SERVICE MANUAL

KOHLER® COURAGE XT-6, XT-7

VERTICAL CRANKSHAFT

KOHLER® ENGINES

General Specifications[1]

Net Power (@ 3600 RPM)
- XT-6 ..... 2.6 kW (3.5 HP)
- XT-7 ..... 3.4 kW (4.5 HP)

Net Peak Torque (@ 2600 RPM)
- XT-6 ..... 8 N·m (5.9 ft. lb.)
- XT-7 ..... 9.5 N·m (7 ft. lb.)

Bore
- XT-6 ..... 65 mm (2.56 in.)
- XT-7 ..... 70 mm (2.75 in.)

Stroke
- XT-6 ..... 45 mm (1.8 in.)
- XT-7 ..... 45 mm (1.8 in.)

Displacement
- XT-6 ..... 149 cc (9.1 cu. in.)
- XT-7 ..... 173 cc (10.6 cu. in.)

Compression Ratio
- XT-6 ..... 8.3:1
- XT-7 ..... 8.5:1

Dry Weight
- XT-6 ..... 10.8 kg (24 lb.)
- XT-7 ..... 13.1 kg (29 lb.)

Oil Capacity (refill)
- XT-6 ..... 0.60 L (20 oz.)
- XT-7 ..... 0.60-0.65 L (20-22 oz.)

Angle of Operation - Maximum (at Full Oil Level) All Directions ..... 25° Intermittent

Air Cleaner Base
Air Cleaner Base Fastener Torque ..... 8 N·m (71 in. lb.)
Air Cleaner Base to Crankcase Fastener Torque ..... 8 N·m (71 in. lb.)

Blower Housing
Blower Housing Stud Torque ..... 10 N·m (88 in. lb.)

Brake
Brake Mounting Fastener Torque ..... 9.5 N·m (84 in. lb.)

Breather Cover
Breather Cover Fastener Torque ..... 10 N·m (88 in. lb.)

Camshaft
End Play ..... 0.2-0.8 mm (0.0078-0.0314 in.)
Running Side Clearance ..... 0.15-0.51 mm (0.0059-0.02 in.)

Carburetor
Carburetor Stud Fastener Torque ..... 9.0 N·m (80 in. lb.)

Basic Engine Tests

Crankcase Vacuum Test

A partial vacuum should be present in the crankcase when the engine is operating. Pressure in the crankcase (normally caused by a clogged or improperly-operating breather) can cause oil to be forced out at oil seals, gaskets, or other available spots.

Crankcase vacuum is best measured with a water manometer or vacuum/pressure test gauge. See Section 2, Tools and Aids. Complete instructions are provided with the testers.

Test the crankcase vacuum with a manometer as follows:

1. Insert the rubber stopper into the oil fill hole. Be sure the pinch clamp is installed on the hose and use the tapered adapters to connect the hose between the stopper and one of the manometer tubes. Leave the other tube open to the atmosphere. Check that the water level in the manometer is at the "0" line. Make sure the pinch clamp is closed.

2. Start the engine and run at no-load high idle speed (2800 to 3750 RPM).

3. Open the clamp and note the water level in the tube. The level in the engine side should be a minimum of **10.2 cm (4 in.)** above the level in the open side. If the level in the engine side is the same as the open side (no vacuum), or the level in the engine side is lower than the level in the open side (pressure), check for the conditions in the table below.

4. Close the pinch clamp **before** stopping the engine.

To perform the test with the vacuum/pressure gauge:

1. Insert the stopper as in Step 1.

2. Insert the barbed gauge fitting into the hole in the stopper. Be sure the gauge needle is at "0."

3. Run the engine, as in Step 2, and observe the gauge reading. Needle movement to the left of "0" is a vacuum, and movement to the right indicates a pressure. A minimum of 10.2 cm (4 in.) of vacuum should be present.

Compression Test

These engines are equipped with an automatic compression release (ACR) mechanism. Because of the ACR mechanism, it is difficult to obtain an accurate compression reading. As an alternate, use the leakdown test described on Page 3.4.

Incorrect Vacuum in Crankcase

Possible Cause	Solution
1. Crankcase breather clogged or inoperative.	1. Disassemble breather, clean parts thoroughly, reassemble, and recheck pressure.
2. Seals and/or gaskets leaking. Loose or improperly torqued fasteners.	2. Replace all worn or damaged seals and gaskets. Make sure all fasteners are tightened securely. Use appropriate torque values and sequences when necessary.
3. Piston blowby or leaky valves. Confirm with cylinder leakdown test.	3. Recondition piston, rings, cylinder bore, valves, and valve guides.
4. Restricted exhaust.	4. Repair or replace restricted muffler/exhaust system.

