

Perfect Point EDM Inc.							
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E•drill Fastener Removal Procedural Guide (FRPG)

Procedure for removing structural fasteners using the E-Drill system.

1. General Requirements

E-Drill fastener removal should only be done by personnel trained to perform the process. Use by untrained personnel could result in equipment or aircraft damage.

Care must be taken to correctly select and match the fastener type on the airframe with the fastener selected on the operator control terminal. Since each fastener size and diameter also has a matching electrode size, using the proper corresponding electrode is necessary to ensure successful system operation. See chapter 2 – Setup for details.

The EDM countersink and protruding head fastener removal equipment, and associated electrodes, is available in two models; the EG model (External Ground) and the CG model (Concentric Ground):

- The EG model supports head-side removal of fastener heads ranging from 0.094" (3/32") to 0.25" (1/4") diameter, and is only for use on metallic structure, or metallic/composite joints. The EG model is not to be used for composite-only structure.
- The CG model supports head-side removal of fastener heads ranging from 0.156" (5/32") to 0.375" (3/8") in diameter. Collar-side removal is currently possible for diameters ranging from 0.156 to 0.281 inch only. The CG model has no airframe material limitations, but use of a vacuum location device is strongly recommended for removal of flush fasteners from composite skin.

UNDER NO CONDITIONS SHOULD EITHER MODEL BE USED FOR A FASTENER SIZE OUTSIDE ITS RANGE.

Key requirements to operate the E-Drill system include:

- 1.1. Selection of correct fastener in the E-Drill Hand Held Terminal
- 1.2. Selection of the correct electrode, as indicated by the terminal.
- 1.3. Selection of the correct adaptor for the front of the hand-tool, including the electrode guide.
- 1.4. Selection of the correct fastener locator for the fastener to be removed.
- 1.5. Placement of the tool concentric and perpendicular to the fastener head.
- 1.6. Steady and constant pressure during the cutting process.

Perfect Point EDM Inc.

Document No.:	60-199	Revision Date:	1/11/2014	Revision:	1	Effective Date:	01/13/2014
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1.7. When removing flush head fasteners, special attention must be used to properly locate and maintain the flush head locator tool in proper position over the fastener head. Otherwise, structural damage can occur.

For a complete description of equipment operation and requirements, see the manufacturers operating instructions. Personnel performing removal operations shall thoroughly review the manufacturer operating instructions.

The maximum distance between a hand removal tool and the cabinet is 10 feet without an extension. An umbilical extension can provide an additional 30 feet between the tool and cabinet.

CAUTION: Do not exceed one umbilical extension.



Figure 1. Typical Fastener after removal using the E-Drill process

2. Setup Procedure

Setup of the equipment, prior to removal of fasteners, is carried out as follows:

- 2.1. Select correct fastener type from Part Number menus, noting electrode size recommended
- 2.2. Remove existing adaptor by twisting and pulling from nose of hand-tool.
- 2.3. Advance the electrode to its forward position by squeezing the trigger, and remove existing electrode and return to adaptor kit. If the correct electrode is already installed then skip to step 2.6

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- 2.4. Check ground pin protrusion and condition as per Quick Start Guide – Maintenance.
- 2.5. Select correct electrode and install using the provided torque wrench tool. Retract the electrode back into the hand tool using the green button under the hand tool grip.
- 2.6. Select and install the required locator and adaptor as follows:
 - 2.6.1. If the fastener to be removed is a button head style, then select the correct button head adaptor (including electrode guide), slide over the electrode, and install onto the front of the hand tool. Finally select the correct Button-Head Locator.
 - 2.6.2. If the fastener is flush head style, and the Vacuum Flush Head Locator tool is used, then follow directions in the vacuum flush head locator kit.
 - 2.6.3. If the fastener is flush head style and the manual Flush head locator is to be used, select the correct flush head adaptor (including electrode guide), and install onto the front of the hand tool. Finally select a red aperture seal slightly larger than the fastener head, and install into the face of the Flush Head Locator.

