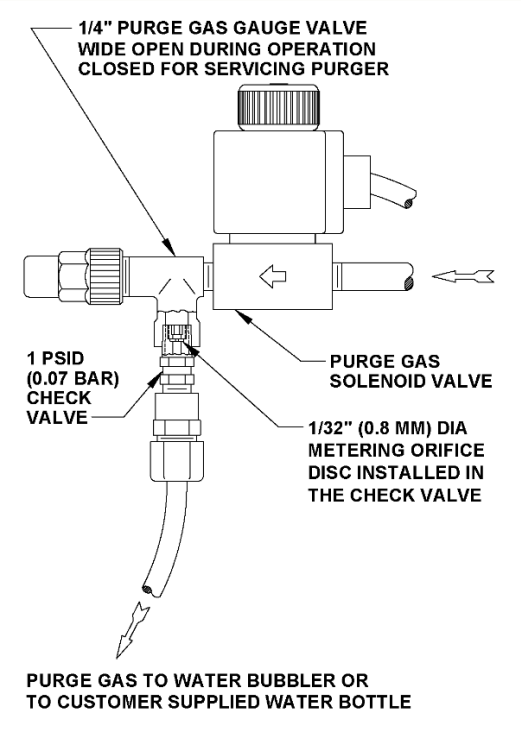


FIGURE 6. PURGE GAS ORIFICE

WATER BUBBLER

Non-condensable gas from the AUTO-PURGER flows through the water bubbler, where residual ammonia is absorbed into the water. The water, with absorbed ammonia, flows to a drain. The water solenoid valve (V6) opens to automatically replenish water to the bubbler each time the purge gas solenoid valve (V5) energizes. The water solenoid valve (V6) remains energized for 30 seconds after the purge gas solenoid valve (V5) de-energizes (float switch magnet pulls in). Large, 1″ (25 mm) diameter bubbles in the water bubbler indicate proper operation.

TOUCHSCREEN

The APWT features a touch screen to allow the user to view the status of the sensor inputs, configure purge points and purge scheduling, monitor alarms, and view purging information such as the number of hours purged and the amount of air purged. Refer to Section 3 for more information on software features. Refer to pages 13 - 20 for an overview of the various screens available on the APWT.

The touch screen includes an 8GB microSD card to save configurable data, alarms, and purging information. This card is necessary for the purger's operation and should not be removed unless information needs to be copied from the microSD card. The microSD card's maximum storage size is limited to 32 GB. Any SD card with more than 32GB will not work with the touch screen. If the microSD card is lost, replace it with the correct size card. Reach out to Hansen for the necessary microSD files. Refer to page 12 for more information.

MICROSD CARD

The microSD card can be removed while power is supplied to the purger. While the SD card is removed, any purging information or alarms will not be saved. The purger should be stopped by pressing OFF via the HOME PAGE to prevent data loss. The SD card can be removed if purging information needs to be saved to a computer or other location. To remove the microSD, open the control cabinet and locate the touchscreen housing on the control cabinet door. At the top of the housing is a cutout. Rotate the metal piece above the cutout and press down on the microSD to release it. With needle-nose pliers, gently grab the microSD and remove it from the slot on the touchscreen. Do not edit the files on the microSD card directly. Copy the necessary files and save them in another folder on the computer. Re-insert the microSD by inserting it into the slot on the touch screen and gently pressing down until the SD card clicks into the slot. Reset the logs after microSD data has been saved. Refer to Figures 7 & 8.

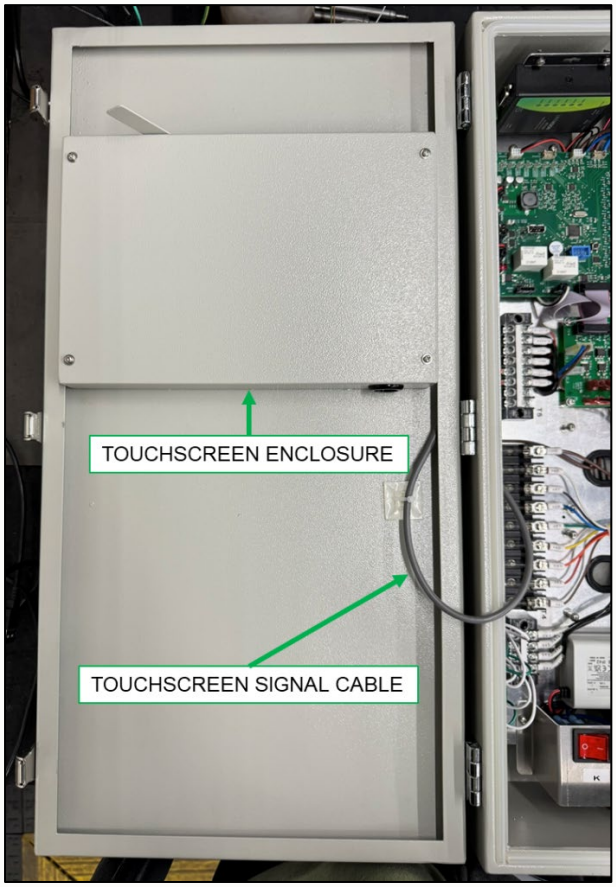


FIGURE 7. CONTROL CABINET DOOR AND TOUCHSCREEN ENCLOSURE

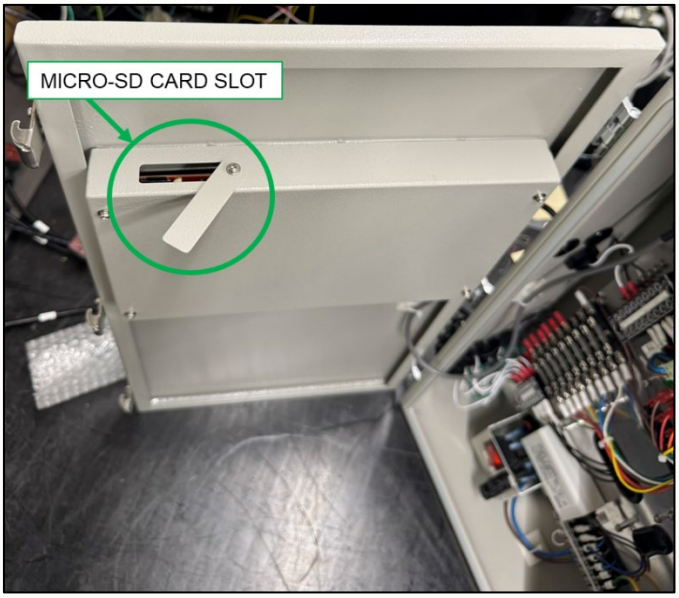
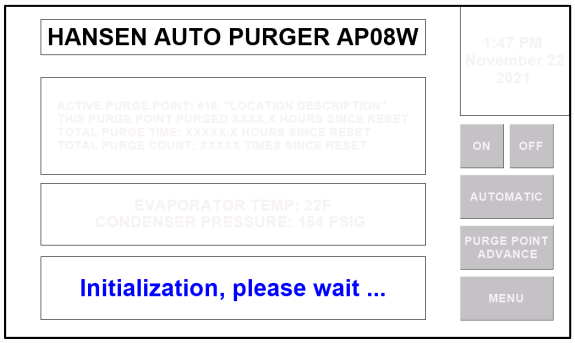


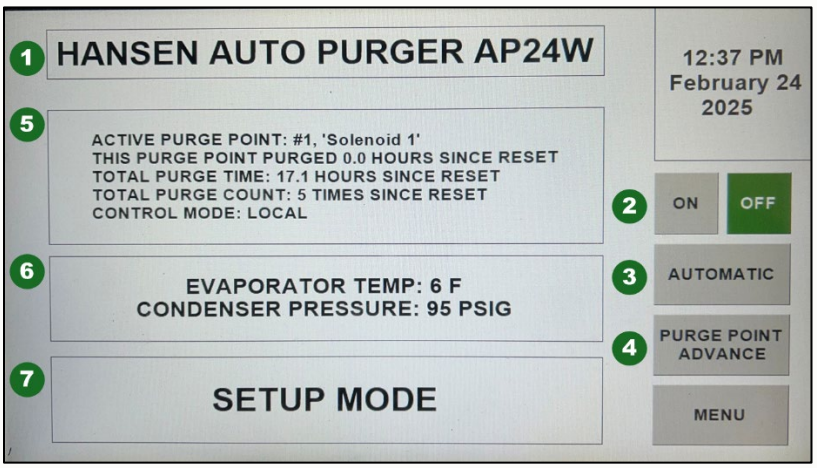
FIGURE 8. LOCATION OF MICRO-SD CARD

INTIALIZATION

The purger will go through the initialization screens anytime power is cycled to the purger. During initialization, the purger firmware and the display microSD files are loaded



HOME PAGE/ MAIN MENU



1. **Title -** This is where the APWT model number will display. The model number will not specify the unit's voltage. The AUTO-PURGER detects the purge point boards that are connected to display the correct model number.

2. **ON/OFF –** The ON button initiates the purger to look for non-condensable gas starting at the purge point displayed in the Purge Point Status box. Once the purger exits PURGER COOLING DOWN, a 5-minute timer will begin. The OFF button will stop the purger from looking for non-condensable gas. The OFF button is also used to clear alarms such as LOSS OF FOUL GAS PRESSURE and SINGLE PURGE EVENT Time Exceeded.

3. **AUTOMATIC/MANUAL –** This button displays whether the purger will automatically cycle through purge points or if it will stay on a single purge point. The mode displayed on the screen is the mode that the purger is in.

4. **PURGE POINT ADVANCE –** Advances the active purge point to the next enabled purge point. The PURGE POINT ADVANCE button works in AUTOMATIC or MANUAL mode.

5. **Purge Point Status –** The HOME PAGE of the purger displays information about the active purge point. The purger will keep track of how many hours each purge point has been purged. The HOME PAGE will also show purge time and purge count information for all purge points. The total purge time can also be found on the LOGS screen. To reset the TOTAL PURGE COUNT value, press and hold the Purge Point Status box for 5 seconds. This will not reset any of the information on the LOGS screen. The control mode can be set to LOCAL or REMOTE. See the Remote Communication section on page 26 for more information.

6. **Sensor Readings –** The AUTO-PURGER displays the current measurements from the pressure transducer and thermistor. If the pressure is below 80 psig, the pressure reading will be displayed in red text. If the evaporator temperature is above the temperature set point, the temperature reading will be displayed in red text. If either of the sensors is wired improperly, the display will show -ERROR. In this state, the AUTO-PURGER cannot be started by pressing ON via the HOME PAGE until the sensors are properly connected. If the sensors are disconnected while the purger is ON, the purger will de-energize all solenoids. To restart the purger, the OFF button must be pressed first to clear the error alarm.

7. **Purger Operating Status Box –** The AUTO-PURGER has an operating status box that displays alarms and the operating stage of the purger

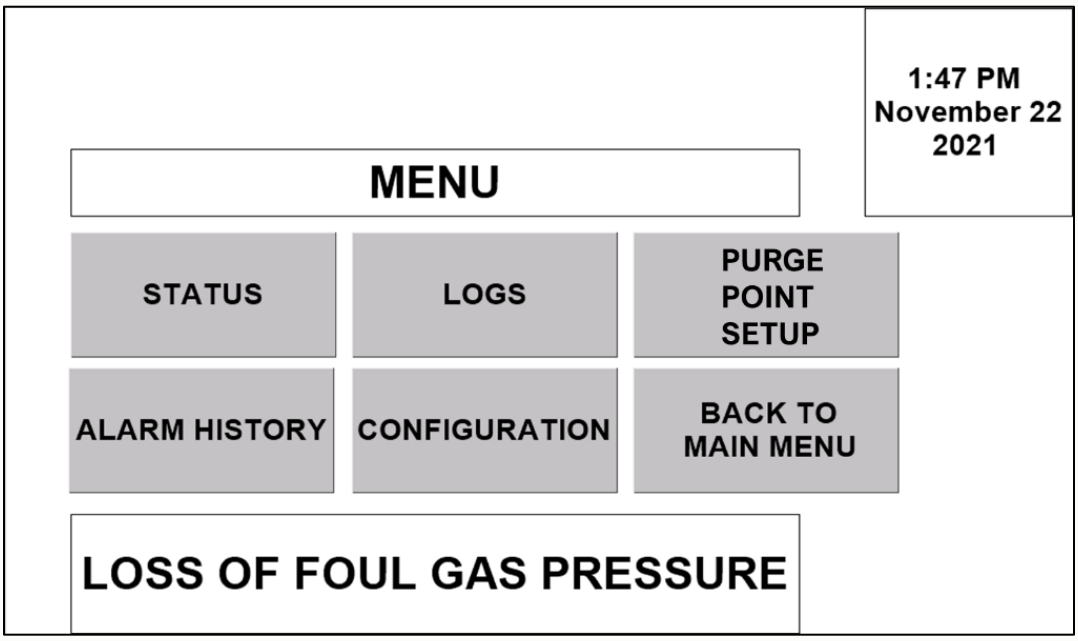
Operating Status

SETUP MODE – This is the AUTO-PURGER's idle mode. In setup mode, purge points can be enabled/disabled on the PURGE POINT SETUP screen. The purger schedule should be set while the AUTO-PURGER is in setup mode.

COLLECTING NON-CONDENSABLE - Once the temperature goes below the Temp Alarm Threshold temperature, the purger will enter Collecting Non-Condensable mode. See page 23 for operation.

PURGING – The purger is releasing non-condensable gas to the water bubbler.

