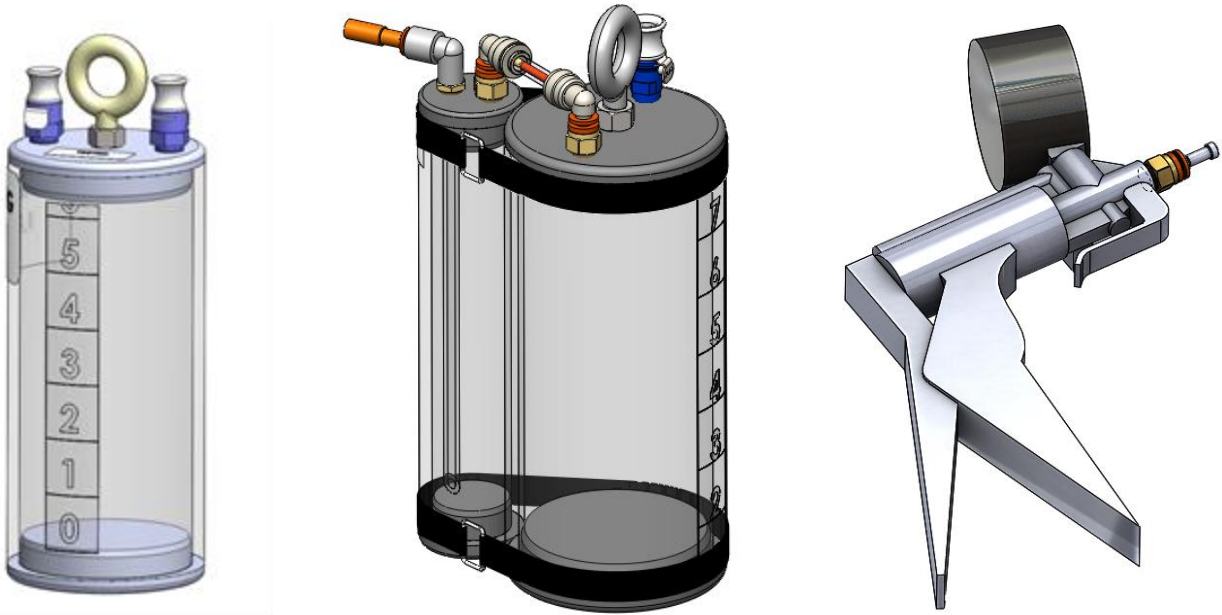


Rejuvenation Instructions

#421 – Vacuum Systems – UPR



This NRI covers the following:

- Understanding the application and operation of the Discard Control System.
- Understanding the application, limitations and operation of the vacuum tank.
- Understanding the application and operation of AC, DC, and manual vacuum pumps.

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WARNING: It is dangerous working around energized high-voltage systems, pressurized systems, and chemicals. Always work in accordance to the Novinium Field Operations Safety Handbook (FOSH) or other local governing safety standards.

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Discard Control System

The discard control system is comprised of a vacuum tank and a discard tank joined together by the discard control valve (Figure 1). The discard control valve is normally open but closes off flow upon contact with Cablecure fluid to stop the flush of fluid through the cable.

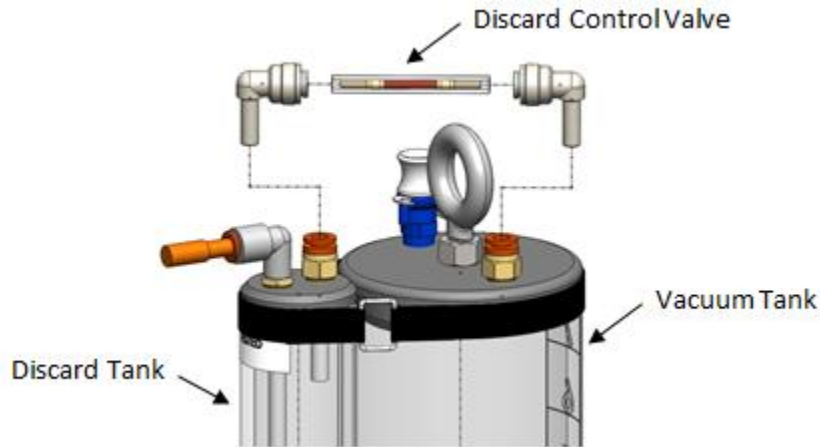


Figure 1: Discard control system.

