



ELECTRICAL

Section 2C - Timing, Synchronizing & Adjusting

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**2
C**

Specifications

CARBURETOR MODELS	Idle RPM – Model 135/200 – Model XR6/MAGIII Wide Open Throttle (WOT) RPM – Model 135/200 – Model XR6/MAGIII Idle Mixture Screw Adjustment (Preset - Turns Out) – Carburetor Model 135 – Carburetor Model 150/200 – All EFI Models Float Adjustment Float Level	650 ± 50 675 ± 50 5000 – 5500 5000 – 5500 1-1/2 ± 1/8 1-1/4 ± 1/8 Not Adjustable Float Even with Bowl Edge w/Bowl Inverted
EFI MODELS	Idle RPM – All Models Wide Open Throttle (WOT) RPM – Model 150XRI/175XRI – Model 200XRI Float Adjustment (Vapor Separator) Float Level	650 ± 50 5000 – 5600 5000 – 5800 Preset @ Factory
IGNITION SYSTEM	Type Spark Plug Type Spark Plug Gap Firing Order	Capacitor Discharge NGK BPZ8HS-10 0.040 in. (1.0 mm) 1-2-3-4-5-6

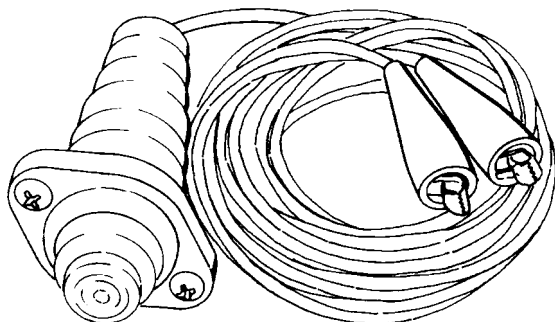


TIMING	Idle Speed/Pickup Timing <ul style="list-style-type: none">– 135 Carb– XR6/MAG III– 200 Carb– 150XRI/175 XRI Models– 200 XRI Model Maximum BTDC <ul style="list-style-type: none">– Model 135<ul style="list-style-type: none">@ Cranking Speed@ WOT RPM– XR6/MAG III/175 XRI<ul style="list-style-type: none">@ Cranking Speed@ WOT RPM– Model 150 XRI<ul style="list-style-type: none">@ Cranking Speed@ WOT RPM– Model 200 Carb<ul style="list-style-type: none">@ Cranking Speed@ WOT RPM– Model 200XRI<ul style="list-style-type: none">@ Cranking Speed@ WOT RPM	<p>0° – 9° ATDC</p> <p>25° BTDC 19° BTDC</p> <p>26° BTDC 20° BTDC</p> <p>22° BTDC 16° BTDC</p> <p>24° BTDC 18° BTDC</p> <p>24° BTDC 18° BTDC</p>
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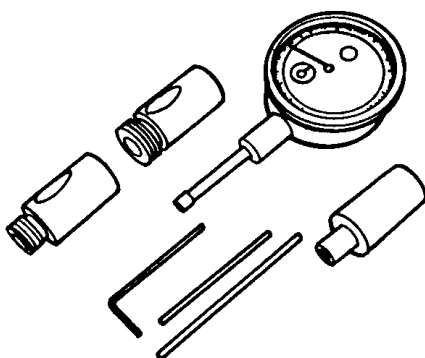


Special Tools

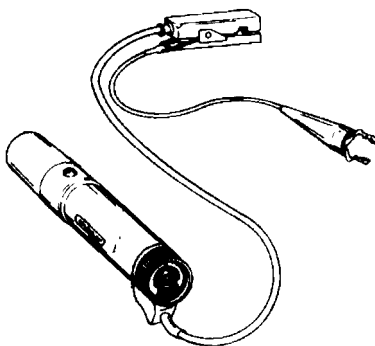
1. Remote Starter Switch 91-52024A1



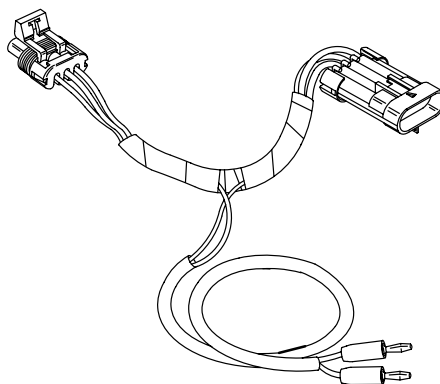
2. Dial Indicator 91-58222A1



3. Timing Light 91-99379



4. Throttle Position Sensor Test Harness (91-859199)



57766



Adjustments

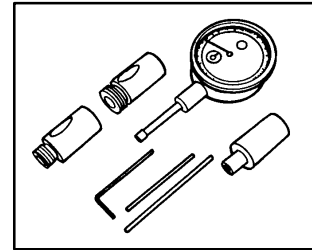
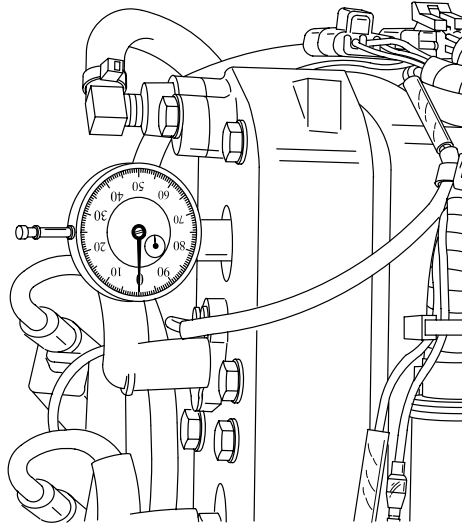
Carburetor Models

TIMING POINTER ADJUSTMENT

⚠ WARNING

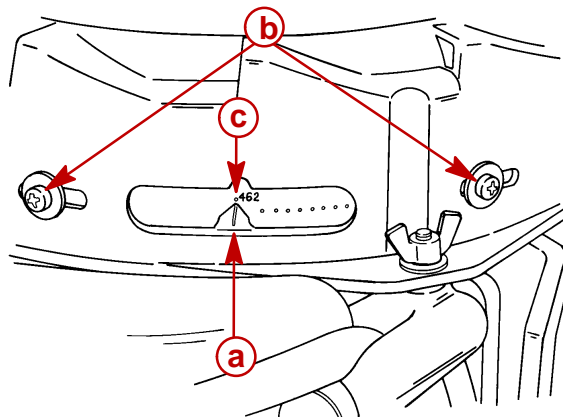
Engine could start when turning flywheel to check timing pointer adjustment. Remove all spark plugs from engine to prevent engine from starting.