4. Remove the throttle-plate screw, the throttle plate, and slide out the throttle shaft, noting throttle lever position. See Figures 5-10 and 5-12.

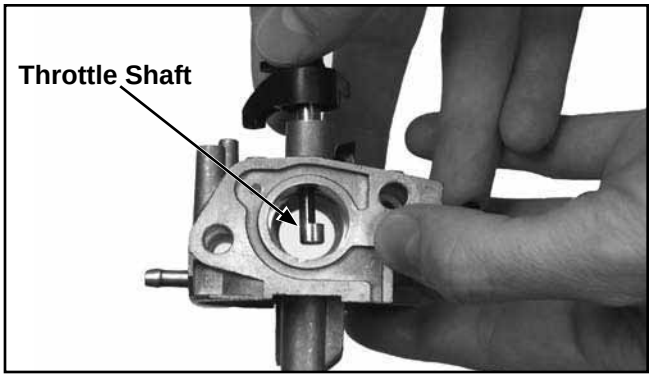

Figure 5-10. Throttle Shaft Removal.

NOTE: Throttle shaft wear is normally accompanied by corresponding wear to the carburetor body, making repair impractical. Replace the entire carburetor if the throttle shaft is worn.

5. To ensure accurate reassembly, mark the choke plate and the carburetor body with a waterproof pen. See Figure 5-11.

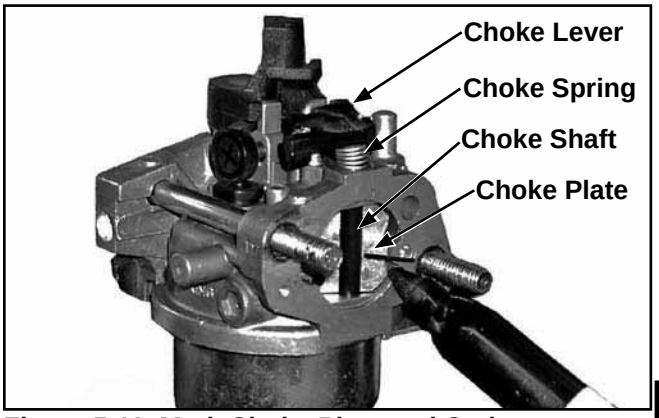

Figure 5-11. Mark Choke Plate and Carburetor.