MENU



STATUS – page 16

Navigate to this screen to see the status of Purge Control solenoids V1 – V6, the pressure and temperature readings, the float ball position, and the operating status or active alarms.

LOGS – page 17

Navigate to this screen to see the unit's purge information. This screen includes the following: Purge Time (last 24 hours), Purge Time (previous 7 days), Ammonia Purged (in pounds), and Air Removed (in pounds). Logs can be updated and reset on this screen as well.

PURGE POINT SETUP – page 18

Navigate to this screen to enable/ disable purge points, rename purge points, and enable/disable New System Startup mode

ALARMS – page 19

Navigate to this screen to see the alarm history for the following alarms: Loss of Foul Gas, High Temperature, and Single Purge Event Time Exceeded.

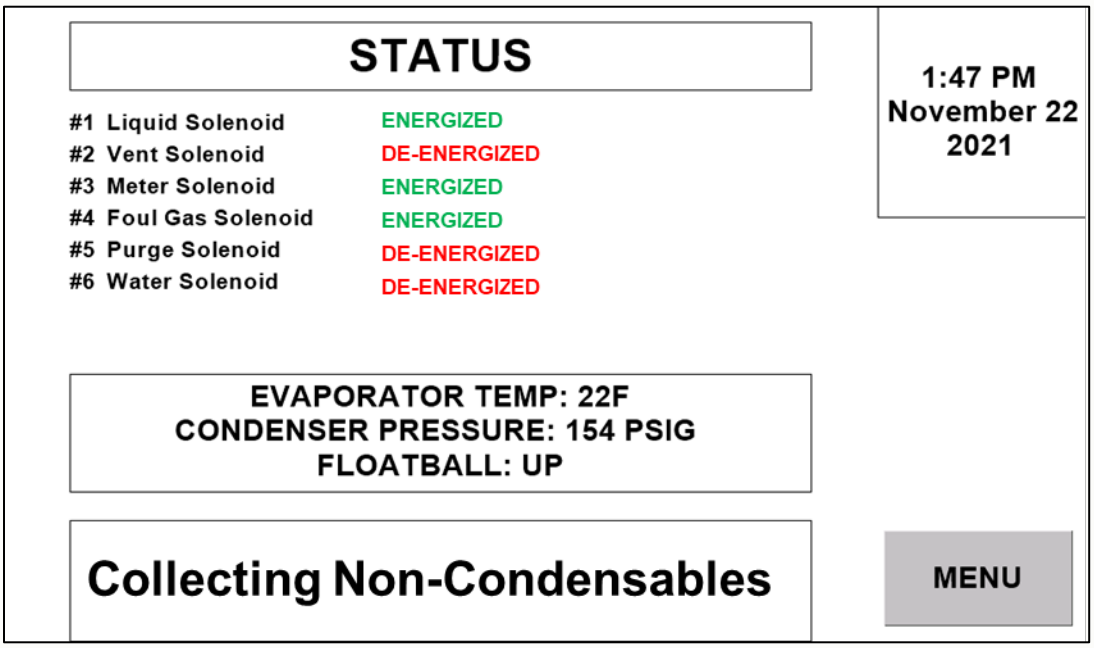
CONFIGURATION – page 20

Navigate to this screen to set several settings, including Single Purge Event timer, Temperature Alarm Threshold, APC Mode, Auto Start, Purge Schedule, Troubleshooting Guides, Time/ Date, and Update Software

BACK TO MAIN MENU

Press to return to the HOME PAGE.

STATUS

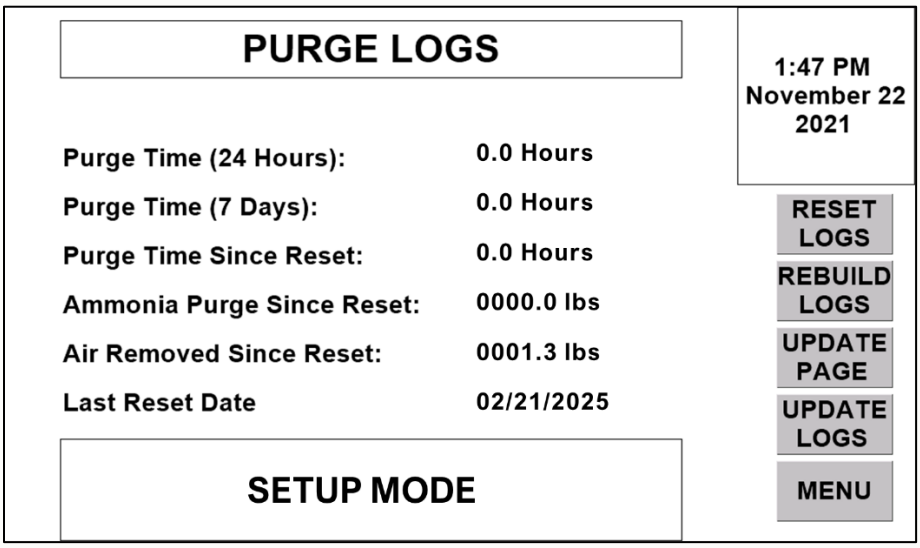


Sensor State – This screen shows the evaporator temperature, condenser pressure, and whether the float ball is UP or DOWN. If -ERROR is displayed for any of these three readings, the Purger will stop or will not start. Check sensor wiring to the sensor terminal block for the FLOAT BALL, Thermistor, and Pressure Transducer inside the cabinet. Check the connector going from the sensor terminal block to the main board.

Purge Control Solenoid States - Shows current commanded state of the 6 solenoid valves that operate the Purger. This screen can be used to verify purge control solenoids are working properly and the control logic is being followed.

Purger Operating Status and Alarms – Includes operating status and active alarms in the Status Box.

LOGS



Note: The information on this screen is saved to the display's microSD card every hour.

Purge Time – Tracks the total number of hours across all purge points that the purger has been in the PURGING state. The purger keeps a log of the purge time for the last 24 hours and the last 7 days. Purge time Since Reset will keep the total number of purge hours indefinitely until RESET LOGS is pressed**.**

Ammonia and Air Purge – Tracks the amount of ammonia and air purged in pounds. The partial pressures of ammonia and air at the system's foul gas pressure and evaporator temperature are used to calculate the percentage of ammonia and air released through the purge gas orifice. Additionally, the flow rate through the purge gas orifice calculates how many pounds of ammonia and air have been removed.

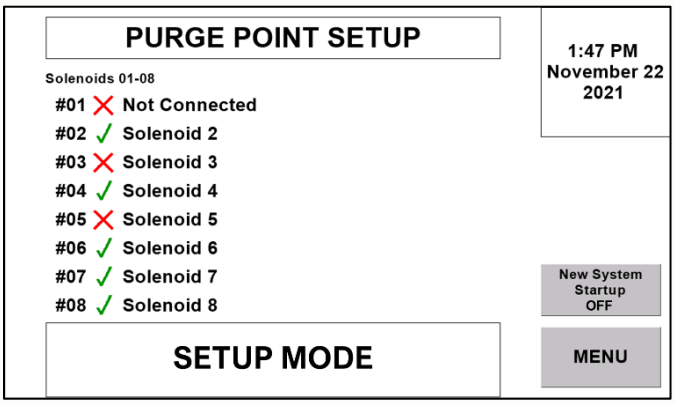
RESET LOGS – Clears Purge Logs screen, purge information data from the HOME PAGE, and the microSD card data. Pressing this button will also update the Last Reset Date.

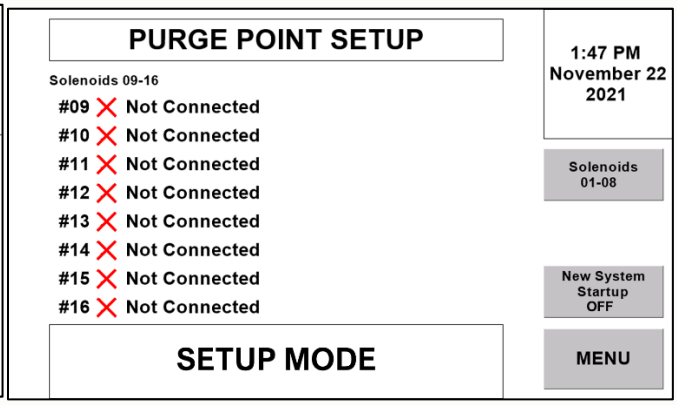
REBUILD LOGS – Re-populates the LOGS page with the latest set of data written to the display's microSD.

UPDATE PAGE – Updates Purge Logs page with the most recent data. The screen will automatically update every hour.

UPDATE LOGS – Writes the current purge log information to the display microSD card in anticipation of a planned power outage/shutdown.

PURGE POINT SETUP





Note: The Purge Point Setup screen is locked while the purger is ON. Settings on this screen should be edited before pressing ON.

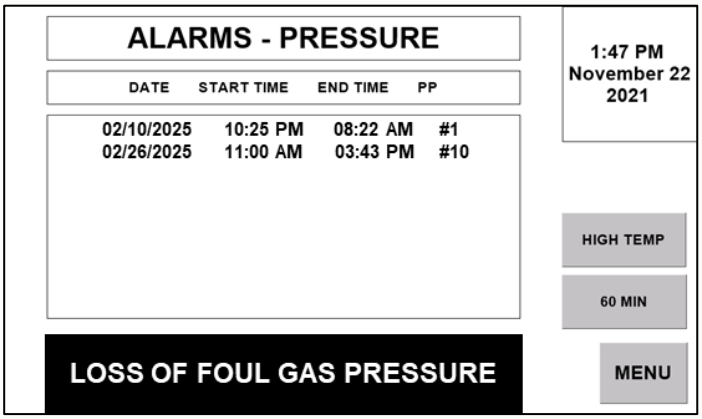
Available Purge Points – The available purge points will be shown on the right side of the screen. Each button allows you to enable/disable alarms for the purge points specified. The number of available purge points depends on the number of installed purge point boards.

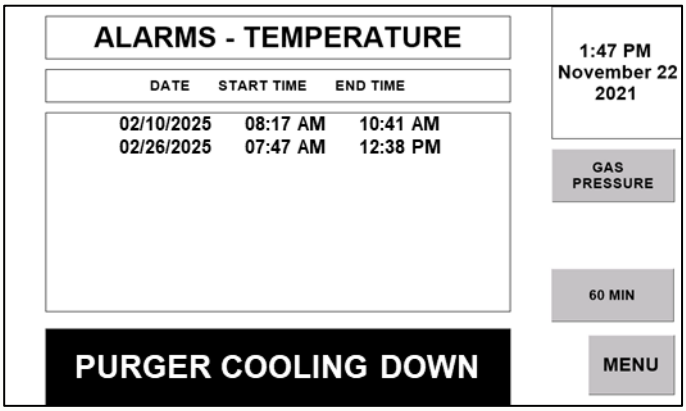
Enable/Disable Purge Points – Click on the red X or green check mark to enable or disable purge points. A green check mark means the purge point is active, and the purge point cycling will purge non-condensable gas at that point. If a purge point board is disconnected, the active purge points will not be purged**.**

Rename Solenoids - Rename each purge point by pressing on the text to the right of the X or check mark. If a purge point board is disconnected, upon reconnection, the name of the available purge points will change to Not Connected. If this occurs, all purge points will have to be renamed.

New System Startup – During start-up of a new purger or under high non-condensable gas removal conditions, enable New System Startup to ignore the Single Purge Event Time. The purger will be able to purge continuously for an indefinite period. To disable New System Startup, navigate to the HOME PAGE and press OFF to re-enable the Purge Point Setup screen. Then navigate back to the Purge Point Setup screen to disable New System Startup.

ALARMS





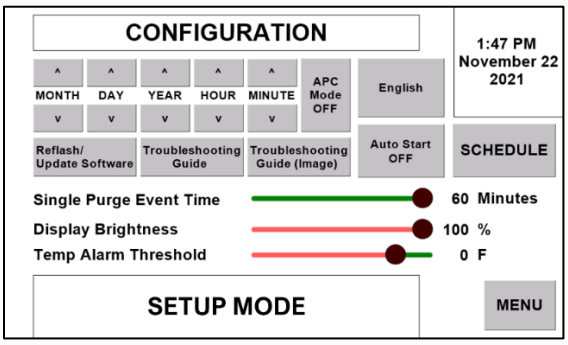
LOSS OF FOUL GAS PRESSURE – This alarm is triggered if the condenser pressure reading is below 80 psig. When the alarm is triggered, the purge solenoid (V5) will be commanded off, and purging cannot resume until the pressure climbs above 87 psig again. This alarm is self-recovering, meaning the unit will continue to purge normally if the pressure issue is corrected. The alarm will flash in the Status Box at the bottom of the display until it is cleared/acknowledged by pressing the Status Box or stopping the Purger with the OFF button and restarting with the ON button. This is to notify the service technician of a problem with one of the purge points. A record will be stored in memory.

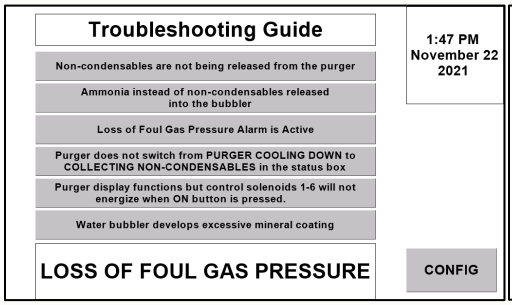
PURGER COOLING DOWN – This alarm is triggered when the evaporator temperature rises above the Temp Threshold Alarm (37ºF by default) while the unit is in Collecting Non-Condensables or Purging mode. When the alarm is triggered, the purge solenoid (V5) will be commanded off, and purging cannot resume until the temperature falls below the temperature set point again. This alarm is self-recovering, but a record is stored in memory.

