

E-DRILL

E-Drill Maintenance & Troubleshooting Guide

For System Part Numbers CP2-SY-XXX

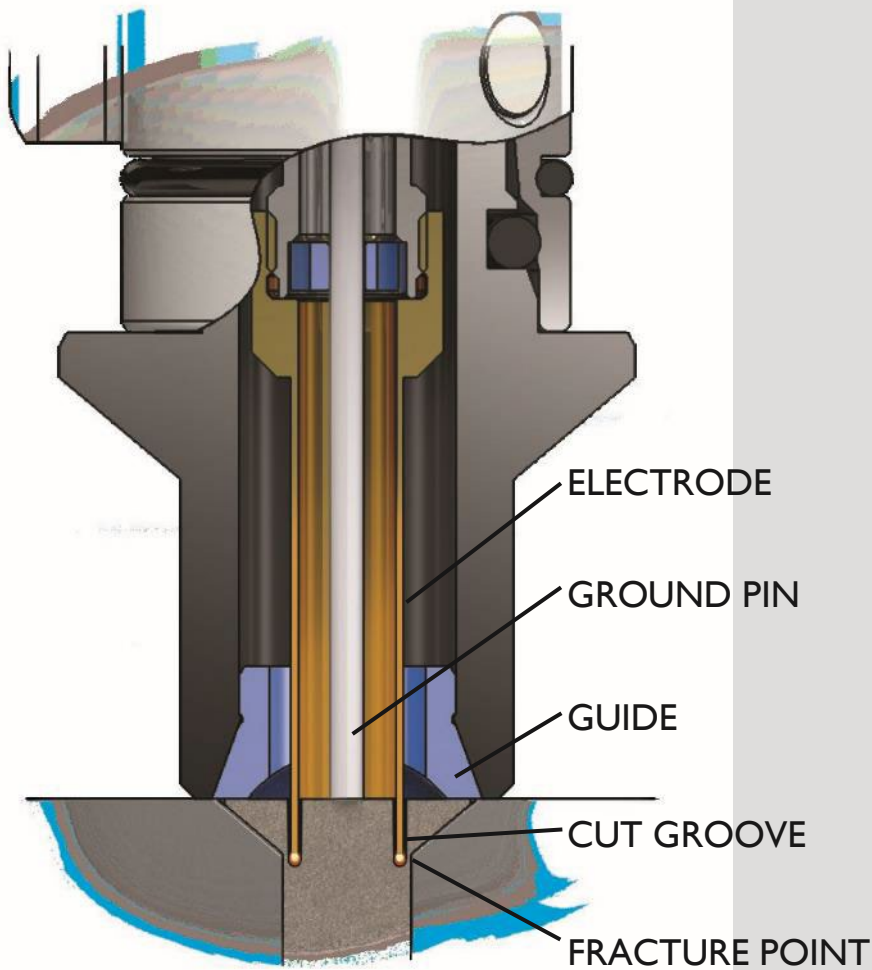
Document #61-405



15192 Triton Lane,
Huntington Beach, CA

PPEDM.com

TECHNOLOGY



Perfect Point's patented handheld electro discharge machining (EDM) technology removes the hardest fasteners quickly and easily. The precision sized electrode cuts a circular groove of material from the fastener head leaving a very thin fracture point between the electrode and the airframe. The exact sizing of the electrode coupled with precision depth control greatly decreases the risk of airframe damage when compared to conventional removal methods. A closed-loop fluid system, consisting of filtered water, flushes the area and removes cut debris. Aggressive flushing during the cut means no heat is transferred to the surrounding area. The forceless cut process significantly reduces risk of damage to the airframe and repetitive motion injury to the operator. Adaptable to flush head, protruding head and collar side applications. Reduced damage, fast cycle times, and elimination of debris result in efficiencies that mean a very quick return on investment.

PROCESS

A precision cut results in low punch out force, eliminating stress on the airframe structure. Drill shards are not created and all cut debris is captured, leaving only the severed fastener for cleanup.



- FORCELESS EDM CUTTING
- REDUCES AIRFRAME DAMAGE
- QUICK CYCLE TIMES
- CLOSED LOOP SYSTEM
- CAPTURES CUT DEBRIS
- LOW PUNCH OUT FORCE
- ERGONOMICALLY SUPERIOR
- WORKS ON ALL FASTENERS



WARNINGS:

The E-Drill system is designed, built, and calibrated to work with factory genuine parts and accessories. The use of non-authorized components, electrodes, or accessories can result in airframe damage, tool damage, personal injury, or death. Lethal high voltages are present throughout the Power Supply Cabinet. Follow all Warning and Caution statements outlined in this User Guide and all equipment Warning placards. Do not proceed with any periodic maintenance until factory trained, authorized, and this document has been thoroughly reviewed and understood. Only trained, authorized technicians should attempt tool use, tool selection, adjustments, dielectric system replenishment, and periodic maintenance. This unit is not field repairable, if any malfunctions are encountered, please contact Perfect Point™ EDM Corporation immediately for service.

The Perfect Point E-Drill system should be protected from frigid conditions that can crack or burst de-ionized water connections and plumbing. If the system is subjected to freezing temperatures, it should be thoroughly inspected by a trained technician for damage or leaks prior to use. If the system will be stored or transported in low temperature conditions, then it should be fully drained first (see System Maintenance - section 4.1).

The Perfect Point E-Drill system should not be operated in the rain or snow. If aircraft repairs necessitate outdoor operation in severe weather conditions, it is recommended the Mobile Service Unit (MSU) be positioned under a protective awning or positioned in a protected area. Cable connections should not be left in pooled water and should be kept elevated or hung. Special Installation may be required where gasoline or volatile liquids are present. Do not block vents. Proper ventilation is necessary for unit operation. Ensure Mobile Service Unit (MSU) is upright and stable on a level ground with casters locked before use.

Product specifications are subject to change, and photographs in this document may not match the current E-Drill product combinations exactly.

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EMC Information

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated radio-frequency disturbances.

Provided that the public low voltage system impedance at the point of common coupling is lower than 77 mΩ this equipment is compliant with IEC 61000-3-11:2017 and IEC 61000-3-12:2011 and can be connected to public low voltage systems. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator, if necessary, that the system impedance complies with the impedance restrictions

Limited Warranty Statement

Perfect Point EDM Corp. warrants to the end user that its products will be free from defects in material and workmanship for a period of twelve (12) months from the date of delivery, but not more than eighteen (18) months after date of shipment, and the successful completion of operator equipment use and maintenance training. This warranty extends only to the original purchaser, is expressly in lieu of all other warranties, expressed or implied, and is further in lieu of all other liabilities or obligations for any consequential damages or losses incurred by the buyer in connection with the purchase or use of the product.

This warranty applies to systems subjected to normal operating conditions established by PPedm and explicitly excludes equipment subjected to:

- User alteration.
- Accident or damage caused by the end-user.
- Improper handling, installation, maintenance, application, or contamination as established by PPedm equipment operating instructions and preventative maintenance.
- Use with improper voltage.
- Use contrary to the operation instructions, and failure to properly service and maintain per PPedm instructions.
- The use of non-authorized components, electrodes, or accessories.

Use of counterfeit electrodes will result in eccentric cuts (which will cause airframe damage) incorrect cut depths, cutting times and electrode life. Use of counterfeit electrodes will also invalidate the warranty. PPEDM will not repair systems or components damaged using counterfeit electrodes.

- Unauthorized disassembly, repair, or alteration by anyone other than PPedm Corp. No allowances will be made for repairs or alterations effected without specific written authorization from PPedm.

This warranty does not cover:

- Normal wear and tear of soft goods (seals, hoses, cables, etc.), E-Drill Adapters, Guides, Locators, Punch Pins or Punch Guides and other fixtures or tools.

Credit will NOT be allowed, nor shipment accepted on any machine or component thereof without Perfect Point's prior written consent and issuance of a PPedm Return Material Authorization (RMA).

