ENGINE SYNCHRONIZATION AND ADJUSTMENTS

PURPOSE

Reliable troubleshooting cannot be done if linkages and settings are out of adjustment in the first place. Start with this basic inspection and adjustment procedure to make sure the troubleshooting is starting where it should, and you are not being misled by other unrelated troubles.

INSPECTION

General - Are there any loose screws or missing parts?

Lubrication - Does the motor look as if lubrication has been neglected?

Fuel Supply - Is it clean, fresh, and the correct mixture?

ADJUSTMENTS

Follow this sequence of steps for basic engine set-up.

1. Set timing pointer.

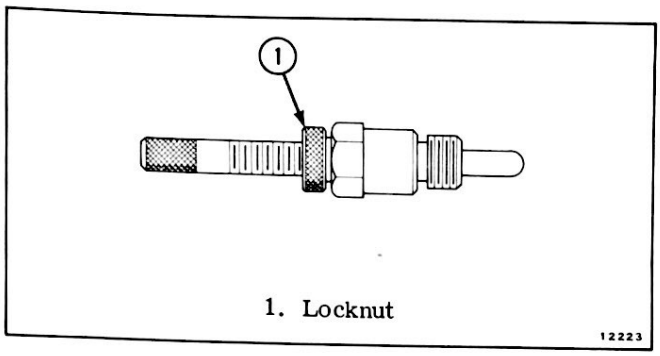
a. Disconnect spark plug leads and remove spark plugs.

1. Timing pointer
2. Screw

63521

Figure 2-7. TDC Alignment

b. Turn flywheel clockwise until the No. 1 cylinder TDC mark is about 1-1/2" past the pointer.



1. Locknut

12223

Figure 2-8. Piston Stop #384887

c. Install Piston Stop #384887 in No. 1 cylinder, and bring the stop against the piston. Tighten the locknut. See Figure 2-8.

d. Hold the piston firmly against the Piston Stop, and mark the rim of the flywheel directly under the pointer.

e. Rotate flywheel clockwise until the piston again contacts the tool. Mark flywheel rim directly under the pointer. Remove Piston Stop.

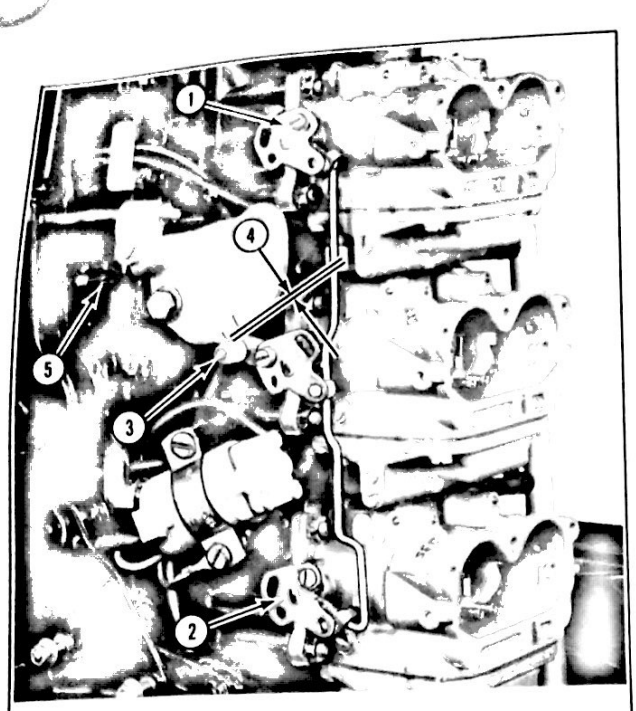
f. Using a scale, measure the mid-point between the two lines. Mark the mid-point line on the rim of the flywheel. If the mid-point line and the cast-in TDC mark on the flywheel are in agreement, the timing pointer alignment is correct. If not, proceed to Step g.

g. Turn the flywheel to align the mid-point mark with pointer (hold flywheel in this position). Loosen pointer adjustment screw, and move pointer to align with cast-in TDC mark on flywheel. See Figure 2-7. Tighten adjustment screw.