1. Applications.

- Maintaining a vacuum on the cable during the injection.
- Controlling the amount of fluid flushed through small and large diameter cables.
- Energized or de-energized injections.
- Used with Cablecure XL, XLe, DMDB, and iDMDB fluids.
- Available as an upgrade kit used with existing vacuum tanks or as a complete kit.
- Available in two sizes to collect the necessary amount of flush for most cable systems.

Discard Tank Volume	Discard Control System	Discard Tank Upgrade Kit
1"	11732-1	11736-1
2"	11732-2	11736-2

Table 1: Part numbers.

2. Pressure rating.

- 30psi.

3. Limitations.

- Tank must remain upright.
- Discard control valves are single use items and must be changed out between injections.
- Discard control valves are fluid sensitive so cleanliness is key.

4. Operation.

- a. Clean the elbow and straight tube fittings on both sides of the discard control valve before every installation.
 - Drops of Cablecure fluid can cause the valve to close prematurely.
 - Compressed gas can be used to "blow dry" the insides of the fittings and to remove trace amounts of fluid.
- b. Just prior to use, install elbow tube fittings on each side of a new discard control valve and use the assembly to bridge between discard tank and vacuum tank as shown in Figure 5.
- c. Use a male quick disconnect (QD) to connect the vacuum tank to the tube leading to the pump.
- d. If the vacuum pump does not have a reliable gauge, a gauge assembly 11021-1 can be installed between the tank and the pump to monitor the vacuum level.
- e. Use another male QD to attach the discard tank to the injection tube leading to the cable.
 - If the cable is going to be energized while the tank is connected, the tubing must be Teflon (818462).
- f. When drawing a vacuum with the pump, hold the discard control system vertical to prevent fluid from being sucked into the pump.
- g. If left unsupervised, the vacuum pump must be disconnected and all equipment must be secured out of the public's reach.

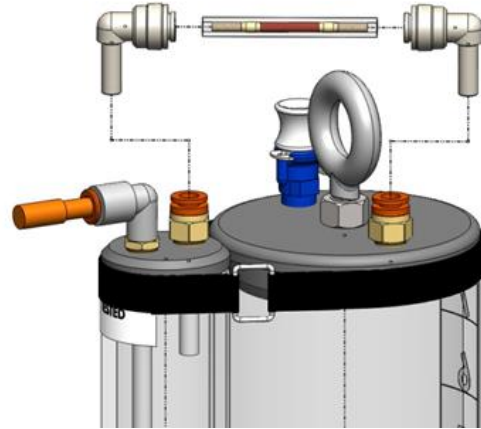


Figure 2: Clean fittings and install discard control valve just prior to use.

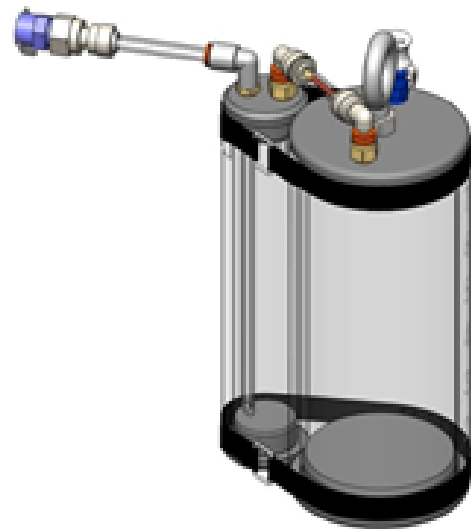


Figure 3: Install tubing and QD.

- h. Ensure that the discard control system is secured vertically (maximum $\pm 20^\circ$ off) either by suspending it by the eyebolt or placing it on a leveled surface.
- i. Remove the discard control valve along with the elbow tube fittings by separating them from the discard tank and vacuum tank.
- j. Remove the elbow tube fittings and dispose of the valve.
 - The elbow tube fittings can be reused after drying.
- k. Empty the discard tank by connecting a section of tubing with a male QD to the tank's inlet port.
- l. Apply minimal pressure to discard tank's outlet port to force the fluid out of the inlet port and into a proper container.
- m. Empty any residual fluid from a vacuum tank by connecting a section of tubing with a male QD to the vacuum port.
- n. Turn the tank over to allow the fluid to drain out of the vacuum port and into a proper container.
- o. Clean the elbow and straight tube fittings on both sides of the discard control valve before every installation.
 - Drops of Cablecure fluid can cause the valve to close prematurely.
 - Compressed gas can be used to "blow dry" the insides of the fittings and to remove trace amounts of fluid.
 - Note: Use orange plugs to protect the fittings between uses. New discard control valves should be installed just prior to installation on a cable.
- p. The discard control system is used during the injection process and must be removed and emptied prior to the soak process to prolong the life of the tanks.
 - Any fluid that enters the discard and vacuum tanks must be treated as contaminated.
 - Never reuse any fluid collected in vacuum or discard tanks.
 - Do not use a tank if any cracks are visible or fittings are loose and cannot be repaired.

