E-DRILL

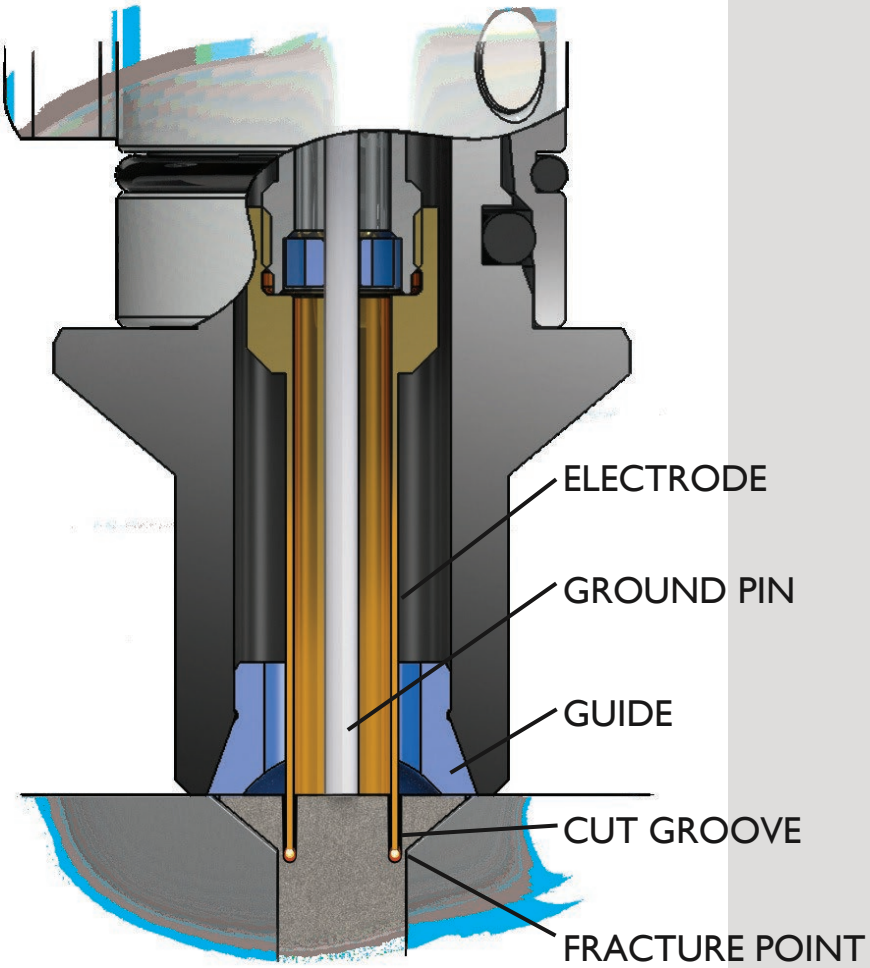
E-Drill Fastener Removal Instructions

For System Part Numbers CP2-SY-002

PPEDM.com

15192 Triton Lane,
Huntington Beach, CA

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 into 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. Constant flushing during the cut means no heat is transferred to the surrounding area. The forceless cut process significantly reduces the 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

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

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 freezing cold 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 fully drained first (refer to Document 61-405 - E-Drill Maintenance and Troubleshooting Guide).

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 be positioned under a protective awning or positioned in a protected area under or in the airframe. Cable connections should not be left in pooled water and should be kept elevated. Special Installation may be required where gasoline or volatile liquids are present. Do not block vents. Proper ventilation is necessary for unit operation.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

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

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 by the use of 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).

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

PPEDM will at its option, 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 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.

PERFECT POINT
AEROSPACE MAINTENANCE TECHNOLOGY

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

WARNING **WARNING** **WARNING**

The USE of Counterfeit Electrodes Can Cause Damage to the E-Drill, Aircraft, Aircraft Components, and Aircraft Structures. THIS IS A SERIOUS SAFETY ISSUE!

Perfect Point electrodes are manufactured to exacting standards and are certified for use with E-Drill systems. Performance and control are matched to specific alloys. Concentricity, Depth Control, Cut Diameter and Electrode Life will not be maintained outside of these specifications.

The USE of Counterfeit Electrodes Will Violate the E-Drill System warranty and Perfect Point WILL NOT Service E-Drill Systems that USE Counterfeit Electrodes

For the Protection of Your E-Drill System and the safety of the Application for Which You Are Using the E-Drill

DO NOT USE COUNTERFEIT ELECTRODES!

Only genuine electrodes supplied in original Perfect Point packaging should be used in your system! If you suspect you have received COUNTERFEIT ELECTRODES, please contact the Perfect Point Support Hotline to Report.

1-714-891-6533

WARNING **WARNING** **WARNING**

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Perfect Point EDM Software End-User License Agreement (EULA)

IMPORTANT- READ CAREFULLY: This End-User License Agreement ("EULA") is a legal agreement between the user (either an individual or a single entity) and Perfect Point EDM Corp. ("PERFECT POINT"), the manufacturer of the E-Drill you have acquired, that includes certain Perfect Point software product(s) installed on the E-Drill system and equipment ("PPEDM SOFTWARE"). The PPEDM SOFTWARE includes computer software, the associated media, any printed materials, any "on-line" or electronic documentation, upgrades and recovery media. By using the PPEDM SOFTWARE, you agree to be bound by the terms of this EULA. If you do not agree to the terms of this EULA, Perfect Point declines to license the PPEDM SOFTWARE to you. In such event, you may not use the PPEDM SOFTWARE, and you should promptly contact PERFECT POINT for instructions on return of the entire product.

PERFECT POINT SOFTWARE LICENSE

The PPEDM SOFTWARE is protected by copyright laws and international copyright treaties, as well as other intellectual property laws and treaties. The PPEDM SOFTWARE is licensed, not sold.

GRANT OF LICENSE. This EULA grants you the following rights:

- **Software.** You may use the PPEDM SOFTWARE as installed on the E-Drill.

OTHER RIGHTS AND LIMITATIONS.

- **Limitations on reverse engineering, Decompiling and Disassembly.** You may not reverse engineer, decompile, or disassemble the PPEDM SOFTWARE.

- **Single E-Drill.** The PPEDM SOFTWARE is licensed with the E- E-Drill as a single integrated product. The PPEDM SOFTWARE may only be used with the E-Drill.

- **Rental.** You may not rent or lease the PPEDM SOFTWARE without prior written approval from PERFECT POINT.

- **Software transfer.** You may permanently transfer all your rights under the EULA only as part of a sale or transfer of the E-Drill, provided you retain no copies, b) transfer all of the PPEDM SOFTWARE (including all component parts, the media, any upgrades, and this EULA, c) you notify PERFECT POINT of the new user, and d) the recipient agrees to the terms of this EULA.

- **Termination.** Without prejudice to any other rights, PERFECT POINT may terminate the EULA if you fail to comply with its terms and conditions. In such event, you must return the entire product to PERFECT POINT, and all its component parts.

COPYRIGHT. All title and copyrights in and to the PPEDM SOFTWARE (including but not limited to any images, photographs, animations, video, audio, music, text and "applets," incorporated into the PPEDM SOFTWARE), and the accompanying printed material, are owned by PERFECT POINT. You may not copy the printed materials accompanying the PPEDM SOFTWARE, without prior written approval from PERFECT POINT. All rights not specifically granted under this EULA are reserved by PERFECT POINT.

This Software Agreement and Limited Warranty are governed by the laws of the State of California, U.S.A.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

1 Contents

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

2 Introduction

Conventionally fasteners are removed by drilling out the head of the fastener with a hand drill and twist drill bit. This process is slow, requires significant strength from the operator, requires skill and precision, generates Foreign Object Debris (FOD), and frequently results in damage to the airframe.

The Perfect Point E-Drill system is a hand-held Electrical Discharge Machining (EDM) tool designed to aid in the removal of hard airframe fasteners. The E-Drill device weakens the fastener by electrically eroding a circular groove through the fastener head and a short distance into the stem (or pin) of the aircraft fastener. During cutting, a closed loop de-ionized water system is used as a Dielectric Fluid and circulated throughout the head of the device, in such a manner that the fastener and surrounding airframe do not heat up and are cold to the touch immediately after cutting.

The depth of cutting is controlled automatically, such that a thin wall remains holding the fastener head in place. The fastener head may then easily be severed by a sharp tap with a hammer and hand punch. When the device is positioned correctly the airframe is not damaged in any way, and the temperature rise in the airframe around the hole is insignificant.

This document's purpose is to provide the user with information on the E-Drill system's component and accessories and provide detailed general instructions for use of the E-Drill on airframe and engine structure.

- For upkeep, regular/scheduled maintenance, and troubleshooting of the E-Drill system refer to the E-Drill system owner's Maintenance and Troubleshooting guide.
- For specific fastener applications refer to the fastener specific appendixes attached to this document.

3 E-Drill System Components

3.1 E-Drill Hand Tools

E-Drill Hand Tool can be configured in two separate modes that cover a wide range of fastener sizes. Each Hand Tool Mode has specific fastener size capabilities and features. This User Guide covers the use of both standard types of E-Drill hand tools modes.

3.2 Center-Grounded (CG) Hand Tool Mode

CG hand tool mode can remove fasteners with a diameter of 5/32" through 3/8". For fasteners smaller than these sizes the External Ground (EG) mode shall be used.

CG hand tool is Center-Grounded by means of a Ground Pin that protrudes through the center of the cutting electrode. Hand tool mode visual identification can be quickly made by inspecting the nose of the hand tool. If the Ground Pin is visible protruding from the center of the electrode, then this is a CG or Center Ground Hand Tool Mode.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

CAUTION:

CG hand tool mode *shall NOT be used* with an electrode smaller than 5/32". Damage to hand tool will result if smaller electrode is used.

Profile view of CG Hand Tool- note protruding ground pin on nose of tool

Profile view of EG Hand Tool- note external grounding wire extending from bottom of handle.

3.3 External Ground (EG) E-Drill Hand Tool

This hand tool configuration can remove fasteners from 3/32" Nominal Stem Size (-3) through 3/8", including oversizes. For fasteners larger than these sizes, the Center Ground (CG) E-Drill Hand Tool Mode should be used.

EG Hand Tool Mode is externally grounded by means of an External Ground lead and clamp. The Hand Tool Ground Lead and Grounding Clamp Assembly have a "break away" safety connector feature for operator safety and to prevent accidental cable breakage.

CAUTION

The External Ground (EG) Hand Tool will NOT operate without the system properly grounded by the Ground Clamp Assembly. Check for electrical ground prior to further system trouble shooting.

3.4 E-Drill Hand Tool General Features and Controls

3.4.1 Interchangeable Adapters

The E-Drill includes a kit of Interchangeable Adapters suitable for different fastener types and removal processes.

Adapters and locators are intentionally manufactured in plastic using brighter colors, so they may be easier to find if dropped or mislaid. This is helpful in all shop environments, but especially in FOD-controlled situations. The plastic also reduces the chance of marring the airframe surface.

3.4.2 Trigger

The trigger is depressed to initiate the cutting process and is held depressed until the cut automatically completes. As a safety feature, should the trigger be released, the cutting process will be aborted immediately. Keeping the trigger depressed after the cut is finished will assist in cleanup of any excess water which may remain after cutting.

3.4.3 Retract Button

The Retract Button recessed in the handle is used when necessary to retract the cutting

electrode. The retract button is actuated for one of the following conditions:

- A new electrode has been installed and needs to be retracted
- The trigger has been operated accidentally when not placed on a fastener and the electrode has moved forward as a result
- The E-Drill has been applied to a non-conductive surface and the electrode has extended in search of a conductive material.

The electrode retracts continuously while the button is held down. Retraction stops when the button is released, or the device reaches the retract limit.

3.4.4 Status Light

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:

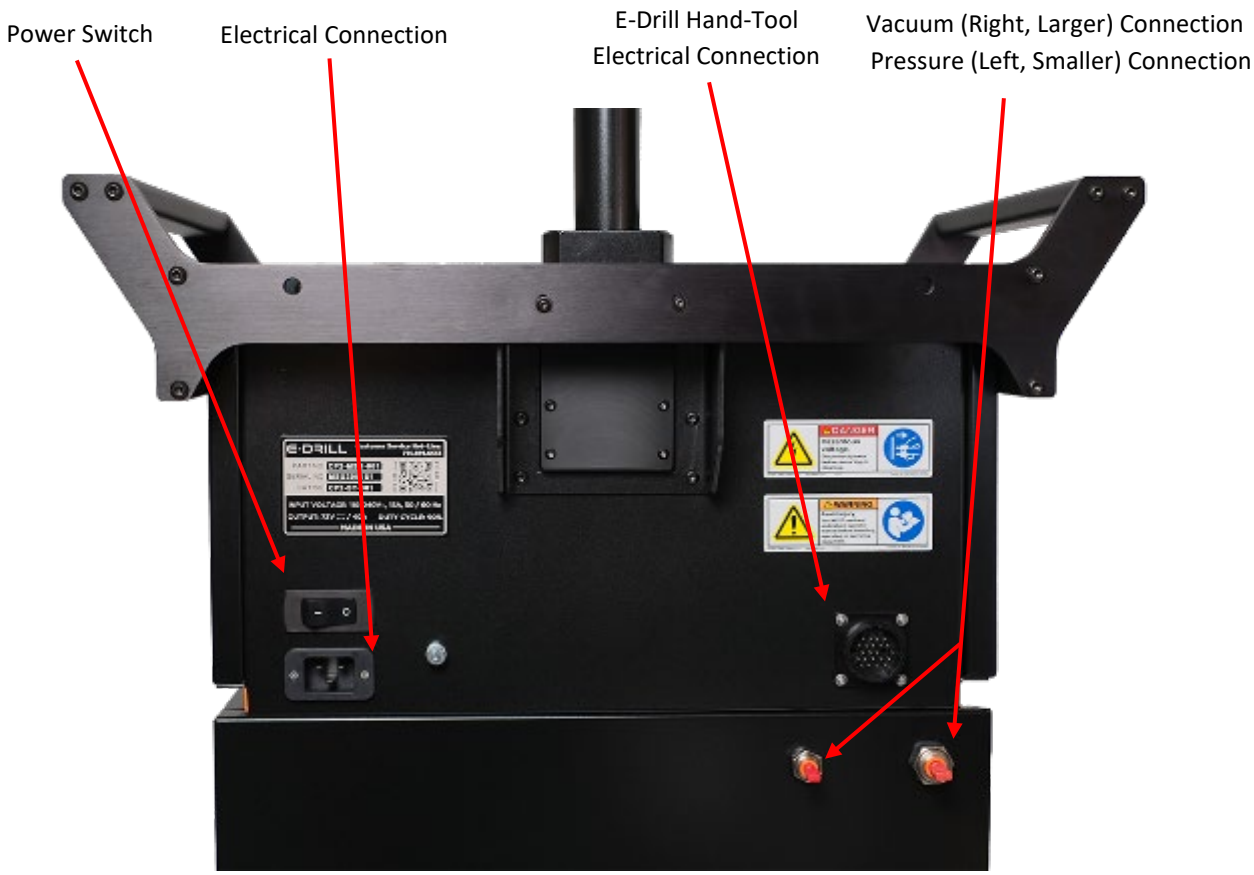
- The head of fastener was not de-painted adequately
- Wrong fastener type was programmed on the terminal
- The electrode is loose

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.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

4 Mobile Service Unit (MSU)



Mobile Service Unit- Rear Connection Panel

4.1 MSU Connection Panel

The hand-tool connector installs with the blue Vacuum dielectric connector on the right, and the black Pressure dielectric connector on the left (matching the cabinet connections). The black electrical connector locking bezel must be twisted until a click is felt.