PPEDM will, at their discretion, repair or replace any defective machine or component thereof for the specified warranty period. PPedm reserves the right to substitute new equipment and/or improve the part(s) on any machine or part thereof judged defective without further liability. Machines or components thereof will be repaired and the warranty time continued.

All machines or components thereof returned for warranty consideration MUST NOT HAVE BEEN TAMPERED WITH

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and all anti-tamper seals and/or striping must be intact. Removed or destroyed anti-tamper seals and/or striping will be cause to VOID these warranty terms and conditions.

Liability Limitations: Under no circumstances shall PPedm have any liability for liquidated damages or collateral, consequential, or special damages loss of production or progress of production, whether resulting from delays in delivery or performance, breach of warranty, negligent manufacture or otherwise. The purchaser agrees to indemnify and hold harmless PPedm from all claims by third parties in excess of these limitations.

THIS WARRANTY IS THE SOLE WARRANTY OF PPedm AND ANY OTHER WARRANTIES EXPRESSED OR IMPLIED IN FACT, INCLUDING ANY WARRANTIES OF MERCHANTABILITY AND FITNESS FOR USE, ARE HEREBY SPECIFICALLY EXCLUDED.



Uncrating and Crating



Uncrating

The PPedm system comes complete in a specially designed crate. Assure the crate is placed securely on level ground prior to opening. All equipment should be handled with multiple personnel of adequate physical strength. Crate may contain Tool Cart, Mobile Service Unit (MSU), and S-Blaster systems. Open crate door with ramp supports (MSU side). This door will double as a ramp for both Tool Cart and MSU removal. Remove lower and front supports before manipulating Tool Cart or MSU. Slowly and safely roll out equipment while centering on ramp. Keys and S-Blaster equipment (if equipped) are placed on the shelf above the Tool Cart. MSU will have additional lateral support placed in front of the unit. After removal of equipment, place all supports and braces back into respective locations in the crate and store away for future shipping. **PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY. All Damage claims should be notated on the Bill of Lading at time of delivery.**

Crating

The PPedm system came complete in a specially designed crate. Assure the crate is placed securely on level ground prior to opening. All equipment should be handled with multiple personnel of adequate physical strength. Crates will have 2 sides, each customized for either MSU or Tool Cart. When packaging MSU, remove both doors from the crate. Remove lateral support from MSU compartment (compartment that does not contain a shelf). Use the door with ramp supports (support side facing down) to load both MSU and or Tool Cart. **MSU and Hand Tool must be drained prior to crating.** Secure Human Machine Interface (HMI) with foam padding originally supplied with unit. The HMI should be positioned vertically, and the screen should be facing away from connector side. Carefully roll MSU into the crate using ramp. Insert lower support. Excessive angles above 10° may result in toppling of MSU. Place lateral crate supports in respective location. The flat door without ramp supports should be used to seal Tool Cart side. The door with ramp supports must be installed on MSU side to prevent component damage during shipping. It is recommended to take photos of equipment prior to packaging and shipping.

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Installation

Location and Moving of Equipment



Read and understand the complete manual before attempting to handle units. Only trained personnel should move components.



Electrical- Disconnect power from deenergized supply line before moving equipment. Review specifications and ensure equipment agrees with facility requirements.



Temperature – Never expose unit to freezing temperatures or rain.



Handling of Mobile Service Unit (MSU) – Use handles to move unit. Never move MSU with the Hand Tool. Personnel of adequate physical strength should move unit. Never handle the unit on surfaces exceeding 10° of slope to prevent toppling. Always place the unit on level ground with casters locked.



Hand Tool – Hand Tool connection should be fully seated and threaded in before use. Detents are located on the connector for proper orientation. Excessive force will damage the connector. Never move the MSU with the Hand Tool. Sharp bends, kinking, or crushing umbilical cord and or exposure to water will damage and lead to improper operation.



Human Machine Interface (HMI) – Handle device with care. It is made of metal, glass, and plastic and has sensitive electronic components inside. Your device can be damaged if dropped, burned, punctured, or crushed, or if it encounters liquids. If you suspect damage to your device or its battery, discontinue use of your device, as it may cause overheating or injury. DO NOT use your device with a cracked screen, as it may cause injury.



Tool Cart – Read and understand all warning labels before use.

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1. Product overview

1.1. Major Components

The E-Drill system comprises the Human Machine Interface (HMI) device, mounting post and cable assembly, the Hand Tool and umbilical cable assembly, and the Mobile Service Unit (MSU) control cabinet. Various tool adapters, electrodes, and accessories are supplied for removal of specific fastener configurations and materials.

1.2. Technical Specifications

Fastener Sizes:	CG Mode - 5/32"–3/8" (4mm - 9.5mm) EG Mode – 3/32"-1/4" (2.38mm - 6.35mm)
Fastener Material:	Aluminum, Titanium, Stainless Steel, Alloy Steel, Inconel, Monel, etc.
E-Drill Hand Tool Dimensions:	7.5" (190.5mm) x 6" (152.4mm) x 2.25" (57.2mm), 10' (3 m) 4.9 lbs. (2.22 kg) 30' (9 m) 10.9 lbs. (4.94 kg)
Mobile Service Unit Dimensions :	28" (711.2mm) x 50" (1270mm) x 22" (558.8mm) 85 lbs. (38.5 kg) DRY 105 lbs. (47.6 kg) WET
System Power Cable Assembly:	14 AWG, C-19 Locking IEC Socket/NEMA 5-15 Plug 20 ft. long (6 m) (North America) 14 AWG, C-19 Locking IEC Socket/Country Specific Plug 20 ft. Long (6 m) (All Others)
Facility Power Requirements:	100/240V~, 15 A, 50/60 Hz NEMA 5-15 Receptacle (North America) Country Specific Plug (All Others)
Maximum Duty Cycle :	50%
Water System Details:	116 PSI Max (8 Bar) 0.65 GPM Max (0.041 L/s) Clean Water Only (Tap or Deionized)
Maximum Voltage and Current Output of Hand Tool:	0A RMS at 72V === 40A RMS at 0V ===

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1.3. Typical Wear Items

	PPedm P/N	Description
1.	EDS0105	Ground Pin Assembly
2.	EDS5106	Replacement Pleated Sediment Filter
3.	EDS5107	Power Cord (North America)
4.	EDS0125	Power Cord (All Others)
5.	EDKXXX-X	Electrodes
6.	EDS2100	Replacement DI Filter

2. E-Drill Daily Checklist

Please follow this checklist to maximize the performance and reliability of your E-Drill System. The last section of this chapter shows typical damage which might be encountered.

2.1. General

- Replace any cracked or frayed cables.
- Tighten any loose connections.
- Check for leaks.
- Replace any cracked components.

2.2. Hand Tools

- Center Ground (CG) Mode – Check Ground Pin tightness using T20 Torx Key (Refer to Fastener Removal Guide section 6.6.).
- CG – check clear insulator sleeve on ground pin.
- CG – Before cutting, check spring loaded movement of Ground Pin against the fastener head.
- Check correct size of electrode (refer to display) is installed and tightened with electrode wrench. Check electrode is not dented nor has uneven wear – dress or replace as necessary).
- Check all cables, strain reliefs, hoses, and connectors for damage.

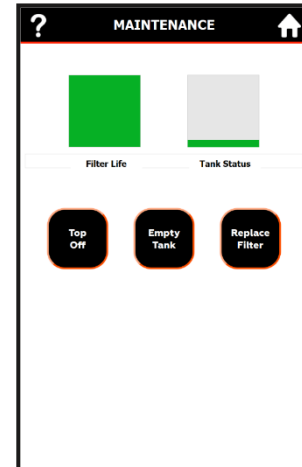


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2.3. Mobile Service Unit (MSU)

- Top-off before starting shift.
- Ensure MSU is upright and stable on a level ground with casters locked before use.
- Check the display for warnings (Sediment Tank or Filter).
- Ensure Hand Tool multi-connector bezel is tightened to detent. Check hoses are fully installed and seated.
- Check all cables, strain reliefs, hoses, and connectors for damage.