SINGLE PURGE EVENT – This alarm is triggered when the float ball stays down (system is in PURGING status) for a duration exceeding the time set by the user in the configuration screen. Triggering this alarm will stop the purging cycle. The alarm can be cleared by pressing the OFF button on the HOME PAGE, but a record is stored in the memory.

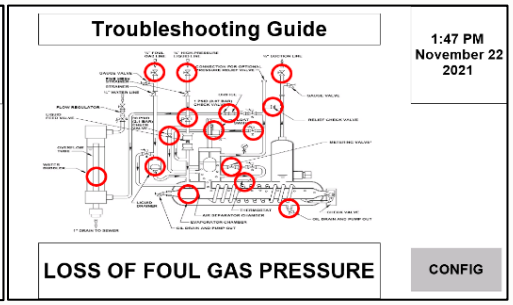
Other alarms that do not have a log are mentioned on page 24.

CONFIGURATION





Troubleshooting Guide



Troubleshooting Guide (Image)

APC MODE – The purger can be configured to work in APC mode when there are no installed purge point boards. Purge point cycling/control is performed with an in-plant PLC. When APC mode is ON, the Active Purge Point on the HOME PAGE will show APC Mode Enabled. See the APC Mode - Purge Point Control Guidelines section on page 22.

AUTO START – If power is lost to the purger due to a power outage, the purger will not start until a technician presses the ON button on the HOME PAGE. Enable the Auto Start feature to have the purger automatically start after a power cycle.

Note: Setting a purge schedule will start the purger according to its schedule. If power is lost during a scheduled time, the purger will not start until a technician presses ON or the next scheduled time, unless Auto Start is active.

SCHEDULE – Navigate to this screen to schedule when the purger should be ON to purge non-condensable gas. See the Setting a Purge Schedule section on page 22 for more information.

LANGUAGE – The purger can be set to display the following languages: English, Spanish, Chinese (Mandarin), and German

SINGLE PURGE EVENT TIME – The purger can stop after the float ball has been continuously in the DOWN position for a given time. The timer can be set for 5 – 60 minutes. See section Purge Gas Solenoid Valve Time Delay Cutout

TEMPERATURE ALARM THRESHOLD – The temperature set point to enter PURGER COOLING DOWN status can be set using the Temp Alarm Threshold bar. Adjust the set point by pressing and dragging the black dot on the Temp Alarm Threshold bar. The purger will exit PURGER COOLING DOWN status when the temperature of the evaporator is 5ºF less than the set point. This can be set at -20ºF (-29ºC) to 40ºF (4ºC). The default temperature alarm threshold is 37ºF (2.8ºC). The purger will exit the PURGER COOLING DOWN status when the evaporator temperature is below 32ºF (0ºC). Adjust the temperature set point if the system's suction pressure and temperature are higher or lower than the default set point. Be advised that increasing the temperature set point above 37ºF will increase the percentage of ammonia that is purged through the water bubbler.

DISPLAY BRIGHTNESS – Adjust the display brightness

UPDATE SOFTWARE – DO NOT PRESS this button unless you are instructed to by Hansen.

TROUBLESHOOTING GUIDES – The AUTO-PURGER features on-board troubleshooting guides. The guides on the display match what is included in the bulletin. The purger offers an image-based guide using the AP flow diagram shown on page 25. Press a red circle to navigate to the accompanying troubleshooting information.

PURGE GAS SOLENOID VALVE TIME DELAY CUTOUT

The AUTO-PURGER software has an adjustable time delay cutoff that controls the purge gas solenoid valve (V5). This valve meters non-condensable gases to the water bubbler during operation. See Figure 13. The time delay cutout feature closes V5 after non-condensable gas has been continuously released into the water bubbler for the customer-defined period. The user can set this time for 5 to 60 minutes. In the unlikely event of a float switch malfunction, electrical fault, or system malfunction, the alarm prevents excess refrigerant from being released. During the start-up of a new purger or under high non-condensable gas removal conditions, it may be advantageous for the purge gas solenoid valve (V5) to remain open continuously. The time delay cutoff can be disabled by activating NEW SYTSEM STARTUP on the PURGE POINT SETUP screen. Activate NEW SYSTEM STARTUP until the high volume of non-condensable gas is removed. When non-condensable gas is removed at short intervals, the NEW SYSTEM STARTUP button should be switched OFF for normal operation.

If the delay time cutoff is exceeded, the purger will throw the Single Purge Event Time Limit Exceeded error, which will de-energize all solenoids. To clear the alarm and reset the purger, press OFF on the HOME PAGE and then ON to reactivate the purger.

PURGE LOGS

The software's counter displays the number of times the purge gas solenoid valve (V5) opens. This valve bleeds non-condensable gas into the water bubbler. The software also counts how many hours each purge point has purged, and the total purge time across all purge points. The counter can be used to measure non-condensable gas activity. If a daily or weekly record is logged, any abnormal changes in the number of times the purge gas solenoid valve (V5) is operated can be noted. 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 (V5) may indicate a problem with the purger. In either case, action can be taken to correct the problem. The counter can be reset by pressing and holding the active purge point box on the HOME PAGE (Figure 9).

The AUTO-PURGER also logs the amount of ammonia and air removed in pounds. The software uses the temperature and pressure to calculate the partial pressures of the air and ammonia vapor in the purger. The gas in the float ball chamber is released through the purge gas orifice at an approximate rate of 2 ft^3 per minute. These values are then used to calculate the amount of ammonia purged and the amount of air removed. These logs are saved to the display's microSD card. See Section 2, page 17, for more information.

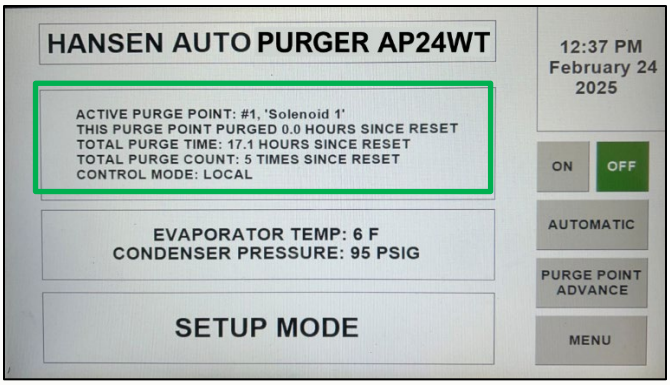
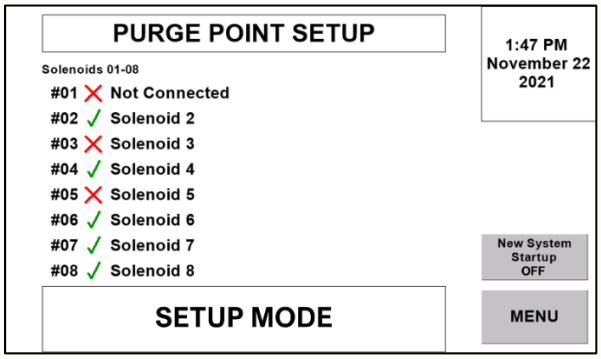


FIGURE 9. TO RESET TOTAL PURGE COUNTS, PRESS AND HOLD THE HIGHLIGHTED BOX FOR 5 SECONDS. THIS DOES NOT AFFECT THE PURGE LOGS PAGE.

PURGE POINT SETUP

Purge points can be activated, deactivated, and renamed on the PURGE POINT SETUP screen. The available purge points are shown on the right-hand side. The available purge points depend on the number of purge point boards installed. The software will automatically detect the number of purge point boards connected. To increase the number of available purge points, purchase a PURGE POINT UPGRADE KIT, 20-2902.

To activate and deactivate purge points, click on the green check mark. A green check mark means the purge point is active; a red X means the purge point is inactive and will be skipped during the purge point sequence. To rename a purge point, click on the text next to the green check mark. The default name for the purge points is "Solenoid X".



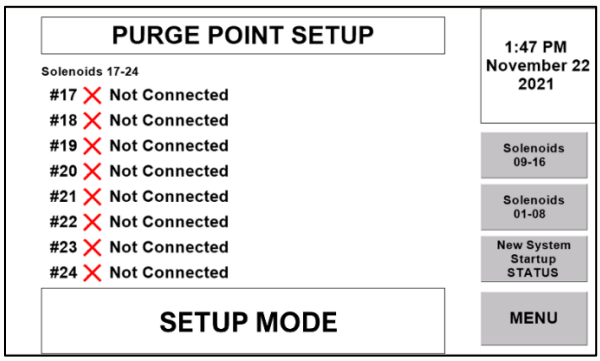


FIGURE 10. PURGE POINT SETUP SCREEN IMAGES

ADAPTIVE PURGE POINT CONTROL

Each purge point is connected to a TRIAC, which energizes the solenoid valves. When the AUTO-PURGER is set to AUTOMATIC mode, the TRIACs operate in sequence. Wire the remote purge point solenoids in sequence. Do not skip any purge point terminals.

The APWT includes adaptive purge point control to determine how long each purge point is active. The software looks for non-condensable gas at each purge point in 5-minute increments. If the float ball goes down at least once during a 5-minute period, the purger will remain on that purge point for another 5 minutes. The purger will continue this sequence until either the float ball remains UP for 5 minutes or the purge point has been active for 20 minutes.

When in AUTOMATIC purging mode, the purge sequence begins at purge point V1, continues to purge point V2, and so on. When the final purge point is completed, the purger returns to purge point V1 and repeats the sequence. This continues as long as the purger is ON.

APC MODE – PURGE POINT CONTROL GUIDELINES

The following lists recommended ways to control purge points when using an APCWT.

Timers: Using a PLC, the user can set up timers for purge point cycling. The duration of the timers depends on the system's requirements. Timers are typically set to cycle through purge points every 5 to 10 minutes.

Remote Communication: Using the Modbus RTU or TCP feature of the AUTO-PURGER can allow for more precise control of purge point cycling. Data such as the position of the float ball, the state of the foul gas solenoid (V4), total purge time, or whether the Purging status is active can be used to cycle to the next purge point. For example, the plant PLC can simulate the adaptive purge point control that other APWT models use by monitoring the float ball register. The PLC could also monitor the total purge time register to learn how long each purge point typically purges. If it is found that one purge point tends to purge more often than others, then the cycling timers can be adjusted to focus more on that purge point. Refer to the Parameter Tables in the Remote Communication section of the bulletin (pages 29 – 35).

SETTING A PURGING SCHEDULE

The AUTO-PURGER can be scheduled to only look for and purge non-condensable gas during specified times. Without a schedule, the purger will continuously cycle through all enabled purge points indefinitely. The AUTO-PURGER can be scheduled for up to 3 shifts per day. To set a purger schedule, navigate to the CONFIGURATION screen and press SCHEDULE. Select the day to be scheduled. Select the start time and the duration that the purger should look for non-condensable gas. For example, setting a shift from 8:00 am to 2:30 pm, set START TIME to 8hr. 00min. and set PURGE TIME to 6hr. 30 min. Save the purge schedule by pressing the UPDATE button. At the scheduled start time, the purger will start, signified by the highlighted ON button on the HOME PAGE. Shifts must be set up for each day individually. Enable or disable the schedule by pressing the highlighted button in Figure 11. The text displayed on the button is the current state of the purger. See Figure 11.

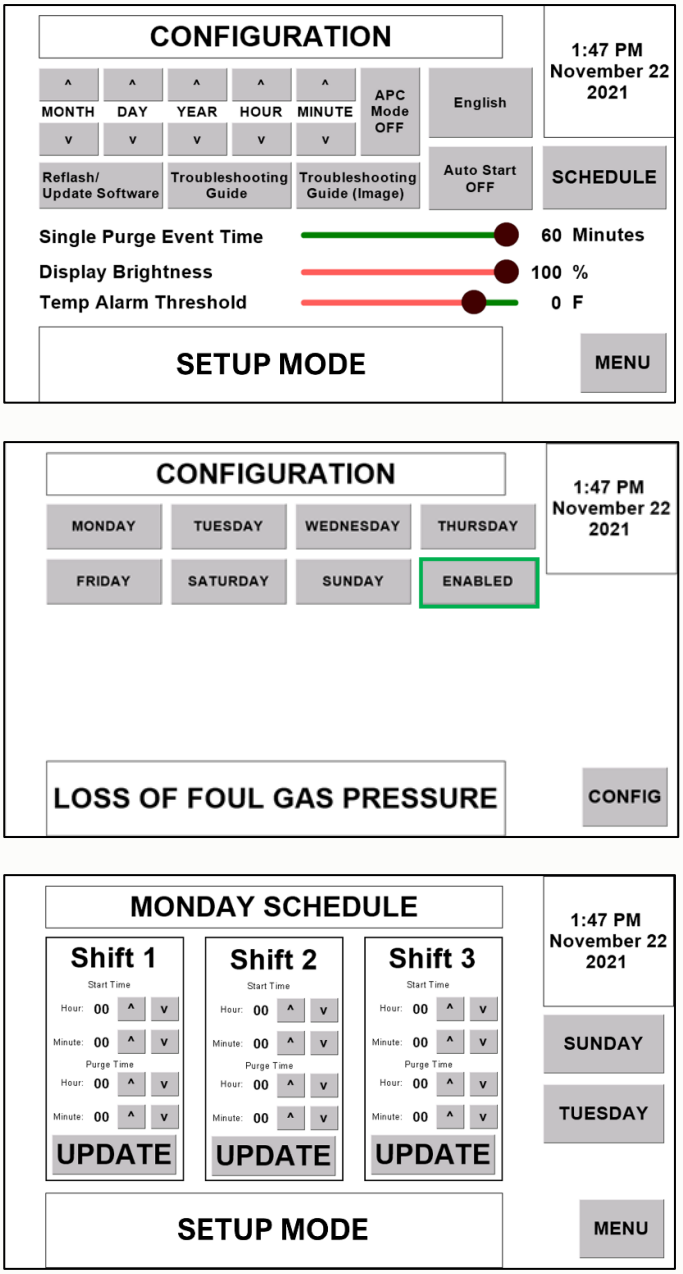


FIGURE 11. SCHEDULING SCREENS

The AUTO-PURGER can automatically start up and operate without the assistance of plant personnel. See Section 2, page 20. Ensure 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. Once line voltage is supplied to the purger, flip the toggle switch inside the control box to the on position. The touchscreen will go through its initialization screens. After initialization, the touchscreen will show the HOME PAGE. Beginning at start-up, the following describes the refrigerant flow through a purger when all connecting shut-off valves are open. Refer to Figure 13.