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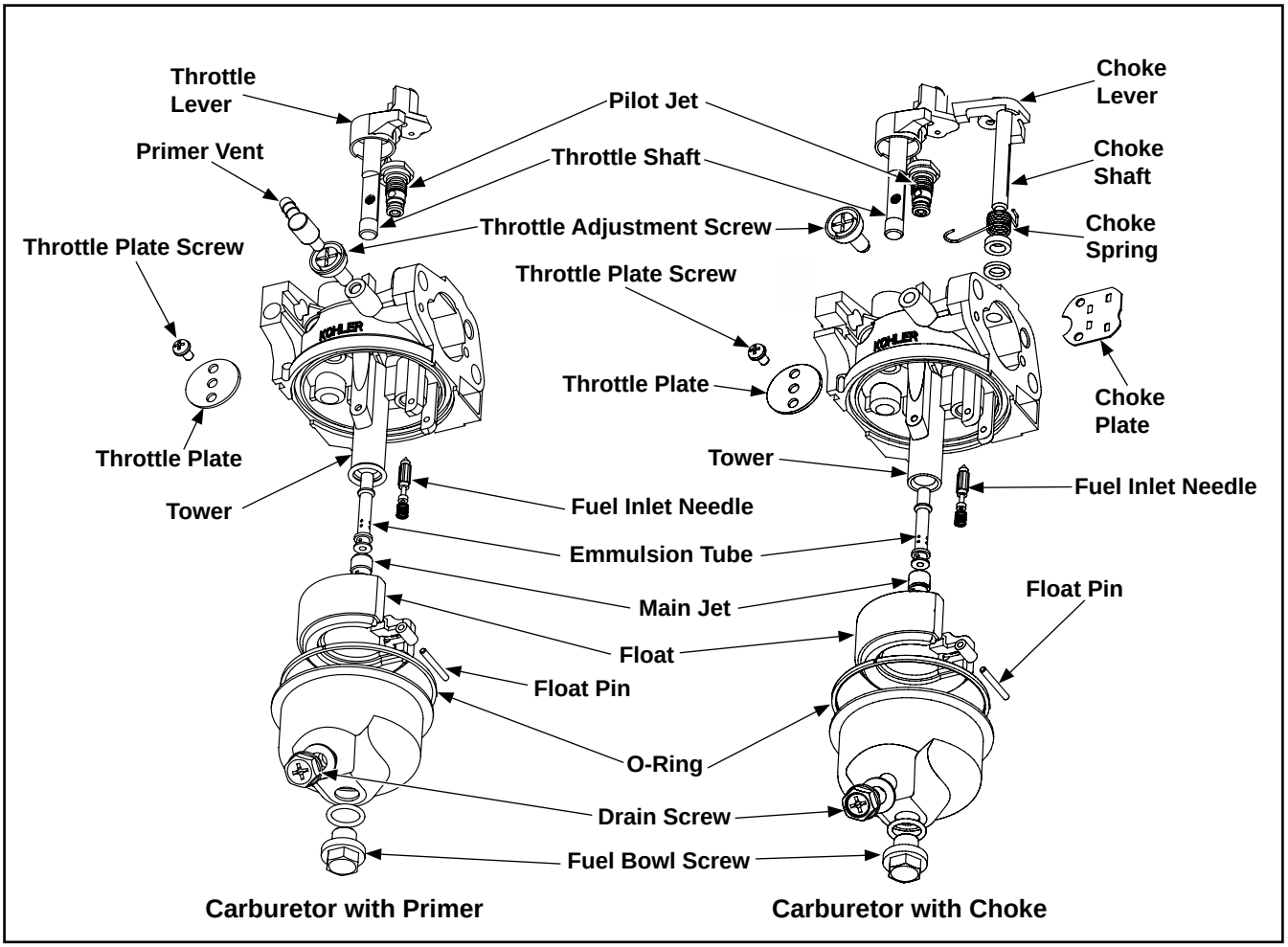

Figure 5-12. Carburetor (Exploded View).

Section 7
Electrical System and Components

This section covers the operation, service, and repair of the electrical system and electrical system components.

WARNING: Electrical Shock

Never touch electrical wires or components while the engine is running. They can be sources of electrical shock.

Spark Plug

Engine misfire or starting problems are often caused by a spark plug that is in poor condition or has an improper gap setting.

The engine is equipped with the following spark plug:

Type:	Champion® RC12YC
Gap:	0.762 mm (0.030 in.)
Thread Size:	14 mm (0.551 in.)
Reach:	19.1 mm (3/4 in.)
Hex Size:	15.9 mm (5/8 in.)

Spark Plug Service

Yearly or every 100 hours of operation, remove the spark plug, check its condition, and reset the gap or replace with a new plug as necessary.

1. Before removing the spark plug, clean the area around the base of the plug to keep dirt and debris out of the engine.

2. Remove the plug and check its condition. Replace the plug if worn or reuse is questionable.

NOTE: Do not clean the spark plug in a machine using abrasive grit. Some grit could remain on the spark plug and enter the engine causing extensive wear and damage.

3. Check spark plug gap using a feeler gauge. See Figure 7-1. Adjust the gap by carefully bending the ground electrode. Gap the spark plug to **0.762 mm (0.030 in.).**

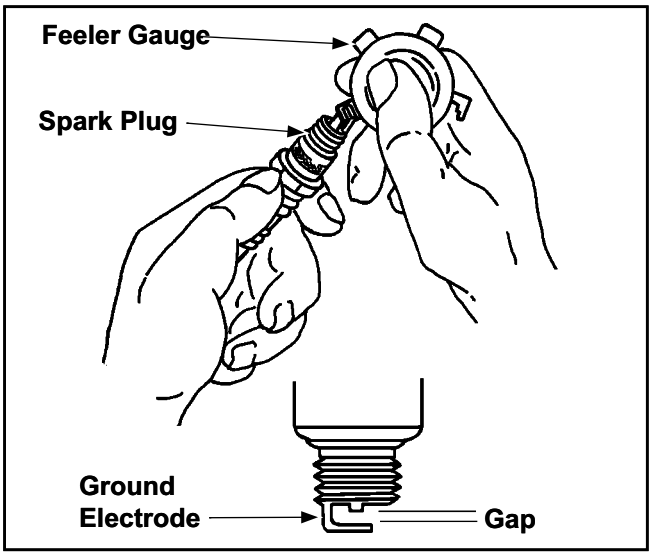

Figure 7-1. Spark Plug Gap.