2.4. Adapters, Locators, and Electrode Guides

- Protruding head – Check bushing is snug fit around fastener head.
- Flush head visual – Check aperture ring is same size or slightly larger than fastener head, so head can be “sighted” for alignment.
- Flush head mechanical – Check size and correct type of Mechanical Locator. Check for wear or damage to locator tip. Check fastener recess is clean and paint-free, and locator fits into fastener head precisely.
- Adapter - Check thread fit to Hand Tool.
- Electrode Guide – Guide should be snug fit around correct size electrode. Check for wear and excessive play. Extract worn guides using the Guide Removal tool and replace.
- Check O-rings for wear or burn marks and replace as necessary (especially VFHL adapter red O-ring).
- Apply O-ring lube grease to adapter tri-wing feature (where it connects to hand-tool), and all adapter and locator O-rings.



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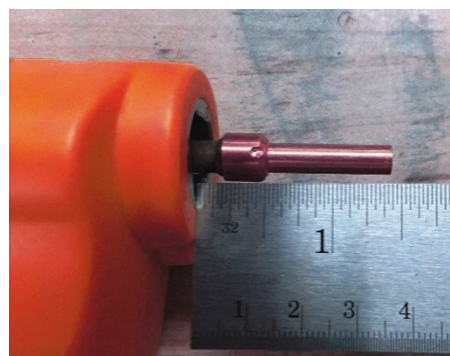
2.5. Damage Examples

Cable connectors typically receive much abuse while in service. The photos below show damage which can be incurred by such abuse.



The Hand Tool case is designed to withstand impacts, but if dropped on its electrode or drive tube mechanism, then damage may occur. For this reason, it is always important to keep an electrode and adapter on the hand-tool, even when not in use.

If a Hand Tool has been dropped and there is concern it may have been damaged, it may be checked by installing a new electrode, squeezing the trigger to ensure the electrode is at its full forward position, and measuring the protrusion of the electrode from the front of the chassis. A new electrode at the full forward position should protrude slightly under 1.5" from the front of the chassis as shown below.



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3. System Maintenance

Beyond the daily checklist, periodic simple maintenance is required to keep the system operating properly. System maintenance is monitored by internal cut cycle counters, which will advise the operator when maintenance is recommended. Once the predetermined cut cycles are reached operator intervention is required to perform maintenance and reset the counters.

To clean the MSU, use a screen cleaning wipe or a soft, dry, lint-free cloth. When necessary, you can dampen the cloth with one of the following: water, isopropyl alcohol (IPA) solution 70% or less. **Never use glass cleaners or other harsh chemical cleaners.**

3.1. E-Drill Factory Refurbishment and Upgrade Services

This document details recommended user maintenance and troubleshooting procedures for the E-Drill product family. There are no user-serviceable components inside the Hand Tools or the Mobile Service Unit, and under no circumstances should the anti-tamper seals be damaged or removed, and devices disassembled. Service tasks or repairs not covered by this document should be conducted by PPedm service personnel.

Please contact the PPedm Customer Service Hotline (714-891-6533) if you have any concerns or questions.

3.1.1. Factory Hand Tool Refurbishment services

E-Drill Hand Tools are the most complex part of the entire E-Drill system, and it is critical to keep the hand-tool in peak condition. In common with other high-duty aerospace tools, E-Drill Hand Tools should be returned for factory service approximately after every 12,000 cuts. The factory service comprises replacement of seals, bearings, motors, O-rings, shafts, or any other worn parts that are encountered.

In addition, the factory service also includes any component or part upgrades which have occurred for that design since the unit was originally built. This may include upgraded circuit boards, seals, connectors or even the outer case. Refurbished systems are rebuilt to the same specification as the current manufactured product.

For Hand Tool Factory Refurbishments, contact:
PPedm Service Hotline 714-891-6533.

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3.1.2. Factory Mobile Service Unit (MSU) Services

The E-Drill MSU does not require a factory recommended upgrade or service interval. The system is designed to provide many years of service with no additional tasks beyond the recommended user maintenance items. However, since the product was introduced several improvements have been made, and as a result several standard factory refurbishment and upgrade services are available as well as factory system repair, should it be necessary.

Please contact the Service Hotline for details of MSU factory refurbishment and upgrade options.

3.2. MSU Maintenance Warnings and service procedures

- A) The **Status section of the Current Part screen** will provide a maintenance warning when 500 cut cycles remain.
- B) The system will continue to operate, but maintenance is recommended before the next shift. After the warning is activated, the system will count down the final 100 cut cycles before automatically shutting down at the mandatory 5500 cut cycle limit. At this time, the TSD will indicate a **"Filter change is required."**
- C) It is recommended that sediment tank, DI, and filter maintenance be completed between shifts, prior to the system shutdown.

3.3. Reset Maintenance Counter

If performed correctly, the Sediment Tank and Filter procedures (refer to sections 3.6 & 3.7 below), will automatically reset their respective counters. However, if the procedures are performed incorrectly, the counters will not be reset, and the system will still be disabled. Both the Sediment Tank and Filter counters can be reset in Advanced Mode (see Appendix 2, Section 5.5 for reset instructions). It is not recommended that a counter be defeated by resetting it without servicing the system, and such activity will void the system warranty.

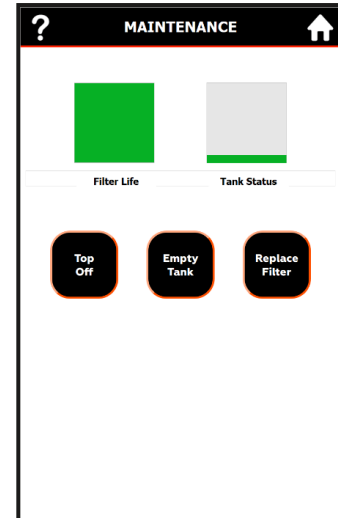
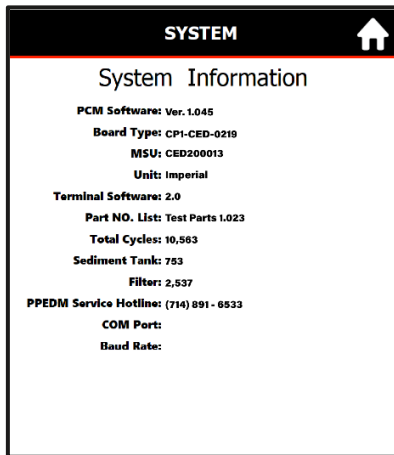
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3.4. Maintenance Screen

System maintenance functions are accessed by selecting the “Maintenance” Tab from the System Menu.

Touching the “Top Off” or “Empty Tank” will turn the button on, activating the function. These actions will end automatically, but touching the button again will turn the function off. The **Tank Status** and **Filter Life** illustrations display system water level status in the water tank and will update automatically as the system is serviced.



The Informational screen is accessed by touching the “Info” button from the System Menu. The information screen contains system configuration details and firmware revisions. The screen also contains the **Total Cycles**, **Sediment Tank**, and **Filter** counters.

3.5. Water System

The Mobile Service Unit (MSU) houses the fluid system that supplies the E-Drill Hand Tool with water during the cut. This water acts as a dielectric fluid during the EDM Process and is used to flush the area to remove debris during a cut. Since the unit contains an inline deionizing filter (DI Filter) on board, **ONLY** clean tap or deionized water is permitted to fill the unit. **DO NOT mix or use any additional chemicals such as antifreeze.**

The following sections (3.6 – 3.9) will walk you through the necessary maintenance procedures to keep the system topped off with water and ensure the deionizing stack, filter, and sediment tank remain working order. These parts will need to be replaced regularly due to routine usage and wear:

- PN: EDS2100 – De-Ionizing Filter for CP2-MSU-XXX
- PN: EDS5106 – Sediment Filter for CP2-MSU-XXX

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3.6. System “Top Off”

The DI water system requires periodic filling or “Top-Off” to replace tiny amounts of DI water lost during the cutting cycle. Should the system run low on water during operation, the Hand Tool will indicate a flashing red light and the display will indicate a “Low Water Level” condition. To “Top-off”, fill an open container with approximately 1 gallon of clean water, enter the maintenance Screen, touch the **Top-Off** function, and immerse the Adapter of the E-Drill in a vessel of water (do not submerge the entire drill, only the front of the E-Drill Adapter should be submerged).

