



Product Manual

Adjustable Pressure Phase Separator APPS-160 Gen-4



Designed and Built by:

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Revision Log

Revision Level	Date	Description
B	07/25/2014	Convert to new layout and combine with manual PN 13428250 for 220V
C	08/10/2016	Update for Gen-4 model; including Gen-3 to Gen-4 upgrades
D	12/15/2016	Update Installing the Gen-4 Upgrade Kit section and Control Box Electrical Schematic



Preface

General

The Adjustable Pressure Phase Separator (APPS 160) is used to lower the saturation point of liquid nitrogen. Liquid nitrogen saturated at a high pressure flows into the APPS 160 and exits at a much lower saturation pressure and temperature. Liquid nitrogen enters the APPS 160 through an automatic solenoid valve and exits through a one-inch vacuum insulated female bayonet. The APPS unit maintains the liquid level in the tank by reading a differential pressure transmitter.

The internal pressure of the cylinder is controlled by a back-pressure regulator and a pressure transmitter that is used to control a venting solenoid valve. If the pressure exceeds the set point of the back-pressure regulator, the APPS unit activates the solenoid valve to rapidly vent the APPS 160 down to the desired working pressure.

Technical Features

- Allows use of low pressure liquid from a high pressure bulk tank
- Tighter pressure control for the lower pressure liquid application
- Adjustable outlet pressure ranges
- Working capacity of 160 liters
- Bayonet outlet connection is standard
- Muffler to reduce noise levels (98 to 106 dB)
- Major components located out of the frost area
- Manual override mode to digitally control fill and vent valves, solenoid valves also include manual handles
- More accurate and reliable level control
- More precise pressure control on liquid use
- Mini-bulk storage for under-sized vacuum lines
- Low cost alternative to two bulk tanks
- Two operating pressure ranges available
- Stainless steel plumbing
- Audible alarm
- Multiple safety features including temperature detection

Product Manual

The APPS 160 Product Manual is designed to be used in conjunction with APPS 160 provided by Chart. If there are any questions regarding the operation of this unit, contact Chart's Technical Service division at 1-800-400-4683.

This manual contains information regarding the safe operation and handling of liquid nitrogen, argon and oxygen with this unit. It should be thoroughly read and understood by anyone that operates the equipment.

The safety requirements for operating the unit and handling of extremely cold liquid products are shown in the Safety section. Use this safety section as a "Safety Checklist" each time the equipment is being used.

The Installation / Operation section includes information on how to install the APPS 160, initial start-up and operation of the unit and references any adjustments that may need to be made.

The Gen-3 to Gen-4 Upgrade section will provide detailed information on how to upgrade your APPS system.

For information on identification of components, schematic of the unit, electrical schematic, or service information see the Specifications section.

Terms

Throughout this manual safety precautions will be designated as follows:



Warning! *Description of a condition that can result in personal injury or death.*



Caution! *Description of a condition that can result in equipment or component damage.*



Note: *A statement that contains information that is important enough to emphasize or repeat.*

Acronyms / Abbreviations

The following acronyms / abbreviations are used throughout this manual:

APPS 160	Adjustable Pressure Phase Separator
dB	Decibel
GPM	Gallons per minute
Hz	Hertz
MAWP	Maximum Allowable Working Pressure
OD	Outer Dimension
PN	Part Number
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch (Gauge)



Safety

General

Strict compliance with proper safety and handling practices is necessary when using an APPS 160 unit. We recommend that all our customers re-emphasize safety and safe handling practices to all their employees and customers. While every possible safety feature has been designed into the units and safe operations are anticipated, it is essential that every user of the APPS 160 unit carefully read all warnings listed in this safety section and contained in the manual itself. Periodic review of this safety summary is recommended.



Warning! INSTALLATION: The APPS 160 should be installed by a trained, knowledgeable technician. The cryogenic piping connected to the inlet and outlet must be constructed of materials suitable for cryogenic service and properly protected from possible over-pressure. The electrical connections to the control box should be completed by a trained technician per the wiring schematic. The APPS 160 should be located on a suitable, level surface and be properly fastened to prevent movement.



Warning! ASPHYXIATION HAZARD: The venting nitrogen gas may displace the available oxygen in the area to the point where the atmosphere is deficient in oxygen. The cold nitrogen vent gas can collect in low areas, increasing the potential risk. When the APPS 160 is installed indoors or in any area with poor ventilation, the installation of an oxygen monitor should be considered.

The normal oxygen content of air is approximately 21%. Depletion of oxygen content in air, either by combustion or by displacement with inert gas, is a potential hazard and users should exercise suitable precautions.

One aspect of this possible hazard is the response of humans when exposed to an atmosphere containing only 8 to 12% oxygen. In this environment, unconsciousness can be immediate with virtually no warning.

When the oxygen content of air is reduced to about 15 to 16%, the flame of ordinary combustible materials, including those commonly used as fuel for heat or light, may be extinguished. Somewhat below this concentration, an individual breathing the air is mentally incapable of diagnosing the situation because the onset of symptoms such as sleepiness, fatigue, lassitude, loss of coordination, errors in judgment and confusion can be masked by a state of “euphoria,” leaving the victim with a false sense of security and well being.

Human exposure to atmosphere containing 12% or less oxygen leads to rapid unconsciousness. Unconsciousness can occur so rapidly that the user is rendered essentially helpless. This can occur if the condition is reached by an immediate change of environment, or through the gradual depletion of oxygen.

Most individuals working in or around oxygen deficient atmospheres rely on the “buddy system” for protection - obviously the “buddy” is equally susceptible to asphyxiation if he or she enters the area to assist the unconscious partner unless equipped with a portable air supply. Best protection is obtainable by equipping all individuals with a portable supply of respirable air. Life lines are acceptable only if the area is essentially free of obstructions and individuals can assist one another without constraint.

If an oxygen deficient atmosphere is suspected or known to exist:

1. Use the “buddy system.” Use more than one “buddy” if necessary to move a fellow worker in an emergency.
2. Both the worker and “buddy” should be equipped with self-contained or airline breathing equipment.



Warning! EXTREME TEMPERATURES: Surfaces in contact with the cryogenic liquid nitrogen or the vent gas will become extremely cold. These surfaces should not be touched.



Warning! PRESSURIZED EQUIPMENT: *In normal operation the APPS 160 and the associated piping will be pressurized. Before the pressure vessel is serviced or any plumbing components are removed, all pressure must be released.*



Warning! ELECTRICAL EQUIPMENT: *In normal operation the APPS 160 has wiring that is powered with 120 volt AC power. In addition, other wiring can be activated automatically without notice. Only knowledgeable technicians should access or repair the electrical wiring.*

Nitrogen and Argon

Nitrogen and argon (inert gases) are simple asphyxiates. Neither gas will support or sustain life and can produce immediate hazardous conditions through the displacement of oxygen. Under high pressure these gases may produce narcosis even though an adequate oxygen supply sufficient for life is present.

Nitrogen and argon vapors in air dilute the concentration of oxygen necessary to support or sustain life. Inhalation of high concentrations of these gases can cause anoxia, resulting in dizziness, nausea, vomiting, or unconsciousness and possibly death. Individuals should be prohibited from entering areas where the oxygen content is below 19% unless equipped with a self-contained breathing apparatus. Unconsciousness and death may occur with virtually no warning if the oxygen concentration is below approximately 8%. Contact with cold nitrogen or argon gas or liquid can cause cryogenic (extreme low temperature) burns and freeze body tissue.