4. Reinstall the spark plug into the cylinder head. Torque the plug to **24.5 N·m (217 in. lb.)**.

Inspection

Inspect the spark plug as soon as it is removed from the cylinder head. The deposits on the tip are an indication of the general condition of the piston rings, valves, and carburetor.

Several examples of normal and fouled plugs are shown in the photos on the following page.

Remove Carburetor Assembly

NOTE: Ensure the fuel tank is empty by running the engine until it stops, and is completely out of fuel.

Remove Choke-less Carburetor

1. Squeeze the hose clamp and slide it and the fuel hose off the carburetor. See Figure 8-13.

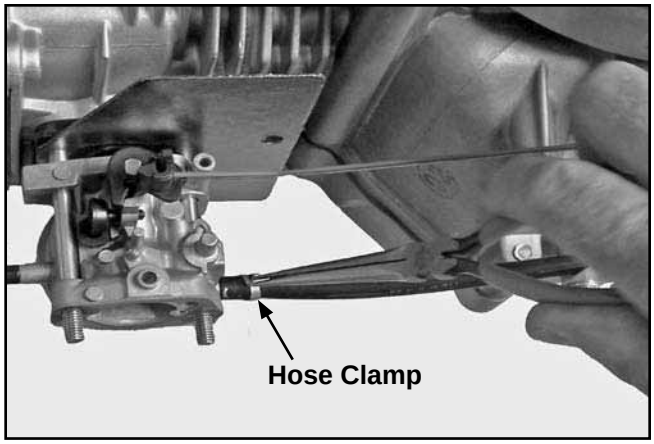

Figure 8-13. Disconnecting Fuel Line.

2. Slide carburetor to the end of the intake studs. See Figure 8-14.

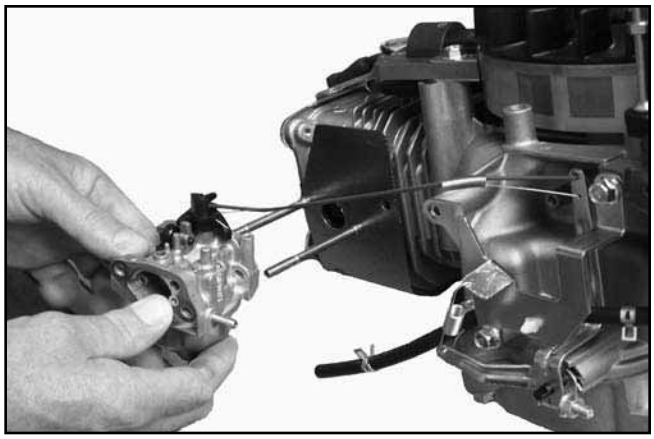

Figure 8-14. Removing Carburetor.

3. Turn the throttle lever clockwise until it stops. Gently push the rod and spring linkages up to disconnect them from the throttle lever. See Figure 8-15.

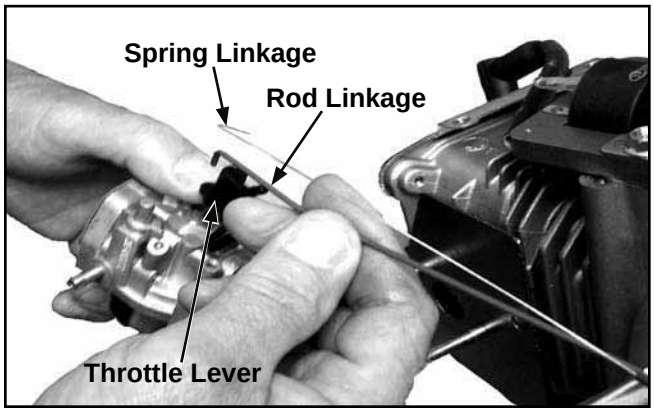

Figure 8-15. Disconnecting Carburetor Linkage.