START-UP

To start up the purger, press the ON button on the HOME PAGE. 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 (V1) energizes to feed refrigerant to the liquid feed valve, which opens to fill the low-pressure flooded evaporator.

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 (V2). 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 (V2).

At the bottom of the touchscreen, it will display PURGER COOLING DOWN and LOSS OF FOUL GAS. The purger continues to cool down. A thermistor attached to the flooded evaporator senses temperature. The AUTO-PURGER will not condense nor allow any foul gas into the water bubbler until the temperature of the purger evaporator is 5°F lower than the temperature alarm set point. By default, this temperature is 32°F (0°C). This could take approximately 15 minutes, depending on the suction line temperature. When the evaporator temperature is below the customer-specified set point, the thermistor switches the purger from the COOLING DOWN stage to the COLLECTING NON-CONDENSABLES stage, and the 5-minute start-up timer will begin. In AUTOMATIC mode, the purger will begin the purge point-cycling sequence.

OPERATION

When the purger is in AUTOMATIC operation, the foul gas solenoid valve (V4) and liquid metering solenoid valve (V3) are energized, allowing a mixture of non-condensable gas and refrigerant into the purger. The thermistor also energizes solenoid valves (V5) and (V6) when the float ball is down (magnet away from the tube).

If the AUTOMATIC/ MANUAL button on the HOME PAGE is set to AUTOMATIC, adaptive purge point control operates each enabled remote purge point solenoid valve in sequence. See the Adaptive Purge Point Control section on page 22 for details. If the AUTOMATIC/ MANUAL button on the HOME PAGE is set to MANUAL (*single purge point)*, then that purge point solenoid valve energizes. The purger will only purge from that point. In APC Mode, purge point cycling is controlled by the plant PLC.

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

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 non-condensable gas 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 (V3), strainer, metering valve (located in the liquid feed line), and then into the flooded evaporator.

Meanwhile, the non-condensable gas travels along the top of the air separator chamber and into the float ball chamber, where it collects. As more non-condensable gases collect, the liquid level gradually falls, causing the float ball to fall. This changes the SPDT switch position of the float switch and energizes the purge gas solenoid valve (V5) and the water solenoid valve (V6), allowing non-condensable gas to bleed through the orifice plate into the water bubbler. As air is released into the bubbler, the liquid refrigerant level in the purger float ball chamber rises.

WATER BUBBLER FLUSH SYSTEM

The water flush system consists of the water bubbler, water solenoid valve (V6), water check valve, and shut-off valve. Water is automatically fed to the bubbler through the solenoid valve (V6). Non-condensable 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 (V6) remains energized 30 seconds after the float switch magnet pulls in. This fills the water bubbler with fresh water for the next purge cycle.

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.

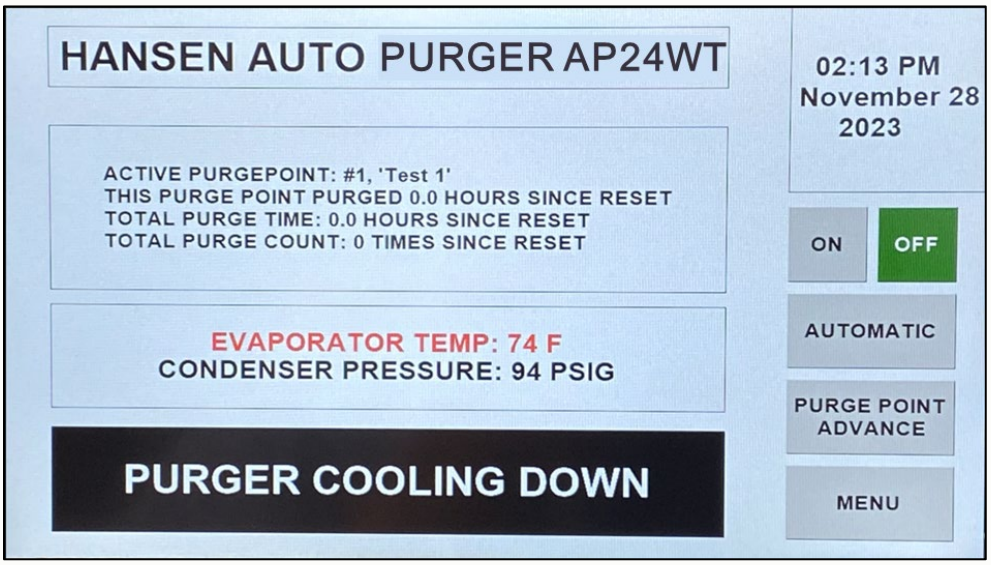
The purger will pump down in several hours. Attach ammonia hoses to the oil drain valves and pump into a suction line to accelerate the process. Close the suction line to isolate the purger. With electricity on, the pressure in the purger should remain at zero. This process should be completed only by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

INPUT CONDITIONS				PURGE CONTROL SOLENOIDS						ALARMS		
Temperature	Float Ball Position	Foul Gas Pressure	Cool Down Time Delay	V1 Liquid Solenoid	V2 Vent Solenoid	V3 Metering Solenoid	V4 Foul Gas Solenoid	V5 Purge Solenoid	V6 Water Solenoid	PURGER COOLING DOWN	LOSS OF FOUL GAS PRESSURE	PURGED OVER TIME LIMIT
>37F	DOWN	N/A	<5 MIN									
>37F	UP	N/A	<5 MIN									
<32F	DOWN	N/A	<5 MIN									
<32F	UP	N/A	<5 MIN									
<32F	UP	<80 PSIG	>5 MIN									
<32F	DOWN	<80 PSIG	>5 MIN									
<32F	UP	>87 PSIG	>5 MIN									
<32F	DOWN	>87 PSIG	>5 MIN									
<32F	DOWN	<80 PSIG	>5 MIN									
N/A	DOWN	N/A	NEW SYSTEM STARTUP IS "OFF", AND PURGED CONSTANTLY >60MIN									

DE-ENERGIZED
ENERGIZED
ENERGIZED WITH 30 SECOND DELAY ON BREAK

FIGURE 12. OPERATION LOGIC FOR AN AUTO–PURGER WITH A **37°F** TEMPERATURE SET POINT & **60 MINUTE** SINGLE PURGE EVENT TIMER.

All Alarms



LOSS OF FOUL GAS PRESSURE – The purger will not purge if the pressure on the foul gas line is less than 80 psig. The AUTO-PURGER throws a LOSS OF FOUL GAS alarm, which is displayed on all display screens. This status box will flash this alarm until it is cleared. Press the status box or OFF on the HOME PAGE to clear the alarm. The status box will switch to show the current state of the purger. If the foul gas pressure returns to an acceptable pressure, the purger can PURGE, but the alarm will continue to flash until it is cleared. The start and end times of the alarm will be logged on the PRESSURE alarm history screen.

PURGER COOLING DOWN – The purger will have solenoid V1 energized to cool down the evaporator. Solenoid V2 will be energized if the float ball is down and de-energized if it is up. Once the temperature goes below the Temp Alarm Threshold, this message will no longer appear in the status box.

Single Purge Event Time Exceeded – The purger should not purge for more than 60 minutes. The Single Purge Event alarm stops the purger after continuous non-condensable gas release into the water bubbler that exceeds the set time limit. The Single Purge Event timer is on the CONFIGURATION screen and can be set for 5-60 minutes. To re-enable the purger, press OFF on the HOME PAGE to clear the alarm and then press ON to start the purger.

NO ENABLED PURGE POINTS – The purger automatically detects connected purge point boards. The NO ENABLED PURGE POINTS alarm will display in several situations: if connection is lost to any purge point boards, if the 16-pin jumper connector is missing from the last purge board, or if all purge points are disabled on the Purge Point Setup screen. See Software Features section 3 for reference.

NO MICRO-SD CARD DETECTED – The purger will display this alarm if the micro-SD card is not in the slot on the touchscreen when power is cycled to the purger. This alarm will not clear until the micro-SD is re-inserted and the purger is power cycled via the toggle switch. The purger can still be activated by pressing ON via the HOME PAGE; however, data such as alarm logs, purge counts, etc., will not be saved until the micro-SD is re-inserted.

ERROR! (PRESS 'OFF' TO CLEAR) – The purger will throw this alarm if either the pressure transducer or the thermistor is disconnected. If the purger is ON and either of the sensors is disconnected, the ERROR! alarm will be displayed, and all purge control solenoids will be de-energized. If the purger is OFF and the sensors are disconnected, the purger cannot be started by pressing ON via the HOME PAGE until the sensors are connected to their terminals. To clear this alarm, press OFF via the HOME PAGE.

SYSTEM FAILURE RESTART SYSTEM – This alarm will initiate if the display cable to the main board is disconnected or if the purger is frozen on a screen. The status LED on the main board will flash rapidly if this alarm is active (see the Main Board section on page 8). Once this alarm is initiated, the purger will be inoperable and must be power cycled.

PURGER AWAITING SIGNAL – The main board of the AUTO-PURGER features an RS-485 connection for remote communication via Modbus RTU. To enter remote mode, navigate to the HOME PAGE; press and hold the date box for 5 seconds. In remote mode, the background of the HOME PAGE will be black, and Control Mode will be set to REMOTE. While in REMOTE mode, the purger will initiate the PURGER AWAITING SIGNAL alarm if the main board does not receive a signal from the RS-485 port for 10 seconds. See the Remote Communication section on page 26 for information.

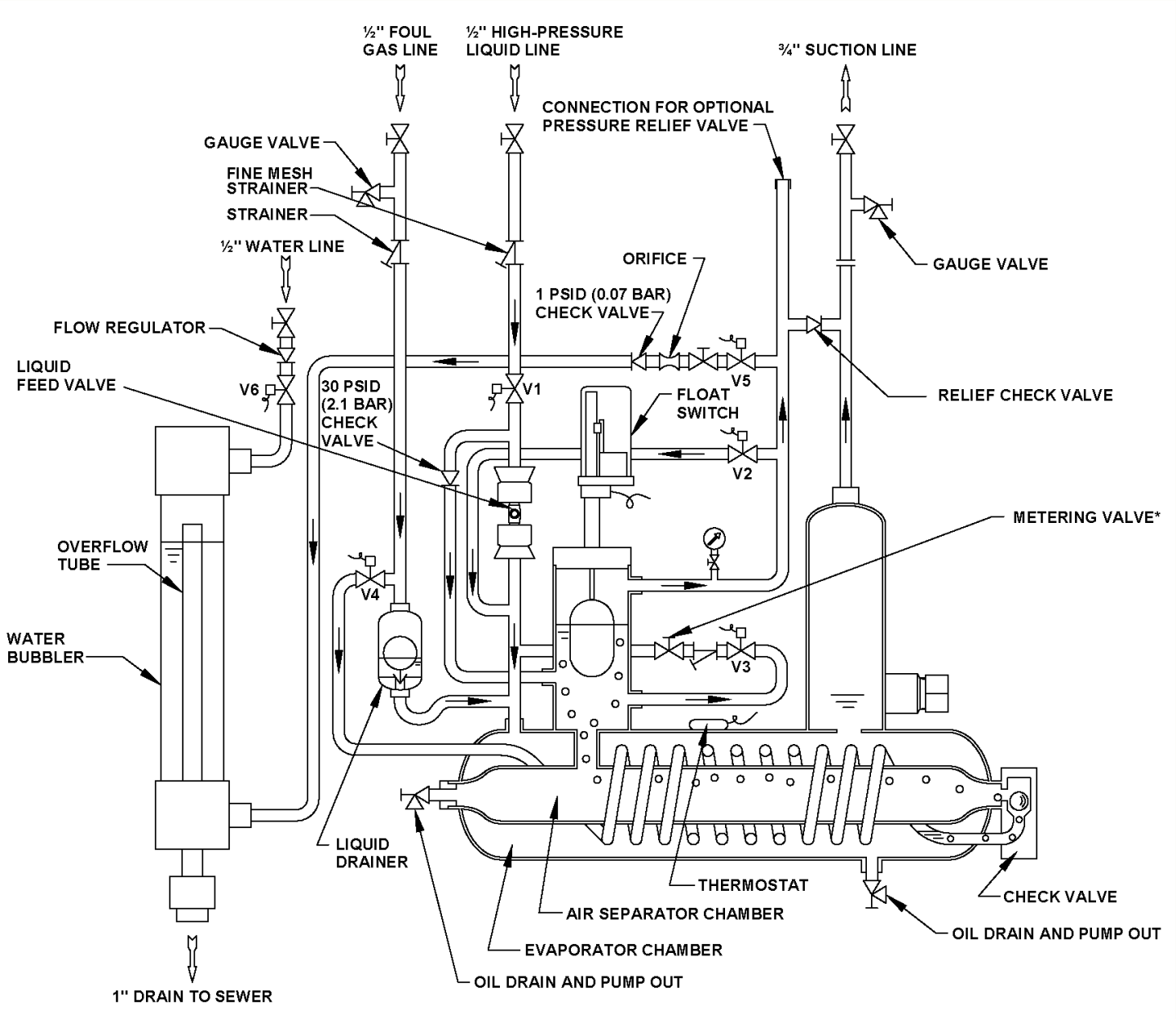


FIGURE 13. AUTO-PURGER AP FLOW DIAGRAM.