5. Upgrade and maintenance.

- a. The Discard Control Upgrade Kit (11736-1 or -2) can be retrofitted to any 3" vacuum tank (Figure 4).
- b. Choose a vacuum tank that is in good working condition and clean of any residual fluid to upgrade.
- c. Unthread one of the QDs from the vacuum tank and replace it with the straight tube fittings using Teflon tape on threads.
 - **NOTE:** If it is a new vacuum tank with ¼ MNPT QDs, use a ¼" straight tube fitting with ¼" MNPT thread (P/N 818493) instead.

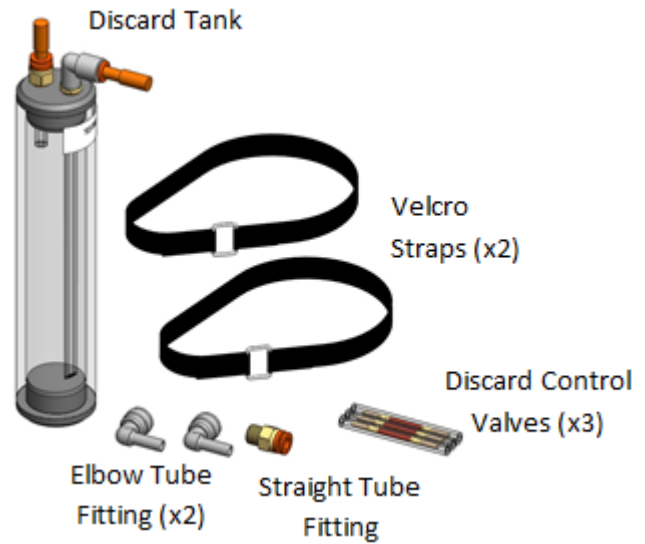


Figure 4: Upgrade Kit 11736-1 or -2.

- d. Plug the tube fitting with an orange plug and pressure test the modified tank to 30psig.
- e. Use either the low-flow flow meter (11357-2) or soapy water to confirm it is leak free.
- f. Install elbow tube fittings on each side of a new discard control valve and use the assembly to bridge between discard tank and vacuum tank.
- g. Use Velcro straps to cinch discard tank and vacuum tank together.
- h. Common replacement parts are provided in Table 2.

Description	Novinium Part No.
Discard Control Valve	11734-1
Elbow Plug Fitting	819820
Velcro Straps	819819
White QD Plug	819785

Table 2: Upgrade Kit 11736-1.

Vacuum Tanks

Vacuum tanks are used to catch fluids exiting from the cable as it is injected from the other end. It also acts as a vacuum reservoir to hold the vacuum on the cable during the injection.

1. Applications.

- Maintaining a vacuum on the cable during the injection.
- Catching and measuring the amount of discard fluid collected from the cable.
- Energized or de-energized injections.

- Used with Cablecure XL, XLe, DMDB, and iDMDB fluids.

2. Pressure rating.

- 30psi.

3. Limitations.

- If the injection pressure is above 30psi, the vacuum tank must be monitored because it could become pressurized above its working limits as it fills up with fluid.
- Maximum sustained operating temperature is 165°F.

4. Operation.

- Use a male QD to connect the vacuum tank to the tube leading to the pump.