4. Slide off the carburetor's heat shield, head spacer, and spacer gasket, noting the sequence. See Figure 8-16.

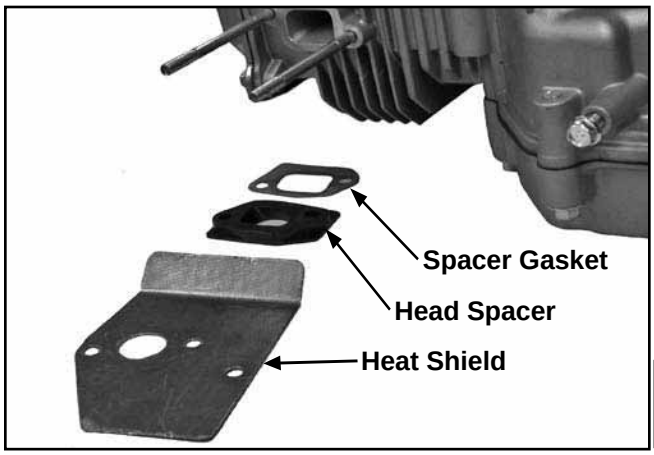

Figure 8-16. Carburetor Gasket Sequence.

Remove Carburetor with Choke

1. Squeeze the hose clamp and slide it and the fuel hose off the carburetor. See Figure 8-17.

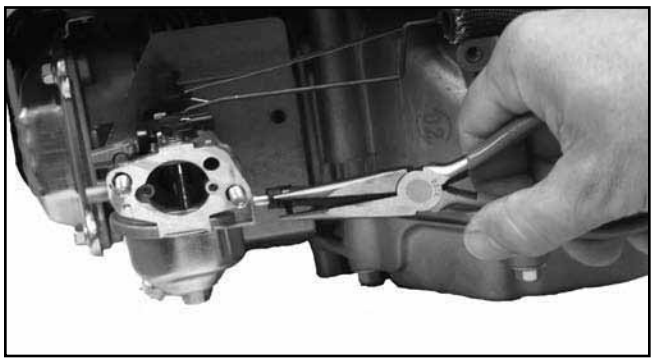

Figure 8-17. Disconnecting Fuel Line.

Section 9
Inspection and Reconditioning

This section covers the operation, inspection, and repair/reconditioning of major internal engine components. The following components are not covered in this section. They are covered in sections of their own:

Air Cleaner, Section 4
Carburetor and Governor, Section 5
Ignition, Section 7

Clean all parts thoroughly. Only clean parts can be accurately inspected and gauged for wear or damage. There are many commercially available cleaners that will quickly remove grease, oil, and grime from engine parts. When such a cleaner is used, follow the manufacturer's instructions and safety precautions carefully. Use gasket remover to remove old material from the valve cover, cylinder head, crankcase, and oil pan. Do not scrape the gasket surfaces, as this could cause damage resulting in leaks.

Make sure all traces of cleaning solvents are removed before the engine is reassembled and placed into operation. Even small amounts of these cleaners can quickly break down the lubricating properties of engine oil.

Crankcase

Inspection and Service

Check all gasket surfaces to make sure they are free of gasket fragments and deep scratches or nicks.

Check the cylinder wall for scoring. In severe cases, unburned fuel can dissolve lubricating oil off the piston and cylinder wall. Without lubrication, the piston rings would make metal to metal contact with the wall, causing scuffing and scoring. Scoring of the cylinder wall can also be caused by localized hot spots from blocked cooling fins or from inadequate or contaminated lubrication.

Flywheel

Inspection

Inspect the flywheel for cracks and check the keyway for wear or damage. Replace the flywheel if cracked. If the flywheel key is sheared or the keyway is damaged, replace the crankshaft, flywheel, and key.

Inspect the ring gear for cracks or damage. Ring gears are not available separately. Replace the flywheel if the ring gear is damaged.

Cylinder Head and Valves

Inspection and Service

Carefully inspect the valve mechanism parts. Inspect the valve springs and related hardware for excessive wear or distortion. Check the valves and valve seats for evidence of deep pitting, cracks, or distortion. The following diagram outlines valve running clearances between the valve stems and guides.

Install Cylinder Head Assembly

Prior to assembly, lubricate all the components with engine oil, including the tips of the valve stems and valve guides.

