



Service Instruction

ENGINE COMPONENTS, INC.

S.I. No.: 92-9-6

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Title: CYLINDER REMOVAL AND REINSTALLATION

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Technical Portions are FAA DER Approved.

Removing a cylinder in order to perform maintenance or repairs, and then reinstalling the same cylinder creates a special situation. Additionally, different cylinder bore surfaces and piston ring combinations require different break-in techniques. Accordingly, each cylinder bore processed by Engine Components, Inc. (ECi®) should be returned to service in accordance with the following procedures performed prior to installation:

A. GENERAL NOTES FOR ALL CYLINDER BORES:

1. Do not reuse rings removed from piston. Cast iron is very brittle, and small cracks not visible will eventually result in ring breakage and cylinder failure.
2. Check end gap and side clearance. **NOTE:** End gap should be checked in choke area as well as in the straight portion of the bore. Use engine manufacturer's data.
3. Custom gapping of piston rings is standard procedure. However, **ALWAYS** break the sharp edges at the ring gap to prevent the ring from digging into the groove and preventing normal rotation.
4. Cylinder bore cleanliness can be evaluated by using clean cellophane tape and a white sheet of paper. Wrap a length of tape (sticky side out) around 2 or 3 fingers. Pat the tape at many locations on the cylinder bore and after cutting the tape, place it sticky side down on a white sheet of paper. A high particle count indicates a dirty surface and requires that the bore be re-cleaned.
5. Break-in procedures should be carefully followed. (See ECi booklet entitled *Engine Break-in Instructions and Oil Management*).
6. If high cylinder head or oil temperature persists, or if very high oil consumption is noted after several hours of operation, then successful break-in will probably not occur. Cylinders should be removed, re-honed and reinstalled with new rings.

B. THROUGH-HARDENED STEEL, NITRIDED STEEL AND CAST IRON BORES CAN BE RETURNED TO SERVICE BY FOLLOWING THESE PROCEDURES:

ALWAYS!

1. Hone for ring finish. **NOTE:** DO NOT use hone stones that have been used to hone chromium. Chromium metal flakes embedded in hone stones have been found to transfer to steel /cast iron bores and cause piston skirt scuffing (See step 2 below).
2. Wrap 100 grit emery cloth around faces of the stones of a hand type cylinder hone. Staple the emery cloth together at the ends so that it will stay in place), and hone with a high flash point solvent such as kerosene or varsol.
3. After honing, the cylinder bore will appear and feel rough. The cross hatch will be visible and the pattern should intersect as close to 35° as possible. The surface finish should be 20 - 30 micro-inches Ra.
4. The cylinder bore should be cleaned using hot soapy water, and then rinsed with clean hot water. All contaminants on the bore, the dome and the hidden area at the top of the barrel where it joins the dome must be removed prior to installation. Absolute cleanliness of the cylinder bore and combustion chamber is essential if long cylinder engine life is to be achieved.
5. Use new rings (See ECi Service Instruction 94-4-1).



C. CHANNELCROMIUM® PROCESS BORES REQUIRE THE FOLLOWING PROCEDURES:

ALWAYS!

1. Hone for ring finish.
2. Use new rings (See ECi Service Instruction 94-4-1).
3. Use only gray cast iron rings.

Warning: Use of rings with chrome faces in chromium plated process cylinder bores will result in engine failure! Use of rings made from any material other than grey cast-iron meeting the requirements of **AMS 7310** will result in high wear or excessive oil consumption.

D. CERMICROME® PROCESS BORES: ECi RECOMMENDS THAT CERMICROME® PROCESS CYLINDERS REMOVED FOR ANY REASON SHOULD NOT BE REINSTALLED.

E. CERMINIL® OR NICKEL+CARBIDE™ PROCESS BORES CAN BE RETURNED TO SERVICE BY USING THE (AETKIT01) REJUVINATION KIT ACCORDING TO THE FOLLOWING:

ALWAYS!

1. Cylinder Selection

- a. These procedures only apply to cylinders with the ECi Cerminil® or Nickel+Carbide™ process applied to the bores.

2. Inspection

- a. Dye check cylinder head to determine airworthiness using suitable measuring equipment.
- b. Verify that bore is within service limits.
- c. Check bore for distress.
- d. Check seats and guides and replace as necessary.

3. Preparation

- a. It is recommended that two people work together to perform the process, one to hold the cylinder in place and spray honing oil and one to operate the hone.
- b. Secure cylinder in the horizontal position on a bench top.
- c. Clean bore.

4. Diamond Honing

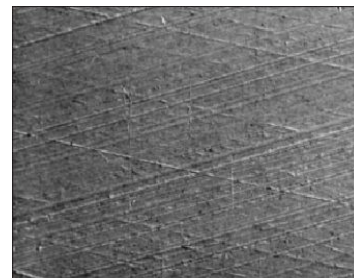
- a. Fill spray bottle with honing oil (P/N SS20-1) (both supplied in the kit).
- b. Install ECi diamond honing stones (P/N AET00002) on the ECi honing tool (P/N AET00001) securing the stones with the cotter pins supplied with the kit. Install the diamond honing stones so that the diamond material is on the leading edge when the tool is rotated in a clockwise direction.
- c. Using the spray bottle, saturate the barrel with honing oil.
- d. Verify that the spring tension nut on the honing tool is at maximum pressure.
- e. Insert honing tool into a drill motor that rotates clockwise at 400 to 600 RPM.
- f. Insert stones into bore, turn on drill and hone for 1 minute at the rate of 40 to 60 stokes per minute with an intermittent spray of honing oil at the rate of one trigger pull per 2 to 4 strokes (1 stroke = 1 full travel in and 1 full travel out). Exercise caution not to hit the dome and let the stones extend 1/3 of their length beyond the shirt end. If the dome is accidentally struck, raised metal should be polished smooth.



- g. Clean bore and check for bright areas. If bright areas are present, re-spray with honing oil and continue honing and spraying for 30 seconds.
- h. Clean bore of all honing residue.

5. Micro Honing

- a. Remove diamond-honing stones from honing tool and install micro honing brushes (P/N AET00003). Again, have the brush on the leading edge when the tool is rotated in a clockwise direction.
- b. Spray bore with honing oil and achieve 100% coverage.
- c. Insert brushes into bore, turn on drill and micro hone for 6 to 8 strokes using the same stroke rate and technique as used with the diamond stones. **DO NOT EXCEED 10 STROKES.**
- d. After micro honing, the cylinder bore will be relatively smooth as compared to a steel bore and the cross hatch will be visible but faint. The surface finish should measure 3 - 8 micro-inches Ra.
- e. If the desired finish is not achieved after completion of rejuvenating process, please call ECi Engineering Department (210) 820-8101 for more information.



*100x CermaNil® or Nickel Carbide™
Process Ring Finish*

6. Cleaning

- a. Thoroughly clean all surfaces of the cylinder.
- b. **WARNING: Honing debris that is left in the cylinder will get into the engine's oil system and cause serious damage.**