When removing the hand-tool, the bezels around the Push-To-Connect™ fluid fittings on the Mobile Service Unit and Umbilical Cable must be pushed in to release the tubes.
When installing the hand-tool, the tubes should be pushed into the push-to- connect fittings and then lightly pulled such that they are "set".

After installing or re-installing a hand-tool, it is good practice to bleed the pressure line to the hand-tool.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Warning

Under no circumstances should the electrical connectors be forced. If aligned correctly, minimal force is required. Excessive force will Damage the connectors and will not be covered under warranty.

4.2 Touch-Screen Display

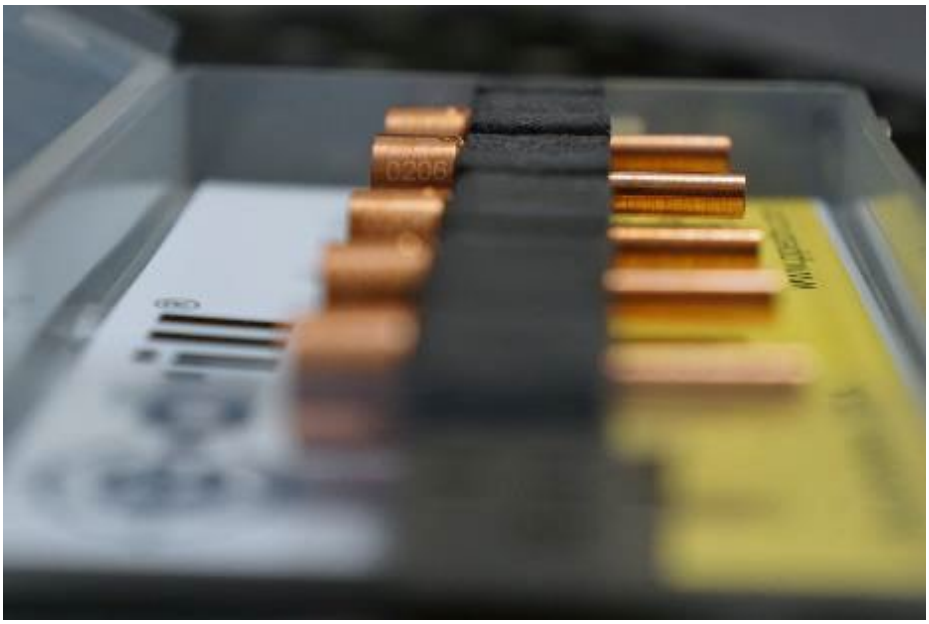
The Touch Screen Display (TSD) on the E-Drill system provides an intuitive interface for operators to control and monitor various aspects of the fastener removal process. It allows users to select fastener types, program cut parameters, view system diagnostics, and perform maintenance tasks. The TSD also displays real-time status updates and error messages, ensuring optimal performance and safety. Through the TSD, users can easily access the fastener library, select electrodes, and adjust settings to match the specific requirements of the fastener being removed.

Key Functions of the TSD:

- Fastener type selection and programming
- Electrode and locator recommendations
- System status and diagnostics display
- Error messages and troubleshooting guidance
- Access to maintenance functions (e.g., water top-off, filter changes)

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

5 Electrodes



Cutting of the fastener is achieved using a precision tubular electrode. Electrodes are available in a range of sizes depending on the fastener size and type to be removed. Once a fastener type is selected from the Touch-Screen display, the system will indicate which electrode to be used for that fastener.

Electrodes are consumable, and wear slightly every cut. A flashing green light on the back of the hand tool, and accompanying message on the display will indicate when an electrode should be replaced. Throughout its life, electrode performance is unchanged, until the point when the system will advise it be replaced.

Selection, installation and use of electrodes is covered in section 6.5. Appendix 5 provides a complete list of all electrode sizes, color codes and diameters.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

6 Locator Tools

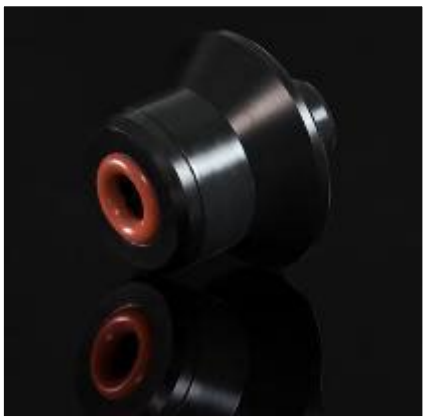
6.1 Locator Adapters

E-Drill locators tools use 3 types of adapters which correspond to the 3 most common series of locator tools. These adapters ensure a mating surface between the E-Drill hand tool and the locator tool. Each type adapter has the following features:

- Mating base for installation to E-Drill hand tool (Threaded or Tri-Wing)
- Removable electrode guide for precision electrode alignment
- Beveled feature for intimate connection with corresponding locator tool

6.1.1 Button Head Adapter

The BHL Adapter and Guide Assembly is installed on the end of the E-Drill for the selected fastener removal application. BHL Adapters are configured for both EG and CG E-Drill use.



6.1.2 Vacuum Series Adapters

Vacuum Flush Head Adapter has a unique shape specific for use on the vacuum assisted locator tools. This unique shape also has It is shaped differently than the FHL adapter and with an O-Ring located on the end of the electrode guide to seal the water during the cut. Use of the VFHL locator tool is required for applications where the work surface is not dispositioned as scrap.

6.1.3 Special Purpose Adapters and Fastener Specific Kits

A range of special purpose adapters is available, for use in confined areas, cavities, or special fasteners. The range includes:

- Slimline Button Head Locators/Adapters, for fasteners close to structure (such as stringers or ribs).
- Extended Adapters and Electrode Extensions, for deep cavities.
- Collar adapters (for collar or nut splitting).

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

- Threaded insert adapters and kits.

Most special purpose adapters are available in Fastener Specific Kits (FSK's) including all the parts and electrodes necessary to address a particular removal situation.

Contact PPEDM for application specific solutions and available FSK's.

Above photo shows an example FSK for Fastener Removal in Confined Spaces.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

6.2 Electrode Guides

Electrode guides are inserted into the Adapters installed on the E-Drill to steady and center the Electrode during the cutting process. Each Guide is sized to a specific electrode size and color coded for easy visual identification.

The same Electrode Guides are used in both the Flush Head Locator (FHL) and Button Head Locator (BHL) systems, while the Vacuum Series Locator Guides are of a different design. Electrode guides are color coded used with their respective Electrode applications as depicted in the chart below.

Note: Guides should be regularly inspected for damage or wear. Guides with heavy usage should be replaced when the electrode does not feel secured in the guide.

To check for Electrode Guide wear, attempt to insert the next OS electrode and observe if it enters the guide. If the next OS electrode passes into the guide, then the guide is out of tolerance and should be replaced.

Fractional Fastener Size	Dash Size	Adapter Electrode Guide	Electrode Packaging
3/32 Nominal	3	GREEN Electrode Guide	GREEN Label
3/32 Plus	3+	WHITE Electrode Guide	GREEN Label
1/8 Nominal	4	ORANGE Electrode Guide	ORANGE Label
1/8 Plus	4+	WHITE Electrode Guide	ORANGE Label
5/32 Nominal	5	BLUE Electrode Guide	BLUE Label
5/32 Plus	5-+	BROWN Electrode Guide	BLUE Label
5/32 1st Oversize (X)	5-X	WHITE Electrode Guide	BLUE Label
3/16 Nominal	6	YELLOW Electrode Guide	YELLOW Label
3/16 Plus	6-+	BROWN Electrode Guide	YELLOW Label
3/16 1st Oversize (X)	6-X	WHITE Electrode Guide	YELLOW Label
3/16 2nd Oversize (Y)	6-Y	TURQUOISE Electrode Guide	YELLOW Label
1/4 Nominal	8	BLACK Electrode Guide	BLACK Label
1/4 Plus	8-+	BROWN Electrode Guide	BLACK Label
1/4 1st Oversize (X)	8-X	WHITE Electrode Guide	BLACK Label
1/4 2nd Oversize (Y)	8-Y	TURQUOISE Electrode Guide	BLACK Label
5/16 Nominal	10	RED Electrode Guide	RED Label
5/16 1st Oversize (X)	10-X	WHITE Electrode Guide	RED Label
5/16 2nd Oversize (Y)	10-Y	TURQUOISE Electrode Guide	RED Label
3/8 Nominal	12	GRAY Electrode Guide	GRAY Label
3/8 1st Oversize (X)	12-X	WHITE Electrode Guide	GRAY Label
3/8 2nd Oversize (Y)	12-Y	TURQUOISE Electrode Guide	GRAY Label

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

6.3 Button Head Locators (BHL)

The BHL system is comprised of 3 basic components, the Button Head Locator, the E-Drill Adapter Assembly, and the required Electrode Guide. The BHL Locator is placed over the Button Head fastener on the work surface. The Button Head Adapter is affixed to the nose of the E-Drill hand tool. The Button Head Locator comprises a white plastic housing, metal insert, and three O-rings for sealing. The BHL assembly is available in two different sizes; EDB0033 for fastener heads up to 0.5" and EDB0034 for fastener heads greater than 0.5".

The metal inserts are removable, and each is intended to be pre-bored to suit a specific fastener head diameter. The inserts may be supplied pre-bored to a specific size upon request, or the customer may purchase piloted blanks either individually or pre-assembled, which they can bore themselves per their requirements. Hexagonal inserts are also available for specific hex-head blind fasteners, and removal of seized nuts and bolts.

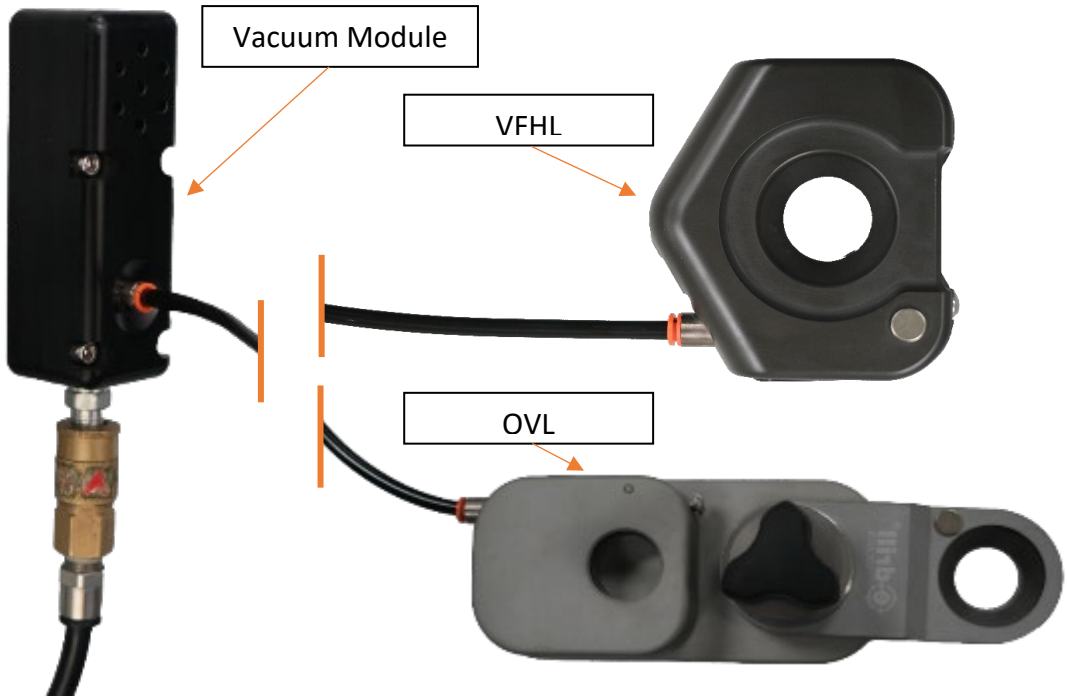
Hint: Typically inserts are bored 0.003" larger than the nominal fastener head diameter. For best precision it is recommended to bore inserts on a lathe or mill to precisely the diameter required, since drilling is limited to only discrete drill sizes and there may not be a suitable size available.

The outside diameter and sealing surface of BHL assemblies is optimized to fit between fastener heads spaced per industry standard (typically greater than 4 to1, spacing to diameter), while maximizing the footprint to enhance perpendicularity. Detailed instructions for use will follow in Section 7.1.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

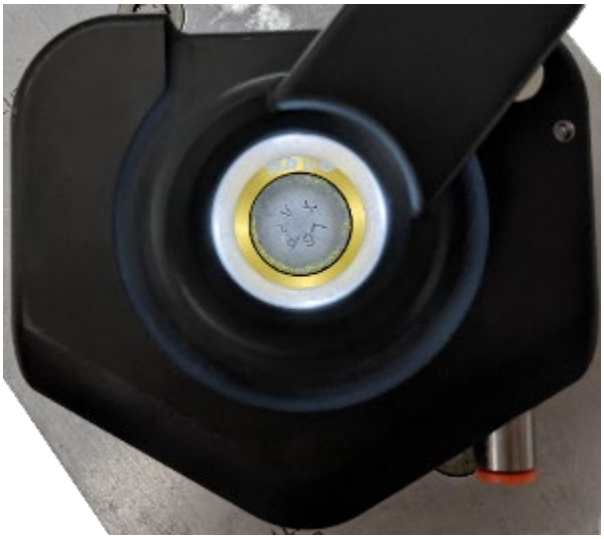
6.4 Vacuum Flush Head Locator (VFHL) System:

The VFHL System is used when removing flush head fasteners. The VFHL system and its sister OVL system are the only tools recommended for use to remove flush fasteners from composite structures.



The VFHL System is a completely self-contained system that operates on standard 100 to 150 psi regulated shop air pressure. The system comes with a 3-suction cup Locator, an LED illuminated bombsight, and special set of VFHL E-Drill Adapters and Locators that uses standard Electrode Guides for centering the Electrodes.

