



ELECTRICAL

Section 2C - Timing, Synchronizing, & Adjusting

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**2
C**

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Specifications

IGNITION SYSTEM Readings taken @ 68°F (20°C).	Type Spark Plug: Type Gap Hex Size Torque Firing Order Ignition Timing: @ Idle (850 rpm) @ WOT (6000 rpm) Stator Coil Output - Peak Voltage: @ 400 rpm (Cranking) @ 1500 rpm @ 3500 rpm Stator Coil Resistance Crank Position Sensor Output Peak Voltage: (WHT/BLK - BLK) for Cylinders 1 & 4 (WHT/RED - BLK) for Cylinders 2 & 3 @ 400 rpm (Cranking) @ 1500 rpm @ 3500 rpm Crank Position Sensor Resistance (WHT/BLK - BLK) for Cylinders 1 & 4 (WHT/RED - BLK) for Cylinders 2 & 3 CDI Unit Output - Peak Voltage: (BLK/ORN - BLK) for Cylinders 1 & 4 (BLK/WHT - BLK) for Cylinders 2 & 3 @ 400 rpm (Cranking) @ 1500 rpm @ 3500 rpm Ignition Coil Resistance: Primary Secondary (Without Boots) High Tension Lead Resistance: Cylinder #1 Cylinder #2 Cylinder #3 Cylinder #4	Microcomputer-Controlled CDI NGK LFR5A-11 0.043 in. (1.1 mm) 5/8 in. (16 mm) 18 lb-ft (25 Nm) 1-3-4-2 5° A.T.D.C 18° B.T.D.C 6 - 9 V (WHT - WHT) 12 - 18 V (WHT - WHT) 14 - 25 V (WHT - WHT) 0.32 - 0.48 Ω (WHT - WHT) 2.8 - 3.4 V 6.5 - 7.8 V 10.5 - 12.0 V 445 - 545 Ω 445 - 545 Ω 165 - 190 V 175 - 200 V 175 - 200 V 0.078 - 0.106 Ω (BLK - BLK/WHT) 3.5 - 4.7 kΩ (Between Towers) 4.5 - 10.7 kΩ 3.3 - 8.0 kΩ 3.7 - 8.9 kΩ 4.3 - 10.2 kΩ



Specifications

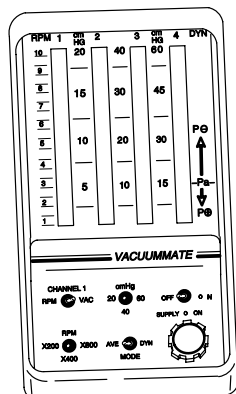
<p>IGNITION SYSTEM Readings taken @ 68°F (20°C).</p>	<p>Engine Protection Controls: Engine Speed Limiter Spark Cut-Out to Cylinders #1 or #4 #1 and #4 #1, #4, and #2 or #3 #1, #2, #3, and #4 Overheat/Low Oil Pressure Engine Speed Control (Spark Cut-Out to Cylinders #1 and #4) 2000 Engine S/N OT178499 and Below Warning Horn/rpm Reduction Reset Temperature (Throttle Closed/Key off) 2001 Engine S/N OT178500 and Above Warning Horn/rpm Reduction Reset Temperature (Throttle Closed/Key Off) 2000 MY Engine Oil Pressure Switch: S/N OT178499 and Below Warning Horn/rpm Reduction Reset Pressure (ECM reset @ Closed Throttle) 2001 MY Engine Oil Pressure Switch: S/N OT178500 and Above Warning Horn/rpm Reduction Reset Pressure (ECM reset @ Closed Throttle) Engine Water Temperature Sensor Resistance: @ -4°F (-20°C) @ 32°F (0°C) @ 68°F (20°C) @ 104°F (40°C) Throttle Position Sensor (TPS): Input Voltage @ Idle (850 rpm) Output Voltage @ Idle (850 rpm)</p>	<p>6200 rpm 6250 rpm 6300 rpm 6350 rpm</p> <p>Gradually Lowers to 3000 rpm</p> <p>140°F (60°C) 118°F (48°C)</p> <p>194°F (95°F) 167°F (79°C)</p> <p>Stamped P.15 Continuity Below 2.2 psi (15 kPa) No Continuity Above 2.2 psi (15 kPa)</p> <p>Stamped P1.5 Continuity Below 21.78 psi (150 kPa) No Continuity Above 21.78 psi (150 kPa)</p> <p>15.5 kΩ 5.79 kΩ 2.45 kΩ 1.50 kΩ</p> <p>5.0 ± 0.25 V (RED - ORG) 0.68 - 0.82 V (PNK - ORG)</p>
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NOTE: The 75/90 four stroke ECM unit electronically controls the ignition timing, therefore making the ignition timing non adjustable. When initially running the outboard, use a timing light to verify that the ignition timing falls within the timing windows. If the ignition timing does not stay within the timing windows, replace the ignition ECM unit and retest.

