EXHAUST VALVE CLEARANCE ADJUSTMENT

The correct exhaust valve clearance at normal engine operating temperature is important for smooth, efficient operation of the engine.

Insufficient valve clearance can result in loss of compression, misfiring cylinders and, eventually, burned valve seats and valve seat inserts. Excessive valve clearance will result in noisy operation, increased valve face wear and valve lock damage.

Whenever the cylinder head is overhauled, the exhaust valves are reconditioned or replaced, or the valve operating mechanism is replaced or disturbed in any way, the valve clearance must be adjusted to the cold setting to allow for normal expansion of the engine parts during the engine warm-up period. This will ensure a valve setting that is close enough to the specified clearance to prevent damage to the valves when the engine is started.

The exhaust valve bridges must be adjusted and the adjustment screws locked securely at the time the cylinder head is installed on the engine. The necessary adjustment procedure is outlined in Section 1.2.2.

The exhaust valve bridge balance should be checked when a general valve adjustment is performed. After the bridges are balanced, adjust the valve clearance at the push rod only.

Do not disturb the exhaust valve bridge adjusting screw.

All of the exhaust valves may be adjusted in firing order sequence during one full revolution of the crankshaft. Refer to the General Specifications at the front of the manual for the engine firing order.

Valve Clearance Adjustment (Cold Engine)

1. If not done previously, clean the loose dirt from the exterior of the engine and remove the valve rocker covers. Discard the gaskets. Then, cover any drain cavities in the cylinder head to prevent foreign material from entering.

2. Place the governor speed control lever in the idle speed position. If a stop lever is provided, secure it in the stop position.

3. Rotate the crankshaft, with engine barring tool J 22582 or with the starting motor, until the injector follower is fully depressed on the particular cylinder to be adjusted. If a wrench or barring tool is used on the crankshaft bolt at the front of the engine, do not turn the crankshaft in a left-hand direction of rotation because the bolt may be loosened.

4. Loosen the exhaust valve rocker arm push rod locknut.

5. Place a .016" feeler gage (J 9708-01) between the valve bridge and the valve rocker arm pallet (Fig. 1). Adjust the push rod to obtain a smooth “pull” on the feeler gage.

6. Remove the feeler gage. Hold the push rod with a 5/16" wrench and tighten the locknut with a 1/2" wrench.

7. Recheck the clearance. At this time, if the adjustment is correct, the .015" gage will pass freely between the valve bridge and the rocker arm pallet, but the .017" gage will not pass through. Readjust the push rod, if necessary.

8. Adjust and check the remaining exhaust valves in the same manner as above.

Valve Clearance Adjustment (Hot Engine)

It is not necessary to make a final hot engine exhaust valve clearance adjustment after a cold engine adjustment has been performed. However, if a hot engine adjustment is desired, use the following procedure.

Maintaining normal engine operating temperature is particularly important when making the hot engine exhaust valve clearance adjustment. If the engine is allowed to cool off before setting any of the valves, the clearance, when running at full load, may become insufficient.
NOTICE: Since these adjustments are normally made while the engine is stopped, it may be necessary to run the engine between adjustments to maintain normal operating temperature.

1. With the engine at normal operating temperature (refer to Section 13.2), set the exhaust valve clearance with feeler gage J 9708-01. At this time, if the valve clearance is correct, the .013" gage will pass freely between the valve bridge and the valve rocker arm pallet, but the .015" feeler gage will not pass through. Readjust the push rod, if necessary.

2. After the exhaust valve clearance has been adjusted, check the fuel injector timing (Section 14.2).

Check Exhaust Valve Clearance Adjustment

1. With the engine at 100°F (38°C) or less, check the valve clearance.

2. If a .016" feeler gage ± .004" will pass between the valve bridge and the valve rocker arm pallet, the valve clearance is satisfactory. If necessary, adjust the push rod.
FUEL INJECTOR TIMING

To time an injector properly, the injector follower must be adjusted to a definite height in relation to the injector body.

All of the injectors can be timed in firing order sequence during one full revolution of the crankshaft. Refer to General Specifications in the General Information Section at the front of the manual for the engine firing order.

CAUTION: To reduce the risk of personal injury when barring over or "bumping" the starter while performing an engine tune-up, personnel should keep their hands and clothing away from the engine as there is a remote possibility the engine could start.

3. Place the small end of the injector timing gage (refer to Table 1 or Section 14 for the correct timing gage) in the hole provided in the top of the injector body with the flat of the gage toward the injector follower (Fig. 1).

![Fig. 1 - Timing Fuel Injector](image)

Time Fuel Injector

After the exhaust valve clearance has been adjusted (Section 14.1), time the fuel injectors as follows:

1. Place the governor speed control lever in the idle speed position. If a stop lever is provided, secure it in the stop position.

2. Rotate the crankshaft, with the starting motor or with engine barring tool J 22582, until the exhaust valves are fully depressed on the particular cylinder to be timed. If a wrench is used on the crankshaft bolt at the front of the engine, do not turn the crankshaft in a left-hand direction of rotation because the bolt could be loosened.

<table>
<thead>
<tr>
<th>Injector</th>
<th>Timing Dimension</th>
<th>Timing Gage</th>
<th>Camshaft Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>9270</td>
<td>1.460&quot;</td>
<td>J 1853</td>
<td>Standard</td>
</tr>
<tr>
<td>9275*</td>
<td>1.460&quot;</td>
<td>J 1853</td>
<td>Standard</td>
</tr>
<tr>
<td>9280*</td>
<td>1.460&quot;</td>
<td>J 1853</td>
<td>Standard</td>
</tr>
<tr>
<td>9285*</td>
<td>1.460&quot;</td>
<td>J 1853</td>
<td>Standard</td>
</tr>
<tr>
<td>9290*</td>
<td>1.460&quot;</td>
<td>J 1853</td>
<td>Standard</td>
</tr>
<tr>
<td>9295#</td>
<td>1.484&quot;</td>
<td>J 1242</td>
<td>Standard</td>
</tr>
<tr>
<td>9200†</td>
<td>1.484&quot;</td>
<td>J 1242</td>
<td>Standard</td>
</tr>
<tr>
<td>9215</td>
<td>1.484&quot;</td>
<td>J 1242</td>
<td>Standard</td>
</tr>
<tr>
<td>M15@</td>
<td>1.460&quot;</td>
<td>J 1853</td>
<td>Standard</td>
</tr>
<tr>
<td>M15**</td>
<td>1.470&quot;</td>
<td>J 24236</td>
<td>Standard</td>
</tr>
</tbody>
</table>

* Turbocharged engines use 1.484" timing (gage J1242).
† 16V 92T (1800 rpm generator set – 860 bhp).
# Generator set only.
* For automotive applications, refer to Section 14.
© Marine pleasure craft and all purpose industrial (non-FF).
Exceptions: Models 8063-7400, 8083-7400 use 1.470".
** All purpose industrial (FP).

TABLE 1 – INJECTOR TIMING

4. Loosen the injector rocker arm push rod locknut.

5. Turn the push rod and adjust the injector rocker arm until the extended part of the gage will just pass over the top of the injector follower.

6. Hold the push rod and tighten the locknut. Check the adjustment and, if necessary, readjust the push rod.

7. Time the remaining injectors in the same manner as outlined above.

8. If no further engine tune-up is required, reinstall the valve rocker covers, using new gaskets.