MARINER OUTBOARDS

MERCURY OUTBOARDS

service bulletin

No. 88-18

1989 Advance Service Information

A. 1989 Outboard Specifications

B. 1989 Mariner 15 HP Timing/Synchronizing/Adjusting

C. 1989 15 HP Propellers

D. 1989 115 HP Timing/Synchronizing/Adjusting

E. EFI Models 220, 200 and Mariner 175 SKI Timing/Synchronizing/Adjusting

MERCURY OUTBOARD SPECIFICATIONS FOR 1989 MODEL YEAR

Model	Gearcase Capacity fl. oz.	Gearcase Capacity m.l.	NGK	Spark Plug Champion	AC	Plug Gap	Idle RPM In Gear (± 50 RPM)	WOT RPM	Point Gap in.	Point Gap mm	Timing Idle	Timing Pick-Up	Timing Max. BTDC Cranking	Timing Max. BTDC Running	Firing Order	Water Pressure	Idle Mixture Screw Adj. (Turns Out)
2.2	3	88.7		RL87YC		.040 (1mm)	950	4200-5200	.012-.016	.3-.4				Adjust Point Gap			E Ring in Second Groove
4	6.6	195.2	BP7HS-10	L82YC		.040 (1mm)	950	4500-5500			5° BTDC			30° ± 2° BTDC			1-1/2
*5	6.6	195.2	BP7HS-10	L82YC		.040 (1mm)	950	4500-5500			5° BTDC			30° ± 2° BTDC			1-1/2
8	6.5	192.2	BUHW (Hi-Energy Coil)	L82YC (Standard Coil)		.040 (1mm)	650	4500-5500			6° BTDC (2 Dots)			36° BTDC (3 Dots)	1-2	1-6 PSI at 2000 RPM	1 to 2
9.9	6.5	192.2	BUHW (Hi-Energy Coil)	L82YC (Standard Coil)		.040 (1mm)	650	5000-6000			6° BTDC (2 Dots)		36° BTDC	36° BTDC (3 Dots)	1-2	1-6 PSI at 2000 RPM	1 to 2
15	6.5	192.2	BP8HS-15			.060 (1.5mm)	725	5000-6000			6° BTDC (2 Dots)			36° BTDC (3 Dots)	1-2	1-6 PSI at 2000 RPM	1 to 2
20	7.6	225.0	BUHW (Hi-Ign) B9HS-10 (Std. Ign)	L76V (Hi-Ign) L77J4 (Std. Ign)	V40FFM (Hi-Ign) M40FFX (Std. Ign)	.040 (1mm)	750	4500-5500				TDC-2° BTDC		25° BTDC (3 Dots)	1-2	2-7 PSI at 2000 RPM	1 to 2
25	7.6	225.0	BUHW (Hi-Ign) B9HS-10 (Std. Ign)	L76V (Hi-Ign) L77J4 (Std. Ign)	V40FFM (Hi-Ign) M40FFX (Std. Ign)	.040 (1mm)	750	5000-6000				TDC-2° BTDC		25° BTDC (3 Dots)	1-2	2-7 PSI at 2000 RPM	1 to 2
35	12.5	370.0	BUHW	L76V	V40FFM		650	5400-6000			1° - 10° ATDC	2° - 5° BTDC	29° BTDC	27° BTDC	1-2	2-5 PSI at 2500 RPM	1-1/4 - 1-3/4
45	12.5	370.0	BUHW-2	L78V	V40FFK		550	5200-5500			3° - 10° ATDC	0° - 2° BTDC	33° BTDC	30° BTDC	1-3-2-4	2-5 PSI at 2500 RPM	1-1/4 - 1-3/4
50	12.5	370.0	BUHW	L76V	V40FFM		675	5200-5500			1° - 10° ATDC		29° BTDC	23° BTDC	1-3-2	1-5 PSI at 2500 RPM	1-1/4 - 1-3/4
60	12.5	370.0	BUHW	L76V	V40FFM		650	5200-5500			1° - 10° ATDC		29° BTDC	23° BTDC	1-3-2	1-5 PSI at 2500 RPM	1-1/4 - 1-3/4
70	22.5	665.4	BUHW-2	L78V	V40FFK		650	4750-5250			0° - 4° BTDC		32° BTDC	26° BTDC	1-3-2	10 PSI Min. at 5000 RPM	1 - 1-1/2
75 work	22.5	665.4	BUHW-2	L78V	V40FFK		650	4750-5250			0° - 4° BTDC		22° BTDC	16° BTDC	1-3-2	10 PSI Min. at 5000 RPM	1 - 1-1/2
80	22.5	665.4	BUHW-2	L78V	V40FFK		650	4750-5250			0° - 4° BTDC		32° BTDC	26° BTDC	1-3-2	10 PSI Min. at 5000 RPM	1 - 1-1/2
90	22.5	665.4	BUHW-2	L78V	V40FFK		650	5000-5500			0° - 4° BTDC		32° BTDC	26° BTDC	1-3-2	10 PSI Min. at 5000 RPM	1 - 1-1/2

MERCURY OUTBOARD SPECIFICATIONS
FOR 1989 MODEL YEAR
(continued)

Model	Gearcase Capacity fl. oz.	m.l.	NGK	Spark Plug Champion	AC	Plug Gap	Idle RPM In Gear (± 50 RPM)	WOT RPM	Point Gap in.	mm	Timing Idle	Timing Pick-Up	Timing Max. BTDC Cranking	Timing Max. BTDC Running	Firing Order	Water Pressure	Idle Mixture Screw Adj. (Turns Out)
100	22.5	665.4	BUHW	L76V	V40FFM		650	4750-5250			2° - 4° BTDC		25° BTDC	23° BTDC	1-3-2-4	10 PSI Min. at 5000 RPM	2
115	22.5	665.4	BUHW	L76V	V40FFM		600	4750-5250			2° - 4° BTDC		25° BTDC	23° BTDC	1-3-2-4	10 PSI Min. at 5000 RPM	2
135	22.5	665.4	BU8H	L6VC			700	5200-5500			7° - 15° ATDC	10° - 12° ATDC	18° BTDC	16° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
150	22.5	665.4	BU8H	L6VC			700	5200-5500			7° - 15° ATDC	10° - 12° ATDC	18° BTDC	16° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
XR4	21.0	621.0	BU8H	L6VC			675	5000-5500			7° - 10° ATDC	6° - 8° ATDC	22° BTDC	26° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
175	22.5	665.4	BU8H	L6VC			700	5600-5800			7° - 15° ATDC	6° - 8° ATDC	20° BTDC	18° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
200	22.5	665.4	BU8H	L6VC			700	5500-5800			7° - 15° ATDC	6° - 8° ATDC	22° BTDC	26° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
200 EFI	22.5	665.4	BUZ8H	QL6VC			700	5500-5800			9° ATDC	9° ATDC	22° BTDC	26° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	