Solenoids: V1 Liquid Line

V2 Vent

V3 Liquid Metering

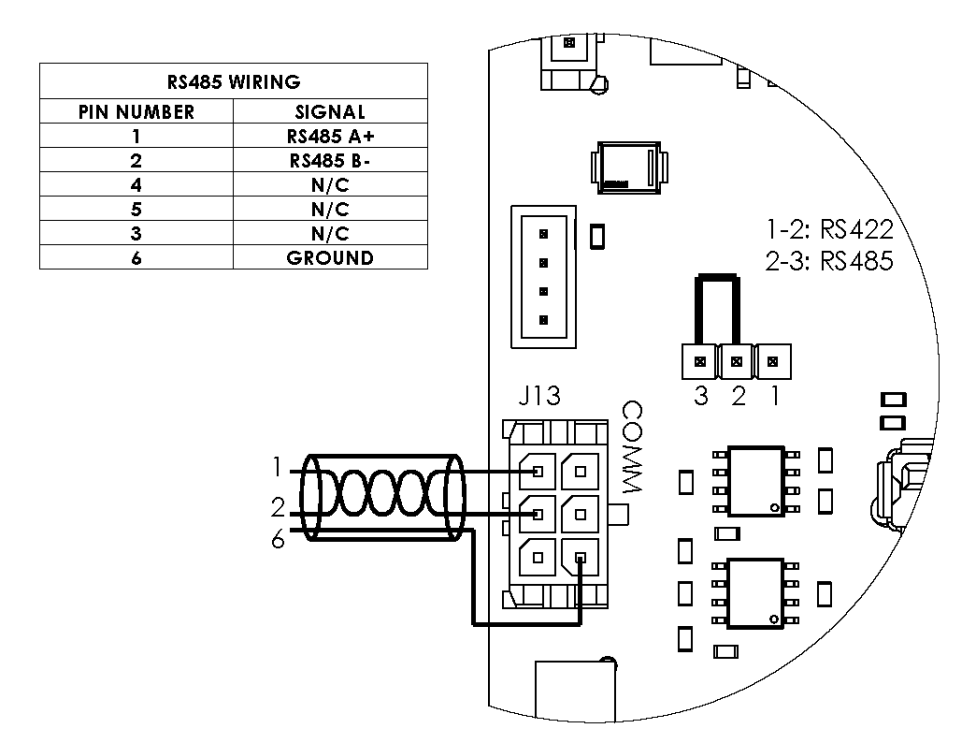
V4 Foul Gas

V5 Purge Gas

V6 Water

REMOTE COMMUNICATION HARDWARE

The AUTO-PURGER can now be controlled via remote communication. All functions of the purger can be read or controlled using remote communication. See the Parameter Table section for all available read/write functions. The Main Board includes an RS-485 connection for Modbus RTU communication. The 6-pin RS485 connector is located on the left side of the main board and is labelled J13/COMM. This connector requires a 6-pin Molex connector and 3 signal wires that are a minimum of 24 AWG. Refer to Figure 14 for the wiring diagram. An optional Modbus RTU/TCP Adapter can be purchased (20-2913). This adapter has an Ethernet port that allows the PLC to communicate with the purger over Ethernet. The kit includes the hardware to mount the adapter inside the control cabinet and cables for the RS-485 signal and 24VDC power supply to the Modbus RTU/TCP adapter. See Figures 15 & 16. **Refer to the Modbus Adapter Setup Guide 2002-92 for Modbus RTU/TCP adapter assembly.**



RS485 WIRING	
PIN NUMBER	SIGNAL
1	RS485 A+
2	RS485 B-
4	N/C
5	N/C
3	N/C
6	GROUND

FIGURE 14. RS485 WIRING DIAGRAM

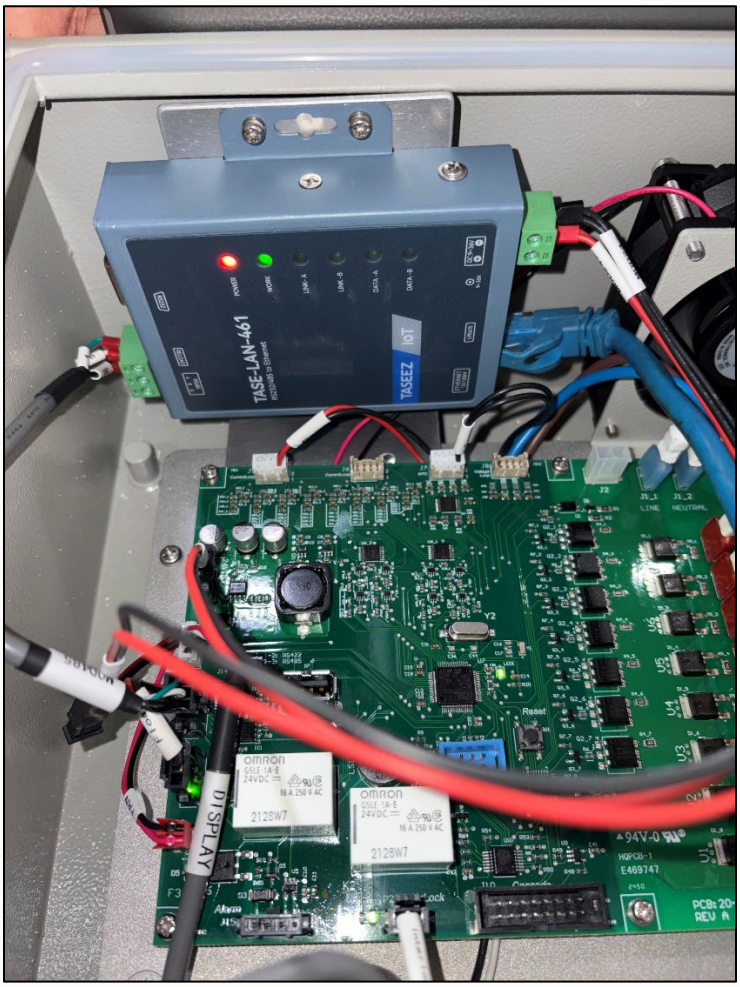


FIGURE 15. LOCATION OF MODBUS RTU/TCP ADAPTER

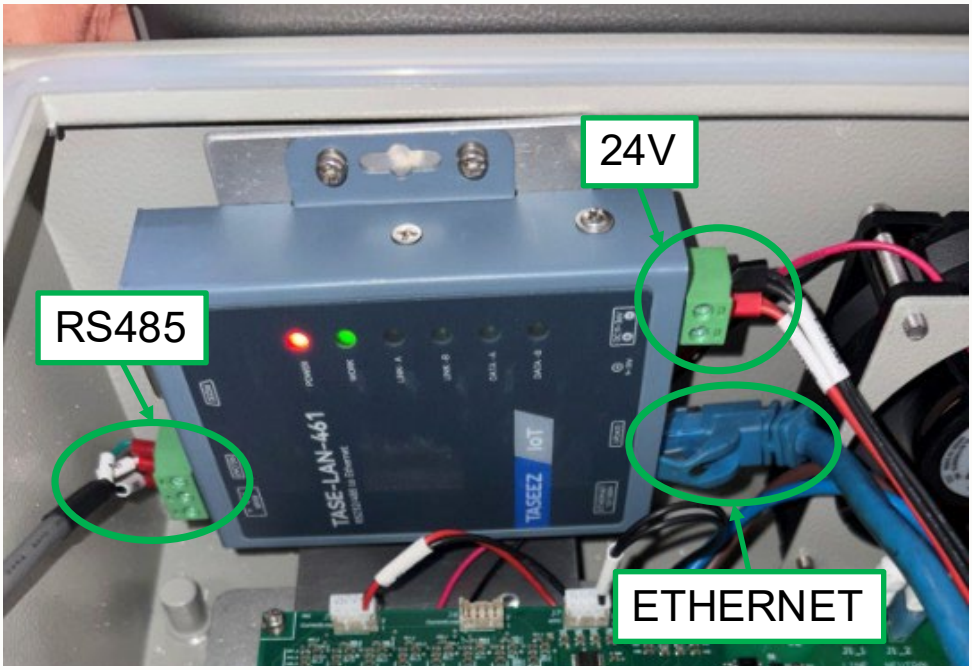


FIGURE 16. MODBUS RTU/TCP ADAPTER CONNECTIONS

REMOTE MODE

In REMOTE mode, the touchscreen is locked on the HOME PAGE, and the purger can only be controlled via remote communication. To enter (and exit) REMOTE mode, navigate to the HOME PAGE; press and hold the time/date box on the top right of the touchscreen for 5 seconds. The background of the HOME PAGE will turn black when it is in REMOTE mode. See Figure 17. While in REMOTE mode, the status box on the touchscreen will flash the PURGER AWAITING SIGNAL alarm. This alarm checks for communication from the Client device every 5 seconds and helps to confirm that the signal from the Client device is working properly.

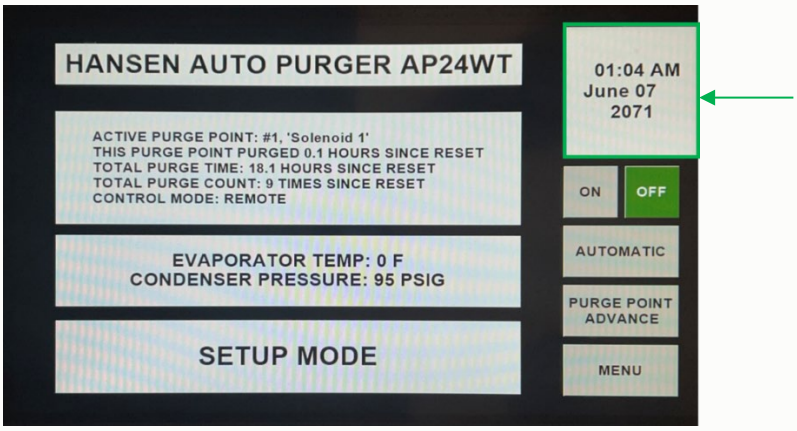


FIGURE 17. HOME PAGE IN REMOTE MODE

Communication Specifications Modbus RTU

The default address of all purgers is 254. If multiple AUTO-PURGERs are connected to one PLC, the address of each purger should be different. To change the address, write a new address to holding register 0x0. Each purger must be set up one at a time, for unique addresses to be set.

Baud rate: 115200
Default Address: 254
8 data bits
1 stop bit
No parity bits

Supported Modbus Commands:

- 01 (0x01): Read Coil Status
- 02 (0x02): Read Input Status
- 03 (0X03): Read Holding Registers
- 04 (0x04): Read Input Registers
- 05 (0x05): Write Single Coil
- 06 (0x06): Write Single Register
- 15 (0x0F): Write Multiple Coils
- 16 (0x10): Write Multiple Registers

Communication Specifications Modbus TCP over Ethernet

To set up the Modbus RTU to TCP adapter, refer to the Modbus Adapter Setup Guide 2002-92.