The Vacuum Flush Head Locator will operate on both convex and concave curved surfaces down to a radius of approximately 4 ft, and on fasteners greater than 2" from the edge of a panel. In situations with radius less than that (wing leading edge or lip seal leading edge as examples) or where fasteners are located on the edge of a panel, an alternative means of location might be more suitable.



Alignment of the fixture over the fastener is accomplished with the assistance of the illuminated "bombsite" which provides visual magnification and illumination of the work-area. The bombsite has a set of targeting rings which allow for precise alignment over the fastener head. Detailed instructions for use may be found in Section 7.

A family of mechanical and illuminated bombsight locators is available, detailed further in section 5.6

6.5 Offset Vacuum Flush Head Locator (OVL)

The OVL is used on highly curved surfaces where accuracy is necessary. It has a smaller footprint than the VHFL and can be articulated, which allows the OVL to align in areas that the VFHL would typically not be able. It can also operate on fasteners which are on the edge of a panel, such as wing leading or trailing edges. The OVL can also affix to more complex curvatures (up to 8" radius concave and 11" radius convex).

OVL System

The OVL tool uses the vacuum module from the VFHL system to provide the required suction for mating to a work-surface. The OVL is also available as its own kit.

The head of the OVL articulates 270˚ axial and has the ability to tilt to a 24" radius. This makes the OVL the necessary tool for removing fasteners on highly curved surfaces.

Care must be used to set the OVL up to align perpendicular to the surface in the proximity of the fastener. This is best achieved by installing the adapter and ensuring that it seals against the surrounding surface, before tightening the screw-knob to lock the OVL's orientation.

Concentric alignment of the OVL to the fastener head is accomplished with the assistance of an illuminated "bombsite" which provides visual magnification and illumination of the work-area. The bombsite has a set of targeting rings which allow for precise alignment over the fastener head. Detailed instructions for use will follow in Section 7.2.

A family of mechanical and illuminated bombsight locators is available, detailed further in section 5.6.

6.6 Visual and Mechanical Bombsights

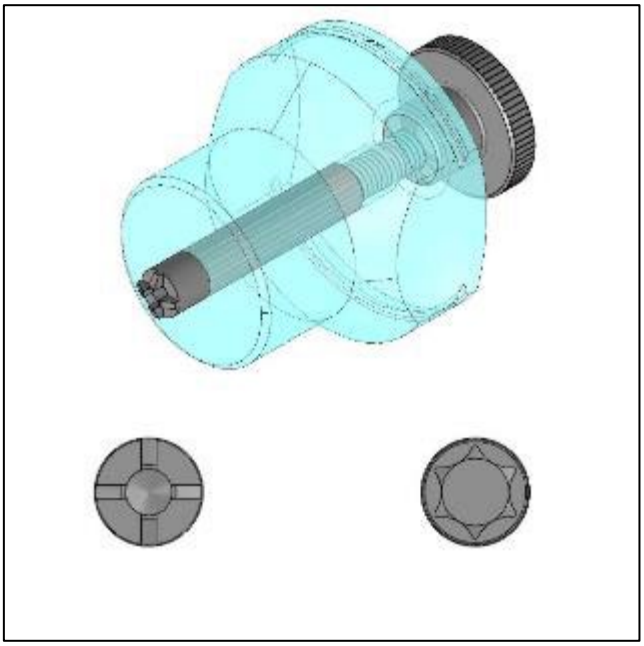
The visual bombsight which assists in precision location of the VFHL and OVL locators is available with a set of different sized apertures which may be installed on the front of the sight lens body.

Mechanical Sights are also available which engage in the recess of screw-type fasteners (Hex, Torx, Tri-wing, Hi-torque, ComposiLok, Philips etc.)

PERFECT POINT
AEROSPACE MAINTENANCE TECHNOLOGY

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Aperture Bombsight

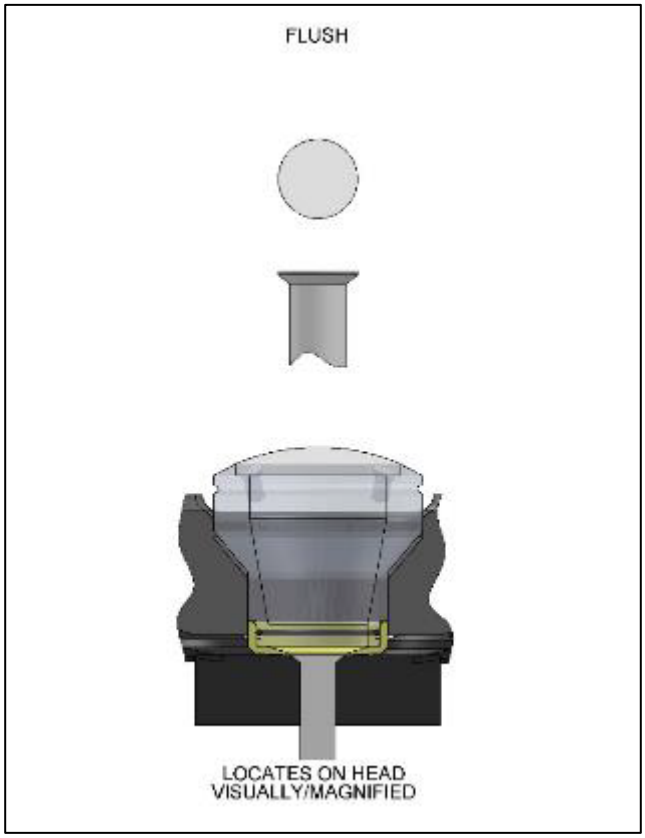


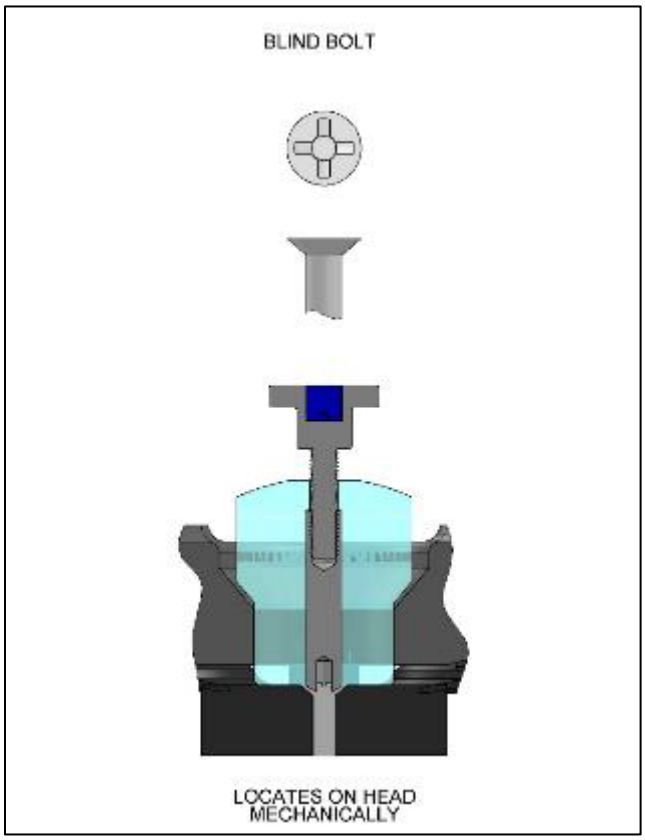
Above: Visual bombsight interchangeable apertures – Mechanical bombsights in various styles

PERFECT POINT
AEROSPACE MAINTENANCE TECHNOLOGY

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Below: Visual and Mechanical Bombsights shown in position on fasteners. Note the selection of visual sight aperture diameter slightly larger than the fastener head.





Below: Example view through visual bombsight located over a flush installed Hi-Lok

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

7 General Best Practices

7.1 Fastener Preparation

To obtain acceptable grounding contact, surface paint must be removed from the fastener head before fastener removal is initiated.

Coating may also be removed with 180-grit or finer emery cloth or a small spoon file, or scraper. Care should be taken not to abrade or damage the surrounding structure. Typically, an area comparable in size to the fastener stem diameter is enough (see example below).

Note: Aluminum fasteners can be deformed by sanding/grinding operations, which makes mechanical or visual alignment difficult. S-Blaster is the Preferred Method of Coating Removal.

7.2 Fastener Identification

Identifying the fastener to be removed is a critical parameter of proper E-Drill use. While it is outside the scope of this document to identify every type of fastener installed on aerostructures, typically airframe fasteners fall into 4 general categories:

- Solid Rivet
- Blind Rivet
- Straight Shank Pin
- Blind Bolts

Note: Each of these fasteners are defined with instructions on proper identification and removal processes in APPENDICES 1-4

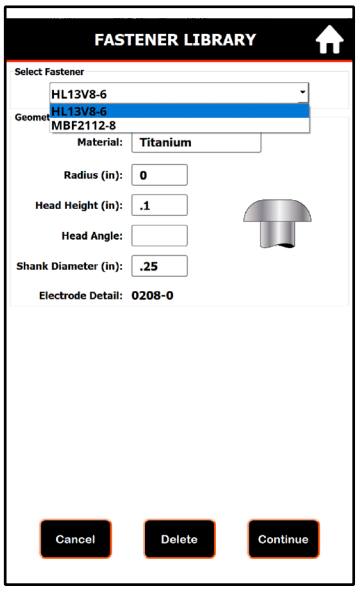
These fasteners can then be sorted into 2 additional categories: Flush and Protruding Head. E-Drill can remove any of the above types and configurations from diameters 3/32”-7/16. The fastener’s diameter drives the use of different E-Drill hand tools and is accounted for in the sizes of Perfect Point Electrodes. Proper fastener identification allows the user to program the Touch Screen Display with the correct command for that specific application.

7.3 Terminal Login and Programing

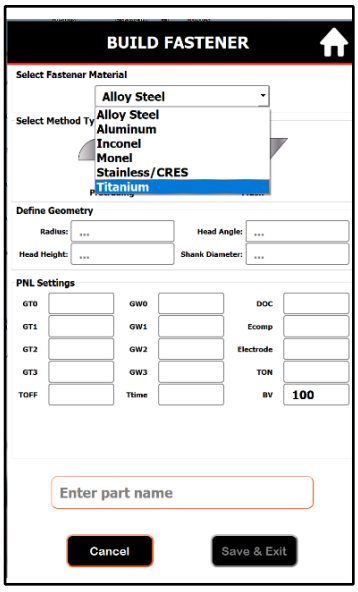
E-Drill's Touch Screen Display allows operators to login, create and edit users, select fasteners to be removed, build and edit fasteners in the library, and perform maintenance functions.

Status (Current Part) Page

Part Number (Fastener Library) Select Page



Build Fastener Page



7.3.1 User Login and Creation

In the E-Drill system, user access levels are designed to ensure the proper use and management of the tool, while maintaining safety and efficiency. By assigning users to specific roles based on their qualifications and responsibilities, the system helps prevent unauthorized changes and ensures that only trained personnel can access advanced features. This structure allows for a controlled environment where the right people have the right access, whether working on specific projects or managing system configurations.

The E-Drill system includes two user levels: Regular and Advanced, each with distinct access permissions to ensure safety and efficiency.

- **Regular Users:** These users can only access fasteners assigned to them, ensuring they work only on approved or qualified projects. They are unable to edit fastener types, create new fasteners, add or remove users, or access advanced system features. This restriction helps prevent unqualified personnel from making changes to critical system settings or using the E-Drill on projects they are not authorized for.

- **Advanced Users:** These users, often engineers or senior technicians, have access to

all fasteners in the library and can create, edit, and approve fastener profiles. They can also manage user accounts and perform advanced system tasks, ensuring that only thoroughly tested and safe fastener profiles are used by regular users.

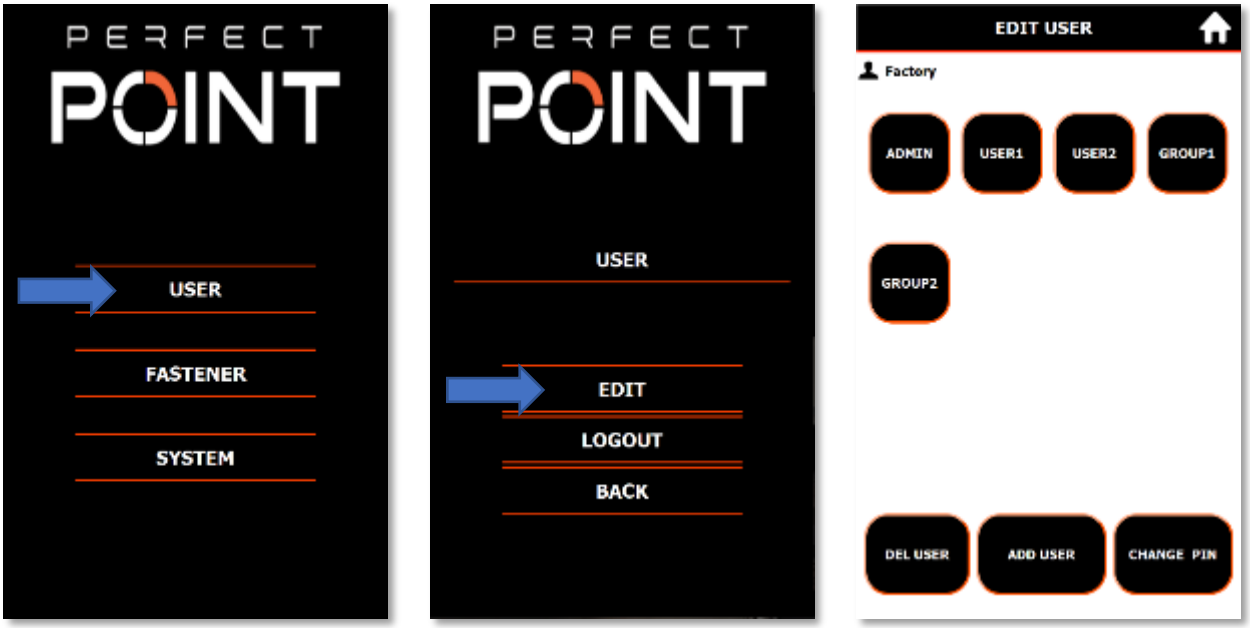
- **Admin:** Each system will have one dedicated Admin profile for modifying user and fastener profiles, as well as providing access to the more advanced functions and controls of the system. Upon delivery the system will remain locked out until the default admin pin is input during training, or with an approved access request prior to or without formal training. The Admin access pin can then be changed by the system Admin.

Creating separate logins with appropriate access levels helps maintain control over system usage, ensuring that regular users operate within their qualifications while advanced users can configure and manage the system. This structure also allows companies to organize fasteners by project, job, or technician qualifications, enhancing safety and efficiency in complex projects.