MARINER OUTBOARD SPECIFICATIONS
FOR 1989 MODEL YEAR

Model	Gearcase Capacity fl. oz.	m.l.	NGK	Spark Plug Champion	AC	Plug Gap	Idle RPM In Gear (± 50 RPM)	WOT RPM	Point Gap In. mm	Timing				Firing Order	Water Pressure	Idle Mixture Screw Adj. (Turns Out)
										Idle	Pick-Up	Max. BTDC Cranking	Max. BTDC Running			
2	1.5	44.4	B5HS	L90	45F	.024 .6mm	1200	4000-5000	.014-.35mm			.043 ± .006	18° BTDC			3
4	3.6	105.0	B7HS	L82	S41F	.024 .6mm	1150	4500-5500		5° BTDC			28° BTDC			1-1/2 - 2
5	3.6	105.0	B7HS	L82	S41F	.024 .6mm	1150	4500-5500		5° BTDC			28° BTDC			1 - 1-1/2
8	6.5	192.2	BUHW (Hi-Energy-Coil)	L82YC (Standard Coil)		.040 1mm	650	4500-5500			6° ± 1° BTDC (2 Dots)		36° BTDC (3 Dots)	1-2	1-6 PSI at 2000 RPM	1-2
9.9	6.5	192.2	BUHW (Hi-Energy-Coil)	L82YC (Standard Coil)		.040 1mm	650	5000-6000			6° ± 1° BTDC (2 Dots)		36° BTDC (3 Dots)	1-2	1-6 PSI at 2000 RPM	1-2
15	6.5	192.2	BP8HS-15			.060 (1.5mm)	725	5000-6000		6° BTDC (2 Dots)			36° BTDC (3 Dots)	1-2	1-6 PSI at 2000 RPM	1 to 2
20	7.6	225.0	BUHW (Hi-Ign) B9HS-10 (Std. Ign)	L76V (Hi-Ign) L77J4 (Std. Ign)	V40FFM (Hi-Ign) M40FFX (Std. Ign)	.040 1mm	750	4500-5500			TDC-2° BTDC		25° BTDC (3 Dots)	1-2	2-7 PSI at 2000 RPM	1-2
25	7.6	225.0	BUHW (Hi-Ign) B9HS-10 (Std. Ign)	L76V (Hi-Ign) L77J4 (Std. Ign)	V40FFM (Hi-Ign) M40FFX (Std. Ign)	.040 1.mm	750	5000-6000			TDC-2° BTDC		25° BTDC (3 Dots)	1-2	2-7 PSI at 2000 RPM	1-2
30	6.1	180.0	B7HS	L82	S41F	.024 .6mm	900	4500-5500		TDC	4° BTDC		25° BTDC	1-2		1-1/2
40	11.2	330.0	B8HS	L78	S40F	.024 .6mm	950	4500-5500		2° BTDC			22° BTDC	1-2	8.5-15 PSI at 5000 RPM	2-1/8
45	12.5	370.0	BUHW-2	L78	V40FFK		550	5200-5500		3°-10° ATDC	0°-2° BTDC	33° BTDC	30° BTDC	1-3-2-4	2-5 PSI at 2500 RPM	1-1/4 - 1-3/4
50	12.5	370.0	BUHW	L76V	V40FFM		675	5200-5500		1°-10° ATDC		29° BTDC	23° BTDC	1-3-2	1-5 PSI at 2500 RPM	1-1/4 - 1-3/4
60	12.5	370.0	BUHW	L76V	V40FFM		650	5200-5500		1°-10° ATDC		29° BTDC	23° BTDC	1-3-2	1-5 PSI at 2500 RPM	1-1/4 - 1-3/4
75	22.5	665.4	BUHW-2	L78V	V40FFK		650	4750-5250		0°-4° BTDC		32° BTDC	26° BTDC	1-3-2	10 PSI Min. at 5000 RPM	1-1/2
75 work	22.5	665.4	BUHW-2	L78V	V40FFK		650	4750-5250		0°-4° BTDC		22° BTDC	16° BTDC	1-3-2	10 PSI Min. at 5000 RPM	1-1/2
90	22.5	665.4	BUHW-2	L78V	V40FFK		650	5000-5500		0°-4° BTDC		32° BTDC	26° BTDC	1-3-2	10 PSI Min. at 5000 RPM	1-1/2

MARINER OUTBOARD SPECIFICATIONS
FOR 1989 MODEL YEAR
(continued)

Model	Gearcase Capacity fl. oz.	m.l.	NGK	Spark Plug Champion	AC	Plug Gap	Idle RPM In Gear (± 50 RPM)	WOT RPM	Point Gap in.	mm	Timing Idle	Timing Pick-Up	Timing Max. BTDC Cranking	Timing Max. BTDC Running	Firing Order	Water Pressure	Idle Mixture Screw Adj. (Turns Out)
100	22.5	665.4	BUHW	L76V	V40FFM		650	4750-5250			2° - 4° BTDC		25° BTDC	23° BTDC	1-3-2-4	10 PSI Min. at 5000 RPM	2
115	22.5	665.4	BUHW	L76V	V40FFM		650	4750-5250			2° - 4° BTDC		25° BTDC	23° BTDC	1-3-2-4	10 PSI Min. at 5000 RPM	2
135	22.5	665.4	BU8H	L6VC			700	5200-5500			7° - 15° ATDC	10° - 12° ATDC	18° BTDC	16° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
150	22.5	665.4	BU8H	L6VC			700	5200-5500			7° - 15° ATDC	10° - 12° ATDC	18° BTDC	16° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
Magnum II	21.0	621.0	BU8H	L6VC			675	5000-5500			7° - 10° ATDC	6° - 8° ATDC	22° BTDC	26° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
175	22.5	665.4	BU8H	L6VC			700	5600-5800			7° - 15° ATDC	6° - 8° ATDC	20° BTDC	18° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
175 SKI	22.5	665.4	BU8H	L6VC			650	5600-6000			9° ATDC	10° ATDC	22° BTDC	25° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	
200	22.5	665.4	BU8H	L6VC			700	5500-5800			7° - 15° ATDC	6° - 8° ATDC	22° BTDC	26° BTDC	1-2-3-4-5-6	12 PSI Min. at 5500 RPM	

B. MARINER 15 HP TIMING/ SYNCHRONIZING/ADJUSTING

SPECIFICATIONS

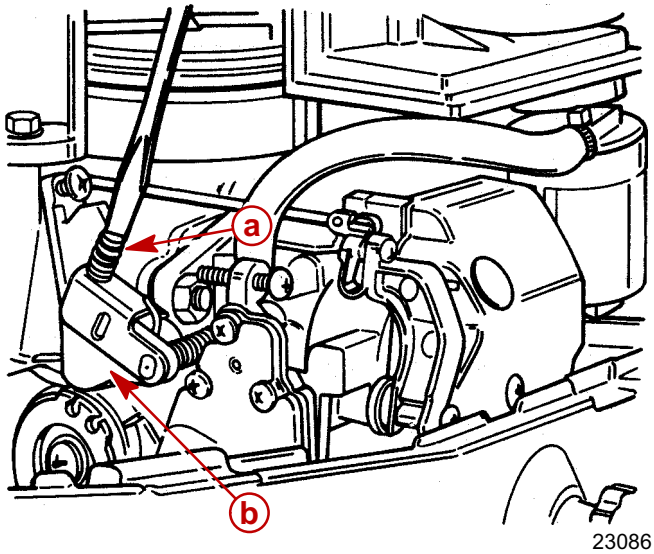
Horsepower	15
Propshaft Kilowatts	11.2
Piston Displacement	16.0 cu. in. (262cc)
Bore	2.375 in. (60.3mm)
Stroke	1.800 in. (45.7mm)
RPM Range at Full Throttle	5000-6000
Idle Speed RPM (In “Forward” Gear)	700-750
Maximum Timing (W.O.T.)	36° BTDC (3 Dots)
Idle Timing	.6° BTDC (2 Dots)
Spark Plug	NGK BP8 HS-15
Spark Plug Gap	0.060 in. (1.5mm)

1. Place outboard in water.
2. Check tiller handle cable adjustment for full throttle movement in both “forward” and “reverse” gears. Adjust jam nuts for proper travel and to eliminate any slack.