1. Remove all spark plugs and install Dial Indicator (91-58222A1) into No. 1 cylinder (top cylinder, starboard bank).



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2. Turn flywheel in a clockwise direction until No. 1 piston is at top dead center (TDC). Set dial indicator at "O" (zero) and tighten indicator set screw.
3. Turn flywheel counterclockwise until dial indicator needle is approximately 1/4-turn beyond 0.462 in., then turn flywheel clockwise so that dial indicator reads 0.462 in. (11.7mm) exactly.
4. Reposition timing pointer so that timing pointer is aligned with 0.462 in. mark on timing decal. Retighten pointer attaching screws 20 lb. in. (2.3 Nm)
5. Remove dial indicator from cylinder.

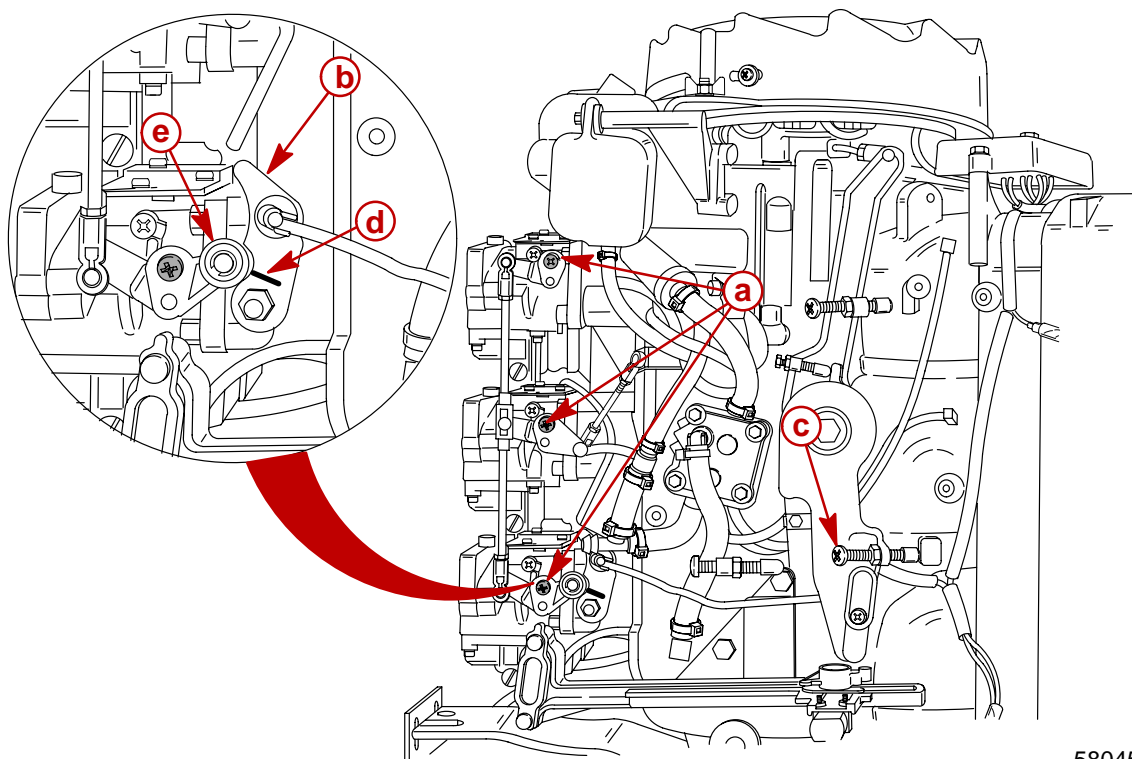


- a** - Timing Pointer
- b** - Attaching Screws
- c** - 0.462 in. Mark



CARBURETOR SYNCHRONIZATION

1. Loosen 3 carburetor synchronization screws (a) to allow shutter plates to close completely.
2. Position throttle lever so that idle stop screw is against idle stop and move roller arm until roller lightly touches throttle cam (b). Adjust idle stop screw (c) on throttle arm to align mark (d) on throttle cam with center of roller. Without moving roller from this position, retighten carburetor synchronization screws.



58045

a - Synchronization
Screws

b - Throttle Cam

c - Idle Stop Screw

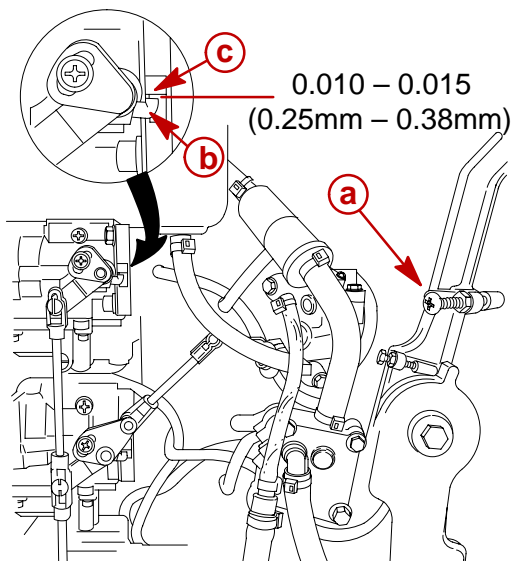
d - Mark

e - Roller

3. Verify throttle shutter plates open and close simultaneously during throttle lever operation. Readjust if necessary.



4. Move throttle lever to wide-open-throttle (W.O.T.) position and adjust full throttle stop screw (a) to allow full throttle shutter opening at W.O.T. Verify that throttle shutters do not act as a throttle stop. Allow 0.010 in. - 0.015 in. (0.25mm - 0.38mm) clearance between throttle shaft arm(b) and stop (c) at W.O.T. Retighten jam nut on adjustment screw.

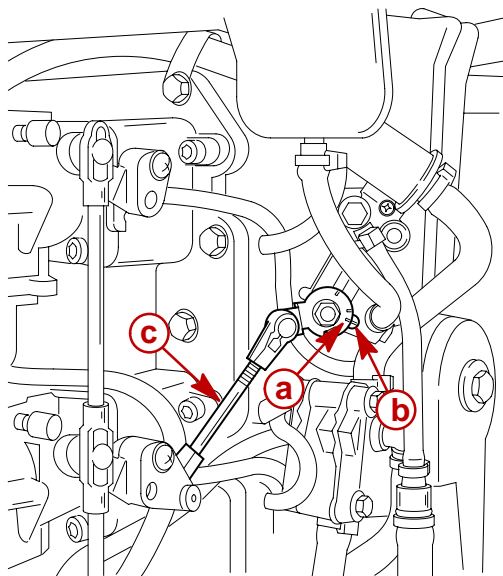


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- a** - Throttle Stop Screw
- b** - Throttle Shaft Arm
- c** - Stop

CARBURETOR/OIL PUMP SYNCHRONIZATION

1. When carburetor linkage is at idle position, alignment mark on oil injection arm should be in-line with mark on casting as shown. If necessary, adjust link rod.