LOGIN: Upon startup, the user will be prompted to login to their user profile as seen in the figure to the right. Select the desired user from the drop-down menu, enter the appropriate user pin number, and press “OK” to proceed to the main menu.

To navigate to the user profile screen, select User from the main menu and then Edit from the User menu. From the user profile screen, users can be added or deleted and the Admin user pin can be changed seen in the Edit User screen in Figure 3. To change users, select **Logout**, and log in using a different user profile.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com



Navigating to the user profile screen

To create a new user profile, press **Add User**, enter the user's name, input a 4-digit pin, and select the type of access this user will have (regular or advanced). Regular users will not have the ability to edit pre-existing fasteners, add/remove users, and execute some of the advanced and admin level advanced features. To delete a user profile, press **Del User** and the user profile you wish you remove.

Adding a user profile

7.3.2 Part Number Selection

Part numbers can/are permanently installed on the terminal library and are programmed based off the fastener manufacturer's datasheet for the part. Perfect Point field service typically writes a comprehensive library, based off user input, upon system setup and initial training. These programs are specialized to the individual user's requirements and are extremely accurate.

To use the Fastener Library Selector:

- Press "Fastener" on the home screen.
- Select "Library".
- Scroll down to the correct part number and select it by pressing it.
- Select "Continue" to select that part number and load parameters from the library (loading status displayed as a green bar at the bottom of the screen).

Upon successful loading of the command the home screen will display the cut parameters and identify the correct electrode cutter for that command.

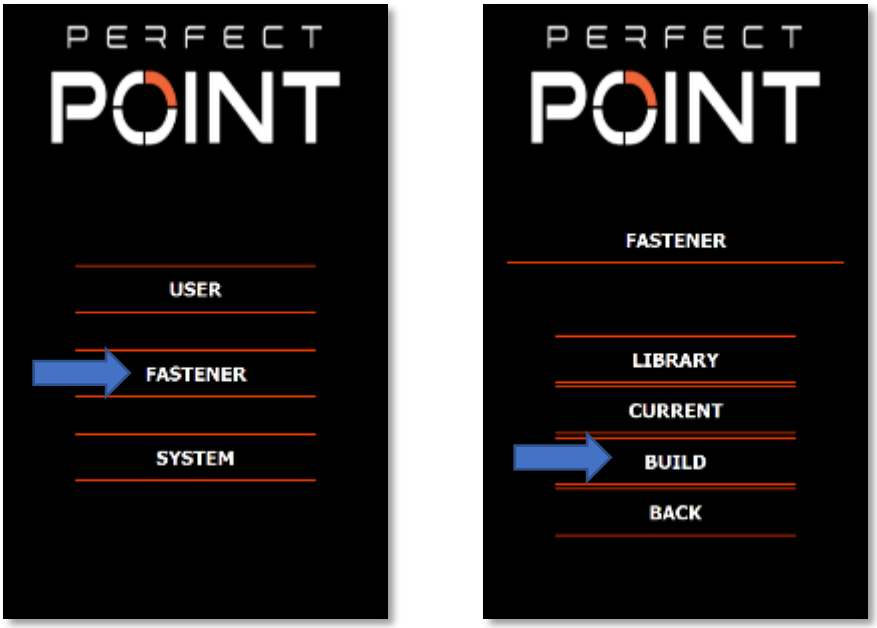
Note: As requirements change, fasteners may be added to or removed from the Fastener Library as needed. Please contact PPEDM Hotline (714) 891-6533 for assistance in changing your site-specific Fastener Library

7.3.3 Build Fastener

NOTE: This feature is only accessible by an Admin user. Material and geometric properties MUST be obtained from the specific fastener engineering drawing.

The build fastener screen is used to program the HMI Touchscreen for new fasteners that are not already in the fastener library. This screen is only available for select users assigned with build fastener privileges such as Admin and other advanced users. Because this process cannot be error-proofed and relies on the operator providing the correct information to system, we suggest you keep these permissions available for only select trusted users.

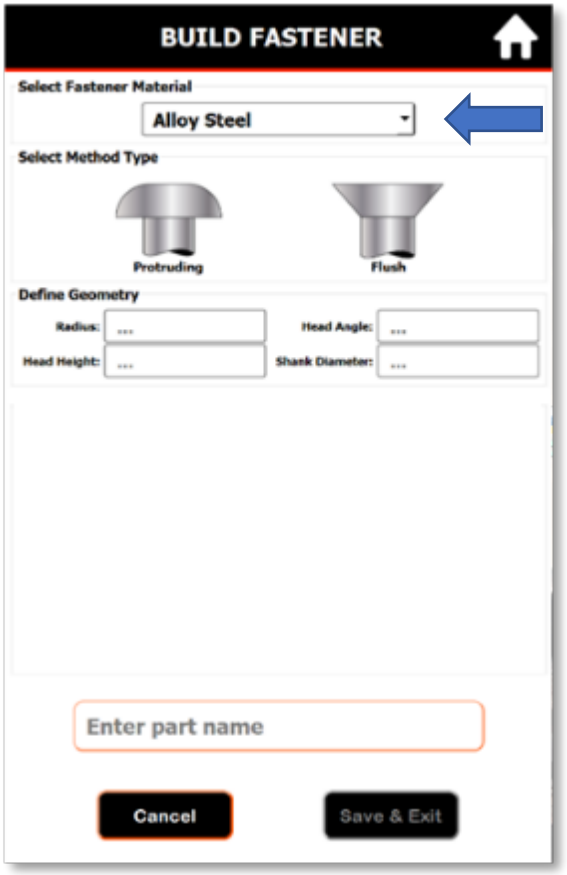
The build fastener function can be accessed by selecting “Build” from the Fastener Menu.



Navigation to the Build Fastener screen

Select the fastener material from the drop-down list. The standard available materials include Alloy Steel, Aluminum, Inconel, Monel, Stainless/CRES, and Titanium. If the fastener material you need to cut is not listed, please contact PPEM support, as this is a special case application.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com



Selecting fastener material

Depending on the method of removal, select protruding or flush head icon. All button-head, pan head, rivets and collar style removals that utilize a mechanical locator will use the protruding removal method. All countersunk or flush head fasteners that require optical locating will use the flush head removal method.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Selecting fastener head type or removal method

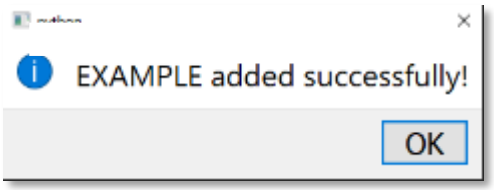
To fully define the fastener, input the nominal geometric dimensions from the engineering drawing into the corresponding fields. Only a flush head will require a head angle input.

- **Radius:** Radius of the transition from head to shank (R on most drawings). Used to determine cut depth.
- **Head Height**: Height of the fastener head (often shown as B or H). Used to determine cut depth.
- **Head Angle**: Used to determines cut depth.
- **Shank Diameter:** Required to determine the correct electrode size.

Note: Make sure the proper fastener radius, head height, head angle, and shank diameter are input in Define Geometry fields, as these determine the electrode and cut depth that will be recommended.

Enter a part/fastener name and press “Save & Exit.” The TSD should display a confirmation that the built fastener was added to the library. All built fasteners will then be accessible via the Fastener Library.

On-screen keypad for naming a built fastener



Build fastener screen display

Note: Admin users can edit all fasteners within the fastener library from the Current Part screen (see section 6.3.4).

CAUTION

Once the other 4 parameters are selected, the system will automatically suggest the Stem Size. It is critical that the user check that the suggestion is correct, since for certain shear head fasteners the suggestion may be incorrect.

CAUTION

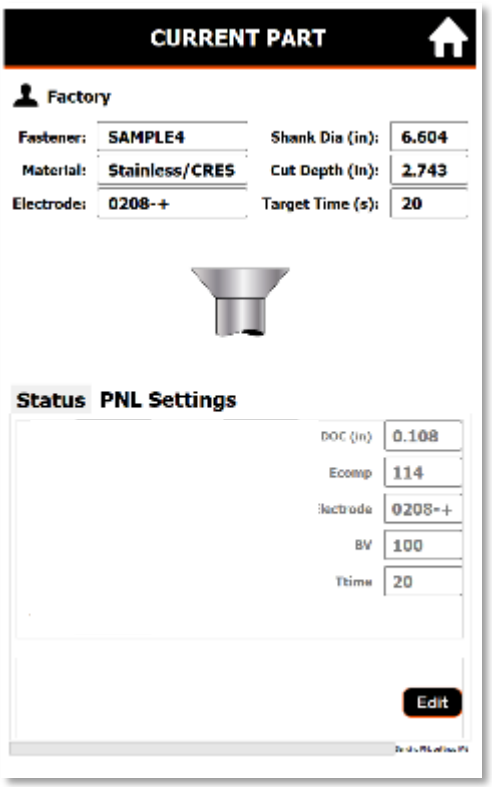
It is not possible combinations may be in the fastener library, it is possible to pick a combination for which there is not a library entry. If that occurs, a Red panel will appear indicating that a library entry has not been found, and the user should re-select. When this occurs, the user should check the default values to ensure they will work or recheck their selection.

Upon successful loading of the command the home screen will display the cut parameters and identify the correct electrode cutter for that command.

7.3.4 Edit Existing Fastener

Admin users have the ability to edit fasteners saved in the fastener library. This is done by selecting **PNL Settings** from the Current Part screen. This is only visible when logged into an advanced/admin user profile. This feature is useful if a change in cut depth or target time is desired. If the cut depth is changed, only one cut should be made before continuing, and a careful inspection of the hole post-removal should be done to ensure breakout has not occurred. If the target time needs to be adjusted to prevent excessive under or overtime warnings, do so by editing the "Target Time" value.

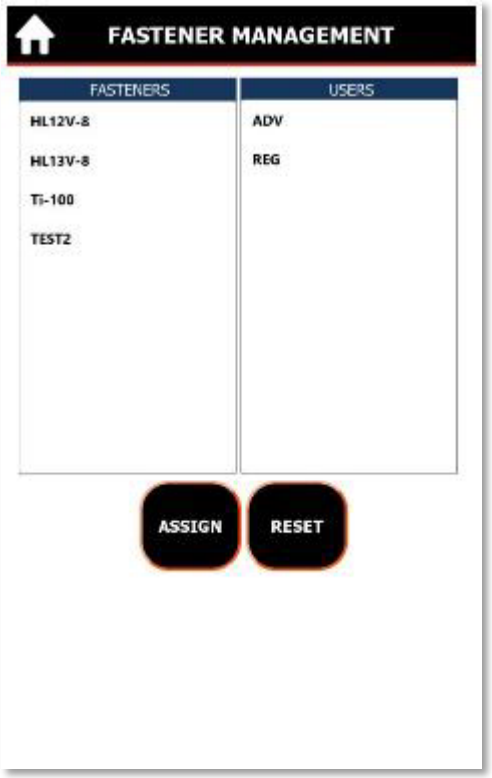
Note: It is not advised to increase the depth by more than 0.005" at a time.

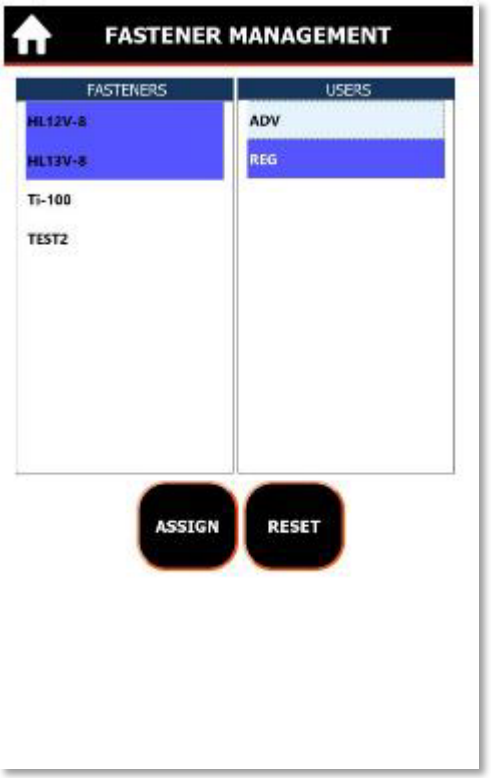


Editing PNL settings from Current Part screen

7.3.5 Manage Menu

The Manage menu allows an advanced user or an Admin to assign any fasteners in the Fastener Library to any of the User Profiles stored on the system. To bulk assign fasteners to users, select all the desired fasteners and the user(s) you would like to grant access to the selected fasteners, and press “Assign”. In this example the HL12V-8 and HL12V-8 fasteners have been selected to be assigned to the REG user profile.



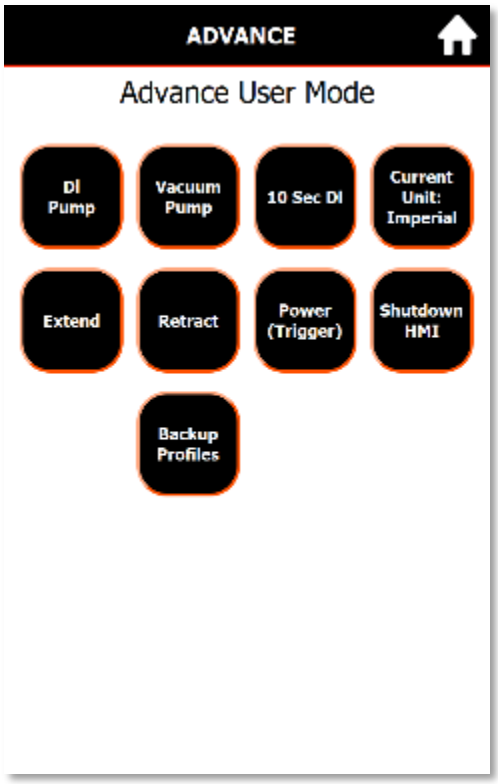


7.3.6 Advanced Menu

The Advanced menu can be accessed by both a regular and admin user, by selecting System from the main menu and then Advance. Keep in mind that regular users may not have access to all commands. The list of advanced commands is as follows:

DI Pump: toggles the pressure pump on/off
Vacuum Pump: toggles the vacuum pump on/off
10 sec DI: runs the pressure pump for 10 seconds to check flow rate
Units: changes between metric and imperial units of measure
Extend: drives the electrode forward/out
Retract: drives the electrode backward/in

Power (Trigger): For special applications and testing this button can be used to fire the E-Drill rather than squeezing the trigger on the hand tool
Shutdown HMI: Safely shuts down the HMI (this executes automatically when the machine is powered down)
Backup Profiles: Saves backup user profiles and fastener library files



Advanced menu commands

7.4 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 (Refer to document #61-405 E-Drill Mmaintenance and Troubleshooting Guide), the Ground Pin should be regularly checked 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:

To replace the ground pin, remove any installed Adapter and Electrode, and retract the conducting tube to its full rear position.