APPROXIMATE INITIAL CARBURETOR ADJUSTMENTS

Idle Speed Screw

1. Shift outboard to “NEUTRAL” and place throttle twist grip to “SLOW”.
2. Push primer/fast idle knob completely in and rotate knob fully counterclockwise.
3. Back idle speed screw (a) off of cam follower (b).
4. Turn idle speed screw inward (clockwise) until it “just touches” cam follower, then inward an additional 1/2 turn to slightly open throttle plate.



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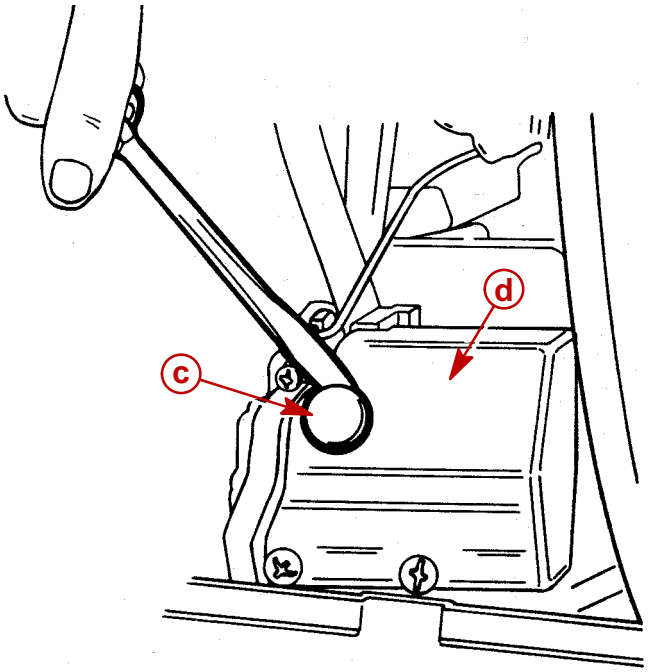
Low Speed Mixture Screw

1. Remove access plug (c) from carburetor air intake cover (d).



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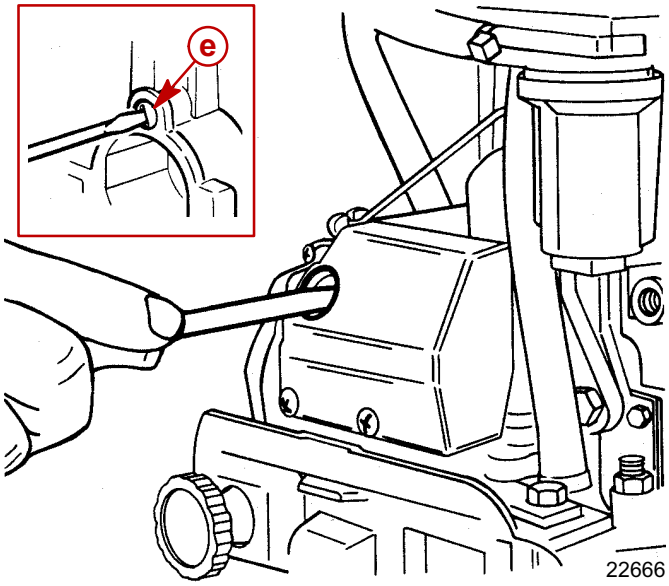
2. Turn low speed mixture screw (e) slowly inward (clockwise) until it seats lightly, then back screw out (counterclockwise) 1-1/2 turns (turning mixture screw in tight will damage needle and seat).
3. Do not install access plug at this time.



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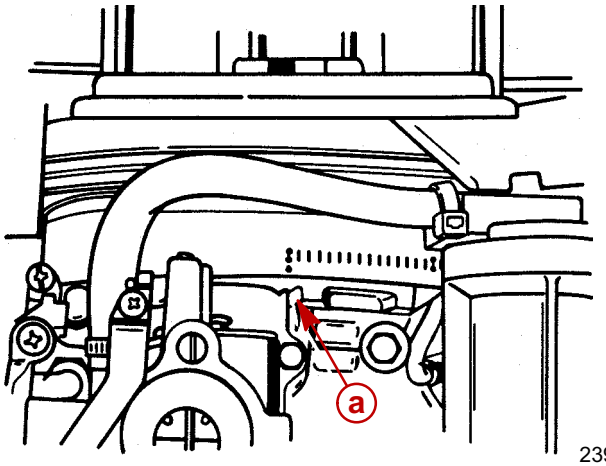
TIMING POINTER LOCATION



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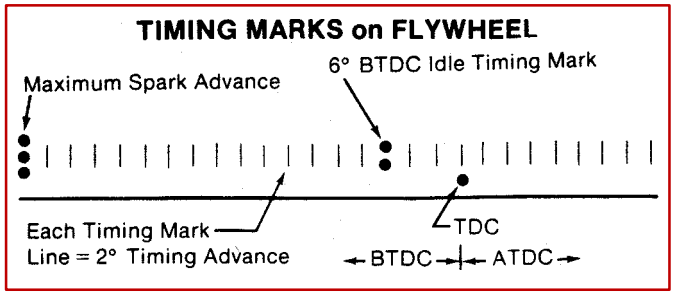
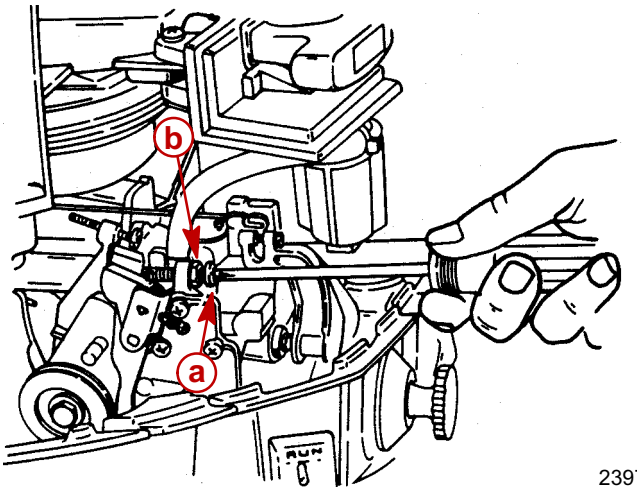
a - Timing Pointer



MAXIMUM TIMING ADJUSTMENT

1. Connect timing light (91-99379) to No. 1 (top) spark plug lead.
2. With engine running in “Forward” gear, fully advance throttle to W.O.T. position.
3. Adjust maximum spark advance screw (a) to align the 36° B.T.D.C. timing mark (3 Dots) on flywheel with timing pointer. Tighten jam nut (b) if so equipped.