- a** - Alignment Mark
- b** - Casting Mark
- c** - Link Rod



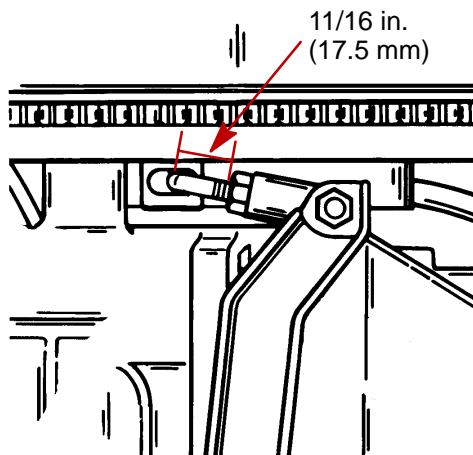
TIMING ADJUSTMENTS

⚠ CAUTION

Engine may be timed while cranking engine with starter motor. To prevent engine from starting when being cranked, all spark plugs must be removed.

1. Insert Spark Gap Tool (91-63998A1) into each spark plug boot and attach alligator clips to good engine ground.
2. Disconnect remote fuel line from engine.
3. Connect remote control electrical harness to engine wiring harness.
4. Remove throttle cable barrel from barrel retainer.

IMPORTANT: If trigger link rod was disassembled verify that 11/16 in. (17.5 mm) length is retained.

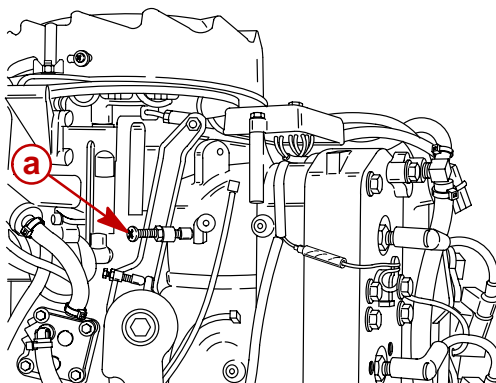
**⚠ WARNING**

While cranking outboard, keep clear of propeller as it may rotate.

IMPORTANT: To time outboard at cranking speed, a fully charged battery must be used.

MAXIMUM TIMING ADJUSTMENT

1. Connect timing light to No 1 spark plug lead (TOP STARBOARD BANK).
2. With engine in neutral, move throttle lever to place maximum spark advance screw against stop. Crank engine with starter motor and adjust maximum spark advance screw to align timing mark (see specifications on page 2C-2) with timing pointer. Ignition timing will retard as engine speed approaches maximum RPM.



a - Maximum Spark Advance Screw

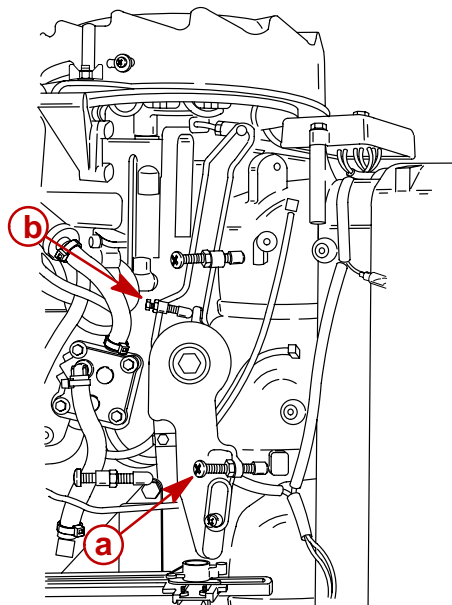
58044



PRIMARY PICKUP TIMING ADJUSTMENT

1. With engine in neutral, hold throttle arm so that idle stop screw (a) is against idle stop. Crank engine with starter motor and adjust throttle primary pickup screw (b) to align specified throttle primary pickup mark on timing decal with timing pointer. Retighten jam nut on adjustment screw.

NOTE: Primary pickup timing also determines engine RPM, refer to "Idle Speed Adjustment" following.



58043

- a** - Idle Stop Screw
b - Primary Pickup Screw

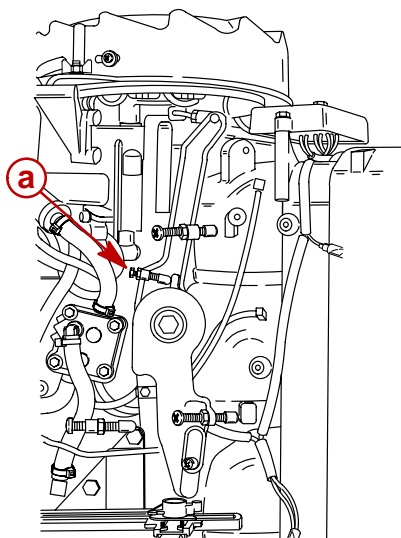
NOTE: All timing adjustments made to outboard under cranking speed conditions should be verified with outboard running and adjustments made if necessary. This is due to advance characteristics of individual ignition systems.

2. Remove timing light from No. 1 spark plug lead.
3. Remove spark gap tools (91-63998A1) from each spark plug boot.
4. Install all spark plugs into cylinder heads. Torque spark plugs to 20 lb. ft. (27 Nm) and attach spark plug leads to spark plugs.



IDLE SPEED ADJUSTMENT

1. With engine in water, connect fuel line to engine. Start engine and allow to warm up.
2. Place outboard in gear and monitor engine RPM. If RPM is above or below recommended RPM (see specifications), readjust primary pickup screw to attain recommended engine speed. Retighten jam nut.



58046

a - Primary Pickup Screw

CAUTION

Engine idle RPM must NEVER EXCEED 750 RPM in gear.

3. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel retainer on cable anchor bracket with a very light preload of throttle lever against idle stop. Lock barrel in place.
4. Check preload on throttle cable by placing a thin piece of paper between idle stop screw and idle stop. Preload is correct when paper can be removed without tearing but has some drag on it. Readjust cable barrel, if necessary.

IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from forward to neutral. (Readjust throttle cable barrel, if necessary.)

NOTE: Carburetors are equipped with idle mixture adjustment screws. See carburetor specifications for mixture screw adjustment.

NOTE: If sufficient throttle cable barrel adjustment is not available, check for correct installation of link rod between the throttle lever and throttle cam. The throttle end of this link rod must be threaded into its plastic barrel until it bottoms against the throttle lever casting, then turned out only far enough to obtain correct orientation of link rod (less than one turn). All timing adjustments must be reset after this procedure.