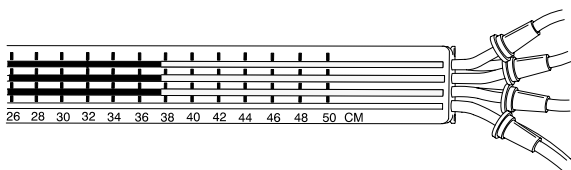


Special Tools

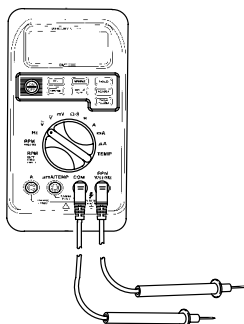
1. New Style Vacuummate Carburetor Tuner P/N 91-809871-1



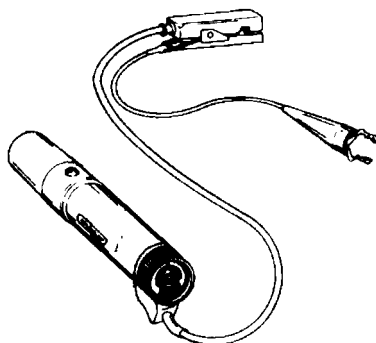
2. Old Style Mercury Filled Carburetor Tuner P/N 91-809641A1. Filters (4) P/N 35-18206.



3. DMT 2000 Digital Tachometer Multi-meter P/N 91-854009A1



4. Timing Light P/N 91-99379





Timing

⚠ WARNING

To prevent personal injury or possible death, from loss of balance or stability while servicing the motor, **DO NOT** attempt to check timing while boat is in motion. Failure to follow one of the recommended servicing procedures may result in the person falling overboard or causing personal injury from fall in boat.

⚠ WARNING

To prevent personal injury from spinning flywheel, **DO NOT** attempt to remove flywheel cover or place hands on top of cover when checking ignition timing.

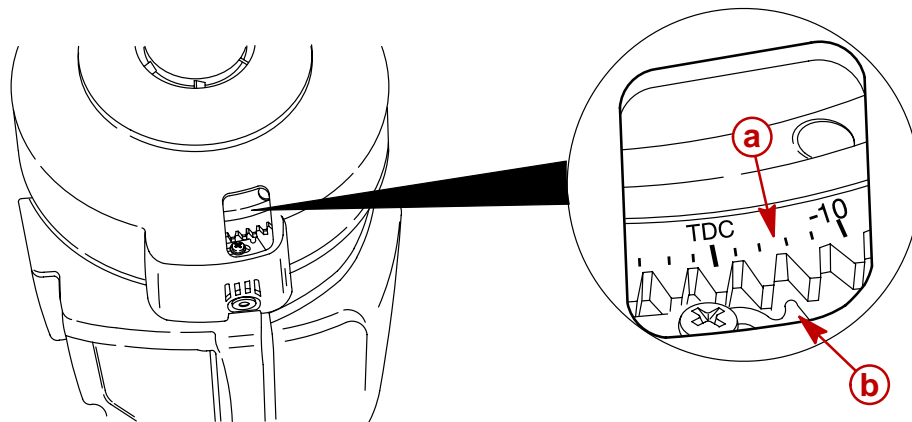
Ignition timing is not adjustable. The CDI unit electronically controls the ignition timing.