Persons suffering from lack of oxygen should be immediately moved to areas with normal atmospheres. SELF-CONTAINED BREATHING APPARATUS MAY BE REQUIRED TO PREVENT ASPHYXIATION OF RESCUE WORKERS. Assisted respiration and supplemental oxygen should be given if the victim is not breathing. If cryogenic liquid or cold boil-off gas contacts worker's skin or eyes, the affected tissue should be flooded or soaked with tepid water (105-115°F or 41-46°C). DO NOT USE HOT WATER. Cryogenic burns that result in blistering or deeper tissue freezing should be examined promptly by a physician.



Installation / Operation

Installation

- Remove the APPS 160 unit from the shipping crate. Visually inspect the unit to ensure there is no visible shipping damage.
- Move the APPS unit to the exact installation location. Location must be flat, level and made from a suitable material such as concrete. Normally the APPS unit is installed outdoors on the pad, near the bulk supply vessel.
 - Mark the locations of the four foot pad holes.
 - Move the APPS unit and drill holes for 3/8" cement anchors (not supplied).
 - Install cement anchors.
 - Move the APPS unit back into position and bolt down securely.
- Connect supply piping from bulk supply vessel to APPS inlet (1/2" male 45° flare fitting). Optional fill hose PN 11000920 can be used for this connection.
- Connect APPS outlet (1" MVE female bayonet) to vacuum insulated pipe system. Refer to the MVIP Product Manual PN 14736238 located on www.chartparts.com for the proper procedure.
- Connect 120 Volt / 60 Hz (or 220 Volt / 50 Hz) electrical supply to APPS control box.
 - Conduit connector is located on bottom of control box.
 - Wiring should be connected to control box through terminal connector "TB1" (See electrical schematics):
 - L1 (hot) to "3" connection on terminal block
 - L2 (neutral) wire to "2" connection on terminal block
 - Ground wire to frame ground label "⏚"
 - Replace control box cover and attach securely.

Start-Up

- Ensure APPS 160 unit is completely and properly installed.
- Apply power to the APPS unit. The APPS-Tel control box display will power on and the unit should enter normal operation. You should hear the valves actuate as it is trying to fill the empty tank.
- Due to the tank being completely empty, the control box may display the alert "LVL TOO LOW" to indicate the liquid level in the tank is too low. This initial alert is expected and can be cleared by pressing the "RE-SET" button.
- The APPS 160 unit should be purged with warm, dry nitrogen gas prior to introducing liquid to ensure that the unit does not have moisture in the inner vessel. This can be done in manual operation using the "FILL" and "VENT" buttons. To enter manual operation select the "OVERRIDE" button from the main screen.
- With the supply valve from the bulk tank turned off, exit the manual operation by pressing the "EXIT" button. The valves may actuate as the unit will now be in normal operation.
- Open manual supply valve slightly to start flow of gas / liquid into APPS unit.
 - Throttle supply valve to prevent over pressure of the APPS unit (opening the relief valves) due to vaporization/cool down losses during the initial fill.
 - Slowly open the supply valve as the APPS inner vessel is cooled to cryogenic temperature.
- After fill cycle ends, the APPS unit will vent more often than normal for the first few hours.
- After the APPS unit is filled and stabilized, the vacuum insulated pipe system can start up per the recommended process.

Operation

- During normal operation, the APPS 160 unit will function automatically.
- The APPS unit will monitor the liquid level using the differential pressure transmitter. The tank will fill to the appropriate level, and it will refill once the liquid level drops below the specified point.
- The APPS unit will monitor the pressure using a pressure transmitter. The vent regulator will release gas as required to maintain the APPS unit at the preset pressure. If the pressure rises above the specified set point, it will open the vent valve and release gas to help reduce the pressure.

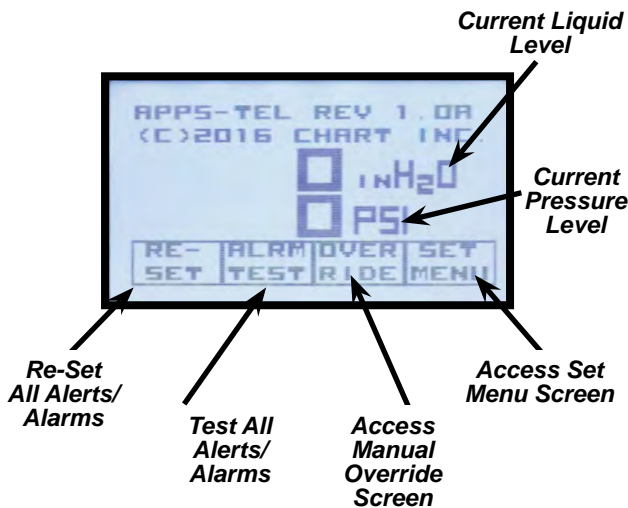


Caution! The vent valve will open without notice. The venting gas will be cold and loud.

- To take the APPS unit out of service push the “OVERRIDE” button to enter manual operation. The APPS unit will still contain liquid nitrogen, therefore it will still supply liquid nitrogen from the outlet until the unit is emptied.

User Interface Display

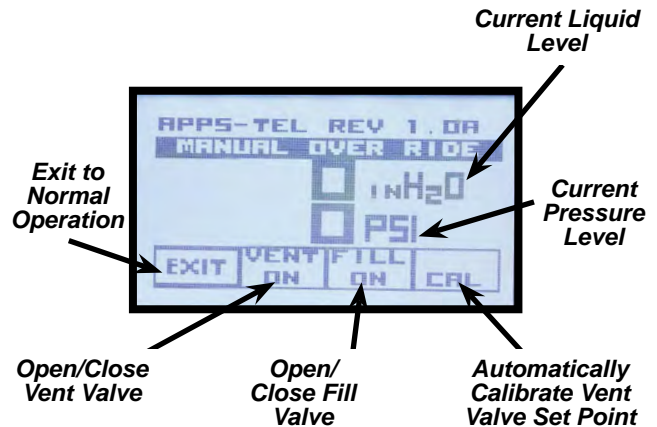
Main Screen



- When the main screen is active the unit is in normal operation
- Displays the current liquid level and pressure inside the tank as well as any alerts/alarms that have been triggered

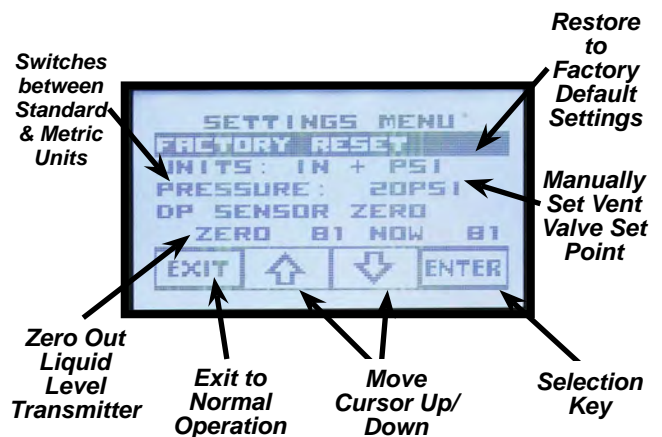
- The main screen can be used to navigate to the other menus using the appropriate buttons.
- Alerts/Alarms can be reset using the “RE-SET” button
- The “ALARM TEST” button tests all of the alarms

Manual Override Screen



- Can be entered using the “OVERRIDE” button from the main screen
- Allows the user to open/close the fill and vent valves to control the liquid level and pressure inside the tank
- Using the “CAL” button automatically calibrates the vent valve set point after the vent regulator has been set to the desired operating pressure.