Adjustments

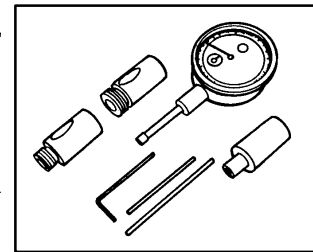
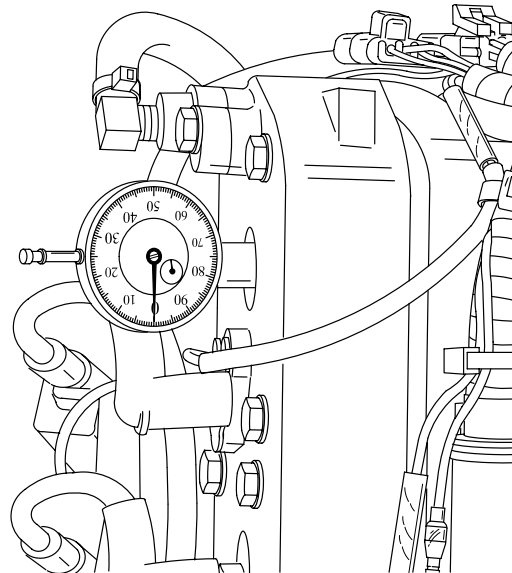
Electronic Fuel Injection Models

TIMING POINTER ADJUSTMENT

⚠ WARNING

Engine could start when turning flywheel to check timing pointer adjustment. Remove all spark plugs from engine to prevent engine from starting.

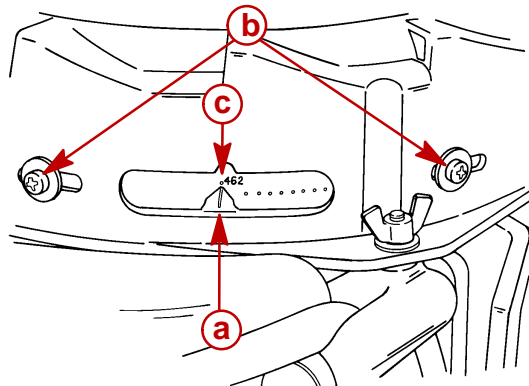
1. Remove all spark plugs and install Dial Indicator (91-58222A1) into No. 1 cylinder (top cylinder, starboard bank)
2. Turn flywheel in a clockwise direction until No. 1 piston is at top dead center (TDC). Set dial indicator at "O" (zero) and tighten indicator set screw.
3. Turn flywheel counterclockwise until dial indicator needle is approximately 1/4 turn beyond 0.462 in., then turn flywheel clockwise so that dial indicator reads 0.462 in. (11.7mm) exactly.



91-58222A1

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4. Reposition timing pointer (if necessary) so that timing pointer is aligned with 0.462 in. mark on timing decal. Retighten pointer attaching screws to 20 lb. in. (2.3 Nm).



- a** - Timing Pointer
- b** - Attaching Screws
- c** - 0.462 in. Mark

5. Remove dial indicator from cylinder.

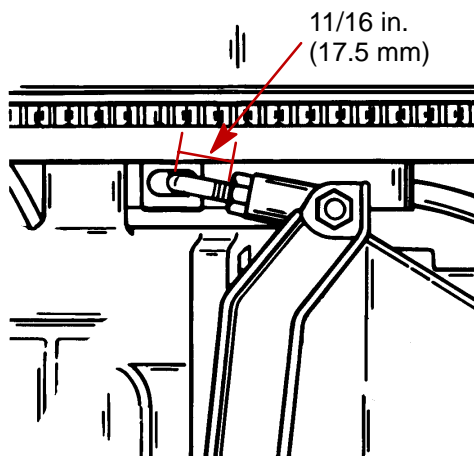


ADJUSTMENTS

⚠ CAUTION

Engine is initially timed while cranking engine with starter motor. To prevent engine from starting when being cranked, all spark plugs must be removed, except No.1 cylinder (top cylinder starboard bank) plug.

IMPORTANT: Control arm link rod must maintain a length of 11/16 in. (17.5 mm). Make any necessary adjustments to link rod before proceeding with timing adjustments.

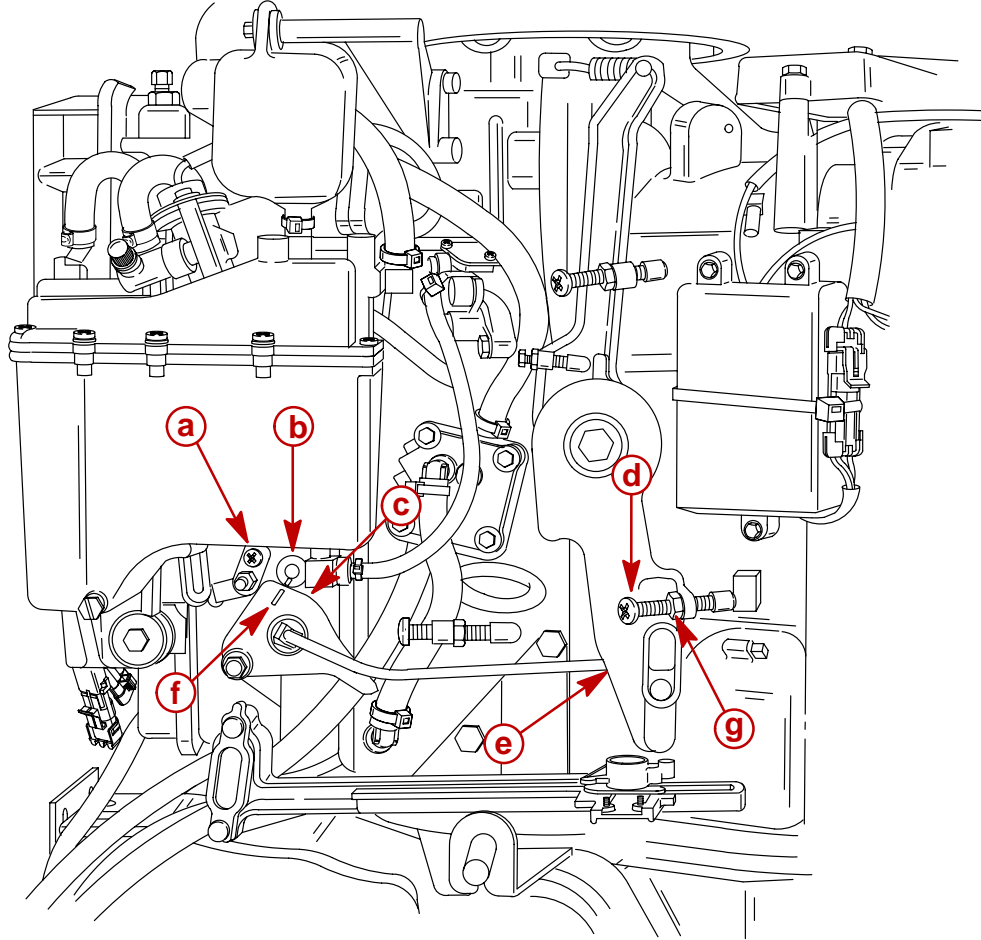


1. Remove all spark plugs except No.1 cylinder (top cylinder starboard bank) plug.
2. Disconnect remote fuel line from engine.
3. Connect remote control electrical harness to engine wiring harness.
4. Remove throttle cable barrel from barrel retainer.