When initially running the outboard, use a timing light to verify that the ignition timing falls within the timing windows as described within the following tests. If the ignition timing does not stay within the timing windows, replace the ignition CDI unit and retest. (Refer to the Ignition Diagnostic Procedures tests in Section 2A.)

IMPORTANT: When checking the timing with the engine running, one of the following test procedures must be followed.

Check maximum timing per specification while running the outboard:

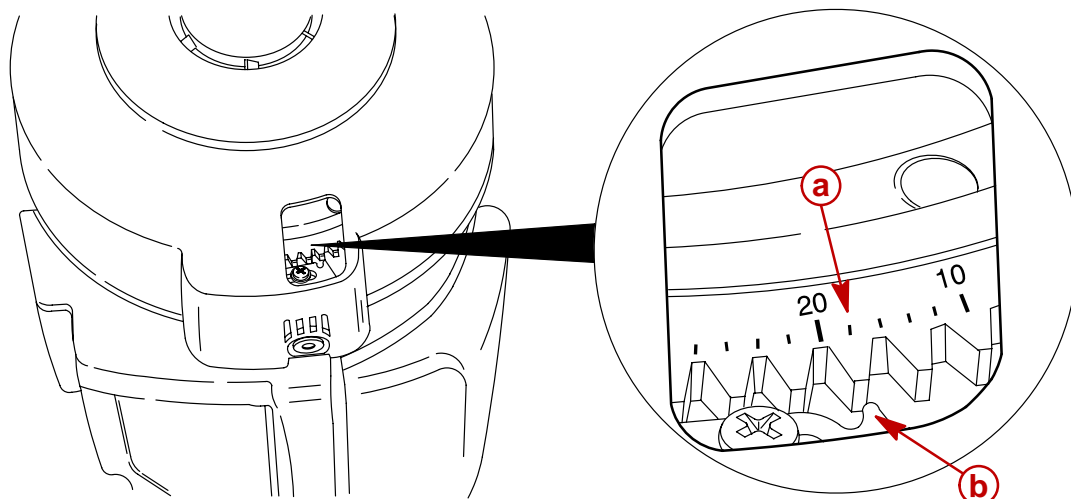
- IN A TEST TANK (with a cut down propeller).
 - ON A DYNAMOMETER.
 - ON A BOAT SECURED ON A TRAILER “**Backed in Water**” (with a cut down propeller).
1. Attach timing light to #1 spark plug lead.
 2. Place the outboard in “Forward” gear and check timing at idle “Retarded.” (If not within specification window, refer to Diagnostic Test Procedures Section 2A.)



- a** - Timing Mark (Full Retarded)
b - Pointer



3. Slowly increase the engine rpm while watching the ignition timing marks. The timing should increase to the maximum timing specification “Full Advance” at approximately 6000 RPM. (If not within specification window, refer to Diagnostic Test Procedures Section 2A.)



a - Timing Mark (Full Advance)

b - Pointer

Carburetor Adjustments

1. Check engine idling speed, adjust if unstable (refer to “**Pilot Screw Adjustment**” and “**Carburetor Synchronization**” below).
2. Check vacuum pressure variation range, adjust if out of specification (refer to “**Pilot Screw Adjustment**” and “**Carburetor Synchronization**” below).

Vacuum Variation Range
Within 5 cm Hg

NOTE: The carburetors are synchronized by adjusting the intake manifold vacuum on the carburetors. Use Carburetor Tuner (91-80964A1) to measure the vacuum.

CAUTION

Do not adjust the carburetors when they are operating properly, excess adjustments can cause poor engine performance.