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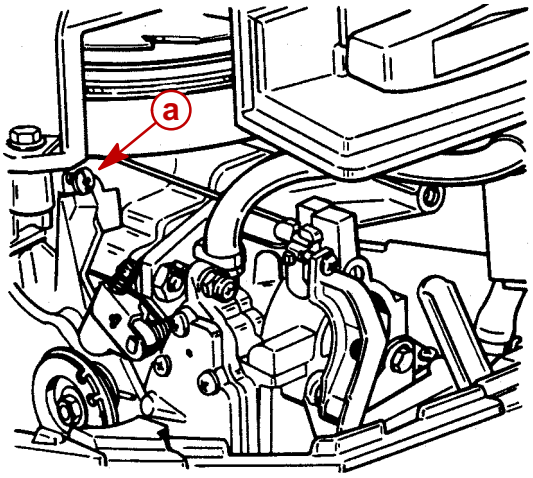
IDLE TIMING ADJUSTMENT

1. Push primer/fast idle knob completely in and rotate knob fully counterclockwise.
2. With engine running in “Forward” gear, reduce engine speed to idle.

IMPORTANT: It may be necessary to adjust idle speed screw to obtain a reasonably stabilized idle.

3. Adjust idle timing adjustment screw (a) to align the 6° B.T.D.C. timing mark (2 Dots) on flywheel with timing pointer.



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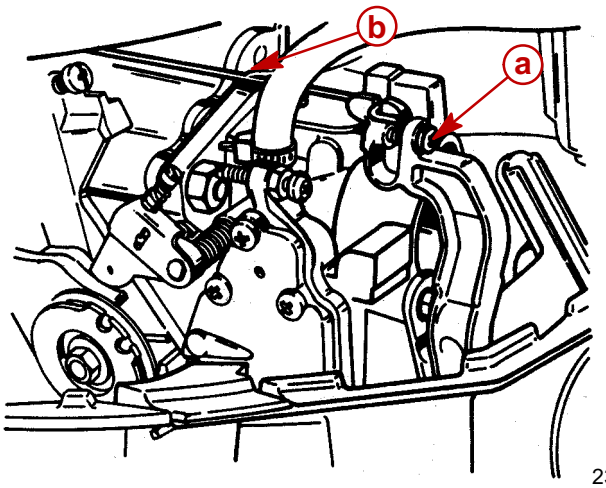
4. Shift to “Neutral’ gear and stop engine.

IDLE WIRE ADJUSTMENT

1. Push primer/fast idle knob completely in and rotate knob fully counterclockwise.
2. Shift outboard to “Neutral”.
3. Adjust screw (a) to remove all clearance between idle wire (b) and trigger.



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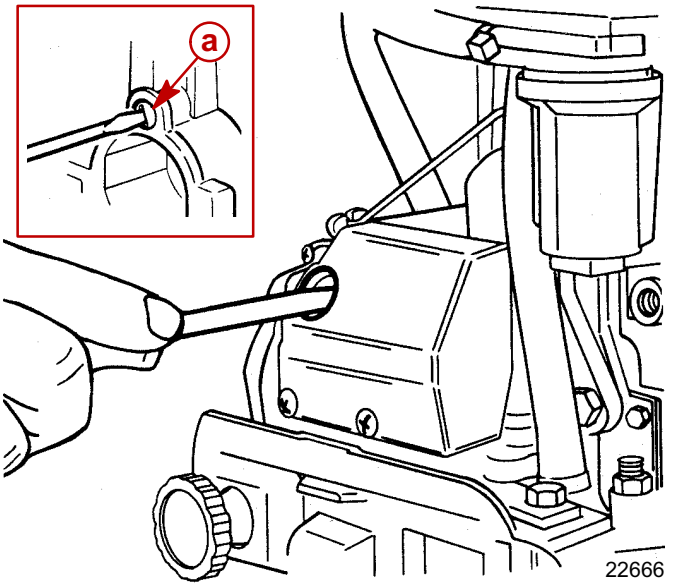
IDLE ADJUSTMENT

Low Speed Mixture Adjustment

1. Start engine and allow to warm up (run for several minutes). Throttle engine back to idle for about one minute to allow RPM to stabilize.
2. Push primer/fast idle knob completely in and rotate knob fully counterclockwise.
3. With engine running at idling speed while in forward gear, turn low speed mixture screw (a) counterclockwise until engine starts to “load up” or fire unevenly from over-rich mixture.



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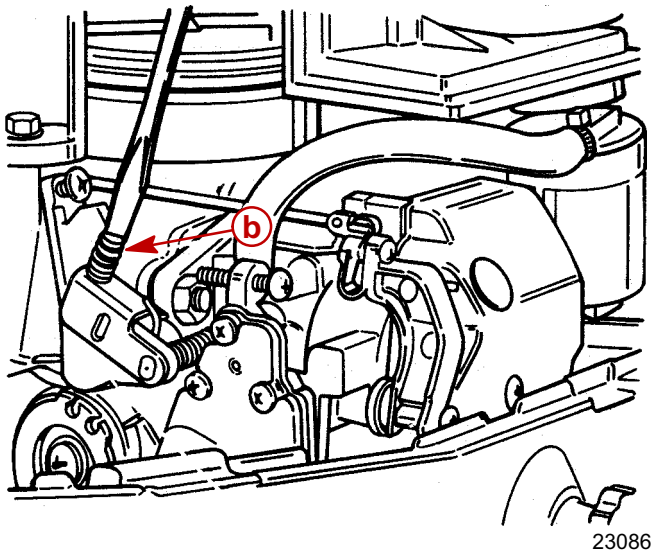
4. Slowly turn low speed mixture screw clockwise until cylinders fire evenly and engine picks up speed.
5. Continue turning mixture screw clockwise until too lean a mixture is obtained and engine slows down and misfires.
6. Set low speed mixture screw halfway between rich and lean.
7. Do not adjust leaner than necessary to attain reasonably smooth idling. When in doubt, set mixture slightly rich rather than too lean.
8. Check for freedom from 4 cycling between idle and 2000 RPM (in forward gear).

Idle Speed Adjustment

1. With engine running at idle in forward gear, make sure primer/fast idle knob is pushed completely in and rotated fully counterclockwise to stop.
2. Adjust idle speed screw (b) to obtain an engine idle speed of 700-750 RPM.
3. Install access plug into opening in carburetor air intake cover.



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C. MARINER 15 HP PROPELLERS

The new Mariner 15 HP model has a new line of propellers.

Diameter	Pitch	No. of Blades	Material	Part Number
9”	10-1/2”	3	Alum.	48-17874A12*
9”	9”	3	Alum.	48-42522A12
9-1/4”	7”	3	Alum.	48-42520A12
9-1/4”	6-1/2”	3	Alum.	48-42524A12

*Standard with Engine

IMPORTANT: For fast-easy identification the pitch and A12 assembly number will be stamped on the propeller. This is necessary because the 15 HP propellers (A12) have a firmer rubber hub than the 6-8-9.9 (A11) propellers. Other than this the propellers appear identical and could be inadvertently interchanged.