3. Fastener Preparation

To obtain good grounding contact, surface paint must be removed from the fastener head before fastener removal is initiated. The Perfect Point S-Blaster system is designed specifically for removal of paint from fastener heads. 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. For removal with no paint present, usually no preparation is required. Some plastic fastener coatings may however require removal. Only a small area of coating in the center of the fastener needs to be removed so the center grounding contact and the electrode can make contact. Typically an area comparable in size to the fastener stem diameter is sufficient (see example in photograph below).

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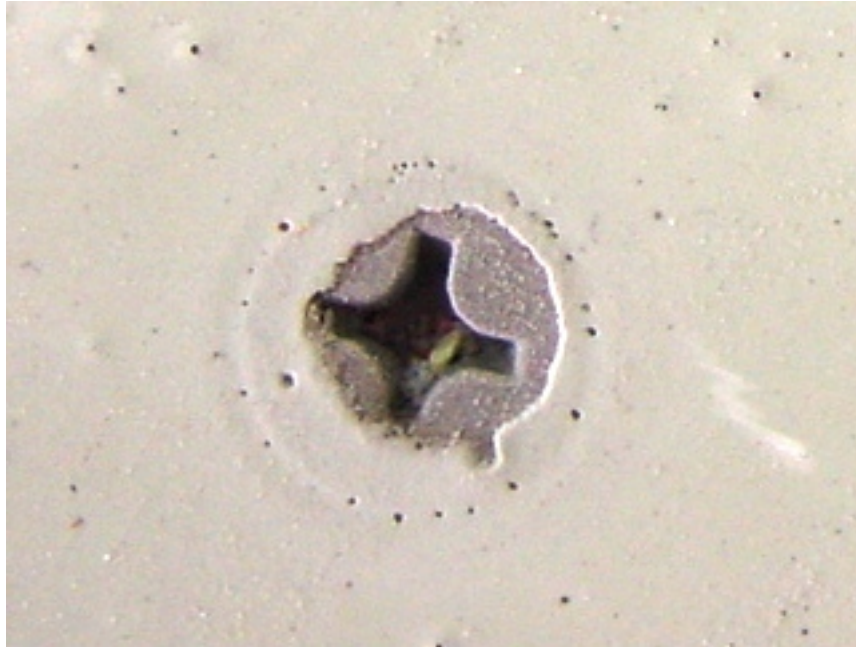


Figure 2. Typical paint removal requirement.

4. Removal procedure

- 4.1. Locate the Button Head or Flush Head locator over/around the fastener head. Take particular care to locate concentric around the fastener.
- 4.2. Firmly insert hand tool and press down with light force, taking care not to move the locator. (If you think the locator may have moved, then extract the Hand Tool and check/adjust concentricity. Ensure the gun is in line with fastener head and not tilted.
 - 4.2.1. Keys to successfully operation include – light grip on gun, firm downward pressure between thumb and first finger, good axial alignment, steady grip and pressure throughout process.
 - 4.2.2. Do not significantly change the pressure of the gun or its attitude after cutting has started.
- 4.3. Squeeze trigger until green light shows.
 - 4.3.1. If cutting doesn't start, or stops almost immediately and indicates a red light (under-time warning), remove gun and locator and clean fastener head (Fastener preparation) – then repeat steps 4.1 & 4.2.
 - 4.3.2. If cutting takes longer than expected and/or the gun indicates a red light (over-time) warning then check the fastener selection on the Hand Held Terminal (HHT), that the electrode is tight in the hand-tool, and that the ground pin protrusion is set correctly.
 - 4.3.3. If light flashes green at end of cut, replace electrode as per Quick Start Guide.
 - 4.3.4. If light flashes red at end of cut, top of water system as per Quick Start Guide.

Perfect Point EDM Inc.

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- 4.4. Repeat steps 4.1 to 4.3 with remaining fasteners to be removed, checking alignment of the cut/burn after each cut to make sure your alignment remains good.
- 4.5. Insert Punch Buddy (if using a Punch Buddy) in burn groove, and punch sharply until head fails. If using a standard punch then place punch on fastener head within burn groove. If after two or three blows the fastener head has not failed, then repeat steps 9-11 & 13 (gun cut indicator will show red light and under-time warning – this is normal when re-cutting a previously cut fastener).
 - 4.5.1. If removing Blind fasteners DO NOT USE a Punch buddy, since that will result in removal of the pin, but not the body of the fastener. Instead use a parallel punch, sized to the same nominal size of the fastener (5/32" or 3/16")
- 4.6. Repeat step 4.5 for other pre-cut fasteners as necessary.