Pilot Screw Adjustment

PILOT SCREW ADJUSTMENT STEPS

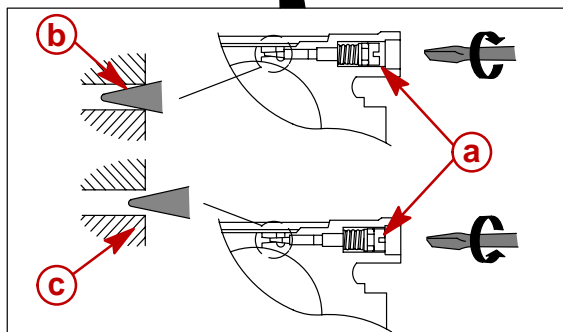
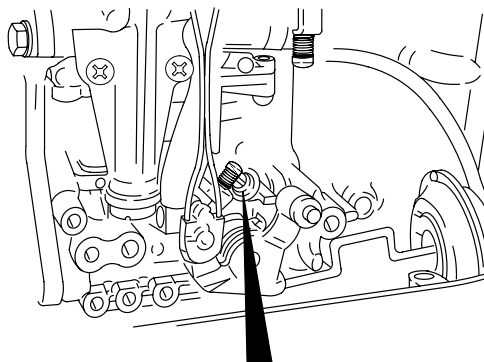
For EPA Engines:

1. Pilot screw is plugged for EPA specifications, making pilot screw non-adjustable.

For Non-EPA Engines:

1. After warming up engine, turn in all of the pilot screws until they are lightly seated.
2. Turn out the pilot screw the specified number of turns.

Pilot Screw Setting	
75 Horsepower	$2\frac{1}{2} \pm 1/2$ turns out
90 Horsepower	$2 \pm 1/2$ turns out



- a** - Pilot Screw
- b** - Lightly Seated Screw
- c** - Properly Adjusted Screw

3. If the engine operates:
 - a. Smooth:
 - (1.) Do not make any further adjustments.
 - b. Unstable:
 - (1.) Turn each pilot screw **in** until the engine idle speed drops approximately 40 rpm, then back each screw **out** 3/4 of a turn.