Model 100, 115

General Specifications

Horsepower	100, 115
Idle RPM Range (in forward gear)	650-700
Full Throttle RPM Range	4750-5250
Piston Displacement	105 (1720.9cc)
Cylinder Bore	3.375 (85.7mm)
Stroke	2.930 (74.4mm)
Engine Type	4 Cylinder, 2 Cycle
Ignition Type	C.D. Breakerless
Recommended Spark Plug	33-97179 BUHW, AC-V40FFM, L76V
Cylinder Firing Order	1324
Recommended Power Trim Fluid	Quicksilver Power Trim & Power Steering Fluid or Transmission Fluid (ATF)
Recommended Fuel	Regular Leaded, Premium Low-Lead and Lead-Free Automotive Gasoline with a Minimum Pump Posted Octane Rating of 86
Recommended Oil	Quicksilver 2 Cycle Outboard Oil
Engine Weight ELOPT ELOPTXL	340 Lbs. 360 Lbs.
Fuel Tank Capacity	6 U.S. Gallons (5 Imp. Gals; 22-1/2 Liters)
Gear Housing Lubricant Capacity	22.5 fl. oz. (665.2ml)
Gasoline/Oil Ratio at Idle	100:1
Gasoline/Oil Ratio at W.O.T.	50:1
Gear Ratio	2:07:1
Oil Injection Tank Capacity	1.4 gal.
Maximum Operation Per Tank Full of Oil at W.O.T.	5 Hrs.
Oil Remaining When Warning Buzzer Sounds	1 Qt.
Operating Time Remaining When Warning Buzzer Sounds	50 minutes approximately

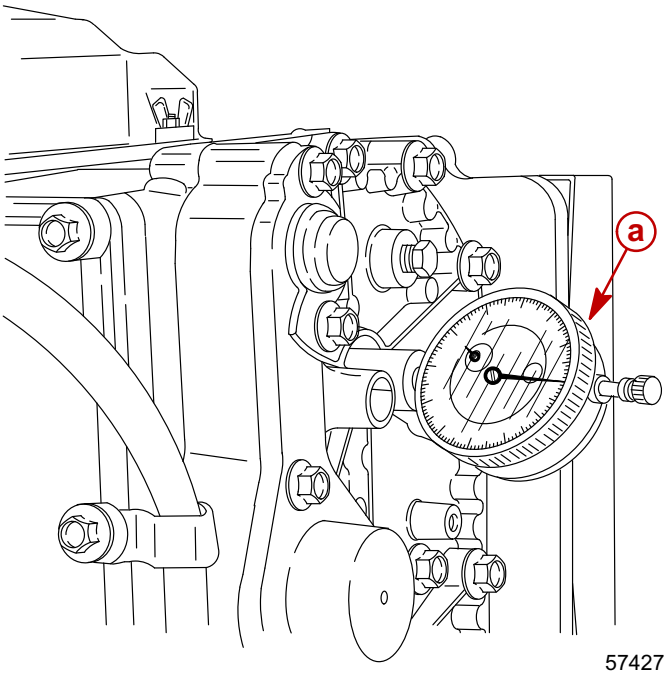
MODEL 100, 115 TIMING/SYNCHRONIZING/ ADJUSTMENT

Timing Pointer Alignment

⚠ WARNING

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

1. Remove spark plugs.
2. Remove aft cowl support bracket.
3. Install dial indicator into No. 1 (top) cylinder.
4. Turn flywheel clockwise until No. 1 (top) cylinder is at top dead center (TDC). Set dial indicator to “O” (zero),



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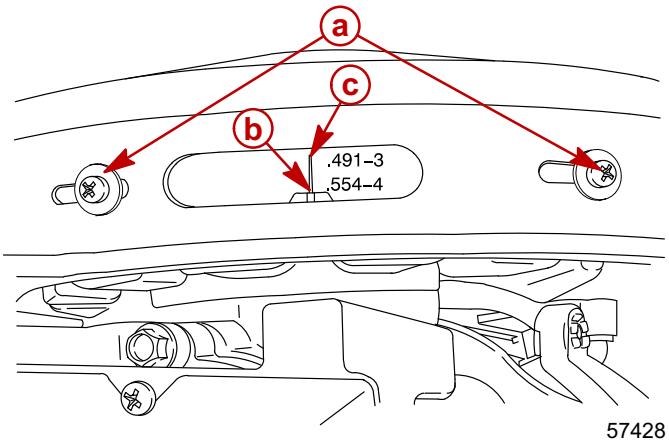
a - Dial Indicator

5. Turn flywheel counterclockwise until dial indicator needle reads approximately .600” B.T.D.C.. then turn flywheel clockwise, so that needle reads .554” B.T.D.C. exactly.
6. If necessary, loosen pointer attaching screws and adjust timing pointer, so that it is aligned with the .554” timing mark on flywheel. Retighten pointer attaching screws.



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a - Attaching Screws
b - Timing Pointer
c - Timing Mark

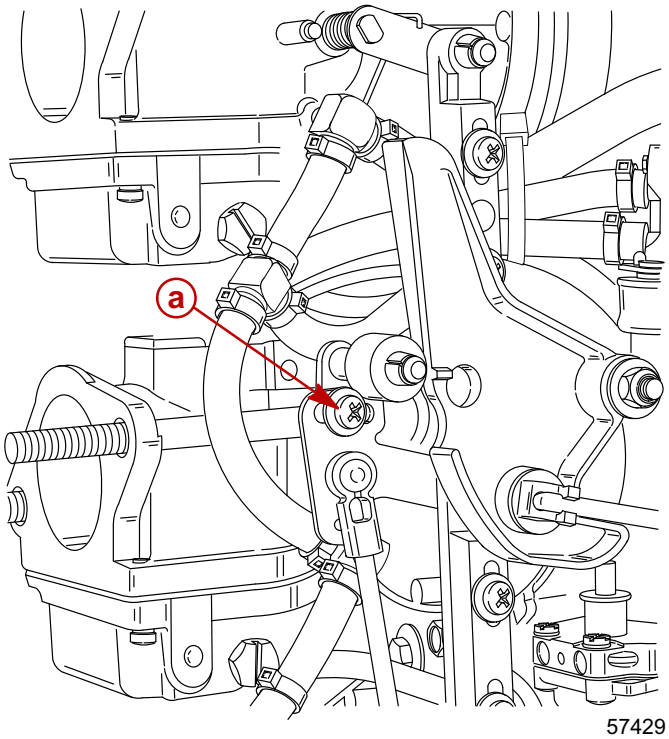
7. Remove dial indicator.

CARBURETOR SYNCHRONIZATION

1. Remove sound box cover.

NOTE: *Sound box attenuator is removed for photographic clarity.*

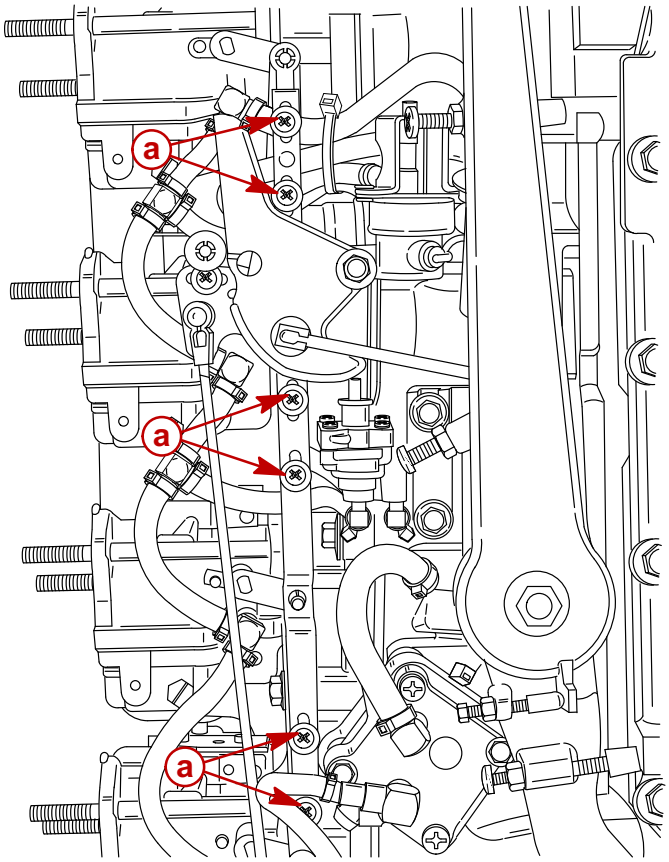
2. Loosen screw of cam follower 1/4 -1/2 turn.