Set Menu Screen



- Can be entered using the “SET MENU” button from the main screen
- If any changes are made, they must be saved by highlighting “SAVE SETTINGS” and selecting “ENTER”

- To set the unit back to factory defaults, highlight “FACTORY RESET” and select “ENTER”
- To change how the units of the liquid level and pressure are displayed, use the “UNITS” selection to toggle to the desired units, then select “ENTER”
- To manually set the pressure setting see the “Adjusting the Operating Pressure” section of this manual
- If the tank is completely empty, the “DP SENSOR ZERO” feature can zero out the differential pressure transmitter (liquid level transmitter) to recalibrate it for accuracy. This is done when the unit is manufactured and should not have to be completed again unless the sensor is replaced. To do so, highlight the selection and press the “ENTER” button.



Caution! *If the tank is not empty, using the zero DP sensor function will cause the liquid level transmitter to be inaccurate. This should only be done by a technician.*



Save all changes made

Set Menu (after change has been made)



Caution! *It is preferred to adjust the vent valve set point using the automatic calibration feature. If setting manually, the operating pressure for the vent valve should be set 2-5 psi above the regulator set point. Not doing so could cause damage to the equipment or keep the liquid from reaching the desired saturation pressure.*

Adjusting the Operating Pressure

To change the operating pressure of the APPS 160 unit, the set point of the vent regulator and vent valve pressures must be adjusted. Power must be on to adjust the operating pressure of the vent valve. Enter manual operation by selecting the “OVERRIDE” button to open the fill and vent valves which can be used to pressure up/down the tank. The vent regulator must be adjusted first.

- To adjust vent regulator, loosen lock nut and turn adjustment bolt.
 - In or clockwise will increase set point
 - Out or counterclockwise will decrease set point
 - Tighten lock nut after adjustment
- To adjust the vent valve pressures:
 - Automatic Adjustment:

- Once the vent regulator has been set, press the calibration button (denoted by “CAL”) located in the manual operation screen. This will automatically adjust the vent valve to open at the appropriate set point. This set point should be 2-5 psi above the current pressure in the tank. The APPS unit should be ready for normal operation at this point. You can press the “EXIT” button to return to normal operation.
- Manual Adjustment:
 - Enter the “Set Menu” through the main screen
 - Use the down arrow to move the cursor to highlight the pressure value, select “ENTER”.
 - Using the up/down arrows, you can increase or decrease this pressure to the desired value. The set points will be in increments of 5 psi.
 - Select “ENTER” again when desired value is reached. Move the cursor to highlight the “Save Settings”, select “ENTER”
 - Pressing the “EXIT” button places the unit back into normal operation with the new operating pressure.

Alerts / Alarms

Alerts

Alerts are used to indicate unusual activity in the APPS unit, and will be displayed and highlighted on the main screen. These are usually less serious and the APPS unit will continue normal operation. Once they have been investigated and there are no issues, the alert can be cleared on the main screen by pressing the “RE-SET” button. If the unit operates normally for an hour after alert has been set, the unit will reset the alert automatically.

<i>Alert</i>	<i>Description</i>
LVL LOW	The liquid level in the tank is too low
PRESS LOW	The pressure in the tank is too low

Alarms

Alarms are used to indicate a fatal issue with the APPS unit and there is an audible alarm that will be activated when an alarm is triggered. They will also be displayed on the main screen. These are usually more serious and the APPS unit will not continue normal operation or operate the fill in manual operation. They must be investigated by a technician to ensure there is no longer an issue before they are cleared. Press the “RE-SET” button to clear an alarm.

<i>Alarm</i>	<i>Description</i>
LVL HIGH	The liquid level in the tank is too high
PRESS HIGH	The pressure in the tank is too high
EXT TEMP TOO COLD	There is presence of liquid gas at the vent, meaning the tank has overfilled
EXT TEMP OPEN LOOP	There is an open loop in the thermocouple signal
EXT TEMP SENSOR SHORT	There is a short in the thermocouple signal
LVL OLF	There is an open loop in the liquid level transmitter signal
LVL SSF	There is a short in the liquid level transmitter signal
PRESS OLF	There is an open loop in the pressure transmitter signal
PRESS SSF	There is a short in the pressure transmitter signal
PCB TEMP ERROR	There is an error with the main control board I ² C communication
EXT TEMP COM ERROR	There is a communication error between the boards of the control box

Troubleshooting

The Troubleshooting table is arranged in a “Trouble/Possible Cause/Remedy” format. Note that possible causes for specific symptoms are listed in descending order of significance. That is, check out the first cause listed before proceeding to the next. If you need further assistance please contact Chart’s Technical Service Team at 1-800-400-4683.



Warning! *The tank must be empty and depressurized before plumbing is removed and the power must be disconnected while the control box cover is removed.*

Trouble	Possible Cause	Remedy
Unit overfills.	Level transmitter not working.	Observe the level value on the display. If the transmitter is not working, this value will not be a correct measurement if it is a transmitter problem. Make sure the transmitter cable is correctly connected inside the box to the terminal “J25”/“J23” depending on the connector type. If this does not work, check for leaks in the phase lines. If there is not a leak, then the transmitter may not be working and will need to be replaced.
	Stuck or bad fill valve.	Use the manual operation menu to control the fill valve. If a fill valve is stuck it could be debris under the seat, faulty valve, or over-tightened valve bolts. Use the manual wheel located on the valve to open/close the valve a few times to free any debris. The bolts should not be tighter than 12 foot-pounds and should be evenly torqued. If the gasket between the bodies leaks, it needs to be replaced.
	No flow in the flex hose phase lines.	Observe the phase lines to make sure they are intact, not leaking and are not obstructed.
	Lines are not correctly connected to the liquid level transmitter.	If both lines flow freely, verify they are connected correctly and not reversed.
Unit does not fill.	Level transmitter not working.	See above first possible cause.
	Alarm could not be set.	Alarms are displayed on the main screen. Verify that there is no alarm set. After investigating and clearing the issue, select the “RE-SET” button to clear the alarm.
No unit function.	No power.	With no supply power to the unit, remove the front cover and verify the power is connected correctly. If so, check the power supply to the APPS unit.



Gen-3 to Gen-4 Upgrade

Current Gen-3 units can be upgraded to our Gen-4 model via the appropriate upgrade kits. Below is a guide to assist in the upgrade process.