Default IP address: 192.168.0.89
Default Port: 10123

Parameter Tables

Purger Configuration

Address	Description	Read/Write
0	New System Start-up: ON – OFF 0 = OFF, 1 = ON	Read (01) Write (05)
1	Purger Active: ON – OFF 0 = OFF, 1 = Active/ON	Read (01) Write (05)
2	Purge Point Cycling: Automatic – Manual 0 = Manual, 1 = Automatic	Read (01) Write (05)
3	AUTO-Start: ON – OFF 0 = OFF, 1 = ON	Read (01) Write (05)
10	APC Mode: ON – OFF 0 = OFF, 1 = ON; Write “True” to switch between ON/OFF	Read (01) Write (05)
44003	Temperature Alarm Threshold -20F to 40F, for negative temperatures write 65535 for (-1F), write 65516 for (-20F)	Read (03) Write (06)

Active Alarm Status

Address	Description	Read/Write
4	Clear LOS OF FOUL GAS Alarm: 1 = Clear Alarm	Write (05)
11001	Alarm: LOSS OF FOUL GAS PRESSURE: Active – OFF 0 = OFF, 1 = Active	Read (02)
11002	Alarm: PURGER COOLING DOWN: Active – OFF 0 = OFF, 1 = Active	Read (02)
11003	Alarm: Single Purge Event Time Limit Exceeded: Active – OFF 0 = OFF, 1 = Active	Read (02)
11004	Alarm: Connection lost to Touchscreen: Active – OFF 0 = OFF, 1 = Active	Read (02)

Operating Status

Address	Description	Read/Write
10001	Interlock Connection Status: Closed – Open 0 = Open, 1 = Closed	Read (02)
10002	Float Switch Position: Down – Up 0 = Up, 1 = Down	Read (02)
10003	(V1) Liquid Solenoid Status: Energized – De-energized 0 = De-energized, 1 = Energized	Read (02)
10004	(V2) Vent Solenoid Status: Energized – De-energized 0 = De-energized, 1 = Energized	Read (02)
10005	(V3) Metering Solenoid Status: Energized – De-energized 0 = De-energized, 1 = Energized	Read (02)
10006	(V4) Foul Gas Solenoid Status: Energized – De-energized 0 = De-energized, 1 = Energized	Read (02)
10007	(V5) Purge Solenoid Status: Energized – De-energized 0 = De-energized, 1 = Energized	Read (02)
10008	(V6) Water Solenoid Status: Energized – De-energized 0 = De-energized, 1 = Energized	Read (02)
10009	Status: Purging: Active – OFF 0 = OFF, 1 = Active	Read (02)
10010	Status: Collecting Non-Condensable Gas: Active – OFF 0 = OFF, 1 = Active	Read (02)
10011	Status: Purger Cooling Down: Active – OFF 0 = OFF, 1 = Active	Read (02)
10012	Status: Remote Mode: Active – OFF 0 = OFF, 1 = Active	Read (02)

30001	Evaporator Temperature: -60F – 300F	Read (04)
30002	High Side Pressure: 0 psig – 285 psig	Read (04)
44001	Active Purge Point: 1 – 24 0 = Purge Point 1…	Read (03)

Purge Point Configuration and Logs

Address	Description	Read/Write
5	Purge Point Advance 1 = Next Purge Point	Write (05)
7	Reset Total Purge Count 1 = Reset Purge Count	Write (05)
8	Reset Purge Logs 1 = Reset logs	Write (05)
9	Update Purge Logs 1 = Update logs	Write (05)
33	Activate Purge Point 1: Activate – Deactivate 0 = Deactivate, 1 = Activate	Read (01) Write (05)
…	…	
56	Activate Purge Point 24	
43001	Single Purge Event Time Limit: 5 – 60 minutes	Read (03) Write (06)
43004	Total Purge Time: Last 24 Hours (in minutes)	Read (03)
43005	Total Purge Time: Last 7 Days (in minutes)	Read (03)
44002	Purge Count since reset	Read (03)
45001	Last reset date: Year	Read (03)
45002	Last Reset date: Month	Read (03)
45003	Last Reset date: Day	Read (03)
45008	Ammonia Purged since reset XXXX.X, e.g., 1.1 lbs. will read as 11	Read (03)
45009	Air Removed since reset XXXX.X, e.g., 10.4 lbs. will read as 104	Read (03)

Scheduling

Address	Description	Read/Write
6	Enable Purger Schedule: Enabled – Disabled 0 = Disabled, 1 = Enable	Read (01) Write (05)
11	Update Purge Schedule: Sunday, Shift 1 1 = Updates the Schedule to the latest data in the corresponding register *Note: Write to these registers after writing a purge schedule to save it. Otherwise, the purger will not save the schedule.*	Write (05)
12	Update Purge Schedule: Sunday, Shift 2	
13	Update Purge Schedule: Sunday, Shift 3	
14	Update Purge Schedule: Monday, Shift 1	
15	Update Purge Schedule: Monday, Shift 2	
16	Update Purge Schedule: Monday, Shift 3	

17	Update Purge Schedule: Tuesday, Shift 1	
18	Update Purge Schedule: Tuesday, Shift 2	
19	Update Purge Schedule: Tuesday, Shift 3	
20	Update Purge Schedule: Wednesday, Shift 1	
21	Update Purge Schedule: Wednesday, Shift 2	
22	Update Purge Schedule: Wednesday, Shift 3	
23	Update Purge Schedule: Thursday, Shift 1	
24	Update Purge Schedule: Thursday, Shift 2	
25	Update Purge Schedule: Thursday, Shift 3	
26	Update Purge Schedule: Friday, Shift 1	
27	Update Purge Schedule: Friday, Shift 2	
28	Update Purge Schedule: Friday, Shift 3	
29	Update Purge Schedule: Saturday, Shift 1	
30	Update Purge Schedule: Saturday, Shift 2	
31	Update Purge Schedule: Saturday, Shift 3	
42003	Sunday Shift 1, Start Time, Hour 0-24 Hours	Read (03) Write (06)
42004	Sunday Shift 1, Start Time, Minutes 0-60 Minutes	
42005	Sunday Shift 1, Purger Active Time, Hour 0-24 Hours	
42006	Sunday Shift 1, Purger Active Time, Minutes 0-60 Minutes	
…	…	
42008	Sunday Shift 2, Start Time, Hour	
…		
42013	Sunday Shift 3, Start Time, Hour	
…		
42021	Monday Shift 1, Start Time, Hour	
…		
42026	Monday Shift 2, Start Time, Hour	
…		
42031	Monday Shift 3, Start Time, Hour	
…		
42041	Tuesday Shift 1, Start Time, Hour	
…		
42046	Tuesday Shift 2, Start Time, Hour	
…		
42051	Tuesday Shift 3, Start Time, Hour	
…	…	
42061	Wednesday Shift 1, Start Time, Hour	
…		
42066	Wednesday Shift 2, Start Time, Hour	
…		
42071	Wednesday Shift 3, Start Time, Hour	

…	…	
42081	Thursday Shift 1, Start Time, Hour	
…		
42086	Thursday Shift 2, Start Time, Hour	
…		
42091	Thursday Shift 3, Start Time, Hour	
…		
42101	Friday Shift 1, Start Time, Hour	
…		
42106	Friday Shift 2, Start Time, Hour	
…		
42111	Friday Shift 3, Start Time, Hour	
…		
42121	Saturday Shift 1, Start Time, Hour	
…		
42126	Saturday Shift 2, Start Time, Hour	
…		
42131	Saturday Shift 3, Start Time, Hour	

Continuous Data Monitoring

This log keeps track of the information from the last hour. (60 total logs, each log is 12 registers)

Address	Description	Read/Write
46001	Log 1: Time, Hour	Read (04)
46002	Time, Minute	
46003	Active Purge Point 0 = Purge Point 1… 23 = Purge Point 24	
46004	Evaporator Temperature: -60F – 300F	
46005	High Side Pressure: 0 psig – 285 psig	
46006	Float Switch Position 0 = UP, 1 = DOWN	
46007	(V1) Liquid Solenoid: 1 = De-energized, 2 = Energized	
46008	(V2) Vent Solenoid	
46009	(V3) Liquid Metering Solenoid	
46010	(V4) Foul Gas Solenoid	
46011	(V5) Purge Gas Solenoid	
46012	(V6) Water Solenoid	
46013	Log 2: Time, Hour	
46025	Log 3: Time, Hour	

46709	Log 60: Time, Hour	

Alarm Logs

Address	Description	Read/Write
LOSS OF FOUL GAS PRESSURE Alarm Log (last 10 alarms)		
45010	Alarm 1 (most recent) Start Time, Year	Read (03)
45011	Alarm 1 Start Time, Month	
45012	Alarm 1 Start Time, Day	
45014	Alarm 1 Start Time, Hour	
45015	Alarm 1 Start Time, Minute	
45017	Alarm 1 End Time, Year	
45018	Alarm 1 End Time, Month	
45019	Alarm 1 End Time, Day	
45021	Alarm 1 End Time, Hour	
45022	Alarm 1 End Time, Minute	
45024	Alarm 1, Active Purge Point 1 = Purge Point 1… 24 = Purge point 24	
45025	Alarm 1, Evaporator Temperature at time of Alarm	
45027	Alarm 1, Float Ball Position at time of Alarm 0 = UP, 1 = DOWN	
…	…	
45028	Alarm 2	
…	…	
45046	Alarm 3	
…	…	
45064	Alarm 4	
…	…	
45082	Alarm 5	
…	…	
45100	Alarm 6	
…	…	
45118	Alarm 7	
…	…	
45136	Alarm 8	
…	…	
45154	Alarm 9	
…	…	
45172	Alarm 10	
PURGER COOLING DOWN Alarm Log (last 10 alarms)		
45190	Alarm 1 (most recent) Start Time, Year	Read (03)
45191	Alarm 1 Start Time, Month	
45192	Alarm 1 Start Time, Day	
45194	Alarm 1 Start Time, Hour	
45195	Alarm 1 Start Time, Minute	
45197	Alarm 1 End Time, Year	

45198	Alarm 1 End Time, Month	
45199	Alarm 1 End Time, Day	
45201	Alarm 1 End Time, Hour	
45202	Alarm 1 End Time, Minute	
45204	Alarm 1, Active Purge Point 1 = Purge Point 1… 24 = Purge point 24	
45206	Alarm 1, High Side Pressure at the time of Alarm	
45207	Alarm 1, Float Ball Position at time of Alarm 0 = UP, 1 = DOWN	
…	…	
45208	Alarm 2	
…	…	
45226	Alarm 3	
…	…	
45244	Alarm 4	
…	…	
45262	Alarm 5	
…	…	
45280	Alarm 6	
…	…	
45298	Alarm 7	
…	…	
45316	Alarm 8	
…	…	
45334	Alarm 9	
…	…	
45352	Alarm 10	
Single Purge Event Time Limit Exceeded (last 5 alarms)		
45370	Alarm 1 (most recent) Start Time, Year	Read (03)
45371	Alarm 1 Start Time, Month	
45372	Alarm 1 Start Time, Day	
45374	Alarm 1 Start Time, Hour	
45375	Alarm 1 Start Time, Minute	
45377	Alarm 1 End Time, Year	
45378	Alarm 1 End Time, Month	
45379	Alarm 1 End Time, Day	
45381	Alarm 1 End Time, Hour	
45382	Alarm 1 End Time, Minute	
45384	Alarm 1, Active Purge Point 1 = Purge Point 1… 24 = Purge point 24	
45385	Alarm 1, Evaporator Temperature at time of Alarm	
45386	Alarm 1, High Side Pressure at the time of Alarm	
…	…	
45388	Alarm 2	
…	…	

45406	Alarm 3	
…	…	
45424	Alarm 4	
…	…	
45442	Alarm 5	

Time Registers

Address	Description	Read/Write
41001	Date: Year	Read (03) Write (06)
41002	Date: Month	Read (03) Write (06)
41003	Date: Day	Read (03) Write (06)
41004	Day of the Week	Read (03)
41005	Hour	Read (03) Write (06)
41006	Minute	Read (03) Write (06)

TOUCHSCREEN DISPLAYS LOSS OF FOUL GAS PRESSURE

This usually means the pressure in the air separator chamber is below 80 psig (5.5 barg). The high-side pressure gauge on the purger reads near suction pressure. The purger will not allow non-condensable gases to be released from the purger.

REASON 1: A remote purge point solenoid valve is jammed closed.

Check: Clear the LOFG alarm by clicking the STATUS BOX or pressing OFF on the HOME PAGE. Advance purge points one at a time with the purge point advance button, waiting approximately 2 minutes before advancing again. Wait until the touchscreen again displays the LOFG alarm. The faulty coil or wiring is now pinpointed. Inspect the remote purge point solenoid valve, which caused the diagnostic code to appear. Manually open the solenoid valve and recheck the pressure.

Action: If the coil is energized, clean and replace any solenoid valve parts as necessary. See also the Caution section on page 45.

REASON 2: Foul gas line restricted.

Check: Inspect the Foul gas line for a closed shut-off valve(s) or the plastic shipping cap still in foul gas line flange.

Action: Open shut-off valves and/or remove the shipping cap. See also the Caution section, page 45.

REASON 3: Faulty pressure transducer.

Check: With the purger in any operational mode, check the high-side pressure gauge reading and compare it to the pressure reading on the touchscreen. They should read the same pressure.

Verify the pressure transducer's 4-20mA signal using a multimeter. Disconnect the pressure transducer wires from the terminal block to measure the current. The pressure transducer has a rated pressure range of -14.7(vacuum) psig to 285 psig. Use the following equation to verify the expected 4-20mA output at a given pressure.

0.053 * (14.7 + *applied pressure*) + 4 = (*expected output)*

Applied Pressure	Expected Output
-14.7 psig	4 mA
0 psig	4.78 mA
80 psig	9.02 mA
150 psig	12.73 mA
285 psig	19.88 mA

Action: If the multimeter reads a 4-20mA signal greater than ±5% from the expected output, replace the high side pressure transducer (P/N PT3) with the purger at zero pressure. See also the Caution section on page 45.

TOUCHSCREEN DISPLAYS PURGER COOLING DOWN

If the purger evaporator temperature is above the temperature alarm threshold set on the CONFIGURATION screen, the purger will not release non-condensable gas from the purger because excessive refrigerant would also escape. This alarm is also displayed during initial start-up until the purger flooded evaporator is cooled down.

REASON 1: Suction temperature is too high.

Check: Verify the pressure at the purger suction line connection. To allow for temperature transfer losses between the purger evaporator and the temperature sensor, the suction temperature should be approximately 20°F (–7°C) or colder. For higher suction temperatures, consult the factory.

Action: Connect to a lower-temperature suction.

REASON 2: Restriction in the suction line.

Check: Inspect the suction line and shut-off valves. These should be a minimum size of ¾". On new installations, also make sure the plastic shipping cap in the suction line flange is removed.

Action: Eliminate the restriction. See also the Caution section on page 45.