57429

a - Screw

3. Loosen 6 synchronizing screws.

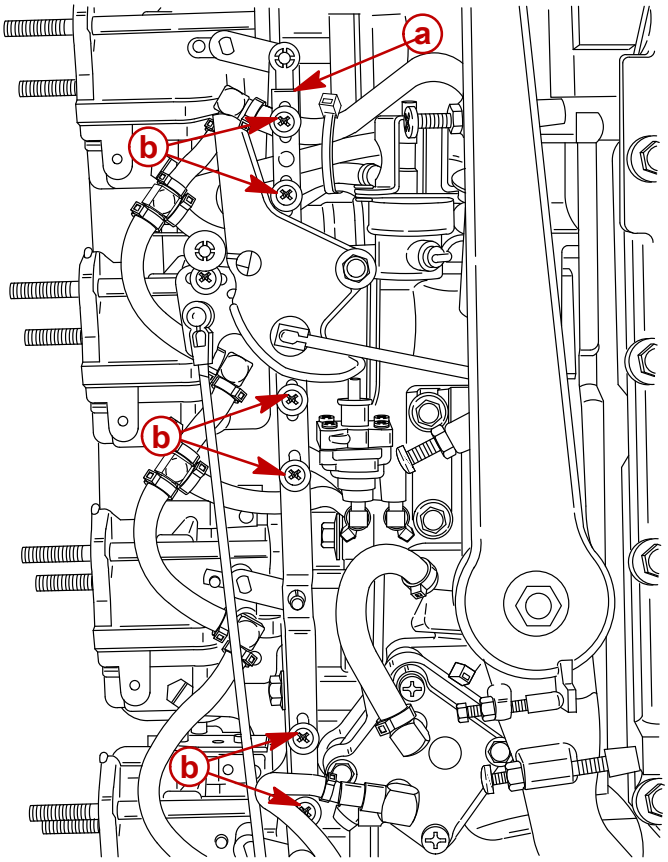


57430

a - Synchronizing Screws

4. Look into carburetor throats and verify throttle shutters are completely closed.

5. Apply light down pressure on carburetor synchronizing shaft and tighten 6 synchronizing screws from top to bottom.

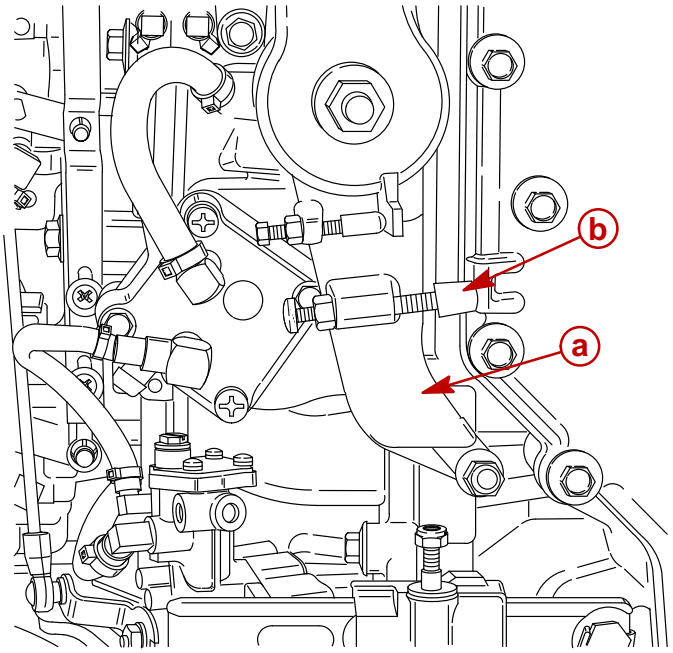


57430

a - Synchronizing Shaft
b - Synchronizing Screws

6. Recheck throttle shutters and make any necessary adjustments.

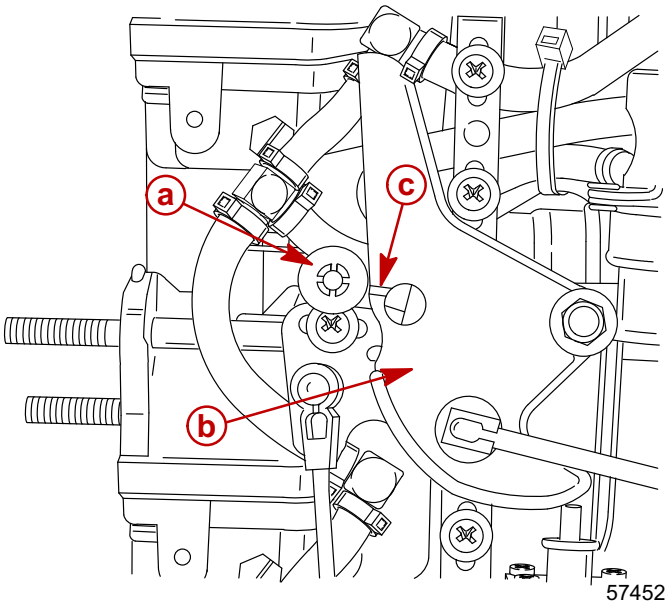
7. Position throttle arm so that idle stop screw is against stop.



57431

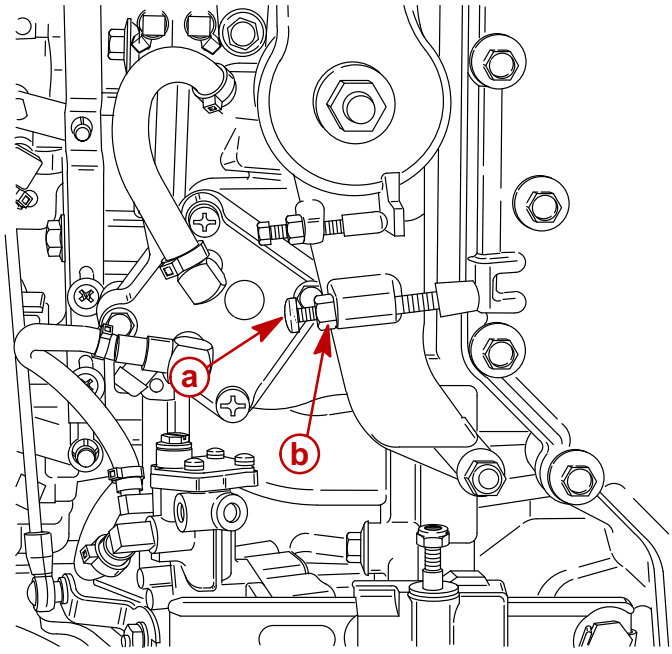
a - Throttle Arm
b - Idle Stop Screw

8. Position cam follower roller against throttle cam. Adjust idle stop screw to align raised mark of throttle cam with center of cam follower roller. Tighten locknut.