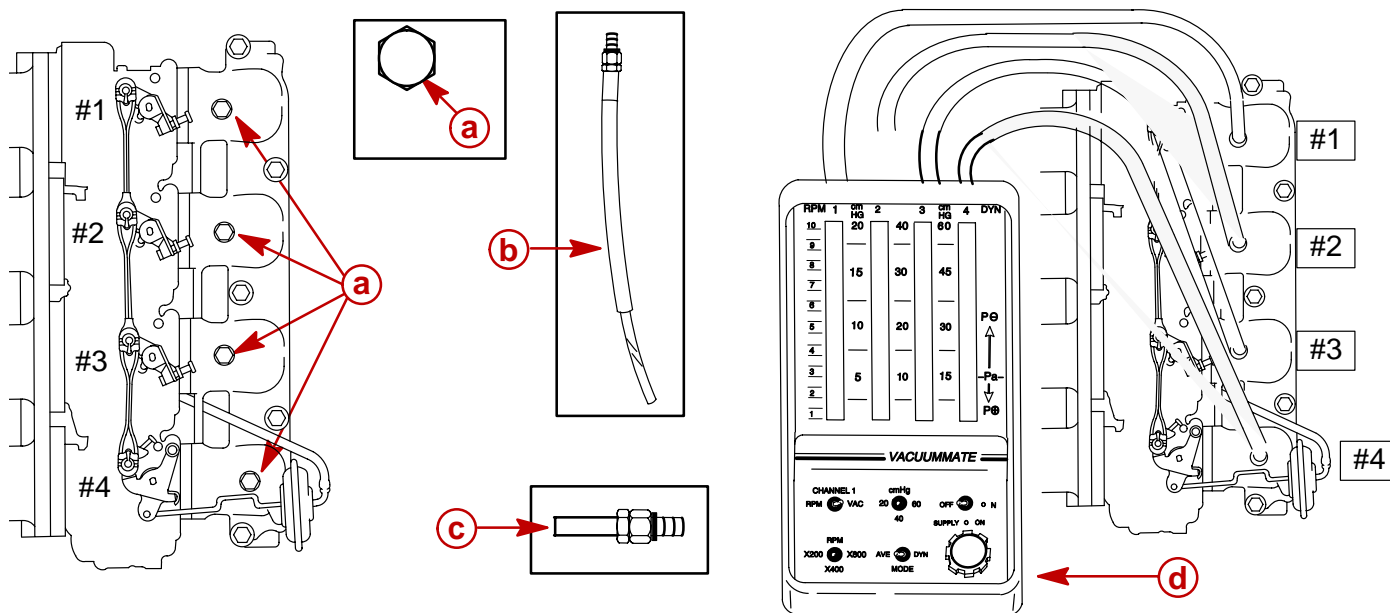


Carburetor Synchronization

NOTE: The carburetors are synchronized by adjusting the intake manifold vacuum on the carburetors. Use Carburetor Tuner (91-809641A1) or Vacuummate Tuner (p/n 91-809871--1) to measure the vacuum.

1. Remove four plugs from the intake manifold.
2. Install intake manifold hose adaptor in each plug hole. Tighten securely.
3. Connect the Carburetor Tuner to the hose adaptors.
4. Install filters to prevent mercury being drawn into carburetors during an abrupt throttle change.

NOTE: Intake manifold hose adaptors are provided with the Carburetor Tuner.



- a** - Intake Manifold Plugs (4)
- b** - Intake Manifold Hose Adaptor (4) From Vacuummate Carb. Tuner
- c** - Intake Manifold Hose Adaptor (4) From Mercury Filled Carb Tuner
- d** - Vacuummate Carb. Tuner (91-809871--1)

CAUTION

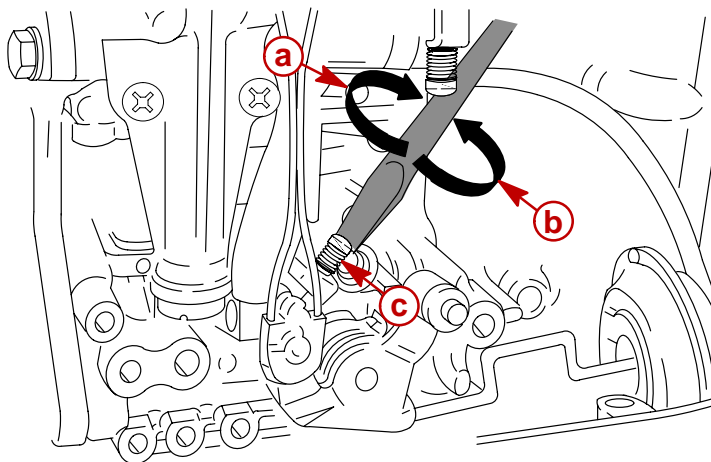
Do not run engine at high rpm or abruptly change throttle position when using the old style liquid mercury filled carburetor tuner (p/n 91-809641). The possibility exists of drawing liquid mercury from the carburetor tuner into the engine during high rpm running or an abrupt throttle change. Installing filters (4) (p/n 35-18206) in each line will help to prevent liquid mercury from being drawn into carburetors during an accidental abrupt throttle change.



5. With the outboard in water, start engine and allow to warm up.
6. Shift the outboard to neutral.
7. Connect a tachometer onto the spark plug lead of cylinder #1.
8. Adjust engine idling speed to 1000 rpm by turning the throttle stop screw on carburetor #4 in direction "a" or "b".

NOTE: Turning idle speed adjustment screw:

- **clockwise (direction "a") will increase** engine idling speed
- **counterclockwise (direction "b") will decrease** engine idling speed.