Note: If using a hand-tool with 30’ umbilical cable, a faster technique is to disconnect the Hand Tool fluid tubes at the back of the MSU and use the service tubing to fill; filling through the Hand Tool may take a long time.

CAUTION



Submersing the E-Drill, its mechanism, or any parts other than the Adapter will destroy the E-Drill electronics and void the system warranty. Submersing the E-Drill fully in water may also cause operator injury due to electrical shock.



Only Submerge
Adapter Tip

When the Tank is full the Full LED indicator will illuminate green, and the pump will turn off automatically. The system is then ready for continued use.

*Note: The Top-Off pump may be stopped manually by pressing the **Top-Off** button a second time. Exiting the Maintenance Screen will also automatically turn the Top-Off function off. However, a “Low Water level” condition can only be cleared by completely filling the system, stopping the fill process manually or exiting Maintenance Screen will not clear the error.*

The Top-Off function will not work if the tank is already full.

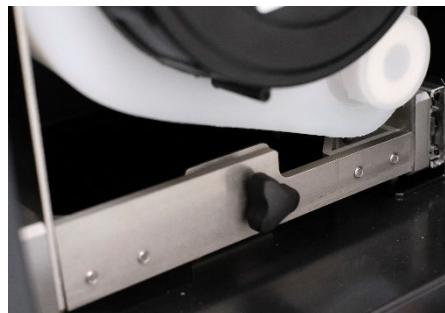
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3.7. Empty And Clean Sediment Tank

The E-Drill system is provided with a maintenance kit which includes a drain bowl and tank wrenches. These tools are used when servicing the tank. Sediment tank cleaning is conducted as follows:

- 3.7.1. Loosen the knob underneath the tank and slide the tank out. Set the drain bowl under the drain cap located towards the bottom of the tank. Remove the cap and empty the tank.

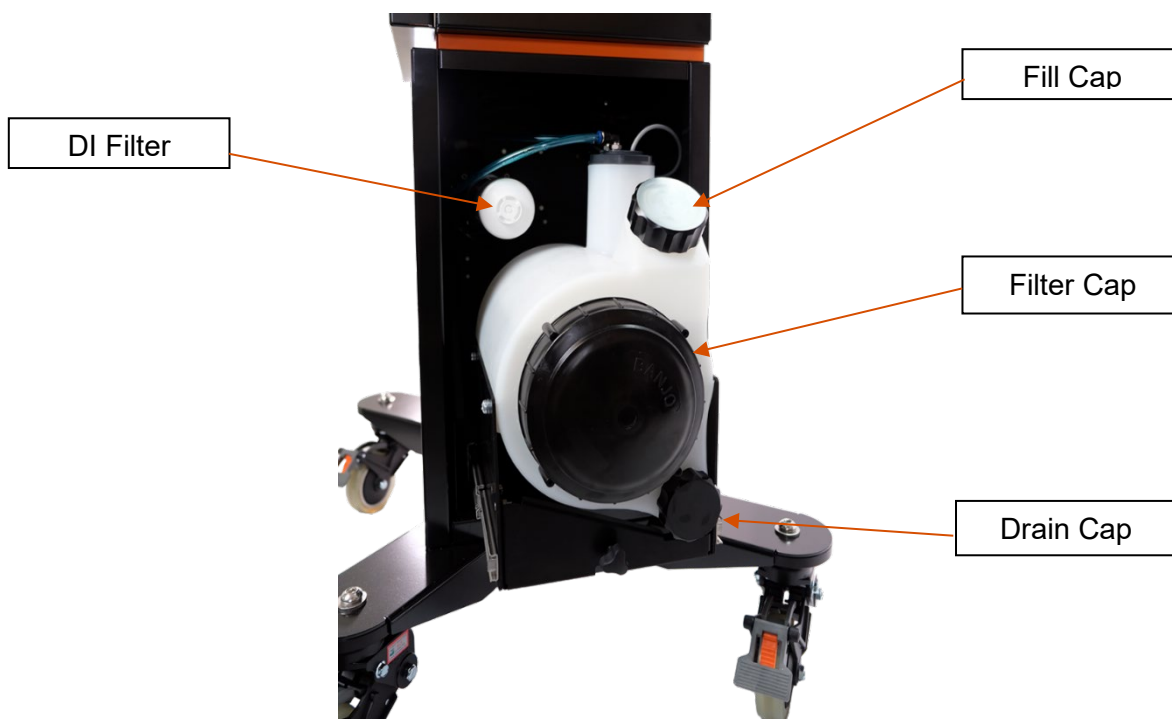


Dispose of the sediment laden water according to facility guidelines.



Caution – Do not attempt to remove or clean the sock on the level sensor. This is not a service item and should not be touched.

Rear of MSU with Tank Assembly Drawer Open and Extended



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3.8. Replace Filter and Remove Sediment

Follow the previous section to empty the sediment tank and prepare for filter change. It is recommended to change the Deionizing (DI) filter cartridge at the same time as the sediment filter. The DI filter cartridge can be removed and replaced without emptying the tank. Procedure is as follows:

3.8.1. Once the tank is empty, Use the provided strap wrench to remove the large cap in the center of the tank side. Once the cap is removed, pull on the sediment filter to remove the filter.

3.8.2. Once the filter is out, keep the drain cap open and spray the inside of the tank with water to clean and drain out any remaining sediment.

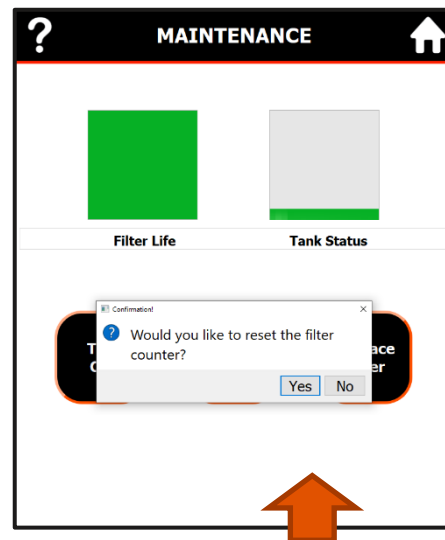
3.8.3. Carefully insert the new filter horizontally until it engages with the filter receptacle inside the tank. Press the filter until it contacts the rear of the tank.



3.8.4. Prior to reassembly, inspect the cap to ensure the seal is clean, properly lubricated and seated. Apply silicone grease to the O-Rings on the end of the filter cap.

3.8.5. It is recommended to replace the DI filter cartridge when replacing the sediment filter. To remove the old filter cartridge simply twist counterclockwise and unthread it from the receptacle. Before installing the new filter, remove any cap, or protective cover from the filter opening, and discard. Thread the new filter cartridge on by twisting clockwise. Ensure it is fully seated before proceeding.

3.8.6. After filter or DI filter cartridge replacement, the system must be completely filled and bled. Follow section 3.9 for recharge and bleed procedure. The system will prompt to confirm that you are resetting the filter count, select "YES."



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3.9. System Bleeding and Charging Procedure:

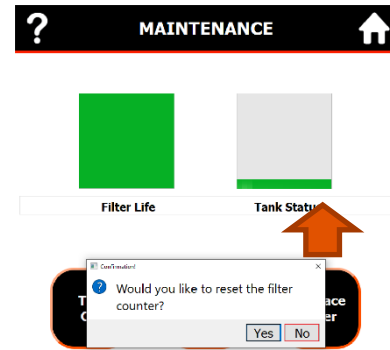
System maintenance and connecting/disconnecting system components can cause air to become entrapped in the DI water system. Bleeding and charging are sometimes required to assure there is no trapped air in the DI system.