57452

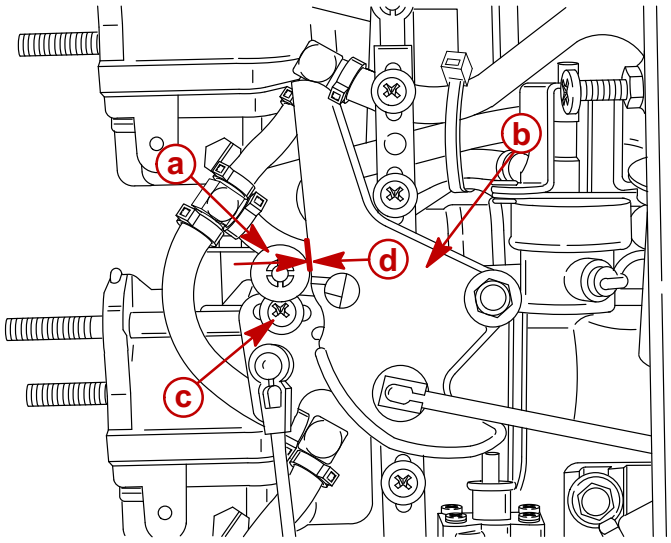
a - Cam Follower Roller
b - Throttle Cam
c - Raised Mark



57431

a - Idle Stop Screw
b - Locknut

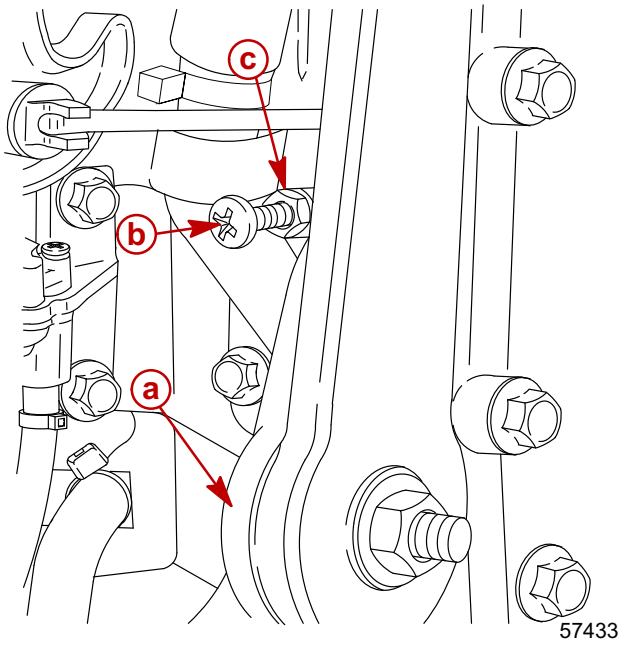
9. Holding throttle cam at idle position, adjust cam follower so that a clearance of .005" - .020" (.127mm-508mm) exists between roller of cam follower and throttle cam. Tighten screw securing cam follower.



57432

a - Roller
b - Throttle Cam
c - Screw
d - .005" - .020" (.127mm - .508mm)

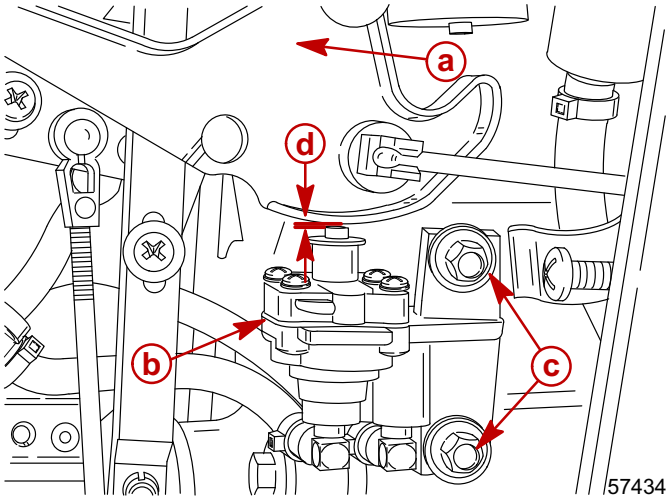
10. Advance throttle arm to wide-open-throttle and adjust throttle stop screw to allow full carburetor butterfly opening. DO NOT allow butterflies to act as throttle stops. If necessary, turn throttle stop screw clockwise 1/2 - 3/4 of a turn. This should allow sufficient freeplay in carburetor linkage at wide-open-throttle. Tighten locknut.



57433

a - Throttle Arm
b - Throttle Stop Screw
c - Lock Nut

11. With the throttle cam at W.O.T. position the accelerator pump to give .030” clearance between throttle cam and top casted surface of accelerator pump as shown. Tighten two mounting screws.



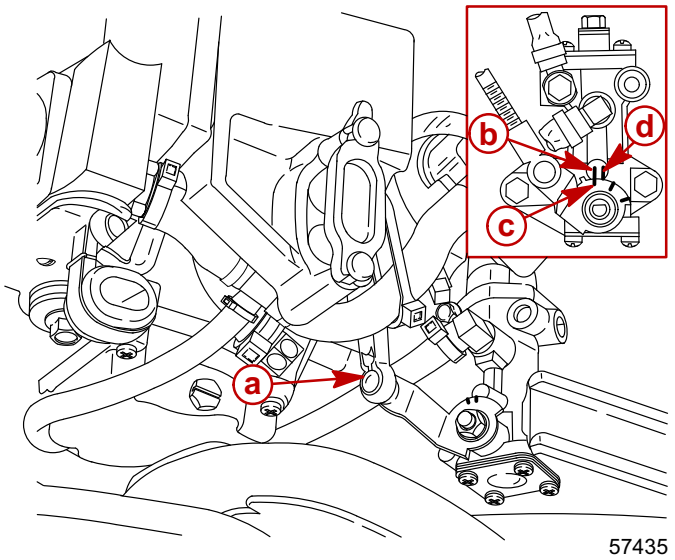
57434

a - Throttle Cam
b - Accelerator Pump
c - Mounting Screws
d - .030”

CARBURETOR/OIL PUMP SYNCHRONIZATION

IMPORTANT: Some engines may have an additional stamped mark (d) which SHOULD NOT be used.

1. While holding throttle arm at idle position, adjust length of link rod so that stamped mark of oil pump body aligns with stamped mark of oil pump lever.



57435

a - Link Rod
b - Stamped Mark (Oil Pump Body)
c - Stamped Mark (Oil Pump Lever)

TIMING ADJUSTMENTS

⚠ CAUTION

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

NOTE: *If initial timing adjustments are made without engine running, then final timing checks should be made with engine running due to timing advance characteristics of ignition system. Maximum engine RPM required to check maximum timing advance is 3000 RPM.*

1. Insert spark gap tool (P/N 91-63998A1) in No. 1 (top) cylinder spark plug boot and attach alligator clip to good ground.
2. Remove throttle cable barrel from barrel retainer.