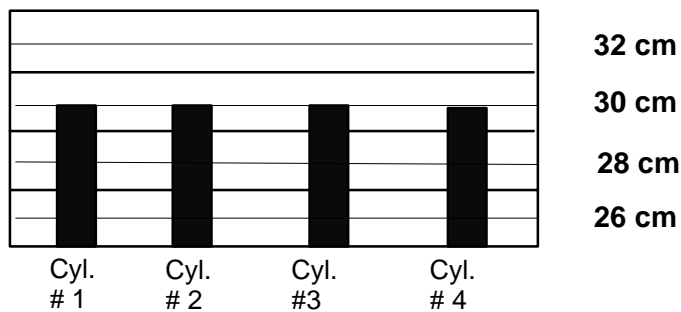
- a** - Engine Idling Speed Increases
- b** - Engine Idling Speed Decreases
- c** - Throttle Stop Screw

9. Measure the vacuum pressure of carburetor #4. It's not important to be at any specific vacuum setting.
10. Turn the throttle valve adjusting screws so the vacuum pressure of carburetors #1, #2, and #3 are the same as carburetor #4.

NOTE: Keep viewing the tachometer, as the engine rpm may fluctuate during adjustments. Keep adjusting the idle rpm screw in order to keep the engine speed at the 1000 rpm.

Example

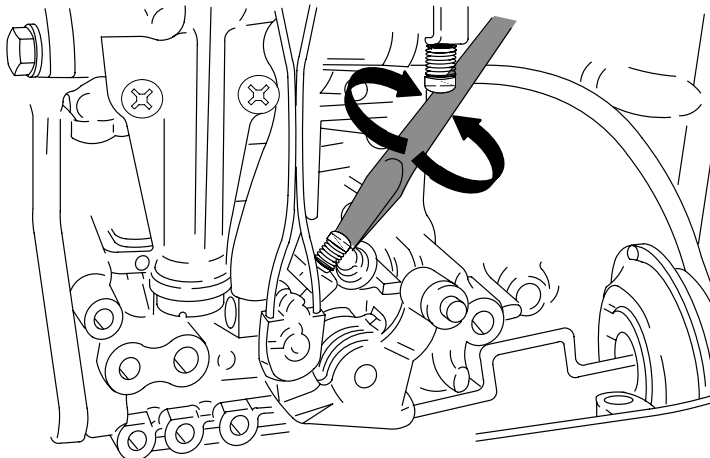
If the vacuum reading of Cyl. #4 (base vacuum) is 30 cm, then adjust carburetor synchronization screws of cylinders #1, #2 and #3 to 30 cm.



11. Rev engine a few times and let engine idle for 15 seconds. Check that the vacuum values remain within 5 cm Hg (67 m bar, 1.97 in Hg) of each other. Re-adjust if necessary.



12. Once synchronization of carburetors has been achieved re-adjust idle speed back to specification



Engine Idle Speed (out of gear)
850 ± 25 rpm

13. Stop engine, remove adaptors and reinstall plugs.

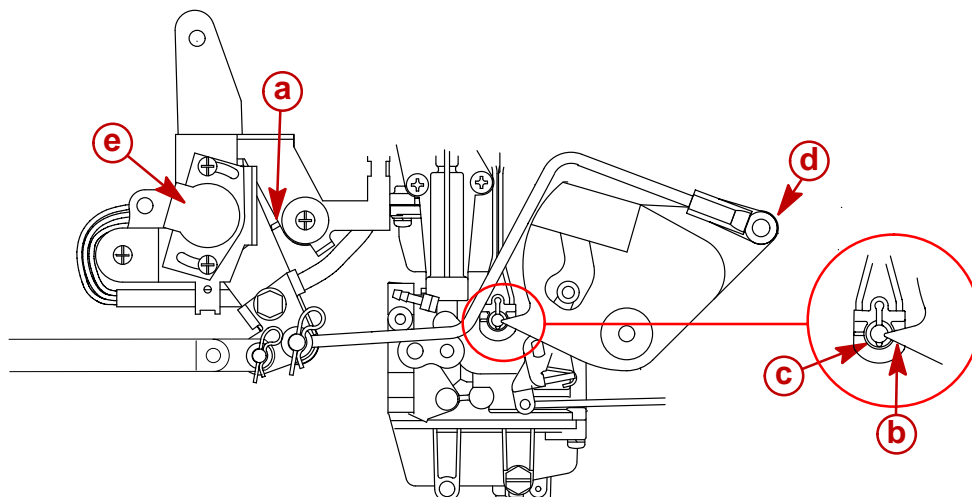
Throttle Cam Adjustment

Check carburetor pickup timing (using “**Checking Steps**” below, adjust if incorrectly set using “**Adjustment Steps**” below).