Install Valve Assembly

1. Install the INTAKE and the EXHAUST valves into their respective positions in the cylinder head. See Figure 10-15.

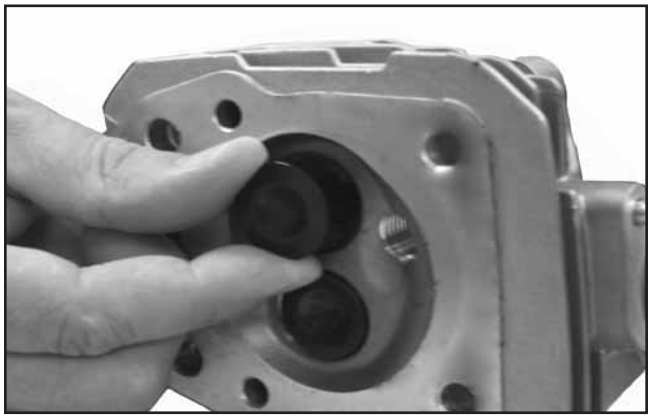

Figure 10-15. Installing Valves.

2. Install the intake valve seal onto the intake valve. Next, slide the valve springs onto both valves and lock them in place with the valve spring keepers. See Figure 10-16.

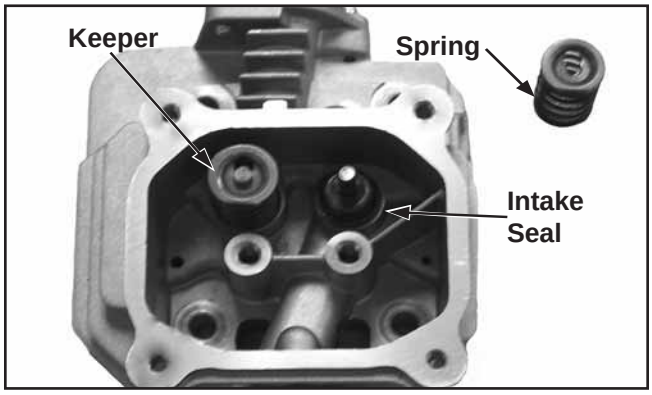

Figure 10-16. Installing Valve Assembly.

Install Cylinder Head

NOTE: **Do not** reuse cylinder head screws or gasket. Always replace with new parts.

1. Examine the sealing surfaces of the cylinder head and crankcase for nicks or burrs.

2. Using the two cylinder head dowels as a guide, install a new head gasket. See Figure 10-17.

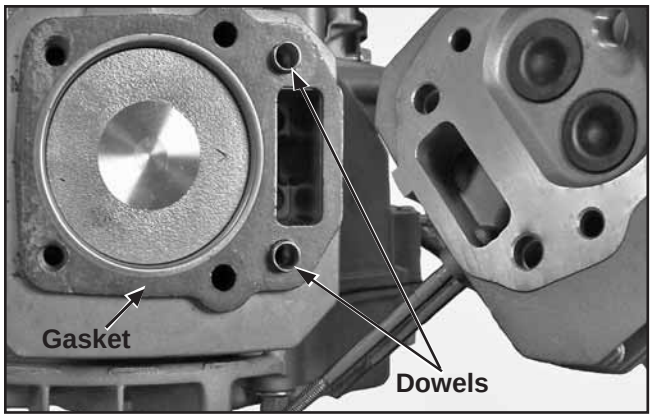

Figure 10-17. Installing Cylinder Dowels.

3. Match the two sides of the head together and finger tighten the four hex screws. See Figure 10-18.

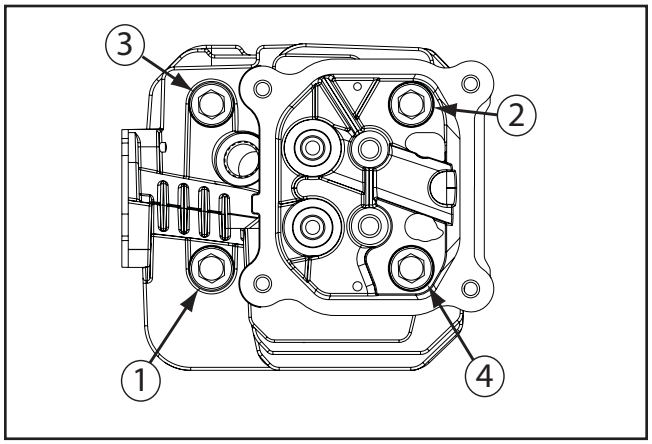

Figure 10-18. Torquing the Screws.

4. Follow the torque sequence in Figure 10-18 and torque the head screws to **27.8 N·m (246 in. lb.).**