5. Quality Control

The following quality control procedures shall be followed:

- 5.1. Only trained operators shall remove fasteners using this process.
- 5.2. 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. An off-center burn condition after a flush fastener removal is illustrated in the photograph below, to the right side of the hole. The damage occurs right at the top of the parallel portion of the hole.

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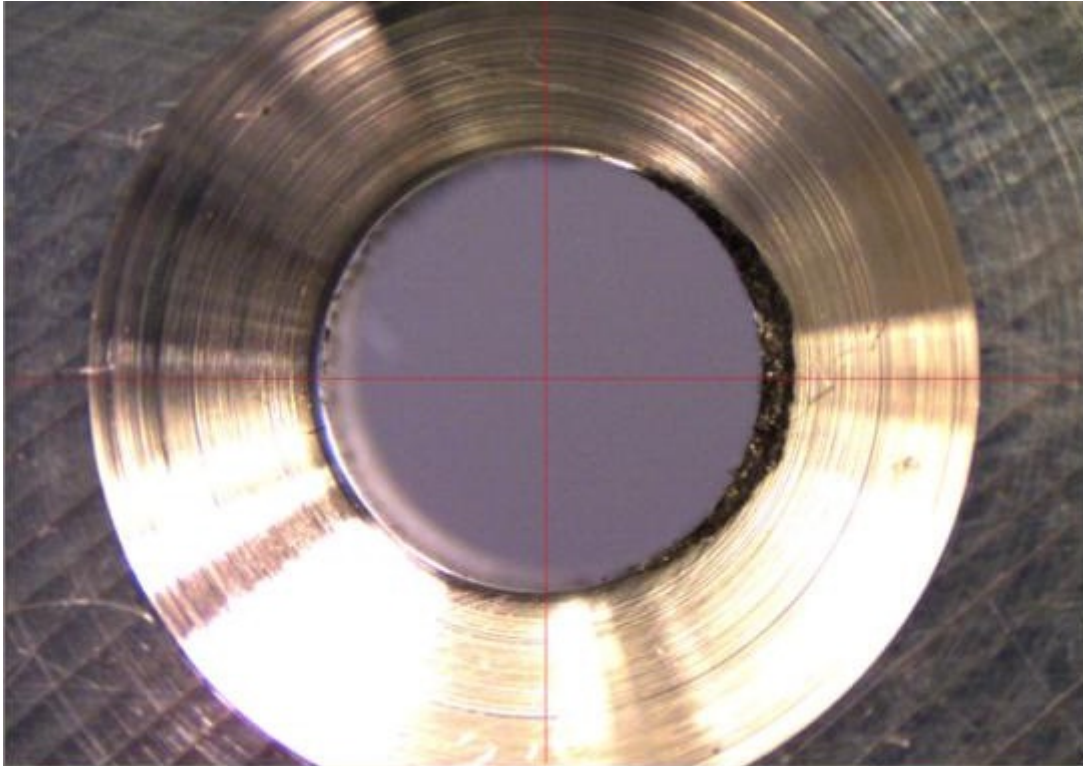


Figure 3. Typical Appearance of Damaged Hole Caused by off-center burn (to the right in this case).

6. Rectification

- 6.1. If a black erosion mark is evident, then the erosion mark should be completely removed PLUS an additional 0.005" of material thickness to eliminate the potential for a heat-affected zone under the black surface. Typically this rectification may be done by oversizing per the replacement fastener specification, with a conventional drill and/or reamer. Occasionally for flush fasteners superficial damage may be removed alternatively by overcutting the countersink by 0.010". A significantly off-center burn may require a second oversize or other remedy.
Existing shop procedures available for removing drill damage or tool marks may be used.
- 6.2. When the rectification has been completed there must be NO EVIDENCE of remnant burn or cratering in the rectified hole (as identified by a black mark), and its surface finish condition should be visibly comparable with a freshly reamed hole.
- 6.3. Follow other applicable fastener installation specifications for the replacement fastener to be used.