2. Adjust throttle cable.

The throttle cable must be adjusted just tight enough to insure that the engine throttle lever returns to its idle stop. If this cable is too loose, the engine idle speed will be high and inconsistant, causing difficulty shifting out of gear. If it is too tight, the control will feel stiff through the shifting range, and the warm-up lever will tend to move up when shifting to neutral.

a. Move remote control lever back slowly so that idle stop screw is against its stop. See Figure 2-9.

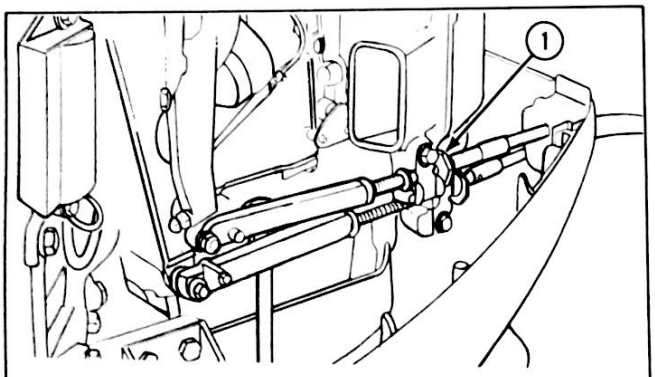


1. Upper carburetor lever adjustment screw
2. Lower carburetor lever adjustment screw
3. Cam follower
4. Space between roller and cam
5. Idle stop screw

803129

Figure 2-9. Throttle

b. If idle stop screw will not go against the stop, turn throttle trunnion adjusting nut until the stop screw contacts with light pressure. See Figure 2-10.



1. Trunnion adjustment nut

93295

Figure 2-10. Throttle Cable Adjustment

3. Synchronize throttle valves.

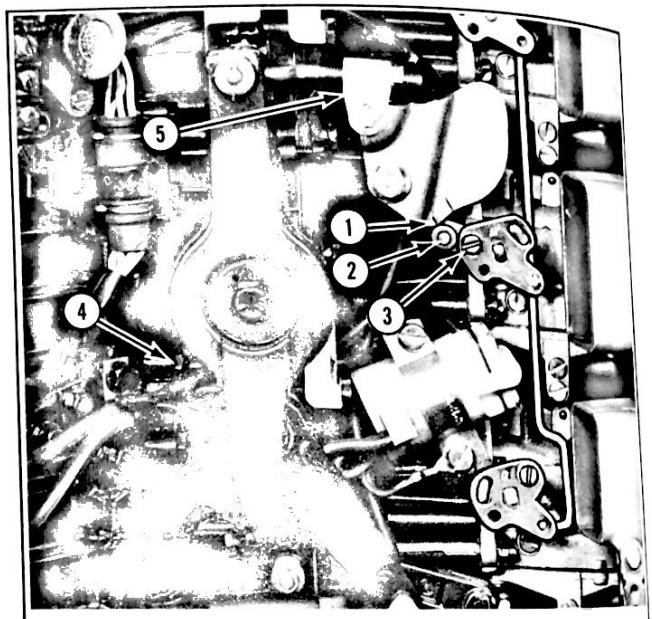
a. Remove air silencer cover to observe throttle valve action.

b. Retard throttle lever until throttle cam follower roller does not touch cam. See Figure 2-9. Loosen upper and lower carburetor lever adjusting screws to allow return springs on throttle shafts to close throttle valves. Rotate throttle shafts manually to make sure valves are closed. Press lightly on tab on adjusting link to remove backlash. Tighten screw. Move cam follower, and check that all throttles start to rotate at the same time.

4. Adjust throttle pickup point.

a. Bottom mark on throttle cam should align with contact point of cam follower roller as roller makes contact with cam. See Figure 2-11.

b. Align bottom mark on throttle cam with contact point of cam follower roller. Loosen carburetor cam follower screw. Rotate throttle shafts to close throttle valves. Press the roller against throttle cam and retighten screw.