Specifications/Components

APPS 160 Gen-3 to Gen-4 Complete Upgrade Kit (110 Volt/60 Hz PN 21039709) / (220 Volt/50 Hz PN 21039702)				
21039713 (Fill Assembly for 110 Volt/60 Hz)	21039708 (Vent Assembly for 110 Volt/60 Hz)	21039711 (Fill Assembly for 220 Volt/50 Hz)	21039706 (Vent Assembly for 220 Volt/50 Hz)	21039700 (Electronics Kit for 110 or 220 Volt)
Fill Valve Plumbing Assembly	Vent Valve Plumbing Assembly	Fill Valve Plumbing Assembly	Vent Valve Plumbing Assembly	APPS-Tel Control Box
110 Volt Solenoid Valve	110 Volt Solenoid Valve	220 Volt Solenoid Valve	220 Volt Solenoid Valve	Sensor Assembly
Valve Support Bracket	Valve Support Bracket	Valve Support Bracket	Valve Support Bracket	Low and High Phase Hoses
Mounting Bolts	Mounting Bolts	Mounting Bolts	Mounting Bolts	Straight and Elbow Swage Fittings
Swage Connector Fitting	Muffler	Swage Connector Fitting	Muffler	Type-T Thermocouple
				Conduit Connectors
				Control Box Mounting Plate

Removal of Gen-3 Equipment (For Complete Upgrade)

1. Removing electrical equipment
 - a. Cut off the liquid supply from the bulk tank and empty the APPS unit completely.
 - b. Disconnect the power supply to the APPS unit. Remove the control box cover and unscrew the terminals of the terminal block that connect to the supply power and any wires that connect to the valves or switches (these will be the wires that are pulled through the grey conduit elbows at the bottom of the control box).
 - c. Unscrew the four mounting bolts that secure the control box to the bracket. Remove the control box.
 - d. Remove both of the phase lines from the switches. Disconnect the phase lines and the Swage fittings from the tank.
 - e. Unscrew the cover to both the liquid level switch and the pressure switch, and then unscrew all wire connections.
 - f. Twist the base of the conduit connections to loosen the conduit, and then use a wrench to unscrew each conduit fitting to remove all of the conduit. Be sure to not remove or cut the wire from the valves.
 - g. Remove the mounting bolts for the liquid level switch and the pressure switch. Remove both switches.
 - h. All that should be left are the two empty brackets and the wires from the valves.
2. Removing fill and vent assemblies
 - a. Locate the brass coupling located at the current fill assembly just before the inlet check valve.
 - b. Remove all plumbing, the fill valve and the support bracket of the fill assembly. This will be everything BEFORE the check valve starting with the coupling. All that should be left is the check valve and all plumbing moving forward.
 - c. Locate the brass coupling located at the vent fill assembly just after the tee fitting connected to the regulator.

- d. Remove all plumbing, the vent valve, the support bracket and the muffler of the vent assembly. This will be everything after the regulator starting with the union. All that should be left is the regulator assembly and all plumbing moving forward to the inlet check valve.

Installing the Gen-4 Upgrade Kit

1. Installing new electrical equipment

- a. Cut off the liquid supply from the bulk tank and empty the APPS unit completely.
- b. Mount the new control box to the existing bracket; bolting the new mounting plate between the new control box and the old bracket.
- c. Plumb the straight connectors to the top of the tank, and then connect the elbow connectors to the transmitter sub assembly under the control box. One elbow should be connected to the tee fitting, the other should be connected to the other side of the liquid level transmitter. Both elbow connectors should be facing down. Be careful to not over-torque the swaged fittings, as these should be turned 1-1/2 times past hand tight. Remember to use the appropriate tape and anti-seize grease on the pipe threads, do not use on the swaged ends.
- d. Bolt the new sensor assembly to the mounting plate using the four mounting holes in the liquid level transmitter.
- e. Remove the control box cover.
- f. The strain relief connectors are the black connectors to the control box included in the electronics kit. They are fed through the four small holes at the bottom of the control box. Two of them are already attached to the transmitters and two of them come separately (one is for the thermocouple wire and the other is a spare with a plug).
- g. Make sure the liquid level transmitter (brass block) cable is connected to "J23" and the pressure transmitter cable is connected to "J20". See electrical schematics.
- h. Connect the thermocouple wire to the "J2" connector on the circuit board and wire appropriately. It should be fed through one of the strain relief connectors (the one without the plug). This can be done by removing the bottom part of the black connector, then replacing the bottom part of the connector once the wire end of the thermocouple is fed through both pieces. Once this is finished, it can be secured through one of the holes on the control box. The red wire should be connected to terminal "1", and the blue wire should be connected to terminal "2". See electrical schematic.
- i. With the power supply off, feed the incoming power cables through the conduit hub at the bottom of the box. The incoming power should be wired to the terminal block "TB1". Connect the "L1" (hot) to "3" connection on terminal block, connect the "L2" (neutral) wire to "2", and connect the ground wire to frame ground label " $\underline{\underline{\perp}}$ ". See electrical schematics.
- j. Run the wires from the valves to the conduit tee using the conduit and elbow fittings (refer to the Components section of this manual). There should be extra conduit and fittings included in the kit if needed. The conduit can be cut to desired lengths.
- k. The wires from the fill and vent valves should be fed through the conduit into the control box through the conduit hole located at the top of the control box. Connect the wires to the terminal block "TB2". Connect the two black wires from the fill valve (L1 and L2) to the terminals labeled "1" and "2" and the ground wire to terminal "3" with the ground label. Connect the two black wires from the vent valve (L1 and L2) to terminals "4" and "5" and the ground wire to terminal "6" with a ground label. See electrical schematic.
- l. Connect the thermocouple washer to the bolt located at the bottom of the muffler. Pull any slack through the black connector into the control box. Tighten down the connector.
- m. Connect the low phase hose to the straight swage fitting at the gas side (this will be the fitting located near the pressure gauge), then run the hose behind the bracket towards the bottom of the tank. This hose can now be connected to the elbow connector attached to the tee fitting.
- n. Connect the high phase hose to the straight swage fitting at the liquid side (this will be located at the knuckle of the tank), then run the hose behind the bracket towards the bottom of the tank. This hose can now be connected to the elbow connector attached to the other side of the liquid level transmitter.
- o. Apply power to the APPS unit.
- p. Navigate to the set menu screen by pressing the "SET MENU" button.

- q. Once again make sure the APPS is completely empty. Highlight “DP SENSOR ZERO” using the down arrow on the keypad. Select “ENTER”, use the up arrow to highlight “SAVE SETTINGS” and press “ENTER” again. You can now use the regular Gen-4 part of this manual to set up the unit. Refer to the Start-Up section.

2. Installing new fill and vent assemblies

- a. Obtain the new fill valve assembly kit. If only the valves are being replaced, simply remove the old valve and replace with the new one. Re-plumb as needed.
- b. Bolt the new support bracket to the tank without fully tightening the bracket down allowing it to move freely up and down.
- c. Undo the two bolts on the right side of the valve when facing the wire outlet, these will be used to attach the valve to the support bracket. Use the stainless swage adapter in the kit to connect the valve to the inlet check valve. Plumb the tube end of the adapter to the valve and the other end to the check valve, then you will be able to connect the two without having to rotate the valve. The support bracket should be connected to the fill valve using the bolts and nuts included in the kit. Re-plumb the fill assembly similar to the Gen-3 unit (refer to the Components section of this manual). Remember to use the appropriate tape and anti-seize grease on all pipe threads.