THROTTLE CAM ADJUSTMENT

1. Loosen cam follower screw (a) allowing cam follower to move freely.
2. Allow roller (b) to rest on throttle cam (c). Adjust idle stop screw (d) on throttle arm (e) to align mark (f) on throttle cam (c) with center of roller (b). Tighten jam nut (g).
3. While holding throttle arm against idle stop, tighten cam follower screw (a) with roller lightly touching cam.



58058

a - Cam Follower Screw
b - Roller
c - Throttle Cam
d - Idle Stop Screw

e - Throttle Arm
f - Mark
g - Jam Nut

**STATIC IDLE TIMING ADJUSTMENT (CRANKING ENGINE WITH STARTER)**

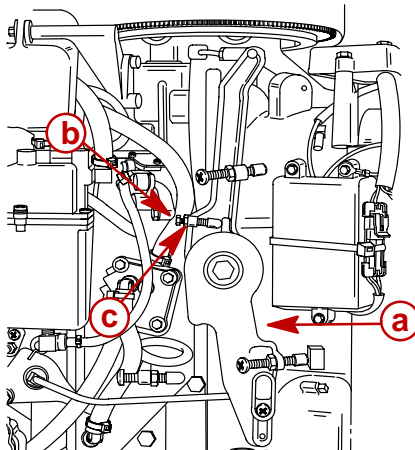
1. Connect timing light to No 1 spark plug lead (TOP STARBOARD BANK).

⚠ WARNING

While cranking engine, keep clear of propeller, as it may rotate.

IMPORTANT: To accurately time engine cranking speed, a fully charged battery must be used.

2. Connect timing light to no.1 cylinder spark plug lead. Crank engine with starter (about 300 RPM) while holding throttle arm (a) against idle stop. Adjust primary pickup adjustment screw (b) to attain appropriate setting. Tighten locknut (c).



58057

a - Throttle Arm

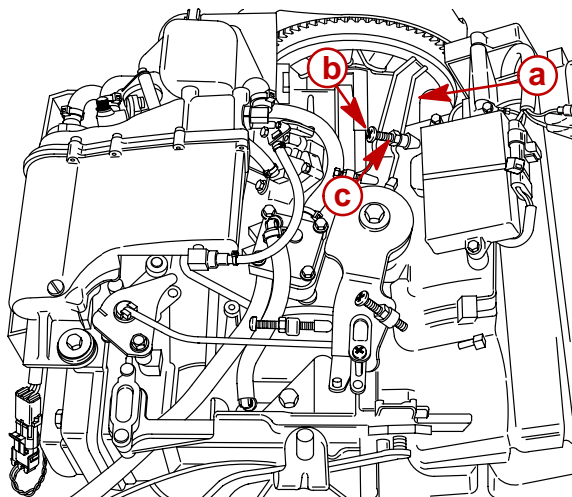
c - Locknut

b - Primary Pickup Screw

STATIC MAXIMUM TIMING ADJUSTMENT (CRANKING ENGINE WITH STARTER)

NOTE: ECM harness remains disconnected for maximum timing adjustment. Timing light remains hooked up to no.1 cylinder.

1. Hold throttle arm (a) so that maximum spark advance screw (b) is against stop. Crank engine with starter. Adjust maximum spark advance screw (b) to set timing to attain appropriate setting. Tighten maximum spark adjustment locknut (c).