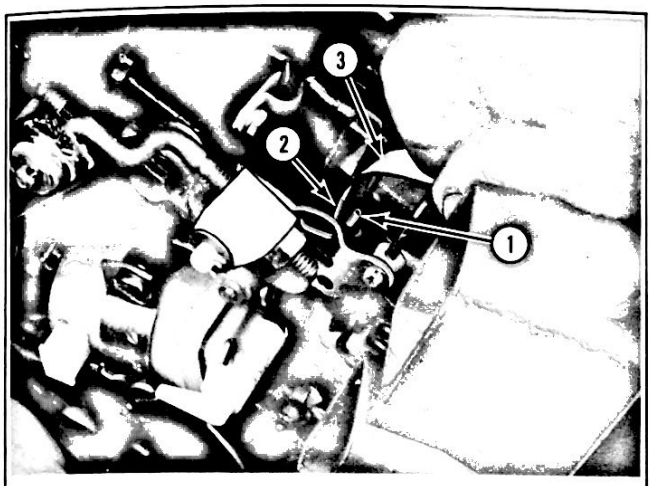
1. Lower mark
2. Roller
3. Cam follower screw
4. Full throttle adjustment screw
5. Throttle cam yoke

Figure 2-11. Throttle Cam and Follower Alignment

5. Adjust wide open throttle setting.

a. Open throttle to wide open position (center carbu tor throttle shaft roll pin against its stop). ADJU **WIDE OPEN THROTTLE STOP SCREW THAT THROTTLE VALVES ARE FULL OP WITHOUT STRAIN ON THROTTLE SHAFT.** Figure 2-12.

b. Adjust full throttle adjustment screw to prevent strain on throttle shaft. See Figure 2-11. A strip of thin 0.003" (0.08 mm) paper between the roll pin and stop should pull out with just a slight drag.



1. Roll pin
2. Stop
3. 0.003" (0.08 mm) paper

Figure 2-12. Wide Open Throttle Stop Adjustment

6. Synchronize throttle and timer linkage.

a. Connect a timing light to No. 1 cylinder.

b. Start motor and advance control box warm-up lever to show 6°-8° advance timing. See Figure 2-13.