Using a 3/16" Hex L-Key Remove the cap on the rear of the hand tool.

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.

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.

7.5 Electrode Installation

There are 14 standard Cutting Electrode O.D sizes available to which covers fasteners from 3/32" to 3/8". Electrodes are designed to remove nominal, 1st oversize, and 2nd oversize fasteners.

Cutting Electrodes are packaged with color coded inserts and provided in kits of 5 each to match their sizes. The E-Drill Electrode Guides to be used in the E-Drill Adapters are color-coded to match. For convenience, each electrode is engraved with its Electrode Part Number.

Electrodes come in a range of standard, first, and second, oversize. Each size is identified by a color and a "dash" size. The complete electrode size range may be found in Appendix 5. Refer to the Operator Touch Screen Display Terminal for recommended Electrode use.

PERFECT POINT
AEROSPACE MAINTENANCE TECHNOLOGY

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

CAUTION

Each FASTENER SIZE and diameter, and oversize fastener has a matching electrode SIZE. When changing to a different stem diameter or oversize type Fastener, the proper corresponding ELECTRODE MUST BE INSTALLED FOR SUCCESSFUL SYSTEM OPERATION.

To install or replace an electrode:

- Unlock the E-Drill Adapter by twisting in a counterclockwise direction (when viewed from the front of the E-Drill), then pull the adapter straight off.
- Unthread the existing electrode using the provided electrode wrench.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

- Occasionally, when the electrode is depleted (flashing green light) the electrode may still not be advanced to the forward limit. In this case the retract button should be pressed momentarily, then the trigger may be depressed, and the electrode will advance completely.

- If the cutting electrode is being changed because of a change of fastener type, then it may be saved and used again later. If the electrode is indicated as needing replacement, then it should be discarded. Attempts to keep using a worn-out electrode could damage the mechanism.

- Check that the threads are clean on the front of the hand-tool and screw the replacement electrode hand-tight but firmly on to the conducting tube.

- Push and engage the electrode wrench over the electrode and tighten. The torque-ring will "skip" when the required torque is reached. Remove the wrench and replace the E-Drill Adapter on the front of the hand-tool.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

- Retract the cutting electrode by pressing and holding down the retract button in the base of the grip until the green light illuminates indicating the electrode is fully retracted.

Note: If the replacement electrode is used/worn then it only needs to be retracted just inside the E-Drill Adapter. Then during the first cut it will reach its correct cutting position faster.

Note: Electrode Wrench torque value is factory set and identified as calibrated with locking compound. Do not attempt adjustment of the Wrench detent setting screws.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

7.6 Hand Tool Operation

7.6.1 General Hand Tool Use

The following instructions are applicable to both the CG and EG hand tool modes. CG and EG hand tool modes operate on the same principles, and only differ in their method of achieving electrical connection and by the size range each is designed for.

To remove a fastener with the hand tool:

- Select the right fastener setting on the Touch-Screen Display.
- Ensure the correct E-Drill Adapter and Electrode for the fastener are used.
- Using thumb and forefinger press the E-Drill lightly down over the fastener to minimize any water leaks which may occur during cutting.
- Allow the E-Drill to reach its own perpendicularity to the fastener as influenced by the E-Drill Adapter and its seal, and then wrap the fingers around the grip to hold securely during cutting.
- Depress the trigger on the E-Drill and keep the trigger depressed until the process is completed. This is indicated by the status light on the back of the hand-tool illuminating.
- Hold the hand-tool as steady as possible during the cutting process.
- Following a successful cut, hold the E-Drill over the fastener for a 2-3 seconds with the trigger depressed allowing the vacuum system to evacuate any excess water left behind by the process. The vacuum will continue to operate for as long as the trigger is depressed.

Correct Grip of E-Drill Hand Tool

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

7.6.2 CG Hand Tool Use

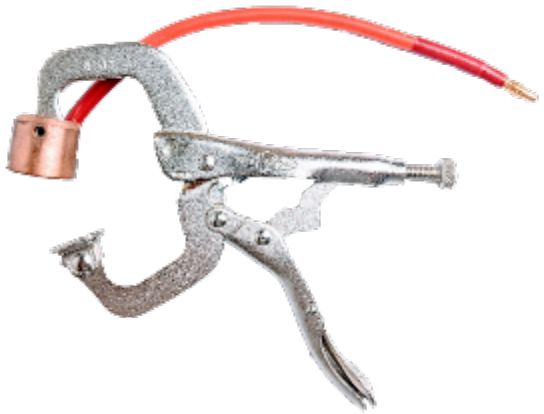
The CG hand tool mode can remove fastener diameters ranging from 5/32" (0.156") and above. During CG hand tool operation, the user will feel slight resistance when the grounding pin contacts the fastener head. This is a normal function of CG hand tool and is caused by the ground pin opening a water valve inside the hand tool. During use depress the tool into the locator allowing the ground pin intimate electrical connection to the fastener.

CAUTION:

Failure to establish electrical ground with the CG Hand Tool Ground Pin on the fastener head (will result in a failed cut cycle. If cutting does not occur, re-clean the fastener head and attempt to re-establish a proper system ground between the E-Drill Grounding Pin and the Fastener Head. Avoid, striking, grinding, or scraping the E-Drill CG Ground Pin on the fastener head. Misuse will result in damage and misalignment of the E-Drill Ground Pin and system failure.

7.6.3 EG Hand Tool Use

EG hand tool mode can remove fastener diameters ranging from 3/32" (0.093") and above. The EG hand tool requires the use of an electrical clamp to achieve connection to the work area. This clamp can be installed at a grounding point, providing that grounding point is electrically conducting to the fastener being removed and is generally within 18" from that fastener. If no grounding point is available near the fastener a temporary cleco fastener can be used. Insert the cleco into the structure near the fastener and attach the grounding clamp to the cleco.



Should the user be unsure if there is a conductive point near the work area, check continuity with a voltmeter. Attach one lead of the meter to the fastener and the other to potential grounding points. Once the meter confirms continuity attach the clamp and begin use.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

8 Fastener Removal Best Practices

The following is a series of detailed general instructions designed to instruct the user on generic fastener removal procedures. For specific applications by fastener type refer the APPENDICES 1-4.

8.1 Raised Head Fastener Cutting

Select the correct fastener in either the Part Number or Build Fastener Screen (Section6.3). Once the correct fastener has been selected on the Touch-Screen Display, the Home Screen will indicate the electrode size to use. Configure the E-Drill hand tool with the correct electrode, button-head adapter, and electrode guide (Section 5). Select the correct Button Head Locator which fits tightly around the fastener head to be removed.

For tight-access fastener situations the Button-head adapter and locator may be one piece (Slimline style). After the heads of the fasteners are prepared (Section 6.1) the operator may proceed with the cutting process.

Grip the E-Drill lightly, nestling the tool between thumb and forefinger as shown below. Position your second finger to depress the trigger when ready.

Place the selected button-head locator over the fastener and press down to ensure it is secure, flat to the surface and forms a good water seal. The Locator should fit snugly concentric around the fastener head with minimal play. If there is excessive play, then select a locator with a smaller metal insert or replace the insert.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Guide the adapter installed on the E-Drill into the Button Head Locator and press firmly but lightly down onto the fastener, (compressing the central E-Drill Ground Pin if using a CG hand tool) and sealing the adapter around the head of the fastener. Ensure the E-Drill is held perpendicular to the surface.

Correct Grip of Button Head Locator

The adapter should be located concentrically around and over the fastener, sealing to the surrounding airframe. If in doubt about E-Drill placement and concentricity go back to step A and try again.

While holding the E-Drill firmly but lightly against the fastener, wrap fingers around the E-Drill grip and squeeze the trigger with your second finger. The device will then automatically go through the following sequence:

- The vacuum pump will turn on to purge the area.
- The cutting electrode will advance until it detects the electrically conductive head of the fastener and calibrates itself.
- The cutting electrode will retract slightly, the system water pump will start and cutting will be initiated. Cutting will proceed until the prescribed depth is achieved (as defined by the fastener selection on the Touch-Screen Display)
- The power will be shut off, the system water pump will stop, and the light on the back of the hand-tool will illuminate.
- The system vacuum pump will continue to operate until 2 seconds after the trigger is released.

Remove the E-Drill from the fastener, revealing the circular groove cut in the fastener head.

If the light on the back of the E-Drill does not show green at the completion of the cut, then the cut may not have completed successfully to depth. If the light is showing a solid red then the likely cause is either a) bad electrical continuity resulting from paint or other coating, or b) the fastener material is different from was selected from the library. Ensure all paint or other coatings are removed, place the E-Drill over the fastener and try again.

A flashing green light indicates the cutting electrode must be replaced. A flashing red light indicates a system error – see the Touch-Screen Display for details.

Upon completion of the cut, select a proper size hand punch and center the punch in the fastener head. Sever the fastener head with a sharp blow on the punch with a hammer. It may be necessary to strike the punch more than once. If the fastener head does not separate, the fastener is most likely an oversize

stem. Select an oversize cutting electrode and setting. Re-cut the fastener and attempt to sever the fastener head again with a punch and hammer.

8.2 Flush Head Fastener Cutting

There are 2 standard series of flushing locating systems. The following are general instructions for use of each of these systems. Vacuum assisted locating tools are the main method of flush fastener removal. Vacuum Assisted locating ensures the process remains stationary during the cut and prevents damage to the airframe.

There is also a broad range of bombsight devices available to ensure very precise location of the vacuum devices concentric with the fastener to be removed. Please review section 0 to ensure you are using the best locator for your particular fastener types.

8.2.1 Vacuum Flush Locator (VFHL)

VFHL use is the preferred method for flush fastener removal on a non-contoured surface.

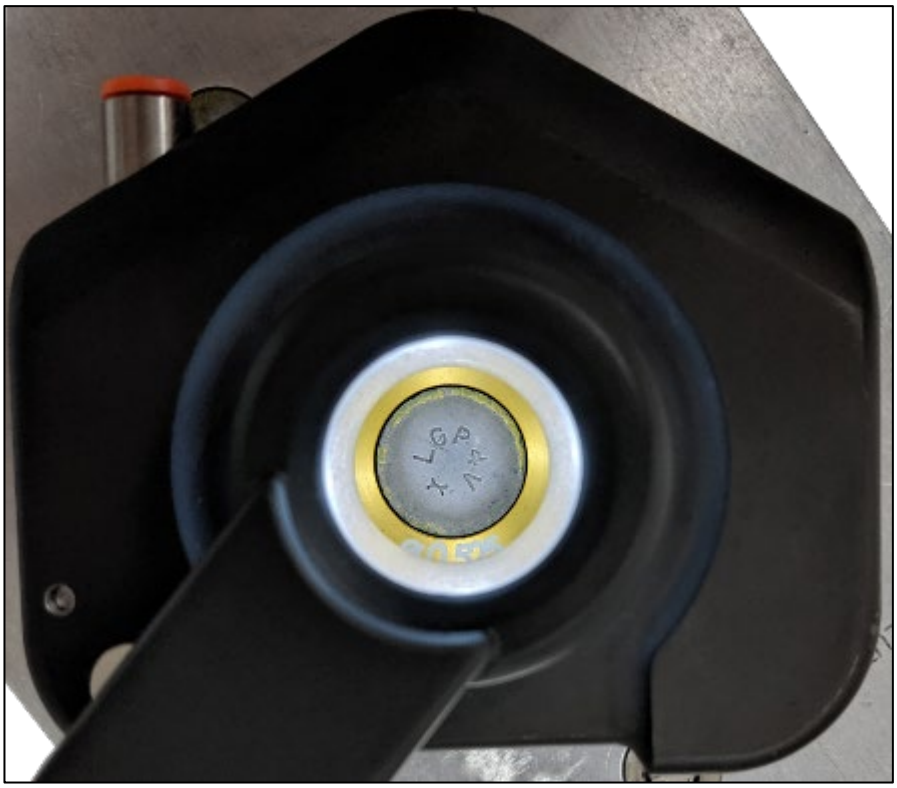
Select the correct fastener in the Fastener library (Section 6.3.2). Once the correct fastener has been selected on the Touch-Screen Display, the Home Screen will indicate the correct electrode size. Configure the E-Drill hand tool with the correct electrode, vacuum adapter, and electrode guide (Section 5). To use VFHL perform the following steps:

- Plug in the venturi vacuum module to both shop air and the vacuum locator tube.
- Move locator over the fastener head to be removed.
- To move the locator, depress the float valve button on the right-hand side of the locator. This will release vacuum to the suction cups and allow free movement of the locator. Release the float valve to "lock" the locator back into place.
- The LED Bombsite illuminates by placing the long end of the bombsite over the small silver magnet located on top of the VHFL. (Note: mechanical locators do not illuminate.)
- Use the aperture locator ring to achieve concentricity over the head of the countersunk fastener to be removed. If using a mechanical locator (lock bolts, Torx, Hex, Tri-wing etc.) ensure the locator is snug in the recess before locking down the vacuum device.

Moving VFHL into position

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

- Once concentricity is achieved, release float valve, remove bombsite, insert hand tool (with VHFL adapter) and begin cutting sequence.



Concentric positioning on head of fastener

Keeping constant and consistent pressure on the hand tool, and ensuring proper perpendicularity, gently squeeze trigger using middle finger. The light on the back of the gun will go out, and the cut will begin. During the cutting process, the following occurs:

- The Vacuum Pump will turn on to purge the area.
- The cutting electrode will advance until it detects the electrically conductive head of the fastener, whereupon it will automatically calibrate itself.
- The cutting electrode will retract slightly, the system Water Pump will start and cutting will be initiated.
- Cutting will proceed until the prescribed depth is achieved (as defined by the fastener selection on the Touch Screen Display)
- Power to the electrode will cease, the system Water Pump will stop, and the light on the back of the hand-tool will illuminate green.