58056

a - Throttle Arm

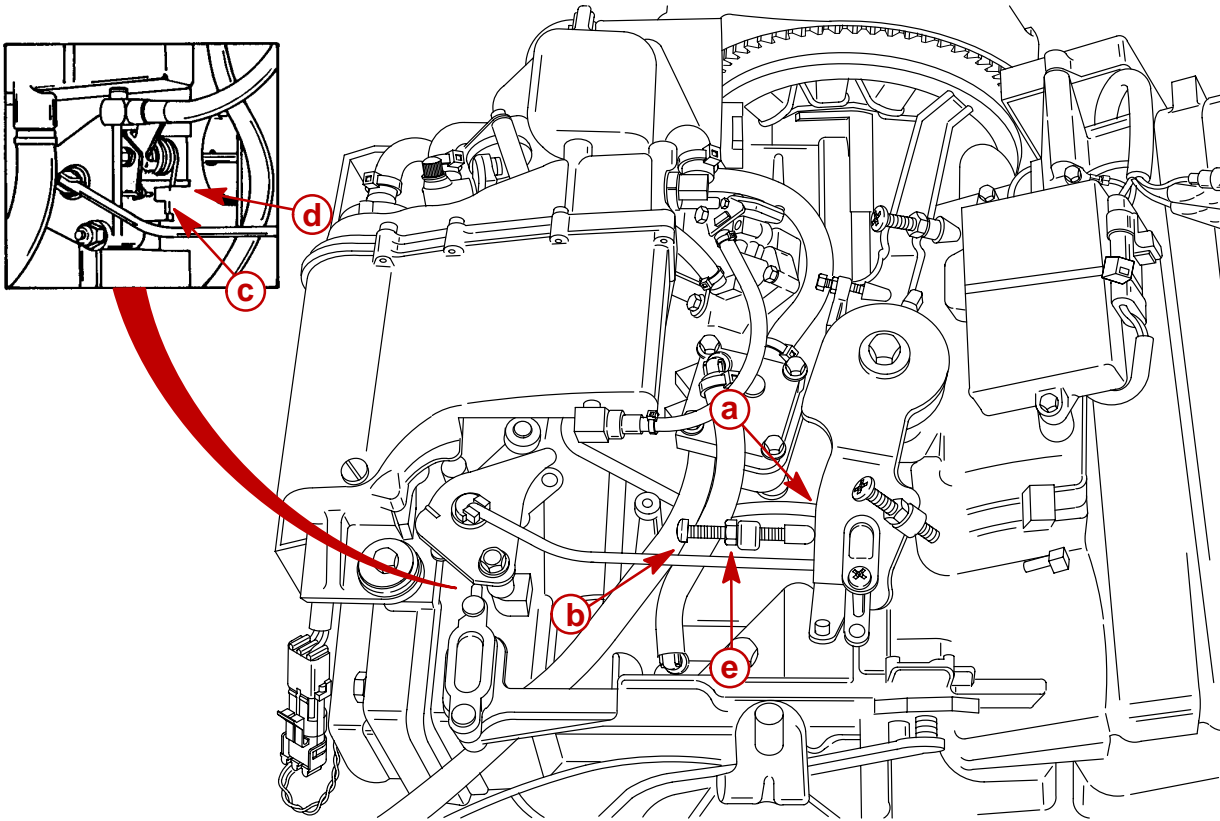
c - Locknut

b - Maximum Spark Advance Screw



MAXIMUM THROTTLE

1. Hold throttle arm (a) against full throttle stop screw (b). Adjust full throttle stop screw to allow full throttle valve opening, while maintaining a clearance between arm (c) of throttle shaft and stop (d) on induction box. Tighten locknut (e).
2. Check for slight free play (roller lifter from cam) between roller and cam at full throttle to prevent linkage from binding. Readjust full throttle stop screw, if necessary.
3. Reconnect ECM harness. Disconnect timing light and install spark plugs and fuel line.



58056

a - Throttle Arm
b - Full Throttle Stop
Screw

c - Throttle Shaft Arm
d - Stop
e - Locknut

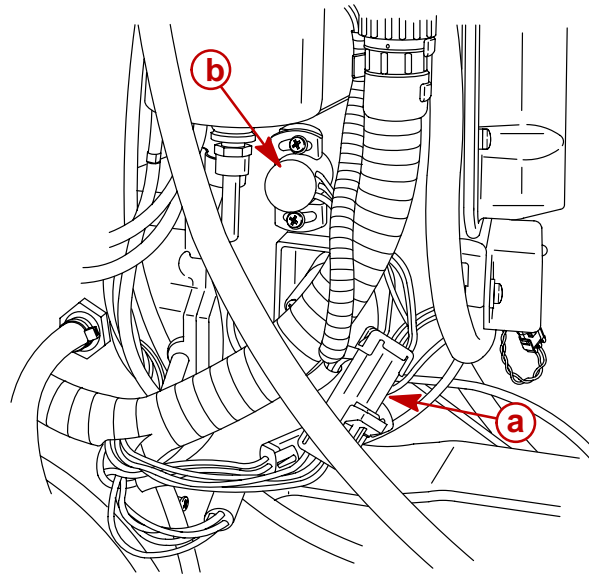


THROTTLE POSITION SENSOR (TPS) ADJUSTMENT

NOTE: The Digital Diagnostic Terminal (DDT) can be used to determine whether the TPS is set within the recommended operating range of 0.200 – 0.300 volts. However, it is recommended that the DDT not be used to make adjustments of the TPS. Due to the circuitry characteristics of the ECM, the DDT is not able to always display accurately small TPS movements. A digital voltmeter should be used when making adjustments to the TPS.

IMPORTANT: TAN/BLACK head temperature leads must be disconnected from port cylinder head before adjusting TPS.

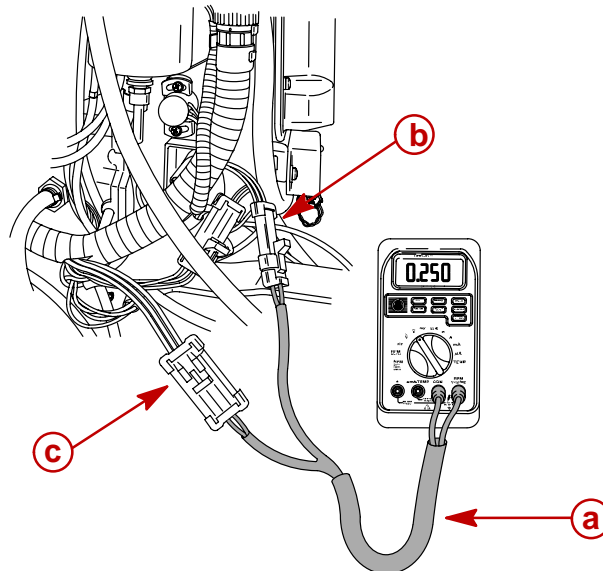
1. Disconnect TPS from EFI harness.



58055

- a** - TPS Connector
- b** - Throttle Position Sensor

2. Connect digital volt meter using TPS Test Lead Assembly (a) (P/N 91-859199) between TPS connector (b) and EFI harness connector (c). Set voltmeter to 2 DC volts.

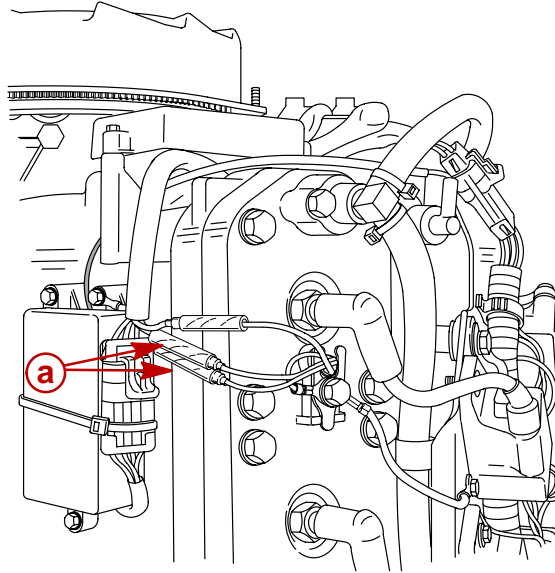


58054

- a** - TPS Test Lead Assembly
- b** - TPS Connector
- c** - EFI Harness Connector



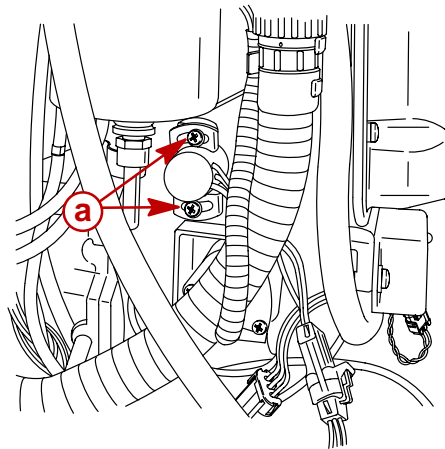
3. Disconnect TAN/BLACK engine head temperature sensor leads located on port cylinder head.