CHECKING STEPS

NOTE: Make sure TPS is fully rotated clockwise (to end of slot position).

1. Turn throttle control lever to the full retard position (throttle arm against throttle stop at idle).
2. Check that the pointer “b” on the throttle cam aligns with the center of the throttle lever shaft “c” as shown.

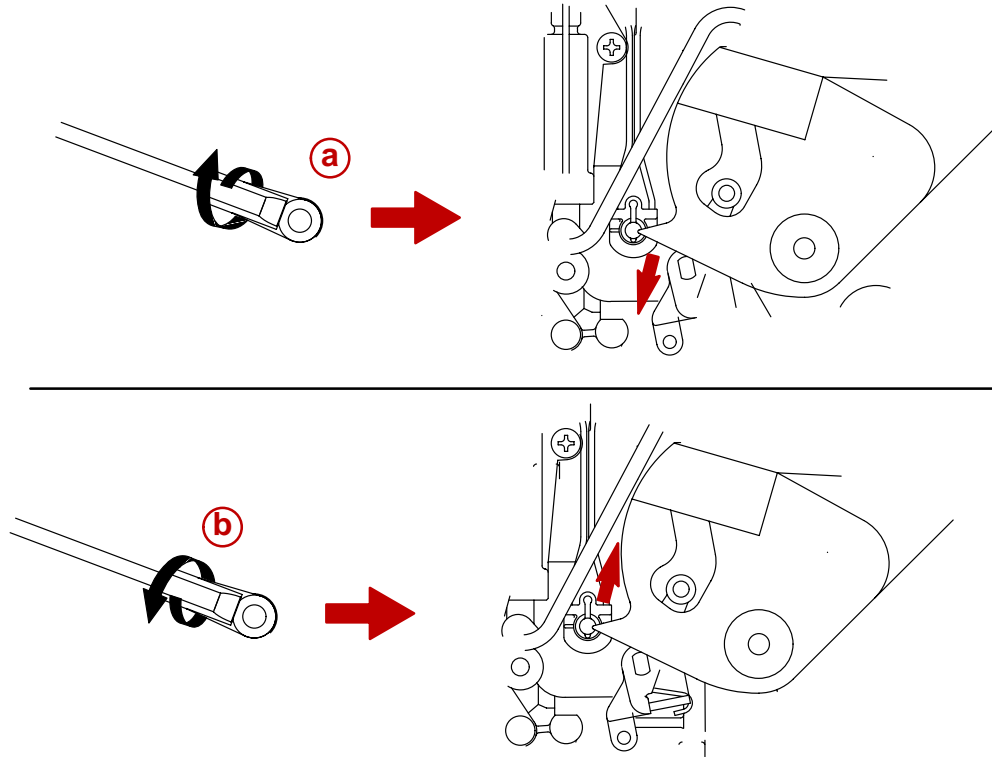


- a** - Throttle Arm Against Throttle Stop At Idle
- b** - Throttle Cam Pointer
- c** - Center of Throttle Lever Shaft
- d** - Ball Connector
- e** - Throttle Position Sensor (TPS)

**ADJUSTMENT STEPS**

1. Unsnap ball connector from ball on cam.
2. Thread connector in or out to allow pointer on throttle cam to center on throttle lever shaft.

NOTE: Threading ball connector clockwise will move pointer down, threading ball connector counterclockwise will move pointer up.



- a** - Clockwise Moves Pointer Down
b - Counterclockwise Moves Pointer Up