Note: *The threaded ends of the stainless swaged fitting may need to be loosened/tightened to align the mounting brackets of the solenoid valve.*

- d. Adjust the support bracket and tighten it down.
- e. Re-wire the new fill valve appropriately. If wiring to the Gen-4 control box, see step “k” in section “1”. The two black wires are for “L1” and “L2” and the green wire is the ground wire. Reconnect conduit as needed.

- f. Obtain the new vent valve assembly kit. If only the valves are being replaced, simply remove the old valve and replace with the new one. Re-plumb as needed.
- g. Bolt the new support bracket to the tank without fully tightening the bracket down allowing it to move freely up and down.
- h. Undo the two bolts on the left side of the valve when facing the wire outlet, these will be used to attach the valve to the support bracket. Use the stainless swage adapter in the kit to connect the valve to the tee fitting. Plumb the tube end of the adapter to the valve and the other end to the tee fitting, then you will be able to connect the two without having to rotate the valve. The support bracket should be connected to the vent valve using the bolts and nuts included in the kit. Re-plumb the fill assembly similar to the Gen-3 unit (refer to the Components section of this manual). Remember to use the appropriate tape and anti-seize grease on all pipe threads.



Note: *The threaded ends of the stainless swaged fitting may need to be loosened/tightened to align the mounting brackets of the solenoid valve.*



Note: *The muffler will be further away from the tank when the stainless swage fitting and the support bracket are installed. There will be no added support to the muffler assembly.*

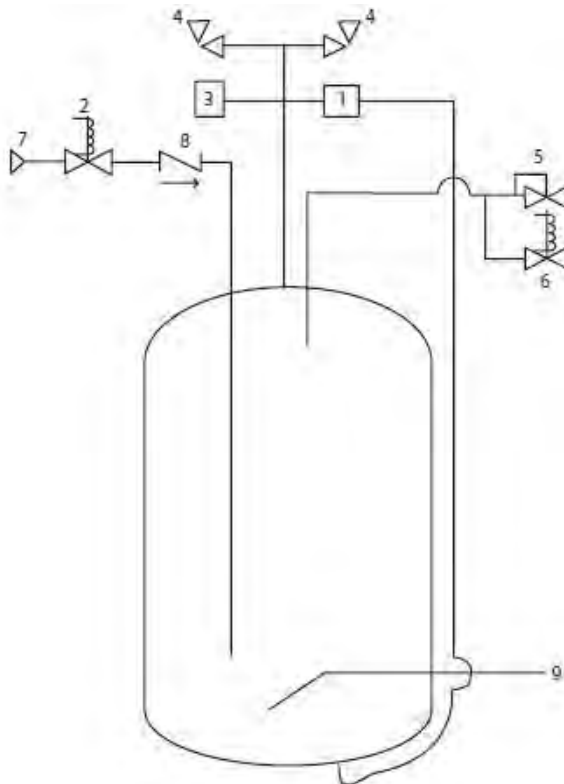
- i. Adjust the support bracket and tighten it down.
- j. Re-wire the new vent valve appropriately. If wiring to the Gen-4 control box, see step “k” in section “1”. The two black wires are for “L1” and “L2” and the green wire is the ground wire. Reconnect conduit as needed.

Specifications

APPS 160 & APPS 160 (220V)

	APPS 160			
	PN 21016545	PN 21016554	PN 21016566	PN 21016567
Operating Pressure	10 to 50 psig	40 to 85 psig	10 to 50 psig	40 to 85 psig
Height	61 9/16"	61 9/16"	61 9/16"	61 9/16"
Width	30 3/16" (20" OD cylinder)	30 3/16" (20" OD cylinder)	30 3/16" (20" OD cylinder)	30 3/16" (20" OD cylinder)
Weight (empty)	210 pounds	210 pounds	210 pounds	210 pounds
Capacity (gross)	42 gallons / 160 liters	42 gallons / 160 liters	42 gallons / 160 liters	42 gallons / 160 liters
Cryogenic fluids*	Nitrogen	Nitrogen	Nitrogen	Nitrogen
Inlet connection	1/2" male 45° flare	1/2" male 45° flare	1/2" male 45° flare	1/2" male 45° flare
Outlet connection	1" female MVE bayonet	1" female MVE bayonet	1" female MVE bayonet	1" female MVE bayonet
Vent connection	1/2" female pipe thread	1/2" female pipe thread	1/2" female pipe thread	1/2" female pipe thread
MAWP	100 psi	100 psi	100 psi	100 psi
Max inlet pressure	235 psi	235 psi	235 psi	235 psi
Max withdrawal rate	15 gpm continuous	15 gpm continuous	15 gpm continuous	15 gpm continuous
Steady state noise	98 - 106 dB	98 - 106 dB	98 - 106 dB	98 - 106 dB
Power requirement	110 Volt / 60 Hz / 200 watts	110 Volt / 60 Hz / 200 watts	220 Volt / 50 Hz	220 Volt / 50 Hz
Audible Alarm	80-95 dB 2900 Hz ±500 Hz	80-95 dB 2900 Hz ±500 Hz	80-95 dB 2900 Hz ±500 Hz	80-95 dB 2900 Hz ±500 Hz

* Oxygen and argon service available upon special request. Specifications subject to change at any time without notice.



- 1 Liquid Level Transmitter
- 2 Fill Solenoid Valve
- 3 Pressure Transmitter
- 4 Relief Valves
- 5 Vent Back Pressure Regulator
- 6 Vent Solenoid Valve
- 7 Strainer
- 8 Check Valve
- 9 One Inch Female Bayonet