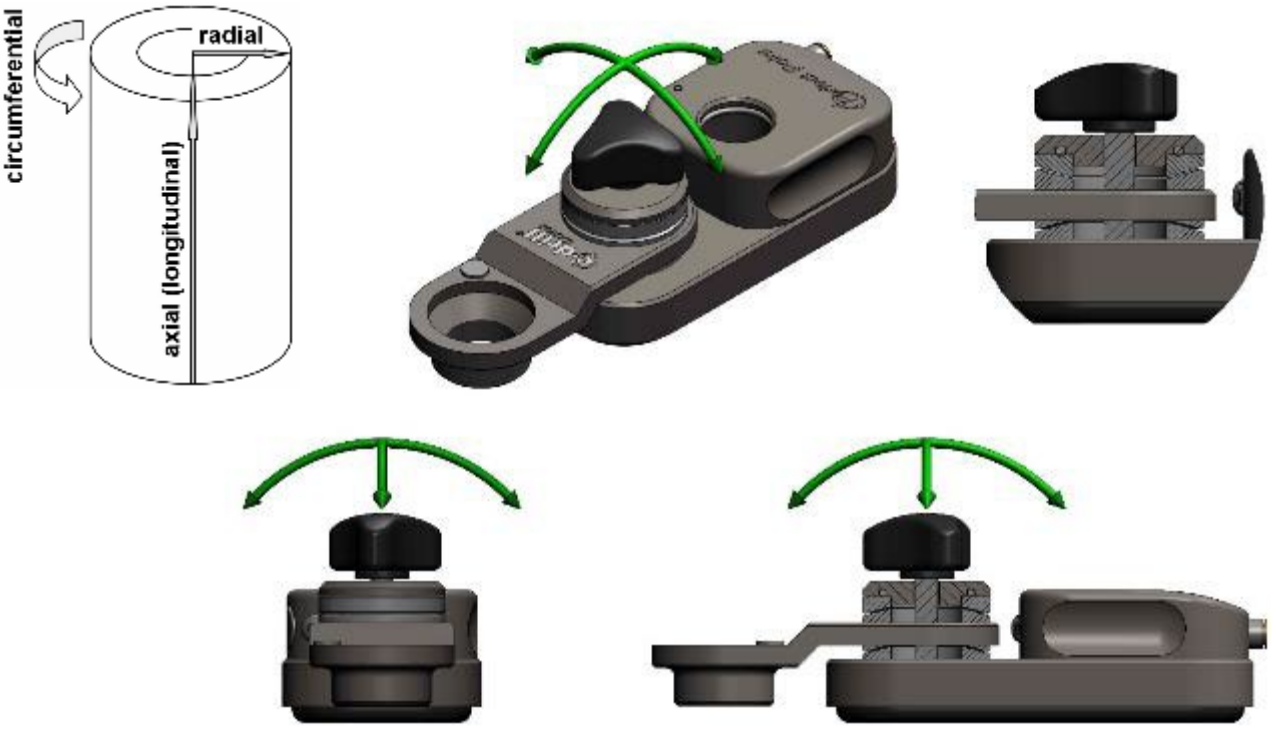
Once the light turns green on the back of the hand tool, the cut is done. After the cutting cycle is complete the vacuum pump will continue to run for 2 seconds. During this time, release the trigger and pull up slightly to vacuum up any residual water.

8.2.2 Offset Vacuum Locator (OVL)

Offset Vacuum Locator is the preferred method for flush fastener removal on a contoured surface. OVL is powered by the vacuum pump from the VFHL kit, operation for turning on vacuum and moving locator is the same as VFHL. OVL is also available as a complete standalone kit.

Select the correct fastener in the Fastner Library (SECTION 6.3.2). Once the correct fastener has been selected on the Touch-Screen Display, the Home Screen will indicate the correct electrode size. Configure the E-Drill hand tool with the correct electrode, vacuum adapter, and electrode guide (SECTION 5).

The OVL needs to be set to the correct perpendicularity for the structure. The receiver can be inclined to match the surface then locked in-place with the large twist-knob (see diagram below). It can effectively adhere to a radius as small as 12" when oriented axially along the radius and 24" when oriented circumferentially along the radius of the surface.



15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

If using the OVL on flat surfaces, the upper spherical washer pair can be inverted to lock the receiver and disable tilt (see diagram upper right). To use OVL on tilted surfaces ensure the upper washer pair are as in the lower diagram, and perform the following steps:

- Locate OVL over the desired fastener
- Insert a spare vacuum adapter into the receiver
- With one hand, loosen the nut on top of the OVL that holds the spherical washer stack-up
- With the other hand, push down in the center of the inserted VHFL adapter
- lift slightly on the "loose" end surrounding the receiver to achieve perpendicularity
- Once perpendicularity is achieved, tighten the nut on top of the OVL.
- Insert the bombsite to achieve final location over the fastener.
- Use the concentric rings or aperture locator ring to achieve concentricity over the head of the countersunk fastener to be removed. If using a mechanical locator (lock bolts, Torx, Hex, Tri-wing etc.) ensure the locator is snug in the recess before locking down the vacuum device.
- Once concentricity is achieved, release float valve, remove bombsite, insert hand tool (with VHFL adapter) and begin cutting sequence.

Note: Once contour matching has been achieved with the OVL's receiver do not adjust the contour when aligning over a fastener. Maneuver the body of the tool to achieve final centering.

OVL located correctly on a contoured surface

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Keeping constant and consistent pressure on the hand tool, and ensuring proper perpendicularity, gently squeeze trigger using middle finger. The light on the back of the gun will go out, and the cut will begin. During the cutting process, the following occurs:

- The vacuum pump will turn on to purge the area.
- The cutting electrode will advance until it detects the electrically conductive head of the fastener, whereupon it will automatically calibrate itself.
- The cutting electrode will retract slightly, the system Water Pump will start and cutting will be initiated.
- Cutting will proceed until the prescribed depth is achieved (as defined by the fastener selection on the Touch-Screen Display)
- Power to the electrode will cease, the system Water Pump will stop, and the light on the back of the hand-tool will illuminate green.

Once the light turns green on the back of the hand tool, the cut is done. After the cutting cycle is complete the vacuum pump will continue to run for 2 seconds. During this time, release the trigger and pull up slightly to vacuum up any residual water.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

8.3 Fastener Extraction using Air Punch

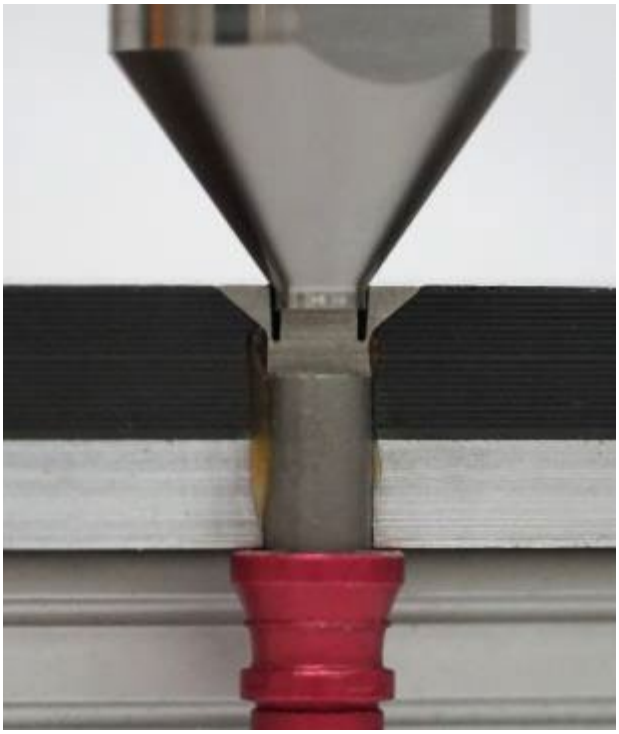
Upon successfully cutting a fastener with E-Drill, the user will still be required to manually sever the head of the fastener from its stem/shank. This may be achieved with a conventional punch and hammer, but there is less risk of damage to airframe or personnel if the Air Punch is used, since it is guided by the cut ring in the fastener head

The Perfect Point Air Punch (p/n EDT1300) is a single shot air-driven punch customized for use with E-Drill. It includes a range of nose adapters and is designed to locate in the cut ring left in the fastener head, and strike the flat platform left on the fastener stem after cutting.

The Process to using the air punch is as follows:

- Ensure the correct air punch nose piece is selected and tightly installed. This should match the size of the electrode that was used for the cut. *Use of the wrong size nose adapter could result in damage to the underlying structure.*
- Align the nose of the adapter in the ring of the cut made previously using the E-Drill. You will feel the air punch drop into the cut ring and lock in place. *See image below for example of the air punch nose engaged with the cut fastener head.* Ensure the punch is located correctly and is locked in, otherwise it is possible to skip off of the fastener and damage the underlying structure.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com



- Once locked in, apply pressure to the back of the air using your off hand and pull the trigger. This should knock the shank of the fastener into the hole and separate it from the head.
- If the fastener was not severed, apply more pressure on the air punch and retry the punch. If after two attempts the fastener is not removed, recut it using the E-Drill and the same settings and locating procedure used the first time.

9 Quality Control

9.1 Authorized Users

Only trained operators shall remove fasteners using this process. Perfect Point Customer Service provides in-depth training courses as part of the initial purchase of an E-Drill System. Should a customer require additional training or assistance with a project, contact Perfect Point Customer Service.

9.2 Damage Inspection

Holes shall be inspected after fastener removal for evidence of off-center burn, as indicated by a black erosion mark, and in accordance with the applicable fastener installation specification for the replacement fastener to be used.

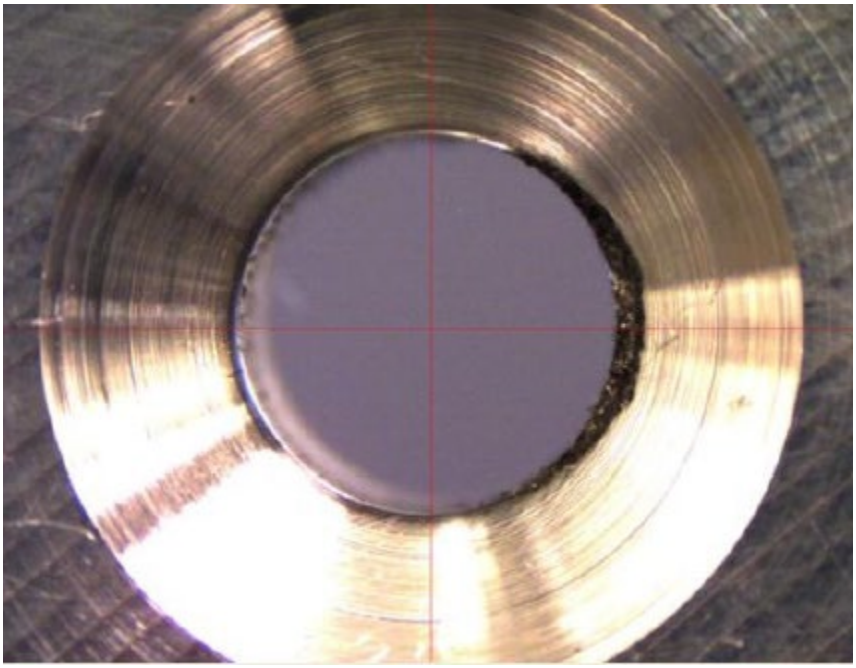
15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

An off-center burn condition after a flush fastener removal is illustrated in the photograph to the right side of the hole. The damage occurs right at the top of the parallel portion of the hole.

This damage must be rectified in-accordance-with the users local engineering procedures.

9.3 Rectification

It is outside Perfect Point's scope of authority to directly disposition damaged holes, however Perfect Point has performed exhaustive studies on the effects of EDM damage to typical aerostructures.



As a general disposition, a user must measure the length of the visibly damaged area. This can be performed by best shop practices depending on the user. Once the dimension on maximum damage has been measured, an additional 0.005" must be added to that measurement. This is to account for the non-visible damage in the Heat Affected Zone (HAZ).

Once the final measurement is derived, typically the engineering disposition will be the same as that of a traditionally drilled hole with that degree of offset. Clean ream the damaged hole in-accordance-with local procedures to the dispositioned size, and the structure will retain its original structural properties.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

10 Appendix 1 – Solid Shank Rivet Removal Instructions

Introduction

Solid Shank Rivets are one of the most prolific fasteners in the aerospace market. These fasteners have applications on almost every single aircraft in existence. Nomenclature changes among users and OEM's; typically, these fasteners are called out as AN, MS or NAS series rivets.

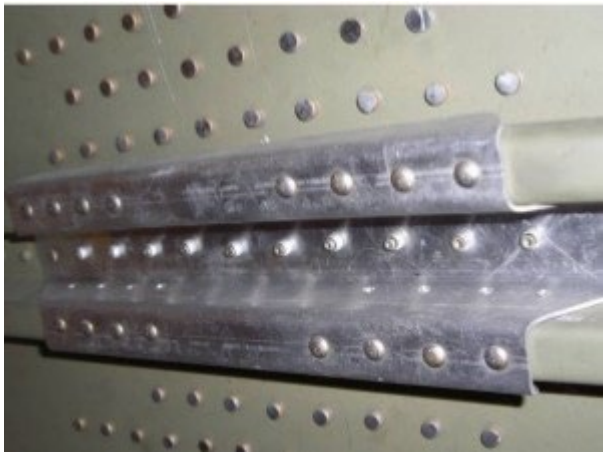


Fig-1: Typical Example of Solid Rivets Installation

Solid Shank Rivets are malleable pins with a shaped head (Raised, Flush or Dome) and a straight shank. The Rivet installed through a joining hole in the structure, and then compressed by an air-hammer and bucking bar. This produces a deformation known as the "bucktail" or "shoptail" which holds the manufactured head of the rivet firmly to the attaching structure.

Solid Shank Rivets are constructed of many different alloys such as: Aluminum, CRES, Alloy Steel, Monel, and Titanium. Differentiation on alloys is determined by the stress and heat requirements of the area in which the rivet is installed. General Best Practice is to identify the alloy of the fastener being removed, which dictates which command is used for the E-Drill. This ensures the correct power settings are applied for the application.

Note: This Instruction guide is intended to familiarize the user with best practices required to remove this specific fastener.

1. Identification

1.1. Head Marking

1.1.1. Read Markings on a solid rivet consist of a series of dots, dashes, triangles, and rectangles, each identifying the fastener's metallurgy and configuration. See Examples below:

MATERIAL	HEAD MARKING	MS MATERIAL CODE
1100	PLAIN	A
2117	DIMPLED	AD
2017	RAISED TEAT	D
2024	RAISED DOUBLE DASH	DD
5056	RAISED CROSS	B
CARBON STEEL	RECESSED TRIANGLE	
CORROSION-RESISTANT STEEL	PLAIN	C

Fig-2: Typical head markings on solid rivets

1.2. Head Configuration

1.2.1. Depending on the fastener type, the fastener head configuration will generally be one of the following:

1.2.1.1. Universal Raised Head

1.2.1.2. Universal Flush Head (typically 100° but could also be 85°,120°, or similar)

1.2.1.3. Double Flush (countersink at both hole ends- often referred to as a repair-rivet or flush-plug

Note: Different configurations of countersink degrees do not affect the E-Drill Process.

1.2.2. Typically, SRM and Work Instruction Manuals have a legend of different Solid Rivet Configurations which are installed on any given aircraft.

2. Setup Procedure

2.1. Fastener Preparation

2.1.1. To obtain acceptable grounding contact, surface paint must be removed from the fastener head before fastener removal is initiated.