58052

a - Temperature Sensor Leads

4. Turn key to the "ON" position.
5. Loosen screws (a) securing TPS to manifold.



58053

a - Screws

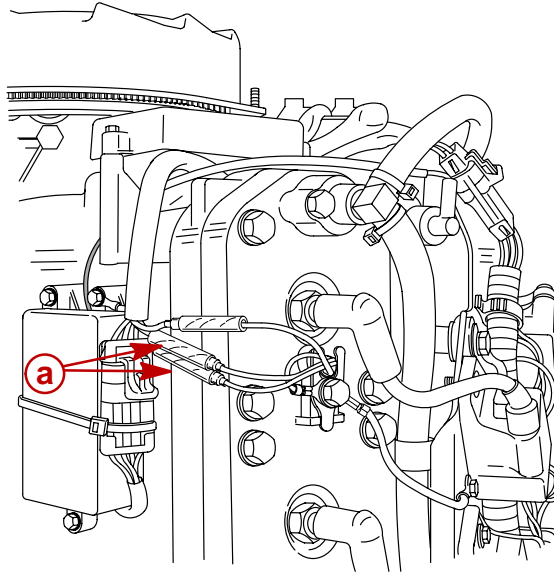
6. Rotate TPS fully clockwise (holding throttle shaft in closed position). On models with ECM P/N 14623A15 and above, voltmeter should read **.200 - .300**. If readout is not within specifications, adjust TPS to obtain readout of **.240 - .260**.

NOTE: If engine appears to run too rich or too lean, TPS can be readjusted. Decreasing voltage yields leaner mixture. Increasing voltage yields richer mixture. Allowable TPS range: **.200 - .300** volts.

7. Tighten TPS screws holding correct tolerance.
8. Disconnect remote control cable from throttle lever.
9. Slowly move throttle lever to full open position while monitoring voltage reading. Voltage reading should increase and decrease smoothly.
10. Set volt meter to 20 DC volts. Maximum voltage reading at full throttle is approximately 7.46 volts.
11. Remove test lead and reconnect TPS harness to EFI harness.



12. Reconnect TAN/BLACK engine head temperature sensor leads located on port cylinder head.

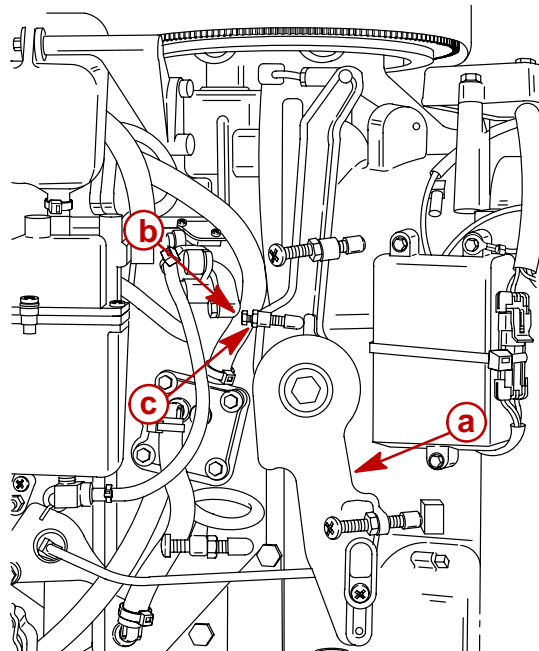


58052

a - Temperature Sensor Leads

IDLE TIMING (ENGINE RUNNING)

1. With engine in water, start engine and allow to warm up.
2. Shift engine into "FORWARD" gear.
3. Hold throttle arm (a) against idle stop (throttle cable barrel removed from barrel retainer). Adjust primary pickup screw (b) to attain appropriate setting. Tighten locknut (c).

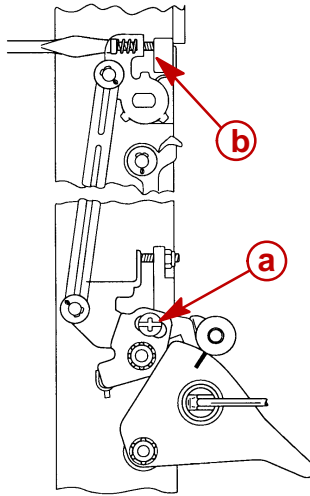


58057

a - Throttle Arm
b - Primary Pickup Screw
c - Locknut

**IDLE ADJUSTMENT**

1. With outboard in water, start and allow to warm up.
2. Loosen cam follower screw (a), allowing free movement of cam. Hold throttle arm against idle stop. Adjust idle speed screw (b) by increasing or decreasing air valve opening to attain appropriate setting.