REASON 3: The flooded evaporator inside the purger is not filled with refrigerant.

Check: Look for a closed liquid line shut-off valve. Also, check that the liquid line solenoid valve (V1) is energized.

Action: Open the liquid line shut-off valve. If not energized, check for voltage at the liquid line solenoid valve coil. Replace the coil if it is burned out.

REASON 4: Faulty temperature sensor.

Check: The resistance across the thermistor. Disconnect the thermistor from the terminal block and measure the resistance across the wires. Resistance values should be in the following range.

Resistance	Temperature
1MΩ	-20ºF
660kΩ	-9ºF
470kΩ	1ºF
330kΩ	11ºF
220kΩ	24ºF
144kΩ	39ºF
100kΩ	52ºF
50kΩ	About 70ºF

Action: Replace the thermistor if it is defective (P/N: 20-2303).

TOUCHSCREEN DISPLAYS SINGLE PURGE EVENT TIME EXCEEDED

If non-condensable gas is released from the purger continuously for the customer-defined time, a time delay will close the purge gas solenoid valve (V5). This limits the possibility of a substantial amount of refrigerant inadvertently being released into the water bubbler in the unlikely event of purger malfunction.

REASON 1: A large volume of non-condensable gas is continuously being removed from the system.

Action: Press OFF on the HOME PAGE to clear the alarm. Press ON to start the purger. If a high non-condensable gas load is expected, set the NEW SYSTEM STARTUP button on the Purge Point Setup page to ON.

REASON 2: Purge gas solenoid valve (V5) is not opening, or the seat/orifice is blocked.

Check: Make sure purge gas solenoid valve (V5) is energized. If not, check for voltage at the solenoid coil.

Action: Replace the coil if it is burned out; otherwise, clean or replace the valve. See also the Caution section on page 45.

REASON 3: The gauge valve, located after the purge gas solenoid valve (V5), is closed.

Check: Verify that the solenoid coil V5 is energized without bubbles appearing in the bubbler.

Action: Open the valve.

TOUCHSCREEN DISPLAYS ± ERROR FOR TEMPERATURE OR PRESSURE TRANSDUCER READING OR DISPLAYS ERROR! ALARM

REASON 1: The temperature or pressure transducer wires are in the wrong terminal.

Check: Verify that the temperature sensor is connected to the terminals labelled TEMP. Verify that the pressure transducer positive (red) wire is connected to the top terminal position labelled Pres-P.

Action: If wires are in the wrong terminal position, connect them to the correct position.

REASON 2: The temperature reading from the thermistor is out of range.

Check: The resistance across the thermistor. Resistance should be similar to the table above.

Action: Replace the thermistor if it is defective (P/N: 20-2303).

TOUCHSCREEN DISPLAYS NO ENABLED PURGE POINTS OR NO MICRO-SD CARD DETECTED

REASON 1: The micro-SD card is not inserted into the touchscreen before the purger is powered on. The enabled/disabled purge points are saved to the micro-SD. If it is removed while the purger is powered off and is not re-inserted into the touchscreen, the purger will act as if there are no purge point boards connected to the main board. In addition, the previous purge point setup will not be saved.

Check: Open the control box and locate the micro-SD slot on the back of the control box door. Verify that the micro-SD is there and fully inserted into the connector on the touchscreen.

Action: If the micro-SD is not there. Re-insert a new micro-SD card with the correct touchscreen files. Contact Hansen to obtain micro-SD files. The maximum micro-SD card size is 32 GB. For best performance, use an 8 GB card.

If the micro-SD card is there, push down on the card until it clicks into the connector. Power cycle the purger to clear both alarms.

REASON 2: All possible purge points are disabled on the Purge Point Setup screen

Action: Go to the Purge Point Setup screen. Activate all necessary purge points. This will clear the NO ENABLED PURGE POINTS alarm only.

REASON 4: No signal between the main board and the purge point board.

Check: Verify that the purger recognizes the purge point board by going to the PURGE POINT SETUP screen. The available purge points should be shown on the right side of the screen. If there are two purge point boards in the control box, there should be a “Solenoids 1-8” button and a “Solenoids 9-16” button on the screen. See the Purge Point Setup section on page 18.

Verify that the 16-pin cable is connected to the connector on the main board and purge point boards. See pages 9 & 10 for board pictures.

There are two 16-pin connectors on each purge point board. Verify that the 16-pin connector, on the right, has a 16-pin jumper plugged in. This jumper will include a small black wire. See Figure 19.

Action: Secure all 16-pin connections. After securing connections, navigate to the PURGE POINT SETUP screen and back to the MENU to recognize purge point boards.

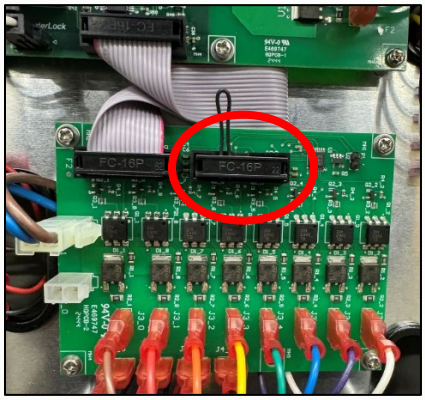


FIGURE 19. LOCATION OF 16-PIN CONNECTOR WITH

JUMPER WIRE

TOUCHSCREEN DISPLAYS SYSTEM FAILURE RESTART SYSTEM

REASON 1: The touchscreen 4-pin cable was disconnected from either the main board or the touchscreen.

Check: Verify the 4-pin cable is plugged into the connector labelled *Display* on the main board. See Figure 4 on page 9.

Action: The purger must be power cycled to clear the alarm. Use the toggle switch in the control box to cycle power.

REASON 2: The touchscreen has frozen while loading one of the screens. This is most likely to happen when exiting the PURGE POINT SETUP screen. The screen is frozen if pressing the MENU button does not go back to the MAIN MENU after 10 seconds.

Action: Power cycle the purger using the toggle switch in the control box.

PRESSING THE ON BUTTON DOES NOT START THE PURGER –

REASON 1: The interlock connection is open.

Check: Verify that the interlock jumper wire is connected. If the interlock is being used, verify that the external device is active and the interlock loop is closed. The interlock LED on the main board should be illuminated brightly if the loop is closed. (See Main Board section on page 8).

Action: Connect jumper wire or close interlock loop with external device.

REASON 2: The evaporator thermistor or pressure transducer reads ±ERROR on the HOME PAGE or STATUS screens

Check: See TOUCHSCREEN DISPLAYS ±ERROR… troubleshooting section.

NON-CONDENSABLES ARE NOT BEING RELEASED FROM THE PURGER

REASON 1: The Single Purge Event time limit has been exceeded.

Symptom: The Single Purge Event Time limit alarm is displayed in the Status Box. The magnet on the float switch is away from the steel tube, and all purge control solenoids are de-energized.

Check: Verify that the Single Purge Event Time limit alarm is showing in the status box.

Action: Press OFF on the HOME PAGE to clear the alarm. For more information, see Section 3, Purge Gas Solenoid Valve Time Delay Cutout on page 21.

REASON 2: The 30 psid (2.1 bar) check valve is stuck open.

Check: 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 3: The relief check valve is leaking or stuck open.

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

Action: Replace or repair the check valve.

REASON 4: The vent solenoid valve (V2) is leaking or stuck open.

Check: Look for frost on the outlet of the solenoid valve. If it operates properly, there should be no frost.

Action: Repair or replace the solenoid valve.

REASON 5: The metering orifice in the 1 psid (0.07 bar) check valve inside the purge gas solenoid valve (V5) is plugged. See Figure 9.

Check: Ensure the purge gas solenoid valve (V5) is energized, then look for non-condensable gas release.

Action: If non-condensable gases are not released, then clean or replace the 1 psid (0.07 bar) check valve (20-1183).

REASON 6: 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 is 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 (V4). To check for a sticking solenoid valve, use the manual-opening stem to temporarily open the valve. Observe if the pressure increases to the condensing pressure. Also, ensure that the plastic shipping cap has been removed from the foul gas line flange.

REASON 7: No non-condensable gases 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 non-condensable gases present.

REASON 8: The metering valve line is plugged.

Symptom: The purger appears to be operating properly, but the entire metering valve line is not frosted.

Check: Look for a restriction in the metering valve.

Action: Unlock the metering valve knob using the .05" 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.

Check: Make sure the metering line solenoid valve (V3) 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 23.

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 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 1 amp fuse is blown. Do not increase the amperage of the fuse.

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

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

AMMONIA INSTEAD OF NON-CONDENSABLES RELEASED FROM THE PURGER

Small bubbles are present in the water bubbler, and there is a strong smell of ammonia is a sign of NH3 vapor. The water bubbler assembly is violently shaking, and there are small bubbles is a sign of NH3 liquid.

REASON 1 (NH3 vapor): The foul gas line is not open.

Symptom: The pressure gauge in the valve package on the purger is not reading within 5–7 psi (0.34–0.48 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 1-amp fuse 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 (V5) seat is leaking.

Symptom: Bubbles are slowly being released in the water bubbler while the purger is in COLLECTING NON-CONDENSABLES mode and the float switch magnet is pulled in against the tube.

Check: Look for dirt or a worn seat in the purge gas solenoid valve (V5).

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 or replace the valve.

REASON 3 (NH3 vapor): 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 6.

REASON 4 (NH3 vapor): The foul gas solenoid valve (V4) 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 (V4) at the purge control terminal with the green wire.

Check: Manually open the foul gas solenoid valve (V4). 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 (V4).

REASON 5 (NH3 vapor): 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 the continuity of all wiring to coils.

Action: Properly install the purge point. Refer to Purge Point Boards in Section 2. Properly connect the purge point solenoid.

REASON 6 (NH3 liquid): The float switch is not properly installed.

Check: Check to see if the 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.

PURGER DOES NOT SWITCH FROM PURGER COOLING DOWN TO COLLECTING NON-CONDENSABLES OR PURGING

REASON 1: The suction temperature is less than 10°F (–12°C) below the temperature alarm set point.

Check: Verify the suction pressure at the purger suction line connection.

Action: If not cold enough, move the suction line to a lower temperature suction, or go to the CONFIGURATION screen and adjust the temperature alarm threshold to a higher temperature

REASON 2: The evaporator is not filled with refrigerant.

Check: The float switch magnet should make contact in 5 to 15 minutes after starting the purger with the ON button.

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 (V1) (V1/ White wire on the purge control solenoid terminal block), 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 feed valve line is plugged.

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

Check: Look for a restriction in the liquid feed valve.

Action: Unlock the liquid feed valve knob using the .05" 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.

Check: Make sure the liquid line solenoid valve (V1) 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 23.

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 ¾″ (20 mm). On new installations, ensure the plastic shipping cap has been removed from the suction line flange.

Action: Remove the restriction or install the correct line size.

PURGE POINT SOLENOID VALVE IS NOT OPERATING PROPERLY

REASON 1: The solenoid valve is faulty.

Check: Verify the resistance of the coil or look for dirt in the valve.

REASON 2: A purge point solenoid valve is not operating.

Check: Verify continuity through the 1 amp fuse.

Action: If faulty, replace the fuse.

Check: Verify the voltage at the purge point terminal. The voltage should be 115V (230V for 230V purger). If no voltage is present, check the continuity between the purge point terminal and the associated flat pin connector on the purge point board. Follow the colored wire from the purge point terminal to the associated purge point board.

REASON 3: No power to the purge point board.

Check: Verify that the 2-pin line voltage jumper cable to the purge point board is connected to the main board and the purge point board for the purge point solenoid that is not working. The voltage across the pins should be 115V or 230V.

Action: Ensure the two-pin cable is plugged into the main board and purge point board.

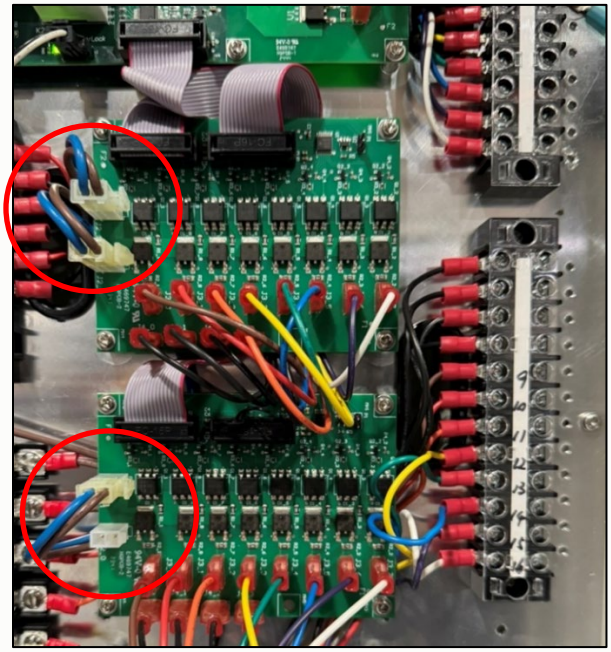


FIGURE 18. LOCATION OF PURGE POINT BOARD LINE VOLTAGE CABLE.

REASON 4: No signal between the main board and the purge point board.

Check: Verify that the purger is recognizing the purge point board by going to the PURGE POINT SETUP screen. The screen should show the available purge points on the right side of the screen. If there are two purge point boards in the control box, there should be a 1-8 button and a 9-16 button on the screen.

Verify that the 16-pin cable is connected to the connector on the main board and purge point boards.