2.1.2. Coating may also be removed with 180-grit or finer emery cloth or a small spoon file, or scraper. Care should be taken not to abrade or damage the surrounding structure. Typically, an area comparable in size to the fastener stem diameter is enough (see example below).

Note: Aluminum Rivets can be deformed by sanding/grinding operations, which makes mechanical or visual alignment difficult. S-Blaster is the Preferred Method of Coating Removal.

2.2. Hand-Tool Selection Mode

2.2.1. Typically, Solid Shank Rivets have a diameter ranging from 3/32" (0.094") to 3/8" (0.375"). This requires the user to select the correct Hand-Tool for the application.

2.2.1.1. Select Center Ground (CG) hand tool mode for fastener sizes 5/32" – 7/16"

2.2.1.2. Select External Ground (EG) hand tool mode for fastener sizes 3/32" – 1/8"

Note: EG Model is only effective if the stack-up material is comprised of a conductive (metal) material.

2.3. Command Input

2.3.1. Select the correct command for the fastener being removed.

2.3.1.1. Select the program for the specific fastener from the Fastener Library

2.3.1.2. Program the parameters into the Build Fastener Screen. (For instructions on the use of the Build Fastener Function refer to section 6.3.3 on pg 29)

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

2.4. Tool Configuration

2.4.1. Following program load on the display, observe the electrode callout for the specific fastener. Install that electrode on the conducting tube, in-accordance-with the general E-Drill User Instruction Guide.

2.4.2. Install the correct (either Flush or Button Head) Locator Adapter on the Hand-Tool, depending on the fastener being removed.

Note: "Domed" fasteners are to be removed by the flush method only. Do not attempt to align a BHL over the slight dome of these rivets. Risk of airframe damage is significant. For applications on Carbon Fiber-Reinforced Plastic (CFRP) or on skin to be re-used, use either the VFHL or OVL Locator Tools for precision error-free location. Non-Vacuum Assisted Flush Locators risk damaging the CFRP due to slippage.

3. Removal Instructions

3.1. Locate the Button Head or Flush Head locator over/around the fastener head. Take care to locate concentric around the fastener.

3.2. Firmly insert handtool and press down with light force, taking care not to move the locator. (If the user suspects the locator may have moved, then extract the Hand-Tool and check/adjust concentricity.

3.3. Squeeze and hold trigger until display light illuminates

3.3.1. Green Light indicates the cut was completed correctly and fastener is ready for extraction.

3.3.2. Red Light indicates the cut was out of parameters (either under or over time prediction).

3.3.2.1. If display indicated under-time warning, attempt to recut the fastener.

3.3.2.2. If the display indicated over-time warning, attempt punchout and note the force required to extract.

3.3.2.2.1. If minimal force is required, no further action is needed.

3.3.2.2.2. If significant force is required or if the fastener does not sever, reattempt the cut.

3.3.2.2.3. If numerous attempts have failed to yield a fracture, check the command settings, electrode size, and recheck the fastener.

3.4. Repeat steps with remaining fasteners to be removed.

4. Punch Out

4.1. Solid Rivets can be extracted by using the Pneumatic/Air Punch of the same nominal size as the electrode used to cut the fastener (see section 0).

4.2. Align the guide feature on the nose of the punch (if applicable) into the EDM cut groove on the fastener. If there is not a guide feature on the nose itself, there should be a recess at the end of the punch pin that can be used for locating the center of the EDM cut.

4.3. Once aligned pull the trigger on the Air Punch and the head of the fastener will be severed from the shank. The shank typically remains in the hole and will need to be tapped though with a mechanical punch and hammer.

Note: Solid Rivets are often installed on very thin skin joints. This may make Punch Out difficult. If there is a notable flexing of the skin-panel or if the rivet will not sever, place a bucking-bar or other solid backing next to the Buck-Tail. Pressing firmly on the bucking-bar, punch fastener until it severs.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

11 Appendix 2 – Blind Rivet Removal Instructions

Introduction

Blind Rivets are a very common fastener in the aerospace market. These fasteners have applications on most aircraft and serve in a several key fastening function. Blind Rivets typically are installed in low-stress areas where loading and vibration are not common. Nomenclature changes among users and OEM's; typically, these fasteners are called out as MS, NAS or CR series rivets.

A Blind Rivet is a two-piece fastener that uses a hardened draw-pin to compress a hollow sleeve and secures itself in place by means of a locking-ring. The Blind Rivet is installed through a joining hole in the structure, typically where a bucking bar or other traditional driving tools cannot access. A pulling head is used to move the draw-pin through the hollow sleeve, thus producing a blub-shaped shop-tail, like that of a driven solid rivet. At a predetermined pressure setting the draw-pin fractures from the fastener leaving a lock ring set into the hollow sleeve.

Fig. 1- Typical examples of Blind Rivets

Blind Rivets are constructed of many different alloys such as: Aluminum, CRES, Alloy Steel, Monel, and Titanium. Differentiation on alloys is determined by the stress and heat requirements of the area in which the rivet is installed. General Best Practice is to identify the alloy of the fastener being removed, which dictates which command is used for the E-Drill. This ensures the correct power settings are applied for the application.

Note: This Instruction guide is intended to familiarize the user with best practices required to remove this specific fastener.

1. **Identification**
   - 1.1. **Head Marking**
     - 1.1.1. Head Markings on a Blind Rivet consist of a series of trade markings that identify the manufacturer, material, and grip of the Fastener. Some examples below:
       - 1.1.1.1. Marking "+" Indicates CRES Stem.
       - 1.1.1.2. Marking "M" Indicates Monel Sleeve.
       - 1.1.1.3. Marking "X" Indicates Inconel Stem.
2. **Head Configuration**
   - 2.1. Depending on the fastener type, the fastener head configuration will generally be one of the following:
     - 2.1.1. Universal Raised Head (button, pan, hex, etc.)

2.1.2. Universal Flush Head (typically 100° but can range from 82° - 130°)

Note: Different configurations of countersink degrees do not affect the E-Drill Process.

2.2. Typically, the SRM and the Work Instruction Manuals have a legend of the different types of Blind Rivet Configurations which are installed on any given aircraft.

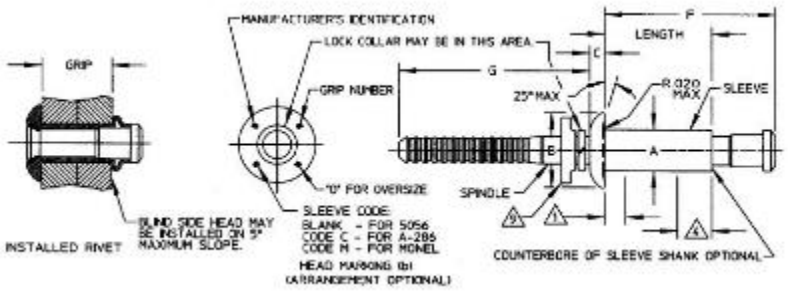


Fig. 2- Diagram of a Blind Rivet

3. Setup Procedure

3.1. Fastener Preparation

3.1.1. To obtain acceptable grounding contact, surface paint must be removed from the fastener head before fastener removal is initiated.

3.1.2. The most optimal method of removing any non-conductive materials from the head of a fastener is to utilize the PPEDM S-Blaster product, designed specifically for such purpose (reference the S-Blaster user guide for additional information).

3.1.3. Coating may also be removed with 180-grit or finer emery cloth or a small spoon file, or scraper. Care should be taken not to abrade or damage the surrounding structure. Typically, an area comparable in size to the fastener stem diameter is enough (see example below).

Fig 3- Installed Blind Rivets with Coating Removed

Note: Aluminum Rivets can be deformed by sanding/grinding operations, which makes mechanical or visual alignment difficult. S-Blaster is the Preferred Method of Coating Removal.

3.2. Hand-Tool Mode Selection

3.2.1. The hand tool can be configured in two distinct modes, depending on the fastener shank diameter and the adjacent work piece material. The CG configuration is typically preferred when the recommended electrode has an ID large enough to accommodate water flow around the grounding pin.

3.2.1.1. Select Center Ground (CG) Mode for fastener sizes 5/32" – 7/16"

3.2.1.2. Select External Ground (EG) Mode for fastener sizes 3/32" – 1/8"

Note: EG Hand tool is only effective if the stack-up material is comprised of a conductive (metal) material.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

3.3. **Command Input**

3.3.1. Select the correct command for the fastener being removed.

3.3.1.1. Select the program for the specific fastener from the Fastener Library

3.3.1.2. Program the parameters into the Build Fastener function.

3.4. **Tool Configuration**

3.4.1. Following program load on the display, observe the electrode callout for the specific fastener. Install that electrode on the conducting tube.

3.4.2. Install the correct (either Flush or Button Head) Locator Adapter on the Hand-Tool, depending on the fastener being removed.

Note: For applications on CFRP or on skin to be re-used, use either the VFHL or OVL Locator Tools for precision error-free location. Non-Vacuum Assisted Flush Locators risk damaging the CFRP due to slippage.

4. Removal Instructions

4.1. Locate the Button Head or Flush Head locator over/around the fastener head. Take care to locate concentric around the fastener.

Note: Flush applications on CFRP, use either the VFHL or OVL Locator Tools. Non-Vacuum Assisted Flush Locators risk damaging the CFRP due to slippage.

4.2. Firmly insert hand tool and press down with light force, taking care not to move the locator. (If the user suspects the locator may have moved, then extract the Hand-Tool and check/adjust concentricity.

4.3. Squeeze and hold trigger until display light illuminates

4.3.1. Green Light indicates the cut was completed correctly and fastener is ready for extraction.

4.3.2. Red Light indicates the cut was out of parameters (either under or over time prediction).

4.3.2.1. If display indicated under-time warning, attempt to recut the fastener

4.3.2.2. If the display indicated over-time warning, attempt punchout and note the force required to extract.

4.3.2.2.1. If minimal force is required, no further action is needed

4.3.2.2.2. If significant force is required or if the fastener does not sever, reattempt the cut.

4.3.2.2.3. If numerous attempts have failed to yield a fracture, check the command settings, electrode size, and recheck the fastener.

4.4. Repeat steps with remaining fasteners to be removed.

5. Punch Out

5.1. Blind Rivets cannot be extracted by using a "Punch Buddy" or Air Punch.

5.2. Use of the Punch Buddy or Air Punch will drive the locking stem out of the fastener, leaving the bulb-shaped sleeve in place.

5.3. Use a Straight Pin Punch of similar diameter as that of the electrode used for the cut.

Note: If a Straight Pin Punch of correct size cannot be acquired, contact Perfect Point Customer Service

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

5.4. Align the Pin-Punch into the Cut Ring on the fastener
5.5. Once aligned strike punch with moderate force using a 12 oz Ball-Peen Hammer or equivalent

Note: Blind Rivets are often installed on very thin skin joints. This may make Punch Out difficult. If there is a notable flexing of the skin-panel or if the rivet will not sever, place a bucking-bar or other solid backing next to the Buck-Tail. Pressing firmly on the bucking-bar, punch fastener until it severs.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

12 Appendix 3 – Blind-Bolt Removal Instructions

Introduction

Fig. 1- Typical examples of Blind-Bolt Fasteners

Blind-Bolts are the most difficult fasteners to remove by traditional drilling/grinding techniques, however, it is one of the easiest fastener types to remove using the E-Drill. Blind-Bolts are the fastener category containing: Visu-Loks/Jo-Bolts, Composi-Loks, Radial-Loks, and any other fastener that is installed via a stationary threaded core and a driving nut.
Typically, these fasteners are constructed of a hardened Steel Alloys or Titanium Cores making conventional drilling extremely difficult to control and results in higher rates of damage. These fasteners are typically installed on Wing Closeout Skins, High-Stress Aerodynamic Surfaces, Flight Control Surfaces, and on Carbon Reinforced Plastics (CFRP). Typically Blind-Bolts deviate from standard nominal diameters and require a larger electrode to remove. Specialized removal kits are available for specific applications and can be ordered from the Perfect Point.

Note: This Instruction guide is intended to familiarize the user with best practices required to remove this specific fastener.

1. Identification

1.1. Head Marking

1.1.1. Head Marking on Blind Bolt Fasteners typically show a VS, PLT, or MBF on the head, followed by a series of numbers. Examples below:

1.1.1.1. PLT 160

1.1.1.2. MBF 2113

Fig. 2- Typical example of Installed Blind-Bolt Fasteners

1.2. **Head Configuration**

1.2.1. Depending on the fastener type, the head configuration will be one of the following

1.2.1.1. Raised-head

1.2.1.2. Flush-head

1.2.1.3. Hex-head

1.2.2. These Fasteners typically have an easily identifiable cross formation known as a cruciform, with a noticeable pin in the center of the head.

2. Setup Procedure

2.1. Fastener Preparation

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

2.1.1. To obtain acceptable grounding contact, surface paint must be removed from the fastener head before fastener removal is initiated.

2.1.2. Blind Bolt Fasteners surface finish must be removed by the S-Blaster System. This is due to the cruciform depression in the head of these fasteners. Mechanical sanding and/or chemical coating removal typically will not yield a conductive surface finish quality required for E-Drill.

Fig. 3- Typical example of installed Blind-Bolt with coating removed

2.2. Hand-Tool Mode Selection

2.2.1. Typically, Blind-Bolt have a diameter greater than 5/32" (0.156") which allows for removal with either Hand-Tool Mode.

2.2.2. Fasteners with drive stems that are broken relatively flush to the fastener head, CG Mode is preferable.

2.2.3. Fasteners with drive stems broken off high or low relative to the fastener face, sometimes require the Externally Grounded (EG) Mode. This is due to the interference between the stem and the Grounding Pin of the CG Hand-Tool.
Note: EG Mode is only effective if the stack-up material is comprised of a conductive (metal) material.

2.2.4. Should the material be completely comprised of CFRP and the CG Mode must be used. Adjust the grounding pin to account for the fastener stem height or depth.

2.3. Command Input

2.3.1. Select the correct command for the fastener being removed.

2.3.1.1. Select the program for the specific fastener from the Fastener Library

2.3.1.2. Program the parameters into the Visual Selection function.

2.4. Tool Configuration

2.4.1. Following program load on the display, observe the electrode callout for the specific fastener. Install that electrode on the conducting tube, in-accordance-with the general E-Drill User Instruction Guide.

2.4.2. Install the correct (either Flush or Button Head) Locator Adapter on the Hand-Tool, depending on the fastener being removed.

Caution: Blind Bolt Fastener's do not typically follow nominal diameters for fastener shanks. Check the Electrode Callout Display on the Terminal prior to installing an electrode onto the hand-tool.