3.9.1. Enter maintenance mode from the system menu on the Touch-Screen Display and complete the Top-Off procedure (see Section 3.4 & 3.5) to assure the system is completely filled.

3.9.2. Once the system is filled, disconnect the Hand-Tool, and attach the purge valve kit to the fluid lines on the MSU.

3.9.3. Select the Empty Tank function (see Section 3.4). Open and close the purge valve several times to aid in the purging process. The system will then prompt you to confirm that you are resetting the filter count, select no.

This procedure should be sufficient to clear excess air out of the system. Repeat this procedure as necessary to bleed air from the system.



3.10. Checking Vacuum and pressure

The system is provided with Vacuum and Pressure gauges to check the performance of the Dielectric water system. Vacuum and pressure may be checked in Advanced Mode (see Appendix 1) or from the maintenance screen (see Section 3.4). It is suggested that this check be carried out monthly or when inferior performance is suspected, per the following specifications:

3.10.1. Vacuum:

Connect the vacuum gauge with the blue hose to the vacuum port on the back of the MSU. From the advanced screen in the System menu, press the Vacuum Pump button to run the vacuum pump. The indicated vacuum should slowly rise (approximately 5-7" Hg) in approximately 60 seconds. Do not run the vacuum pump past 9in/hg.

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Press the Vacuum button again to turn the pump off. Vacuum should hold or degrade slowly over 30 seconds (approximately).

3.10.2. Pressure

Connect the pressure gauge valve kit with the black hose to the pressure port, and the blue hose to the vacuum port on the back of the MSU. From the advanced screen in the system menu, press the DI Pump button to run the pressure pump. With the valve closed, the indicated pressure should quickly rise to 110 PSI \pm 5 PSI.

Press the Pressure button again to turn the pump off. Open the valve to relief the pressure inside the lines. Take care when disconnecting the gauge in case the line is still pressurized.

If either of the above specifications are not met, visually inspect the water tank system and visible tubing for damage or leaks. Also check the lid/cap seals are in-place and not damaged. Contact PPedm Customer Service Hotline (714.891.6533) if there are no obvious problems.

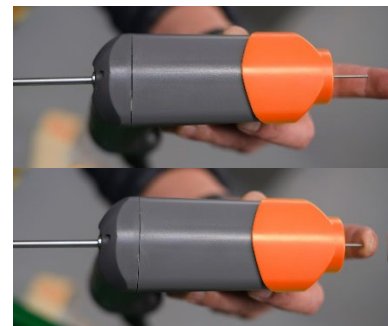
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3.11. Ground Pin Replacement:

Ground Pin Installation is a critical parameter in efficient operation of the device (much like the electrode in a TIG welder). As described in the Weekly Maintenance Schedule (Section 3.8), the Ground Pin should be checked regularly for excessive burning or damage and correct protrusion from the front of the E-Drill. The procedure for checking and adjusting, and if necessary, replacing the ground pin is as follows:

- 3.11.1. To replace the ground pin, remove any installed Adapter and Electrode, and retract the conducting tube to its full rear position.
- 3.11.2. Using a 5mm Hex L-Key Remove the cap on the rear of the Hand Tool.
- 3.11.3. Insert a T20 Torx L-Key in the rear of the hand-tool to loosen the ground pin from its CG seated position. Once it is loose, press the front of the ground pin in, until it reaches the rear set of threads on the Hand-Tool, continue to unscrew the ground pin using the T20 Torx L-Key. Once the rear of the ground pin is completely out of the hand-tool, gently pull it out.
- 3.11.4. Lightly coat the shaft of the new Ground Pin Assembly with a light coating of O- Ring Lube (do not over lubricate). Insert the prepared Ground Pin Assembly into the back of the E-Drill pressing it through the E-Drill's internal seals. Use care not to bend the Ground Pin during insertion. Use the T20 Torx L-Key to screw the new ground pin in place. Once it is past the first set of threads, gently press the ground pin until it reaches the next set of threads and continue to screw until it is hand tight. (do not use excessive torque). Reinstall the Ground Pin Cap on the rear of the Hand Tool.



Install the required Electrode and Adapter and resume E-Drill operation.

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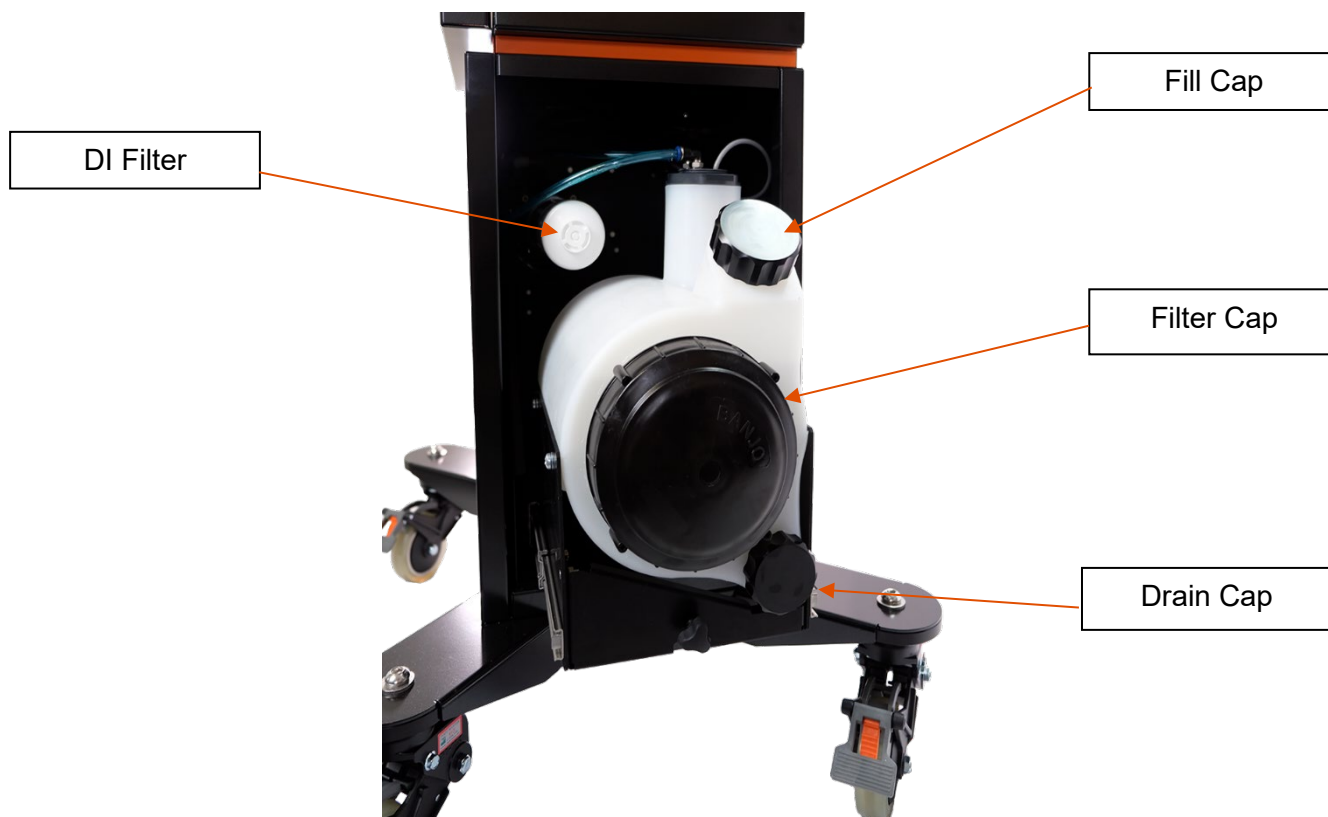
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3.12. Draining of system for storage or transport.

The Perfect Point E-Drill system should be protected from freezing conditions that can crack or burst de-ionized water connections and plumbing. If the system is subjected to freezing temperatures, it should be thoroughly inspected by a trained technician for damage or leaks prior to use. If the system is to be stored or transported in low temperature conditions, then it should be completely drained first.