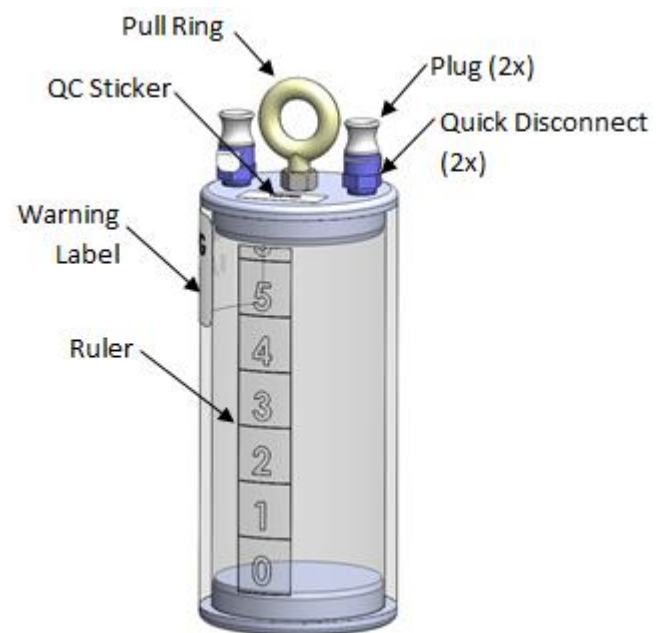


Figure 5: Vacuum tank.

- If the vacuum pump does not have a reliable gauge, a gauge assembly (p/n 11021-1) must be installed between the tank and pump to monitor the vacuum level.



Figure 6: Use test gauge assembly to ensure adequate vacuum in the cable.

- c. Use another male QD connector to attach the vacuum tank to the injection tube leading to the cable.
 - If the cable is going to be energized while the tank is connected, the tubing must be Teflon (p/n 818462).
- d. When drawing a vacuum with the pump, support the vacuum tank vertically to prevent any fluid from being sucked into the pump.
- e. The tank must be continually monitored while an electric vacuum pump is running to prevent fluid from entering the pump when the tank is filled.
 - If left unsupervised, the vacuum pump must be disconnected and the tank must be secured out of the public's reach.
- f. To empty a vacuum tank, disconnect it from the cable and connect two sections of tubing to the tank's ports.
 - Apply minimal pressure to one tube to force the fluid out the other and into a proper container.
 - **WARNING:** Anything connected to an energized or potentially energized source is considered potentially energized.
- g. The vacuum tanks are used during the injection process and must be removed prior to the soak process.
 - Any fluid that enters the vacuum tank must be treated as contaminated.
 - Never reuse any fluid collected in the vacuum tank.
 - Do not use a tank if any cracks are visible or fittings are loose and cannot be repaired.

5. Storage and maintenance.

- Teams are allowed to change the gender of QDs (from female to male) on vacuum tanks.
- The team is responsible for holding a vacuum on the tank at all times. Ensure that it does not leak after the QD has been changed.
- Vacuum tanks are not storage tanks. Empty all Cablecure fluid when placing tanks in storage.
- Vacuum tanks are not transportation containers. Empty all Cablecure fluid when shipping them.
- Store tanks in a cool dry place.

Vacuum Pumps

Vacuum pumps are used to evacuate the air trapped in feed tanks, charge tanks, and the cable system. Three types of vacuum pumps that utilize AC and DC voltage sources and manual sources are available for the UPR injection process (Figure 7).