Verify that the right 16-pin connector on the purge point board has a 16-pin jumper plugged in. This jumper will include a small black wire.

Verify that the screen does not display NO ENABLED PURGE POINTS in the Status Box.

Action: Secure all 16-pin connections. After securing connections, navigate to the PURGE POINT SETUP screen and back to the MENU to recognize purge point boards.

CONTROL CABINET APPEARS TO HAVE NO POWER (DISPLAY DOES NOT TURN ON)

REASON 1: No power to the purger.

Symptom: The main board LEDs are not illuminated. The touchscreen is not illuminated.

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

REASON 2: No power to the main board (Figure 4).

Symptom: The green LEDs on the purger board are not illuminated.

Check: Verify voltage to the board. The voltage between terminals J1_1 Line and J1_2 Neutral on the main board should be 115V (230V for 230V purger).

REASON 3: The screen is black, but the main board LEDs are illuminated.

Action: The touchscreen display may be asleep from idle. Tap the touchscreen to turn it back on.

REASON 4: The touchscreen signal cable is disconnected.

Symptom: The touchscreen is not on.

Check: Check that the 4-pin touchscreen signal cable is plugged into the touchscreen. Check that the 4-pin cable is plugged into the 4-pin Molex connector on the main board terminal J12.

REASON 5: The 12A fuses are disconnected or blown.

Symptom: The toggle switch is flipped to the on position, but the switch does not illuminate.

Check: Verify that the 12A fuse knobs are not disconnected.

Action: Push in fuse knobs until you hear a click. If the knobs are fully pushed in and there is still no voltage, replace the 12A fuses.

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.

DISPLAY PRESSURE READING IS 8 PSI TO 10 PSI LESS THAN THE HIGH SIDE PRESSURE GAUGE

REASON: Ground path on the HMI mounting bracket

Check: Open the control box. Measure the voltage between the positive pressure transducer terminal and the ground/back plate. If the voltage reads 23V ~ 24V, then the display mounting bracket needs to be replaced. See Figure 19.

Action: Contact the factory for a new mounting bracket kit, 20-2919. Refer to the bracket install guide 2002-95.

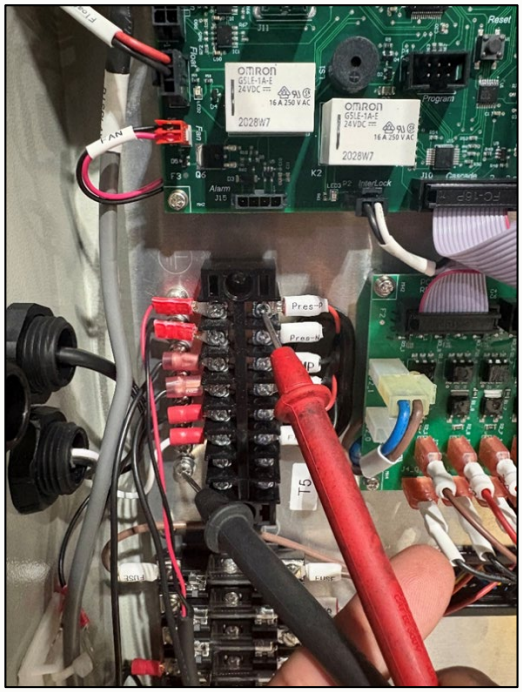


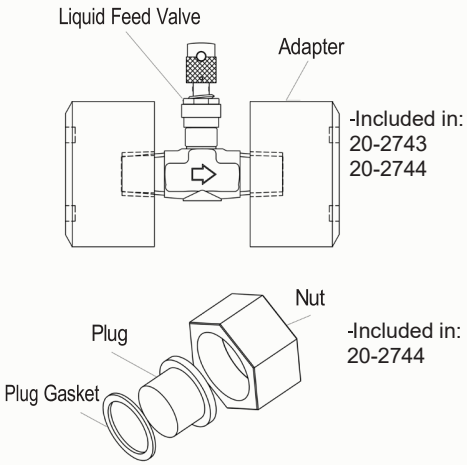
FIGURE 19. VOLTAGE MEASUREMENT LOCATION

PARTS LIST

Mechanical	
Part Number	**Description**
20-2743	Kit, Liquid Feed Valve
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)
20-1959	Water Bubbler Assembly, antisyphon (w/end connections)
20-1186	Metering Valve
20-1198	Metering Valve Seal Kit
20-1648	Metering Valve Strainer
20-1737	Screen Assembly Replacement Kit for the above strainers, includes: 20-1535 Screen Assembly 78-0016 Strainer Gasket
70-1182	Tube/Plunger Kit for all purger solenoid valves with new solenoid
20-1183	Check Valve, 1 psid (.07 bar) (White)
20-1184	Check Valve, 30 psid (2.1 bar) (Blue)
20-1185	Check Valve, 225 psid (15.5 bar)—Replaces older 200 psid (13.8 bar) check valve (Green)
20-1214	Check Valve Seal Kit, for 1, 30, and 200/225 psid (.07, 2.1, and 13.8/15.5 bar) check valves
20-1311	Liquid Drainer
20-2918	Kit, Preventive Maintenance, APWT

MECHANICAL KIT LIST

Kit	Description	QTY	Description
20-2743	**Kit, Liquid Feed Valve**	(2)	Adapters, Liquid Feed Valve
		(1)	Liquid Feed Valve
		(2)	Flange Gaskets
		(2)	Flange Bolts
		(2)	Flange Nuts
20-2744	**Kit, AP Liquid Feed Retrofit (Replaces Level Control Valve & Heater 20-1179)**	(1)	Assembly, Liquid Feed Valve
		(1)	Nut
		(1)	Plug
		(1)	Strainer Basket
		(1)	Seal
		(1)	Strainer Gasket
		(1)	Plug Gasket
		(2)	Flange Bolts
		(2)	Flange Nuts



LiquidFeedRetrofit Kit

PARTS LIST

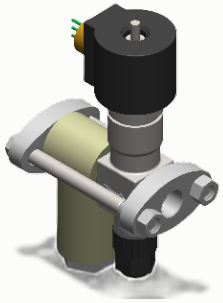
Electrical		
Part Number	**Description**	
70-1176	Pilot Light, Beacon, Amber for Purge Gas Solenoid	
70-1177	Pilot Light, Beacon, Green	
70-1088	Solenoid Coil, DIN Connection - 115V, 50/60Hz, 16 Watt	
70-1089	Solenoid Coil, DIN Connection - 230V, 50/60Hz, 16 Watt	
HS2B/1	HS2 (Brass) Water Solenoid Valve Only (Less Coil), 1/4" FPT	Solenoid V6
HS2/1	HS2 Solenoid Valve Only (Less Coil), 1/4" FPT	Solenoid V2 and V5
HS2F/1	HS2 Flanged Solenoid Valve Only (Less Coil).	Solenoid V1 and V3
HS8A/1	HS8 Foul Gas Solenoid Valve Only (Less Coil)	Solenoid V4
20-2916	Fuse, 1A, Purge Points & Purge Control Solenoids 115V & 230V Purger (refer to page 7)	
20-2917	Fuse, 12A, Cabinet Power, 115V & 230V Purger (refer to page 7)	
PT3	Pressure Transducer	
20-2303	Thermistor for the APM, APMF, APWT	
20-2915	Main Board (refer to page 7)	

Replacement control cabinets are available for standard purgers. Contact the factory for selection.

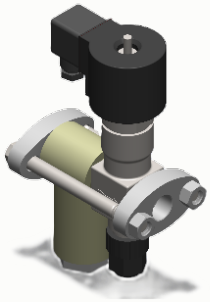
PURGE POINT SOLENOID VALVES

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.

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 CLOSE-COUPLED STRAINER



HS8ST 1/2″ SOLENOID VALVE WITH DIN PLUG CONNECTION AND CLOSE-COUPLED STRAINER

CONTROL BOX KIT LIST

Kit	Description	QTY	Description
20-2900 (120V) 20-2901 (230V)	KIT, AP08WT, CONTROL BOX UPGRADE, APWT	(1)	Control Box Assembly
		(1)	Sensor Upgrade Kit
		(1)	Coils & Beacon Lights, 115V / 230V
		(1)	HLLSWE
		(4)	Control Box Mounting Screws
		(4)	Washers
20-2907 (120V) 20-2908 (230V)	KIT, APCWT, CONTROL BOX UPGRADE, APWT	(1)	Control Box Assembly, APC
		(1)	Sensor Upgrade Kit
		(1)	Coils & Beacon Lights, 115V / 230V
		(1)	HLLSWE
		(4)	Control Box Mounting Screws
		(4)	Washers
20-2909 (120V) 20-2910 (230V)	KIT, AP16WT, CONTROL BOX UPGRADE, APWT	(1)	Control Box Assembly
		(1)	Sensor Upgrade Kit
		(1)	Coils & Beacon Lights, 115V / 230V
		(1)	HLLSWE
		(1)	Purge Point Upgrade Kit
		(4)	Control Box Mounting Screws
		(4)	Washers
20-2911 (120V) 20-2912 (230V)	KIT, AP24WT, CONTROL BOX UPGRADE, APWT	(1)	Control Box Assembly
		(1)	Sensor Upgrade Kit
		(1)	Coils & Beacon Lights, 115V / 230V
		(1)	HLLSWE
		(2)	Purge Point Upgrade Kit
		(4)	Control Box Mounting Screws
		(4)	Washers
20-2904	KIT, COMPLETE MAINTENANCE L/SENSORS, APWT	(1)	(White) Check Valve,1 psid
		(1)	((Blue) Check Valve, 30 psid
		(1)	(Green) Check Valve, 225 psid
		(3)	Metering Strainer Basket Kit
		(6)	Hansen Plunger Kit
		(2)	12A Fuse
		(7)	1A Fuse
		12”	Tubing, 3/8"Od Plastic
		(1)	Nylon Fitting
		(3)	Nylon Elbow Tube
		(1)	1/2"(13mm) Solenoid Valve (HS8A)
		(1)	NH3 Temp/Press Gauge 30inHg - 300psig

CONTROL BOX KIT LIST (refer to page 7).

Kit	Description	QTY	Description
20-2902	**KIT, PURGE POINT UPGRADE, APWT**	(1)	8 Purge Point Board, APWT Controller
		(1)	Extension to Solenoid Block Harness
		(1)	Extension to Extension signal harness
		(1)	Extension to Extension Line Voltage Harness
		(1)	Terminal Block, 12 Terminals
20-2903	**KIT, SENSOR UPGRADE, APWT**	(1)	Pressure Transducer
		(1)	Thermistor
		(1)	1/4" Angled Transducer Valve
		(2)	½” Strain Relief
		(2)	Locknut for Strain Relief
20-2913	**KIT, MODBUS RTU/TCP ADAPTER**	(1)	Modbus RTU/TCP Adapter
		(1)	Mounting Bracket, Modbus Adapter
		(1)	RS-485 to Modbus Adapter Harness
		(1)	Modbus to Main Board 24V Harness
		6 (each)	Mounting Fasteners (Screws, Washers, Nuts)
20-2905 (120V) 20-2906 (230V)	**KIT, COILS WITH WIRE HARNESSES & BEACONS, APWT**	(6)	DIN Plug-In 115V/ 230V Coils
		(6)	DIN Connector Gaskets
		(6)	Beacon Light Knobs
		(5)	Green Beacon Lights
		(1)	Amber Beacon Light (Solenoid V5)
20-2914	**TOUCHSCREEN HMI KIT**	(1)	Touchscreen HMI
		(1)	HMI Power/Signal Cable
		(4)	Stand-Offs (Mounting Hardware)
		(4)	Screws (Mounting Hardware)
20-2918	**KIT, PREVENTIVE MAINTENANCE, APWT**	(1)	(White) Check Valve,1 psid
		(1)	((Blue) Check Valve, 30 psid
		(1)	(Green) Check Valve, 225 psid
		(3)	Metering Strainer Basket Kit
		(6)	Hansen Plunger Kit
		(2)	12A Fuse
		(7)	1A Fuse
		(1)	HS8A Piston Kit
20-2919	**KIT, TOP BRACKET REPLACEMENT, DISPLAY HOLDER**	(1)	Mounting Bracket
		(2)	Screws (Mounting Hardware)

SELECTING AN AUTO-PURGER®

In addition to the AUTO-PURGER® AP, Hansen Technologies offers three other versions—the compact AUTO-PURGER® APM, the gas (air) and water AUTO-PURGER® APP, and the Non-electrical 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 APWT

This is the refreshed AUTO-PURGER. This purger replaces the original AP purger. It has solid-state control and is ideal for larger systems, up to 1500 tons (5300 kW) of ammonia. With models available to purge up to 24 points, the APWT features automatic start-up with electronic control. The purger uses adaptive purge point control to detect non-condensable gas at each purge point. The AP includes an automatic water bubbler. Standard NEMA 4-rated enclosure.

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 non-condensable 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 non-electronic AUTO-PURGER (NEAP) is ideal for small systems, up to 100 tons (350 kW). The non-electronic 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.

AUTO-PURGER APP

AUTO-PURGER PLUS is an automatic, electronically controlled non-condensable gas (air) and water purger for reducing the energy costs of operating an ammonia refrigeration system. Shipped preassembled, insulated, and includes an automatic water bubbler, a relief valve, and an isolation service valve package. One AUTO-PURGER PLUS is typically sufficient for a 1500-ton (5275 kW) system (or a 750-ton (2638 kW) system operating below 0 psig (0bar g). All models are suitable for ammonia only.

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.

HANSEN TECHNOLOGIES

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