To drain the system completely follow section 3.7 (Empty and Clean Sediment Tank). Before re-use follow section 3.8 (System Bleeding and Charging) to refill and bleed the dielectric system.



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4. Trouble-Shooting Guide

This section of the Maintenance and Troubleshooting Guide lists common maintenance issues encountered and their solutions. In the event of issues, it is recommended that the E-Drill Daily Checklist (section 2.0) is followed before using the deeper investigation steps listed in this section.

The troubleshooting section may be used in two ways. Firstly, common symptoms may be traced in the flow-charts in section 4.1.

Secondly, if the flow-charts do not resolve the issue, section 4.2 provides a more detailed set of fault descriptions and rectification.

If a solution cannot be found in this Trouble-Shooting Guide, do not hesitate to contact the Customer Service Hotline Phone at 714-891-6533. This number is in 3 places on the system for ease of access.

- Mobile Service Unit directly above the system power switch.
- The “Information” page of the “Maintenance” screen on the touchscreen of the HMI.
- Printed in the header of this Maintenance Guide.

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4.1. Status Lights

The Status Light communicates various conditions during operation as follows:

Solid Green light upon cut completion – Cut was successfully completed.

Solid Green while operating the retract button – Electrode is fully retracted.

Flashing Green upon cut completion – Cut was completed successfully but the electrode needs replacement before next cut. **The system is disabled until electrode has been replaced and fully retracted.**

Solid Red upon cut completion – Cut was completed with errors. Either the trigger was released before reaching depth, or the cut took excessively long. Which condition occurred will be reported by the Touch-Screen Display. Likely issues causing slow cutting include:

- The head of fastener was not de-painted adequately
- Wrong fastener type was programmed on the terminal
- The electrode is loose

Flashing Red (at any time) – An error has been identified, system is disabled. System error will be displayed on the Touch-Screen Display. Typically, the flashing red indicates a low water level, and a Top-Off needs to be performed. **The system is disabled until the water level is restored.**

Note: Solid lights are informational - The unit is still operational.

Flashing Lights require user intervention - Unit is disabled until the condition is resolved.

4.2. Trouble-Shooting Diagnostic Flowcharts

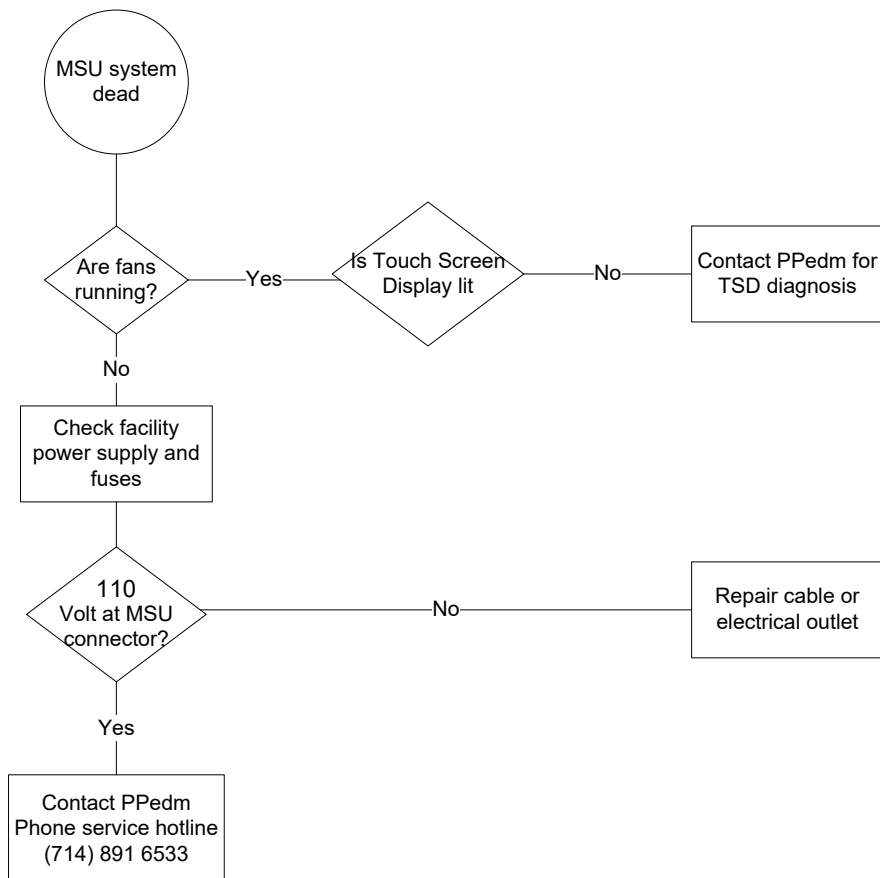
Flow charts cover the following conditions:

- MSU system dead.
- System does not cut when trigger pressed.
- Cutting too slow.
- NO vacuum at hand-tool.

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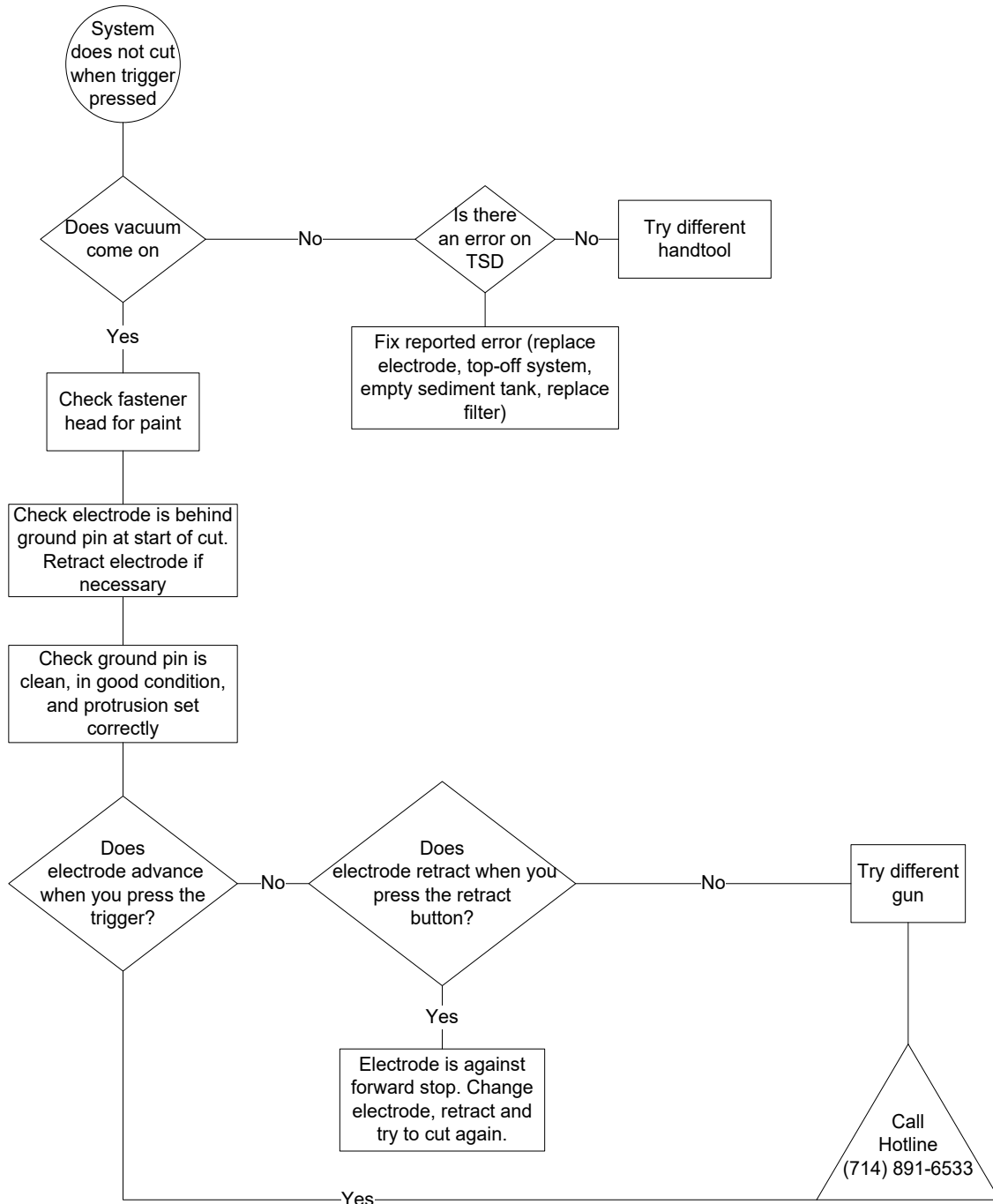
4.2.1. Mobile Service Unit (MSU) system dead