Service

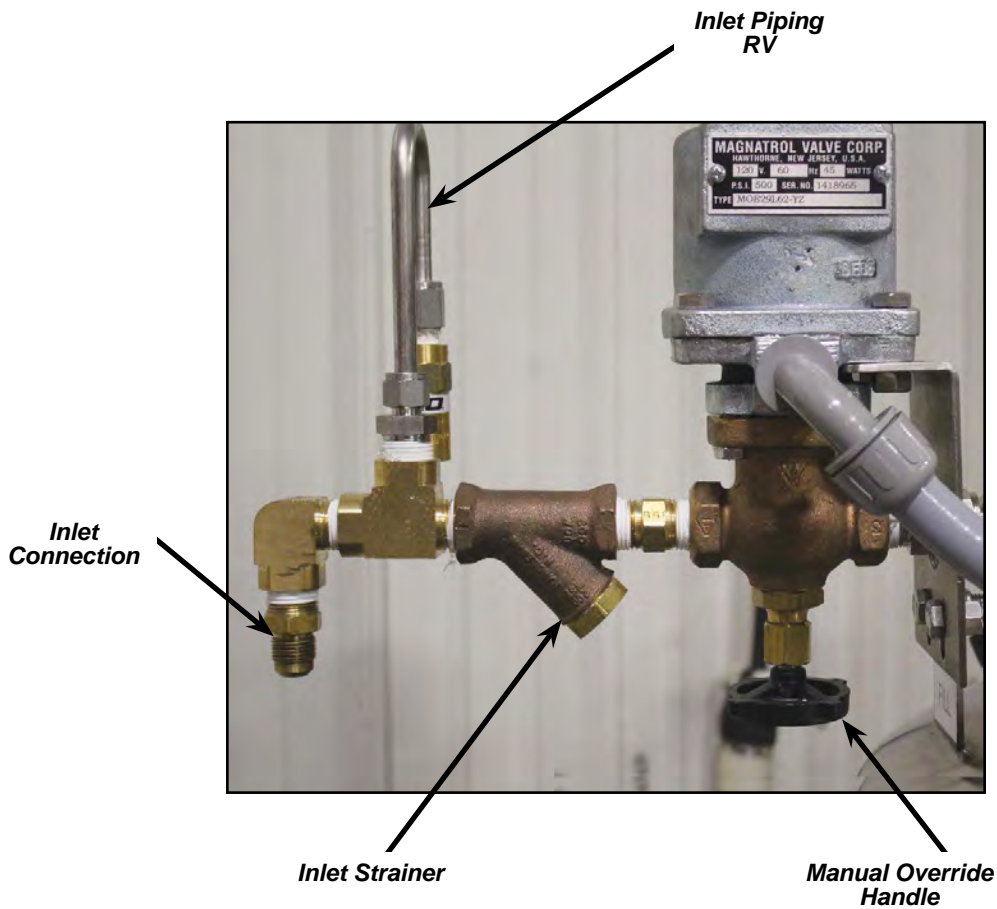
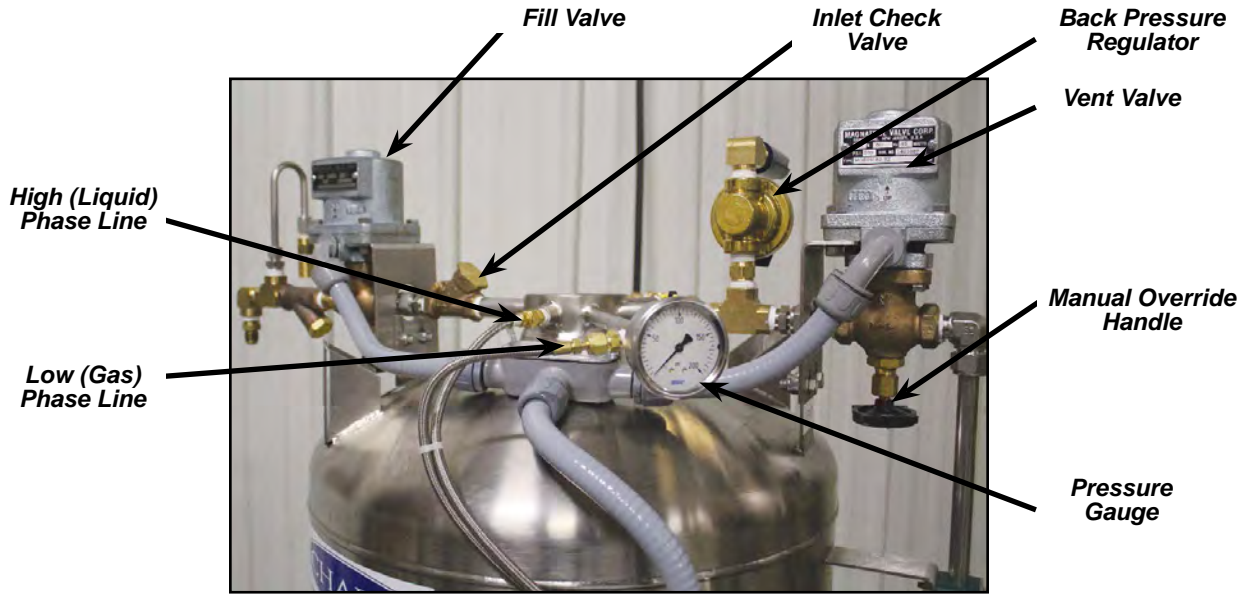
- The APPS 160 unit should only be serviced by a knowledgeable technician.
- Power should be disconnected before covers are removed from the control box. If not, these boxes will contain “hot” wires and/or wires that will become “hot” without notice.
- Liquid nitrogen and all pressure should be released before any plumbing component is removed.
- Potential service parts are as follows:

Part Description	21016545 (10-50 psig)	21016554 (40-85 psig)	21016566 (10-50 psig)	21016567 (40-85 psig)
Vessel PRV (100 psig)	11915572	11915572	11915572	11915572
Vessel SRV (150 psig)	11915581	11915581	11915581	11915581
Inlet piping RV (235 psig)	1810062	1810062	1810062	1810062
Vent regulator	11756911	2110582	11756911	2110582
Fill or vent valve	10925509	10925509	11828891	11828891
APPS-Tel Control Box	21026247	21026247	21026247	21026247
Liquid Level Transmitter	13740770	13740770	13740770	13740770
Pressure Transmitter	21036306	21036306	21036306	21036306
Strain Relief Connectors	11040833	11040833	11040833	11040833
Gore Vent	21036305	21036305	21036305	21036305
Inlet strainer	11529090	11529090	11529090	11529090
Inlet check valve	11208931	11208931	11208931	11208931

See pictures on following pages for the identification of components.

All parts are available from Chart at www.chartparts.com.