3. Removal Instructions

3.1. Locate the Button Head or Flush Head locator over/around the fastener head. Take care to locate concentric around the fastener.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Note: Flush Blind Bolt Applications on CFRP, use either the VFHL or OVL Locator Tools, and the mechanical locator (refer to section 0) for precision error-free location. Non-Vacuum Assisted Flush Locators risk damaging the CFRP due to slippage. For Blind Bolt fasteners where there is a recess (torx, hex, tri-wing Hi-Torque etc.), the correct mechanical locator (refer to section 5.6) should be used.

3.2. Firmly insert hand tool and press down with light force, taking care not to move the locator. (If the user suspects the locator may have moved, then extract the Hand-Tool and check/adjust concentricity.
3.3. Squeeze and hold trigger until display light illuminates
  3.3.1. Green Light indicates the cut was completed correctly and fastener is ready for extraction.
  3.3.2. Red Light indicates the cut was out of parameters (either under or over time prediction)
    3.3.2.1. If display indicated under-time warning, attempt to recut the fastener
    3.3.2.2. If the display indicated over-time warning, attempt punchout and note the force required to extract.
      3.3.2.2.1. If minimal force is required, no further steps are needed
      3.3.2.2.2. If significant force is required or if the fastener does not sever, reattempt the cut.
      3.3.2.2.3. If numerous attempts have failed to yield a fracture, check the command settings, electrode size, and recheck the fastener.
3.4. Repeat steps with remaining fasteners to be removed.

4. Punch Out

4.1. Blind-Bolt Fasteners can typically be extracted by using a "Punch Buddy" or Air Punch of the same nominal size as the electrode used to cut the fastener (see section 0).
4.2. Align the punch into the Cut Ring on the fastener.
4.3. Once aligned strike punch with moderate force using a 12 oz Ball-Peen Hammer or equivalent.

Note: Generally Blind-Bolts are installed in rigid areas of the aircraft and should sever easily with a solid punch impact.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

13 Appendix 4 – Straight-Shank Pin Removal Instructions

Introduction

Straight-Shank Pins are a very common form of structural fastener. Often referred to as: Hi-Loks, Hi-Lites, Hucks, Lock-Bolts, Eddie-Bolts or Pin-Rivets, these fasteners are installed with a collar that is threaded or swaged on depending on type.

Straight-Shank Pins are hardened pins with a shaped head and a threaded or grooved shank. These fasteners are typically constructed of Steel or Titanium alloys, which makes conventional drilling difficult. Straight Shank Pins are installed in high-strength/stress mating joints, frame stations, fairing ribs, and many other places where strength and rigidity are required.

Fig. 1- Typical examples of Straight Shank Pins

Note: This Instruction guide is intended to familiarize the user with best practices required to remove this specific fastener.

1. Identification

1.1. Head Marking

1.1.1. Head Marking on Straight-Shank Pin Fasteners typically show a HL, HST, LGPL, or LHPL on the head, followed by a series of numbers. Examples below:

- HL 10
- LGPL2

1.2. Head Configuration

1.2.1. Depending on the fastener type, the head configuration will be one of the following

- Raised Head
- Flush Head

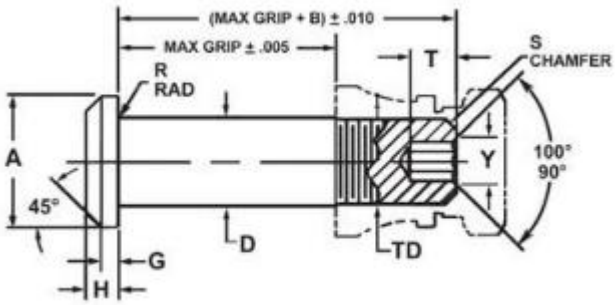


Fig. 2- Diagram of a Straight Shank Pin

1.3. Collar Configuration

1.3.1. These Fasteners typically have a flat planed surface and are easily identifiable due to the method of installation (Collared).

2. Setup Procedure

2.1. Fastener Preparation

2.1.1. To obtain acceptable grounding contact, surface paint must be removed from the fastener head before fastener removal is initiated.

2.1.2. Coating may also be removed with 180-grit or finer emery cloth or a small spoon file, or scraper. Care should be taken not to abrade or damage the surrounding structure. Typically, an area comparable in size to the fastener stem diameter is enough.

2.2. Hand-Tool Mode Selection

2.2.1. Straight-Shank Pins have a diameter greater than 5/32" (0.156") which allows the user to select either style hand tool

2.2.1.1. Center Grounded (CG) Mode is preferable on Straight Shank Pins

2.2.1.2. Externally Grounded (EG) Mode can be used on this application, but is of no direct benefit to the user, unless the surface face of the fastener is damaged or deformed.

2.3. Command Input

2.3.1. Select the correct command for the fastener being removed.

2.3.1.1. Select the program for the specific fastener from the Fastener Library

2.3.1.2. Program the parameters into the Build Fastener function.

2.4. Tool Configuration

2.4.1. Following program load on the display, observe the electrode callout for the specific fastener. Install that electrode on the conducting tube, in-accordance-with the general E-Drill User Instructions.

2.4.2. Install the correct (either Flush or Button Head) Locator Adapter on the Hand-Tool, depending on the fastener being removed.

Note: For flush pin applications on CFRP or on skin to be re-used, use either the VFHL or OVL Locator Tools for precision error-free location. Non-Vacuum Assisted Flush Locators risk damaging the CFRP due to slippage. For pin fasteners where there is a recess (torx, hex, tri-wing Hi-Torque etc.), the correct mechanical locator (refer to section 5.6) should be used.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

3. Removal Instructions

3.1. Locate the Button Head or Flush Head locator over/around the fastener head. Take care to locate concentric around the fastener.

3.2. Firmly insert hand tool and press down with light force, taking care not to move the locator. (If the user suspects the locator may have moved, then extract the Hand-Tool and check/adjust concentricity.

3.3. Squeeze and hold trigger until display light illuminates

3.3.1. Green Light indicates the cut was completed correctly and fastener is ready for extraction.

3.3.2. Red Light indicates the cut was out of parameters (either under or over time prediction)

3.3.2.1. If display indicated under-time warning, attempt to recut the fastener

3.3.2.2. If the display indicated over-time warning, attempt punchout and note the force required to extract.

3.3.2.2.1. If minimal force is required, no further action is needed

3.3.2.2.2. If significant force is required or if the fastener does not sever, reattempt the cut.

3.3.2.2.3. If numerous attempts have failed to yield a fracture, check the command settings, electrode size, and recheck the fastener.

3.4. Repeat steps with remaining fasteners to be removed.

Note: Flush applications on CFRP, use either the VFHL or OVL Locator Tools. Non-Vacuum Assisted Flush Locators risk damaging the CFRP due to slippage.

4. Punch Out

4.1. Straight-Shank Pins can be extracted by using a "Punch Buddy" or Air Punch of the same nominal size as the electrode used to cut the fastener (see section 0).

4.2. Align the punch into the Cut Ring on the fastener

4.3. Once aligned strike punch with moderate force using a 12 oz Ball-Peen Hammer or equivalent.

Note: Typically, Straight-Shank Pins are installed in rigid areas of the aircraft and should sever easily with a solid punch impact.

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

14 Appendix 5 – Cutting Electrode Sizes and Adapter Color Matching

There are 17 different standard Cutting Electrode O.D sizes available to cover 18 different diameter fasteners from 3/32" to 3/8". Electrodes are designed to remove nominal, X (1st Oversize) and Y (2nd Oversize) fasteners.

Cutting Electrodes are packaged and color coded and provided in kits of 5 each to match their sizes and the hand-tool Adapters used with that size Electrode. The chart and color legend below illustrates the size color coding. Refer to Perfect Point™ Consumables Order Form (Document No.60-122) provided with the System Documentation Package for Electrode part number and Adaptor Tip ordering information.

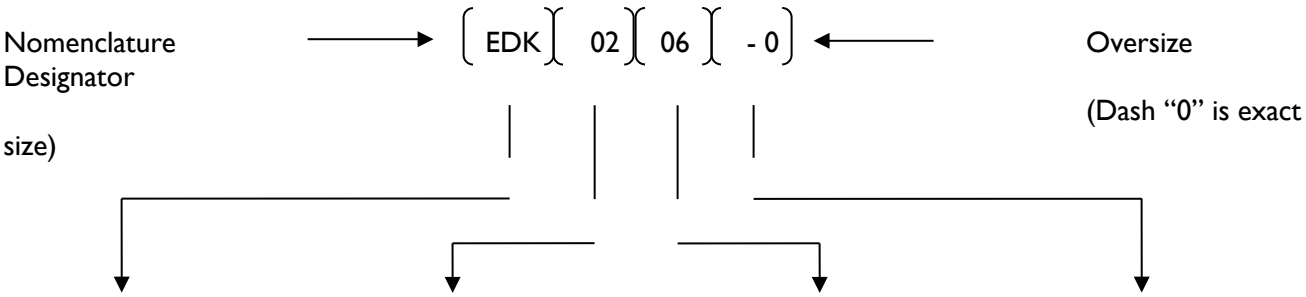
Electrode Size	Dash Size	Hand-Tool Adapter Body (Tri-wing)*	Adapter Electrode Guide	Electrode Packaging
3/32 Nominal	3	YELLOW Adaptor Body	GREEN Electrode Guide	GREEN Label
3/32 Plus	3+	YELLOW Adaptor Body	WHITE Electrode Guide	GREEN Label
1/8 Nominal	4	YELLOW Adaptor Body	ORANGE Electrode Guide	ORANGE Label
1/8 Plus	4+	YELLOW Adaptor Body	WHITE Electrode Guide	ORANGE Label
5/32 Nominal	5	YELLOW Adaptor Body	BLUE Electrode Guide	BLUE Label
5/32 Plus	5-+	YELLOW Adaptor Body	BROWN Electrode Guide	BLUE Label
5/32 1st Oversize (X)	5-X	YELLOW Adaptor Body	WHITE Electrode Guide	BLUE Label
3/16 Nominal	6	YELLOW Adaptor Body	YELLOW Electrode Guide	YELLOW Label
3/16 Plus	6-+	YELLOW Adaptor Body	BROWN Electrode Guide	YELLOW Label
3/16 1st Oversize (X)	6-X	YELLOW Adaptor Body	WHITE Electrode Guide	YELLOW Label
3/16 2nd Oversize (Y)	6-Y	YELLOW Adaptor Body	TURQUOISE Electrode Guide	YELLOW Label
1/4 Nominal	8	YELLOW Adaptor Body	BLACK Guide	BLACK Label
1/4 Plus	8-+	YELLOW Adaptor Body	BROWN Electrode Guide	BLACK Label
1/4 1st Oversize (X)	8-X	YELLOW Adaptor Body	WHITE Guide	BLACK Label
1/4 2nd Oversize (Y)	8-Y	YELLOW Adaptor Body	TURQUOISE Guide	BLACK Label
5/16 Nominal	10	YELLOW Adaptor Body	RED Guide	RED Label
5/16 1st Oversize (X)	10-X	YELLOW Adaptor Body	WHITE Guide	RED Label
5/16 2nd Oversize (Y)	10-Y	YELLOW Adaptor Body	No Guide Required at this size	RED Label
3/8 Nominal	12	YELLOW Adaptor Body	No Guide Required at this size	GRAY Label
3/8 1st Oversize (X)	12-X	YELLOW Adaptor Body	No Guide Required at this size	GRAY Label
3/8 2nd Oversize (Y)	12-Y	YELLOW Adaptor Body	No Guide Required at this size	GRAY Label

PERFECT POINT
AEROSPACE MAINTENANCE TECHNOLOGY

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

Electrode Part Number Legend:

EDK0206-0



Nomenclature:

EDK: = E-Drill electrode Kit (5 electrodes)

Electrode Material:
01 = Brass Alloy
02 = Copper Alloy

Fastener Diameter: 06 = Fastener Stem Size Designator (3/16")

EXAMPLE:
03 = 3/32" Fastener
04 = 1/8" Fastener
05 = 5/32" Fastener
06 = 3/16" Fastener
08 = 1/4" Fastener
10 = 5/16" Fastener
12 = 3/8" Fastener

Size Designator:

All Electrode kits carry a dash number indicating a nominal size (-0), a Plus (+), or letter designators (-X or –Y) for each of the three oversize electrode OD's available.

- The Plus "+" size Electrodes are specifically for use on fragile airframe only.
- Plus sizes -5, -6 & -8 are also designed for use with Blind Bolt fasteners such as ComposiLok, VisuaLok, Jo-Bolt etc. where the shank diameter is not true nominal.
- The Letter "X" depicts the first oversize or, *plus 1/64th of an inch.*
- The Letter "Y" depicts the second oversize or, *plus 2/64ths (or 1/32nd) of an inch).*

Notes:

PERFECT POINT
AEROSPACE MAINTENANCE TECHNOLOGY

15192 Triton Lane
Huntington Beach, CA 92649
Office Tel: 714-892-3400
Hotline Tel: 714-891-6533
www.ppedm.com

For CherryMax and other blind "pull" fasteners whose "nominal" shank size is dimensionally closer to an oversize, use one oversize above the fastener size. For example, a 3/16" (-6) nominal alloy steel CherryMax should be removed with the 1st oversize electrode (0206-X). A 1ST over CherryMax should be removed with the 2nd over electrode (0206-Y).

For ComposiLok and other blind bolt fasteners, use the "Plus" size electrodes for -5, -6 and -8 sizes. For other sizes use the nominal size.

For applications where a metal component is being replaced, such as wing skin replacement, an electrode one oversize may be used in order to ease removal (less or no punch-out required). Damage which will result will be limited to the lip of the hole, and therefore the old skin will still be acceptable for using as a template for a replacement skin.

Electrode Size	Electrode Packaging	Electrode actual diameter
3/32 Nominal	GREEN Label	0.078"
3/32 + size	GREEN Label	0.082"
1/8 Nominal	ORANGE Label	0.105"
1/8 + size	ORANGE Label	0.114"
5/32 Nominal	BLUE Label	0.135"
5/32 Plus	BLUE Label	0.139"
5/32 1st Oversize (X)	BLUE Label	0.15"
3/16 Nominal	YELLOW Label	0.159"
3/16 Plus	YELLOW Label	0.168"
3/16 1st Oversize (X)	YELLOW Label	0.174"
3/16 2nd Oversize (Y)	YELLOW Label	0.189"
1/4 Nominal	BLACK Label	0.22"
1/4 Plus	BLACK Label	0.229"
1/4 1st Oversize (X)	BLACK Label	0.235"
1/4 2nd Oversize (Y)	BLACK Label	0.25"
5/16 Nominal	RED Label	0.282"
5/16 1st Oversize (X)	RED Label	0.297"
5/16 2nd Oversize (Y)	RED Label	0.312"
3/8 Nominal	GRAY Label	0.345"
3/8 1st Oversize (X)	GRAY Label	0.36"
3/8 2nd Oversize (Y)	GRAY Label	0.375"