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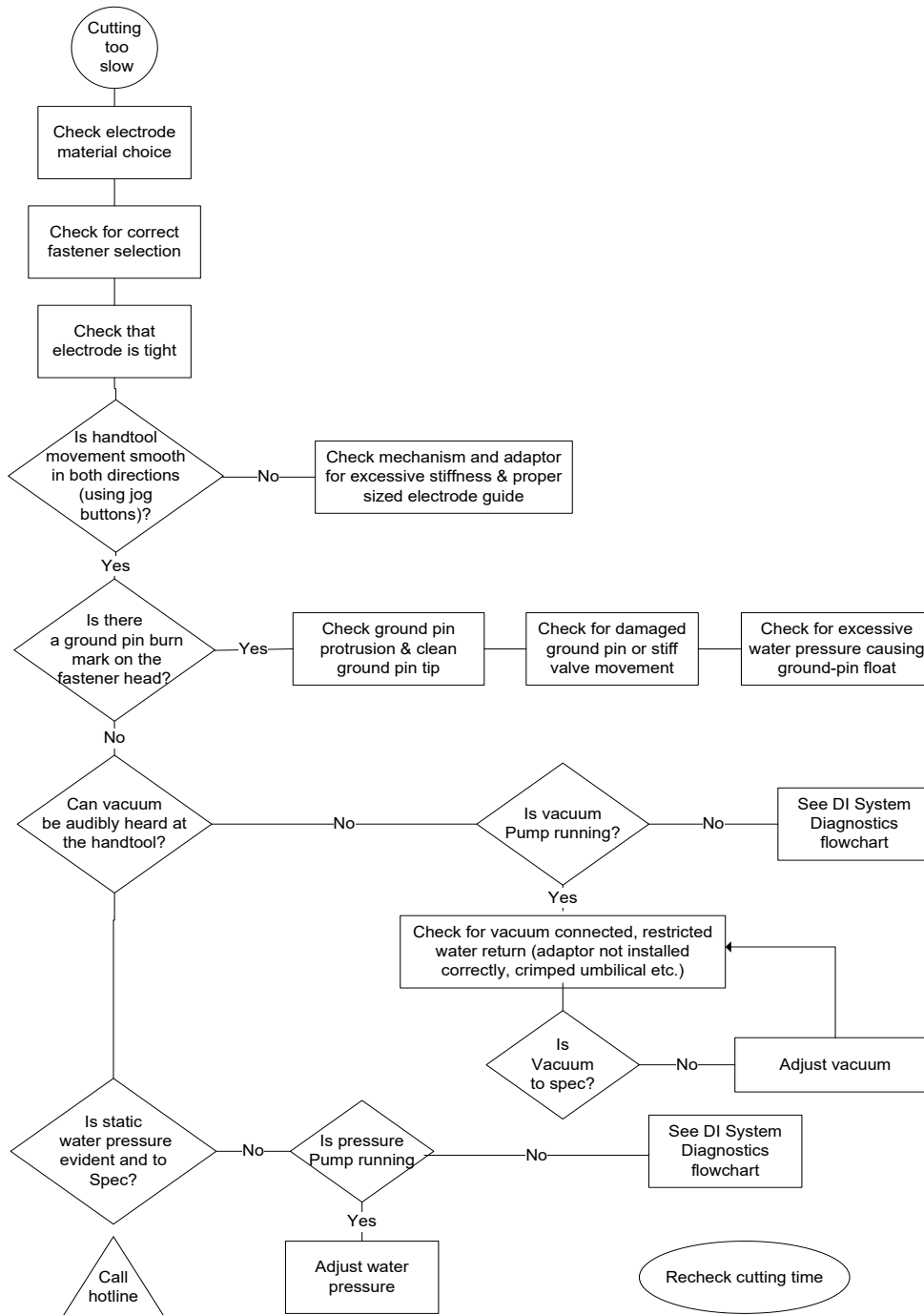
4.2.2. System does not cut when trigger pressed



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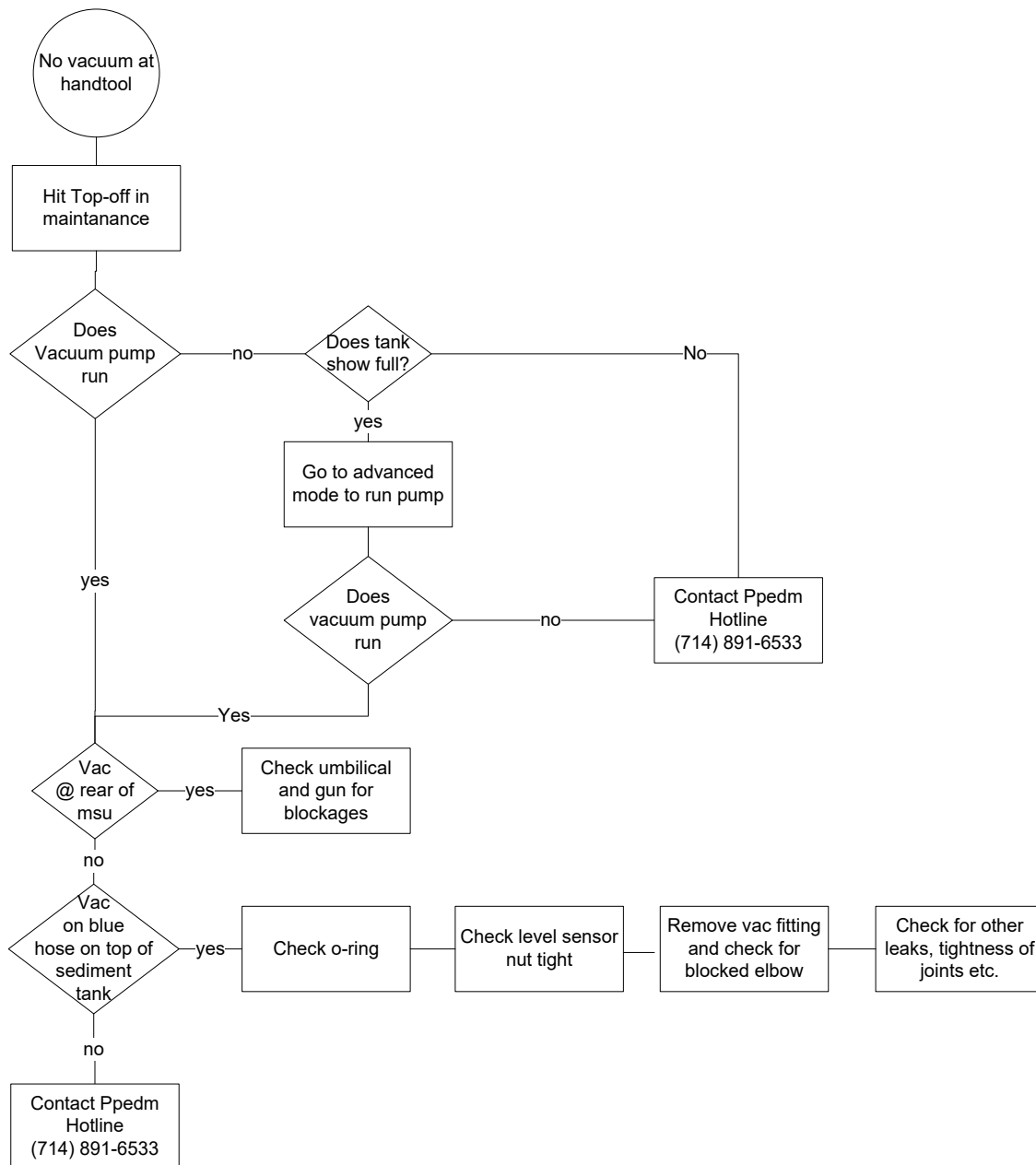
4.2.3. Cutting too slow