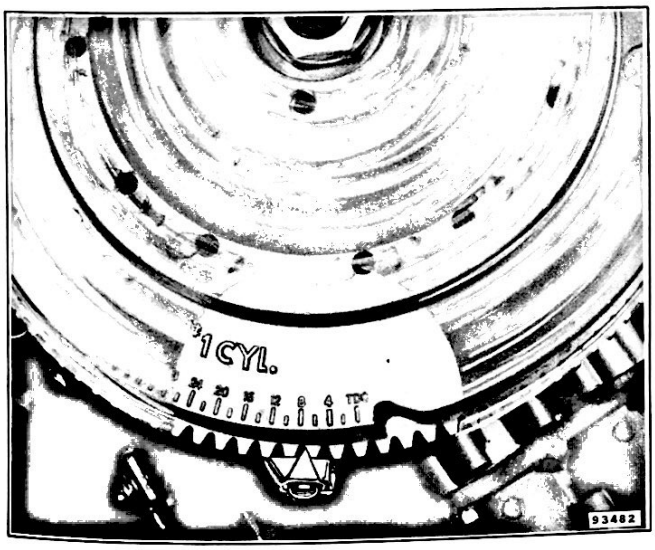


Figure 2-13. 6° - 8° Advance Timing

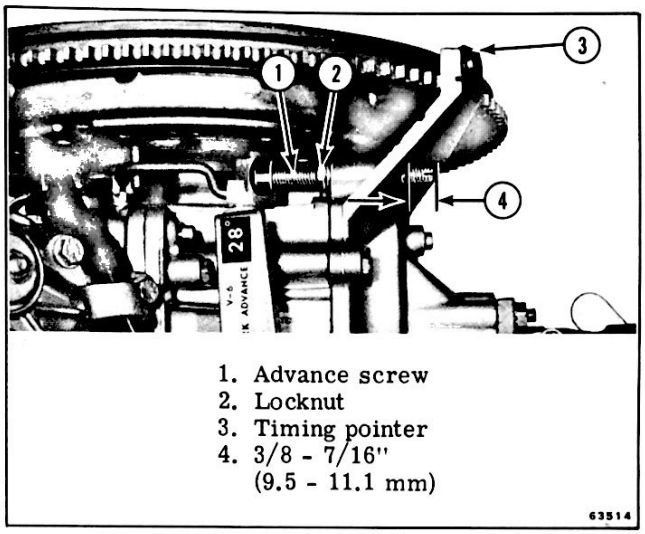
c. Stop motor and adjust throttle cam yoke to align pickup point on throttle cam with contact point of throttle cam roller. See Figure 2-11.

d. Start motor and recheck.

7. Adjust maximum spark advance.

NOTE

The engine must be run with a test wheel or propeller for this test. Do not use a flushing device.



1. Advance screw
2. Locknut
3. Timing pointer
4. 3/8 - 7/16" (9.5 - 11.1 mm)

Figure 2-14. Spark Advance Stop Screw

a. Make initial adjustment of full advance stop screw. See Figure 2-14. This is just an initial starting dimension.

b. With the timing light connected to No. 1 spark plug lead, start the engine and set engine speed to 4300 to 4600 rpm (in gear). Observe the degrees of advance indicated by the timing pointer (timing grid #1 cylinder). Stop engine, and connect timing light to #2 spark plug lead. Start and run engine at 4300 to 4600 rpm in gear. Observe the degrees of advance indicated by the timing pointer (timing grid #2 cylinder). Stop motor. Select the cylinder with the highest indicated degrees of advance and adjust full advance screw so the higher reading cylinder indicates the correct advance as shown below. See Figure 2-15. Move advance stop adjustment screw to obtain proper setting. One turn clockwise retards timing about 1°. One turn counterclockwise advances timing about 1°.

Maximum spark advance

150 & 175 hp - 28°
200 hp - 26°
235 hp - 24°

During break-in set all engines at 24°.

Figure 2-15. Motor Running at 28° Advance Timing B.T.D.C. (175 hp Shown)

8. Adjust idle speed.

a. Idle speed should be 650 rpm in gear and 900 rpm in neutral.

b. Turn idle stop screw to obtain correct idle speed. See Figure 2-9.

WEATHER AND ENGINE PERFORMANCE

The horsepower ratings of all motors are those that would be obtained under ideal conditions. However, weather and altitude will affect the performance of any outboard motor. Some factors that will decrease the output of a motor are:

- Low barometric pressure
- High temperatures
- High humidity
- High altitude

When running an engine on a hot humid summer day the performance of a motor can be decreased noticeably. See Figure 2-16. Sometimes the weather alone can cause the engine rpm to drop below the recommended operating range. In such a case a lower pitch propeller can be used to bring rpm back into the operating range, but in any case, top boat speed will not be as high as on a cool dry day.

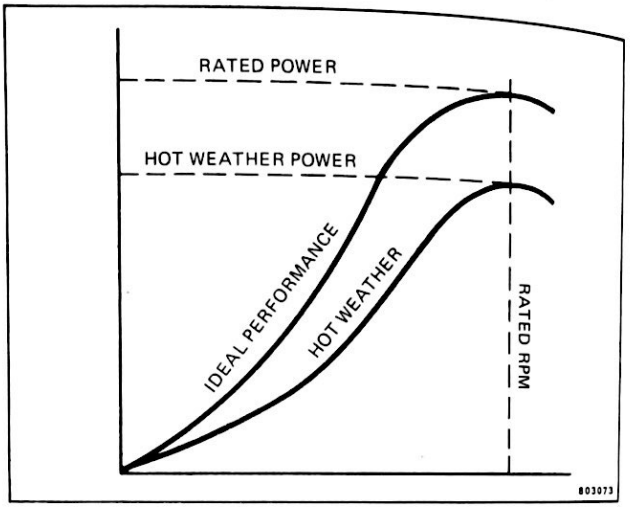


Figure 2-16. Ideal Performance and Hot Weather Performance