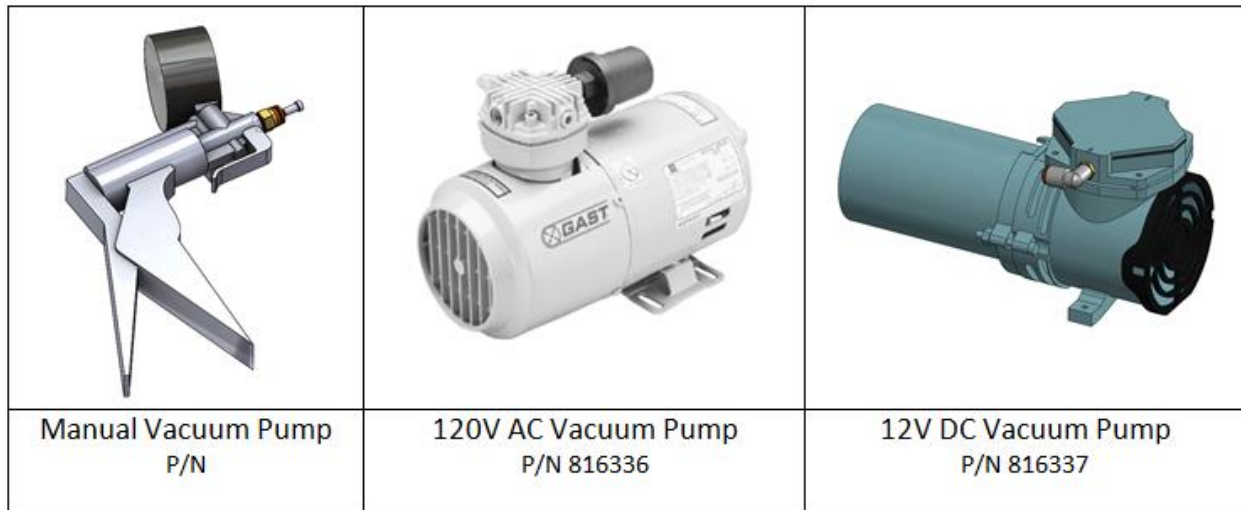


Figure 7: Vacuum pumps.

1. Applications.

- Evacuate feed tanks and charge tanks during fluid filling.
- Draw a vacuum in vacuum tanks and evacuate the cable system prior to and during injection.

2. Pressure rating.

- Vacuum (27" Hg maximum).
- Not designed for positive pressure.

3. Limitations.

- Hand power vacuum pumps are slow and are not suited for evacuating large volumes such as feeder cables.
- Electric vacuum pumps must be continually monitored to ensure that they do not ingest fluid.
- Long lengths of tubing between the vacuum pump and the feed tank or cable system will greatly reduce the pump's speed and efficiency.

4. Operating the 120V AC vacuum pump.

- a. Connect the pump to the tank with a new section of tubing.
 - The tube length should be less than 6ft.
 - Longer tubing will reduce the speed of the pump.
- b. Place a small tank in line close to the pump to act as a separator to isolate the pump from the fluid and increase its life.
- c. Connect the pump's power cord to the power supply through an American standard three-prong plug to safely ground the pump.

- d. If a portable generator is being used, the body of the pump must be grounded to the base of the generator.
 - **NOTE:** It is usually necessary to start the generator before starting the vacuum pump.
- e. It is also possible to run the AC vacuum pump off of the 120V secondary in the transformer.
- f. Use a ground fault current interrupter (GFCI) to safely connect the vacuum pump to the secondary buss.
 - An example of the AC vacuum pump and GFCI are shown in Figure 8.



Figure 8: Possible configuration for the AC vacuum pump.

5. Operating the 12V DC vacuum pump.

- a. Connect the pump to the tank with a new section of tubing.
 - The tube length should be less than 6ft.
 - Longer tubing will reduce the speed of the pump.
- b. Place a small tank in line close to the pump to act as a separator to isolate the pump from the fluid and increase its life.
- c. Larger diameter tubing may be used to reduce the loss of efficiency with long lengths of tubing.
 - This can be helpful because the 12V DC vacuum pumps are usually mounted to a vehicle, which may be a long distance from the end of the cable.

- d. The 12V DC vacuum pump can also be configured to be battery powered.
 - This can be particularly useful in backyard work where equipment must be used remotely.
 - An example of a pump connected to a rechargeable battery is shown in Figure 9.

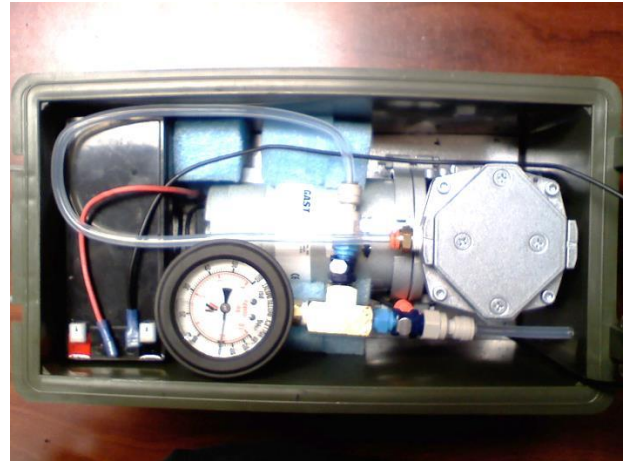


Figure 9: Possible configuration for the DC vacuum pump.

6. Operating the manual vacuum pump.

- a. Connect the pump to the tank with a new section of tubing that is no more than 6ft long.
- b. Squeeze the handle to operate the pump.
- c. Press the small trigger to relieve a vacuum.