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4.2.4. No vacuum at hand-tool



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4.3. Fault Descriptions and Rectifications

4.3.1. Mobile Service Unit (MSU) General Fault

Trouble	Probable Cause	Remedy
No activity, no display, internal fans not running.	No input power.	Ensure Power cable is correctly plugged in at MSU and power outlet. Turn the power switch to ON. Verify voltage from outlet
System displays low water level error.	Water is below minimum level.	Refer to section 3.6. System "Top Off"
Initial top off routine ends prematurely. Pressing the button again causes more top off, as if previous top off ended prematurely.	Normal behavior. Since the top off routine is vacuum driven, when the vacuum stops the level drops slightly below its previous height during filling. Level is ok after the initial automatic stop.	
Cutting occurs but Vacuum Pump does not start	Supply voltage too low.	Check facility power output.
	Pump damaged from flooding.	MSU requires service Contact PPedm Customer Service Hotline for assistance
Mobile Service Unit makes loud screeching noise.	Air entrapped in the Mobile Service Unit Pressure Regulator.	Bleed DI system (See Ch. 3 System Maintenance, Section 3.9 System Bleeding and Charging)
System overflows during Top Off routine causing water puddle under the MSU.	System Sediment Tank Level Sensor is stuck.	Contact PPedm Customer Service Hotline for assistance

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4.3.2. E-Drill general fault

Trouble	Probable Cause	Remedy
No cutting occurs, vacuum pump does not start.	If green light on hand-tool is flashing, the Electrode needs replacement.	Replace electrode.
	Flashing red light on Hand-Tool indicates a System error	Observe error displayed on control terminal. Check the water level. Contact the PPedm Customer Service Hotline for support.
	Hand-tool not connected to utility cabinet.	Recheck hand-tool connection on rear of cart. Ensure locking bezel is fully rotated.
No cutting occurs, Pressure pump does not start.	Fastener surface is not conductive.	Check correct location of Hand-Tool over fastener. Verify that all surface coatings have been removed
CG Hand Tool will not cut.	Ground pin incorrectly adjusted or damaged.	Check ground pin for wear and replace if necessary
EG Hand Tool will not cut	Bad ground connection.	Check for bad or lose ground clamp connection.
Cutting occurs but system shows red warning LED at end of cut.	Hand-tool trigger was released prematurely.	Re-cut fastener ensuring to hold down trigger until system finishes cutting.
	Cutting process ended prematurely.	Check library setting for correct fastener type. Make an additional cut by squeezing trigger a second time while still in-place over fastener. The system will likely repeat the same error since less cutting is required in the second cycle.

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Trouble	Probable Cause	Remedy
Cut does not reach correct depth.	Hand-tool not firmly and consistently held in contact with fastener and airframe surface throughout cut.	Press hand-tool firmly over fastener and maintaining consistent pressure until cut is complete.
Cycle time excessively long. Cutting too deep.	Hand-tool is not held stable during cut.	Hold hand-tool in a fixed position during cutting.
	Electrode is not tight.	Tighten electrode with electrode torque wrench.
Cut slower than expected.	Electrode is not tight.	Check electrode tightness with electrode torque wrench.
	Air in system.	Bleed DI system.
	Leaks in water system.	Check visually for leaks in water system or for kinked hoses. Use Purge Kit to check correct operating pressure as in section 3.10.2.
	Wrong fastener selected.	Check fastener settings.
	Wrong electrode type.	Check electrode material application.
	Operator error.	User lifted or moved E-Drill during cut sequence.

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Trouble	Probable Cause	Remedy
Water sprays excessively out of hand-tool. Hand-tool cannot be held easily against work surface.	Vacuum and water connections incorrect.	Check water tube connections.
No cutting occurs. No water evident. Burning smell around electrode	Wrong Adapter in use for the fastener being removed; resulting in the ground pin not being fully depressed – typically a button-head tip is being used for a flush head fastener. Incorrectly adjusted or damaged Ground Pin.	Select the correct adapter configuration for the fastener. If the wrong tip is used, then the depression of the ground pin will not be sufficient for water flow, resulting in overheating and damage to the equipment.
Fastener does not punch out.	Wrong fastener settings.	Check all settings in the HMI.
	Wrong electrode size.	Check electrode against fastener application.
	Insufficient cut depth programmed in fastener library.	Check fastener size.
	User Error	User lifted hand-tool during cut sequence.

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Trouble	Probable Cause	Remedy
E-Drill stops within a second of starting and does not go to cut depth.	Ground Pin protrusion is significantly out of adjustment or worn beyond its life. Paint, corrosion, or sealant on fastener head has not been fully removed.	Adjust Ground Pin protrusion with Ground Pin Setting Tool. Clean fastener head for proper grounding. Cutting a depressed center fastener (such as a Torx or Phillips head) without specially adjusting the Ground Pin protrusion to match the fastener depth.
Electrode advances to limit and Hand Tool emits a constant buzzing noise.	E-Drill Trigger is stuck in the on position.	Power off system. Check operation of trigger, clean surrounding area to attempt to free the trigger assembly. Trigger should “click” when depressed. Contact PPedm Customer Service Hotline if the problem persists.
Cutting or Cutting Time is intermittent and/or taking longer than usual	Electrode has come loose in E-Drill.	Remove adaptor and drive electrode forward using the trigger. Using the Electrode Torque Tool re-tighten electrode.
Water leaking from E-Drill retract button or ground pin adjusting hole.	E-Drill seal failure	Call the PPedm Customer Service Hotline and obtain an RMA and return E-Drill to PPedm for service.
Vacuum pump does not stop operating after 3 seconds of trigger release. E-Drill “buzzing” and does not stop automatically at the end of cut.	Water inside of E-Drill.	Call the PPedm Customer Service Hotline and obtain an RMA and return E-Drill to PPedm for service.

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












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APPENDIX A – Symbols

Symbol	Details
	WARNING: Proceed with Caution
	WARNING: Hazardous Voltage
	WARNING: Temperature.
	WARNING: Toppling
	You Must Read and Understand Operator Manual Before Installing, Operating, or Servicing Equipment
	Hazardous Voltage, Disconnect Power Before Servicing or Cleaning
	Welding Power Output: Plasma Cutting
	Direct Current (DC)
	Alternating Current (AC)
	Energy Supply
	Type of Cooling
	Water Inlet: water system MSU to Hand Tool
	Water Outlet: water system MSU to Hand Tool
	Input
	Output
	Remote Control
	Pressure Warning 0.8 MPA (8 Bar)
	Earth Ground
	Frame or Chassis Ground
	Protected Ground

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U_o	Rated No-Load Voltage
X	Duty Cycle
I_2	Rated Cutting Current
U_2	Conventional Load Voltage
$U_1 = 100V$ $U_1 = 240V$	Rated Supply Voltage: 100V or 240V
$I_{1max} = 47.5A$	Rated Maximum Supply Current: 47.5 Amps
$I_{1eff} = 10A$	Maximum Effective Supply Current: 10Amps
$P_{1max} = 0.85 kW$	Maximum Power Consumptions, 0.85 kW
	Power Off
	Power On
	Instructions and Help
	Back/Home
	Add/Build
	Shortcut to Fastener Library
	User
	HMI Language Preference – English (US)
	HMI Language Preference – Spanish
	HMI Language Preference – French
	HMI Language Preference – German
	HMI Language Preference – Chinese (Simplified)
	HMI Language Preference – Japanese (Katakana)