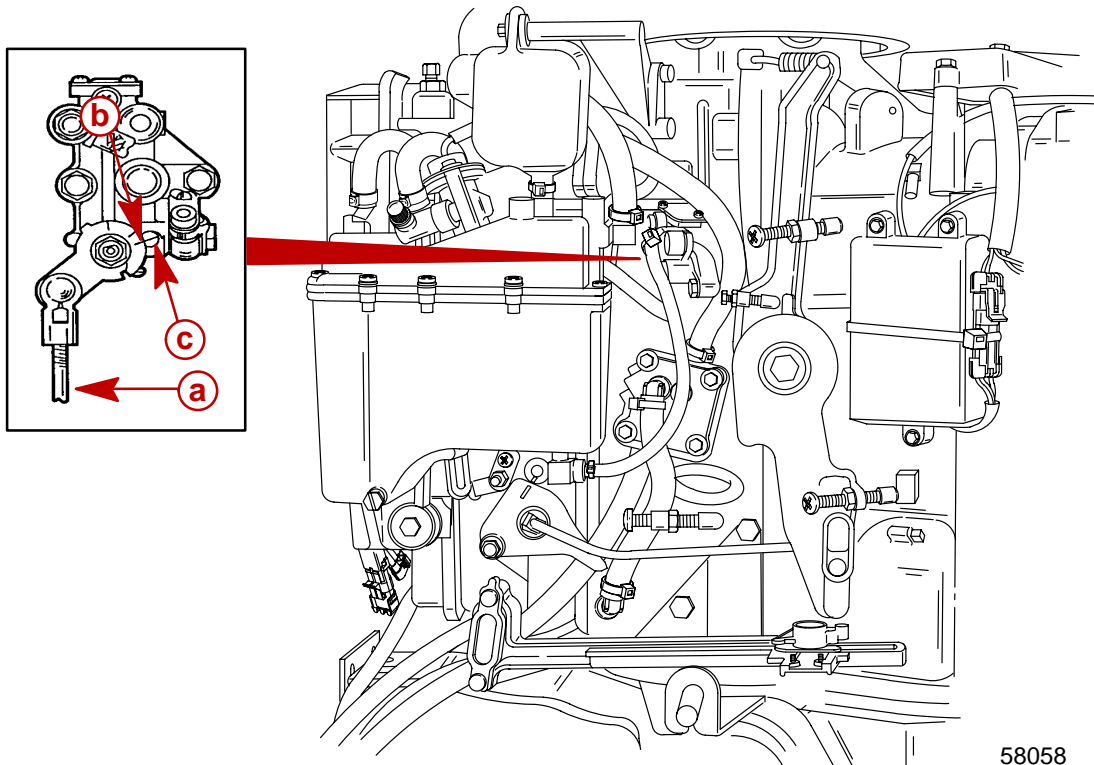


a - Cam Follower Screw

b - Idle Speed Screw

THROTTLE VALVE/OIL PUMP SYNCHRONIZATION

1. While holding throttle arm against idle stop, adjust length of link rod (a) so that stamped mark (b) of oil pump lever aligns with stamped mark (c) of oil pump body.



a - Link Rod

b - Stamped Mark on Lever

c - Stamped Mark on Body

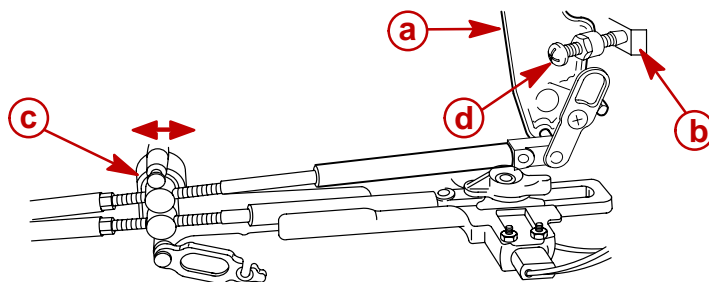
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THROTTLE CABLE INSTALLATION

1. With end of throttle cable connected to throttle lever, hold throttle lever (a) against idle stop (b). Adjust throttle cable barrel to slip into barrel recess of control cable anchor bracket, with a light preload of throttle lever against idle stop. Lock barrel in place.

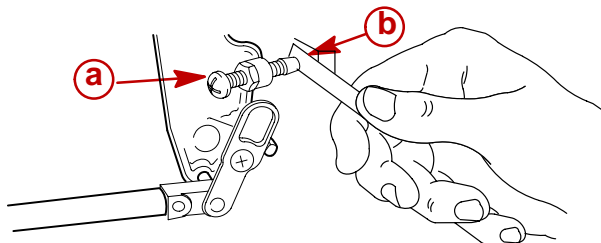
IMPORTANT: Excessive preload on throttle cable will cause difficulty when shifting from “FORWARD” to “NEUTRAL” (readjust throttle cable barrel, if necessary).



57838

- a - Throttle Lever
- b - Idle Stop
- c - Cable Barrel – Adjust To Hold Idle Stop Screw Against Stop
- d - Idle Stop Screw

2. Check preload on throttle cable by placing a thin piece of paper between idle stop screw (a) and idle stop (b). Preload is correct when paper can be removed without tearing, but has some drag on it (readjust throttle barrel, if necessary).



57839

- a - Idle Stop Screw
- b - Idle Stop

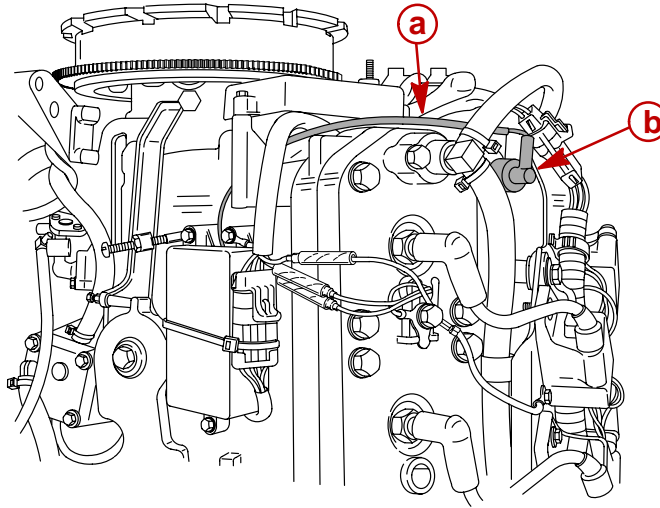
DETONATION CONTROL (200 MODEL)

1. With outboard running in “FORWARD” gear, advance throttle to 3500 RPM and check that spark timing has electronically advanced timing to 24° BTDC. This indicates knock control circuit is functioning.



MAXIMUM TIMING ADJUSTMENT (ENGINE RUNNING)

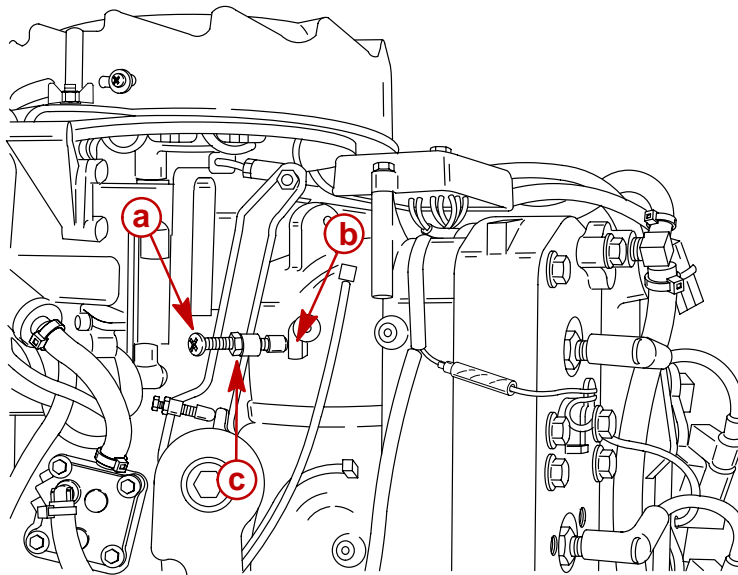
1. Disconnect WHITE/BLUE lead (a) from detonation sensor (b). (200 model)



58041

- a** - WHITE/BLUE Lead
- b** - Detonation Sensor

2. Outboard running in gear, advance throttle arm until maximum spark adjustment screw contacts spark stop, at about 2500 RPM. Adjust maximum spark adjustment screw (see specifications) if necessary. Tighten locknut and turn engine off.



58044

- a** - Maximum Spark Adjustment Screw
- b** - Spark Stop
- c** - Locknut

3. Reconnect WHITE/BLUE lead to detonation sensor (200 model).