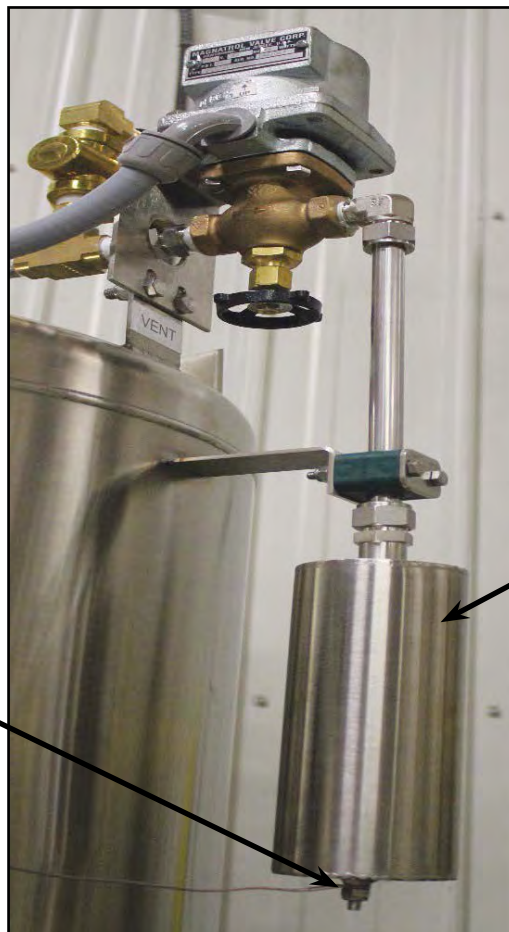
Components





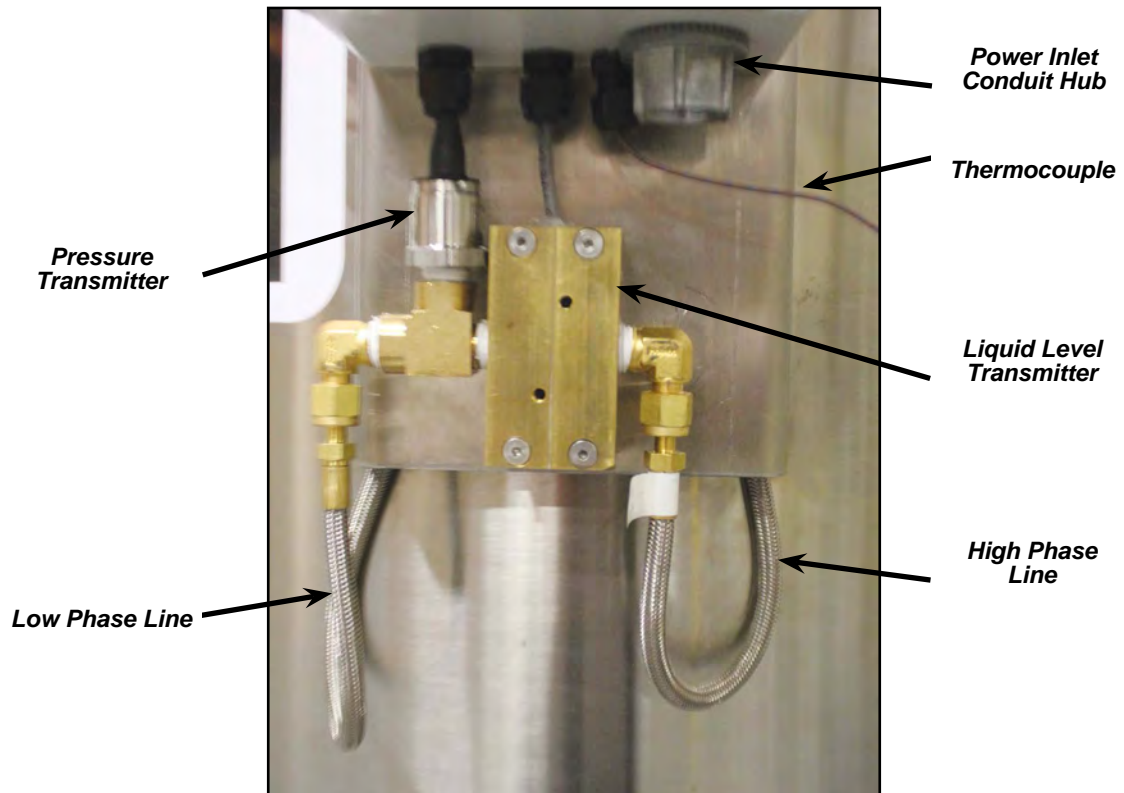
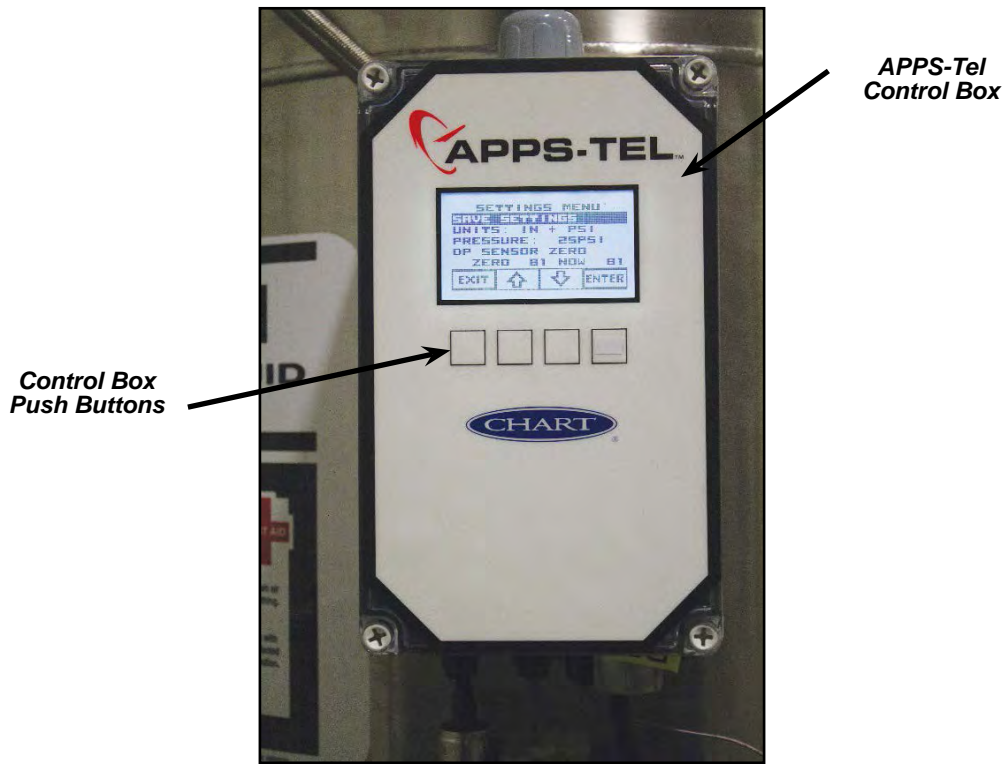
Primary RV

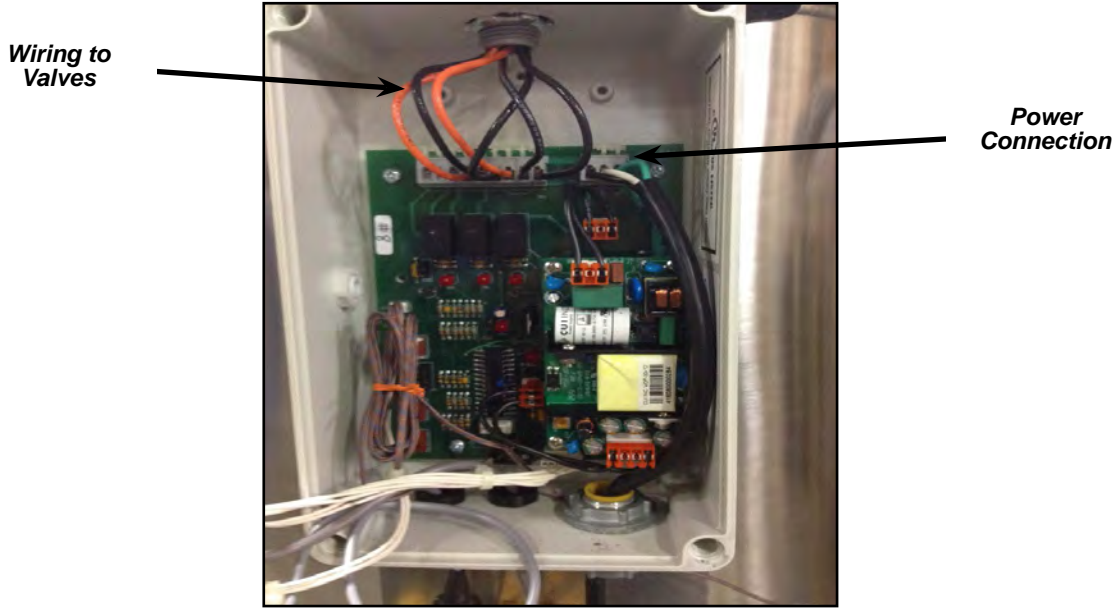
Secondary RV



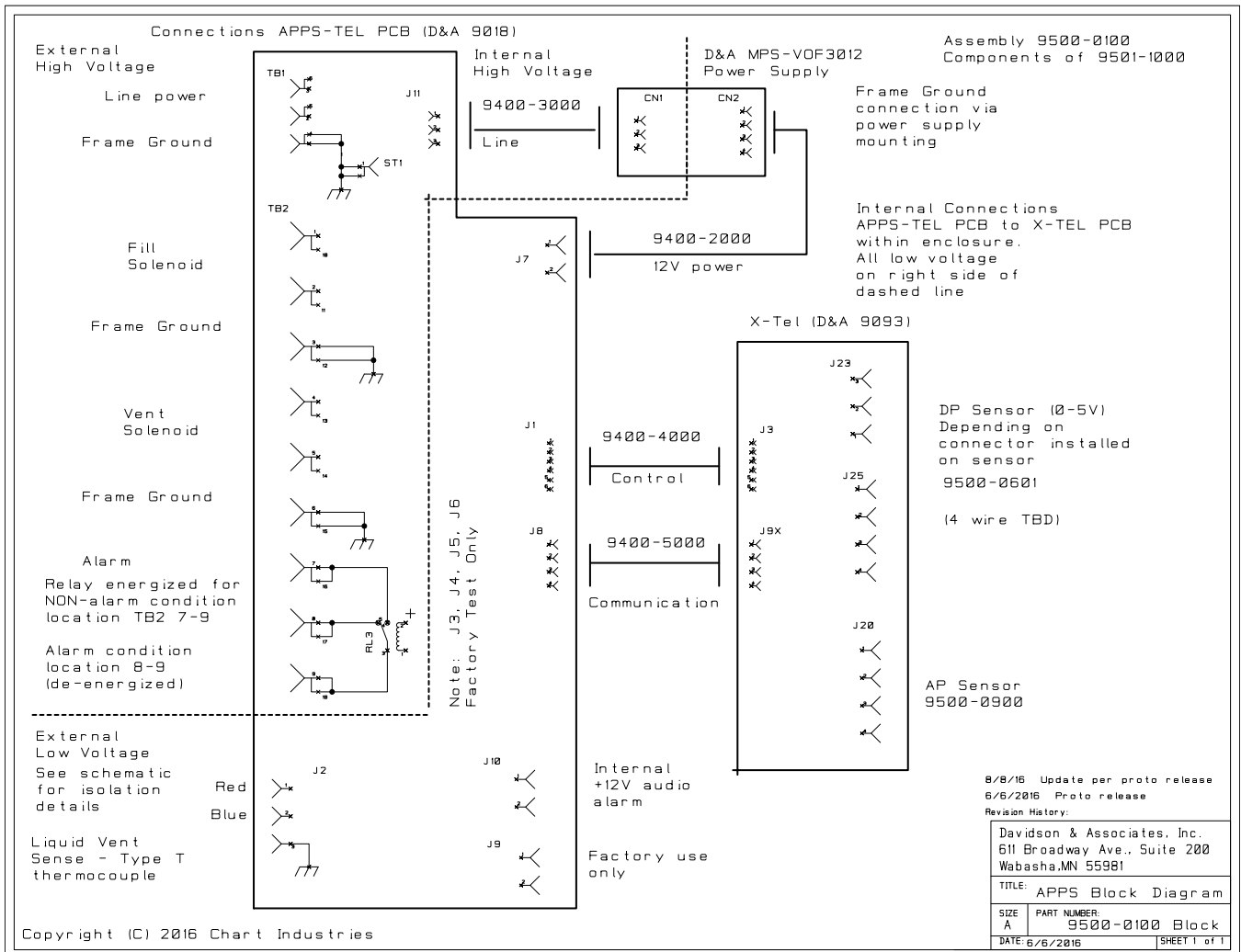
Thermocouple Connection

Vent Muffler

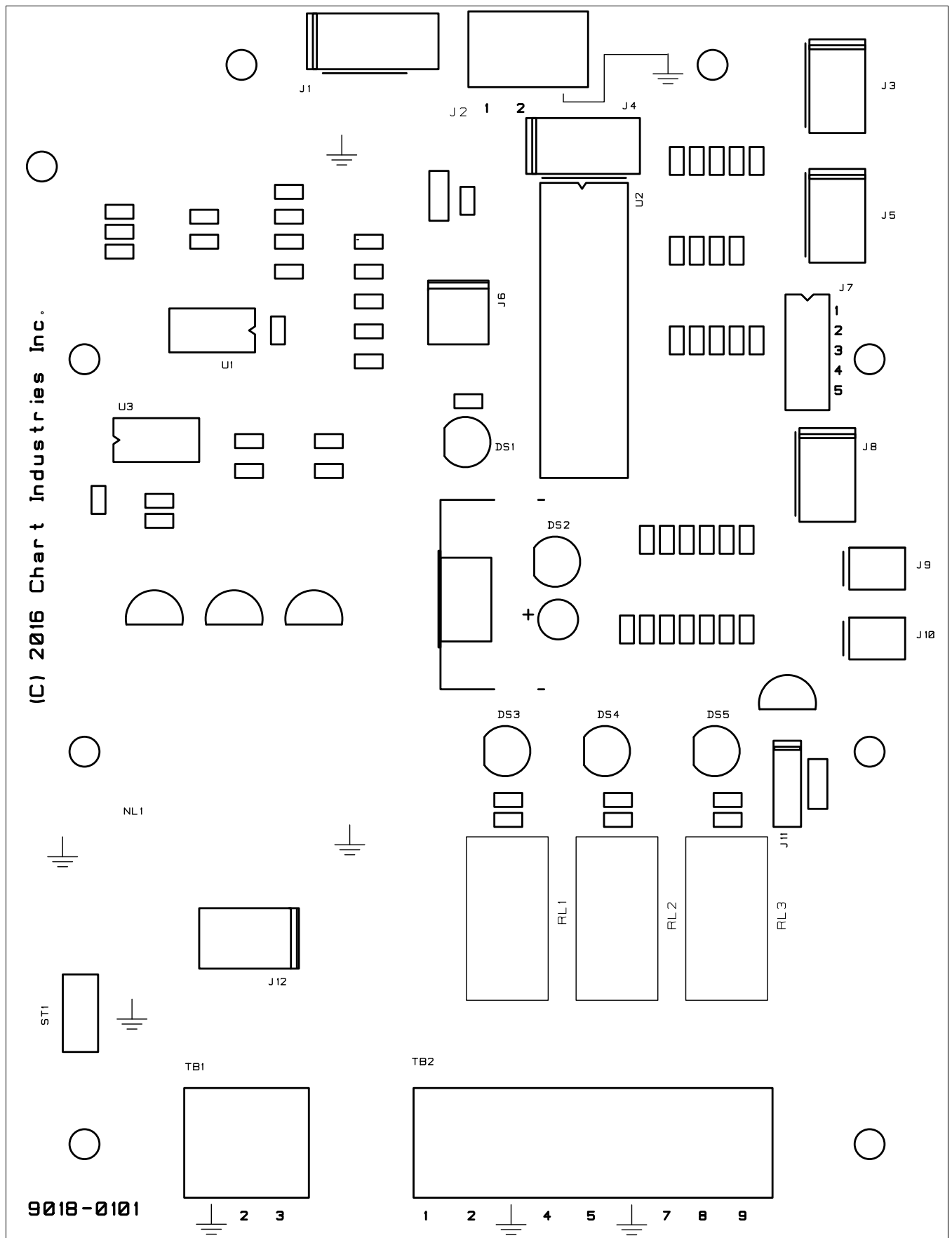




Control Box Electrical Schematic



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