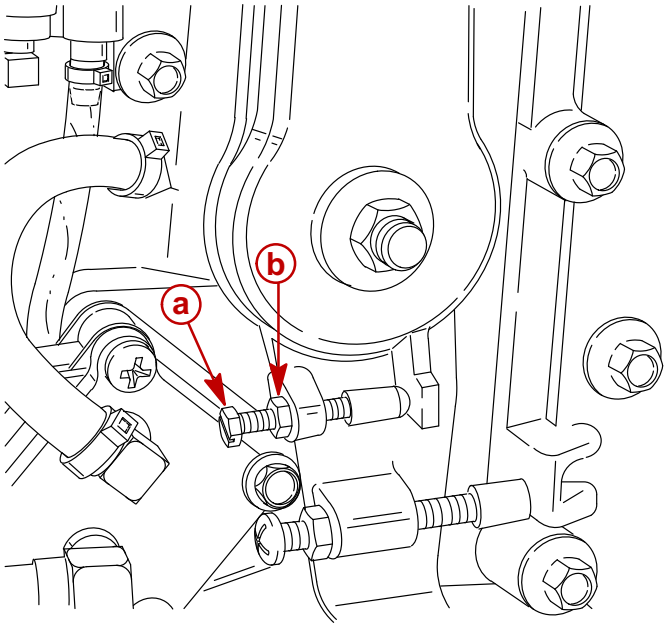
IDLE TIMING ADJUSTMENT

⚠ WARNING

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

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

1. Connect timing light to No. 1 (top) spark plug lead.
2. Shift engine into neutral.
3. Holding throttle arm at idle position, crank engine with starter motor and adjust idle timing screw to align 3 degrees B.T.D.C. timing mark of flywheel with timing pointer. Tighten locknut.

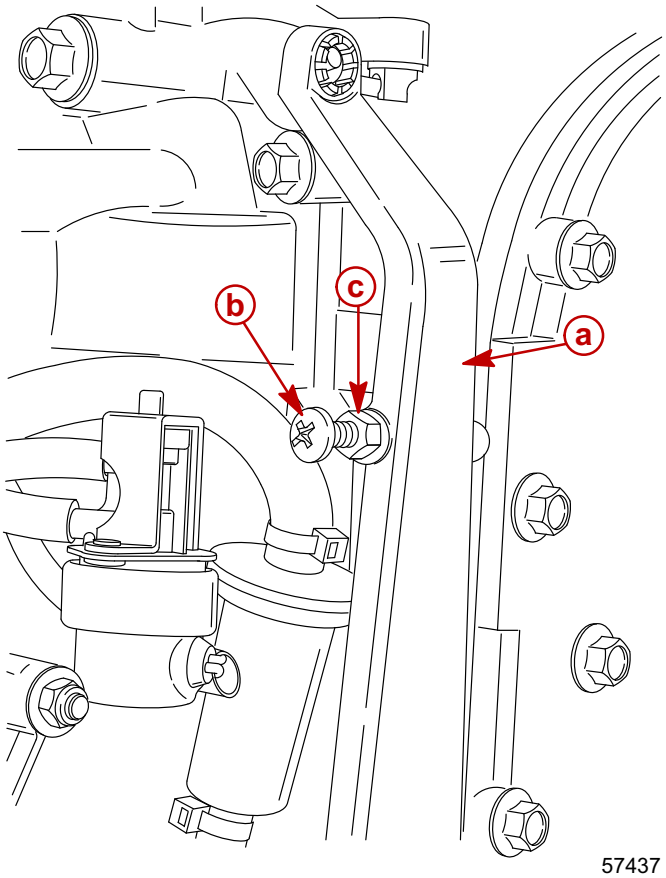


57436

a - Idle Timing Screw
b - Locknut

MAXIMUM TIMING

1. Hold control arm so that maximum spark advance screw is against stop. Crank engine with starter motor and adjust maximum spark advance screw to align 25 degrees B.T.D.C. timing mark on flywheel with timing pointer. (Due to the advance characteristic of this ignition system, this cranking speed adjustment will automatically be reduced (retarded) to 23 degrees B.T.D.C. at an engine speed of 5000 RPM. Tighten locknut.



57437

a - Control Arm
b - Maximum Spark Advance Screw
c - Locknut

Carburetor Adjustments

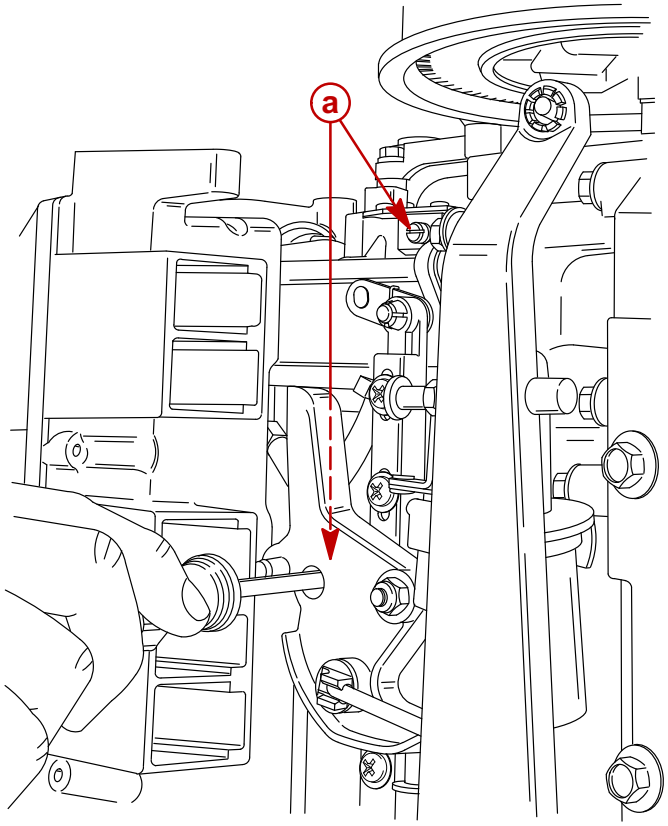
INITIAL STARTING ADJUSTMENT

NOTE: *Only the top two carburetors on four cylinder models have adjustable idle mixture screws.*

After service or replacement of carburetor, turn low speed mixture screw adjustment in (clockwise) until it seats LIGHTLY--then back-off (each carburetor) 1-1/4 turns. This will permit engine startup.

LOW SPEED MIXTURE ADJUSTMENT

1. Start engine and allow to warm-up (run for several minutes). Throttle back engine to idle for about one minute to allow RPMs to stabilize.
2. With engine running at idle speed--in water--IN FORWARD GEAR (prop on)-turn low speed mixture screw IN (clockwise) until engine starts to “bog” down and misfire. Back out 1/4 -1/2 turn.
3. Check for too lean mixture on acceleration; outboard will hesitate on wide-open-throttle acceleration if idle mixture is too lean. Adjust idle mixture screws 1/4-1/2 turn richer (counterclockwise) if necessary and recheck acceleration performance.
4. DO NOT adjust leaner than necessary to attain reasonably smooth idling. When in doubt, stay on the slightly rich side of the adjustment as this will improve outboard starting characteristics after normal operating temperature is obtained.



57438

a - Low Speed Mixture Screws

Timing/Synchronizing/Adjusting EFI Models 220/200/ Mariner 175 SKI

Specifications

Full Throttle RPM Range		
	220, 200	5600-6000
	175 SKI	5200-5700
Idle RPM (in forward gear)		600-675
Maximum Timing @ Cranking Speed		
	220, 200	*19° BTDC
	175 SKI	22° BTDC
Idle Timing		
	220, 200	9° ATDC
	175 SKI	10° ATDC
Recommended Spark Plug		
	220	NGK BU8H
	200	NGK BUZ8H
	175 SKI	NGK BU8H
Firing Order		1-2-3-4-5-6

*Due to the detonation sensor on these models this adjustment will result in a spark timing of 25° BTDC at 3500 RPM.

Special Tools

Part No.	Description
*91-58222A1	Dial Indicator Gauge Kit
*91-59339	Service Tachometer
*91-99379	Timing Light
91-11001A1	Electronic Fuel Injection Tester

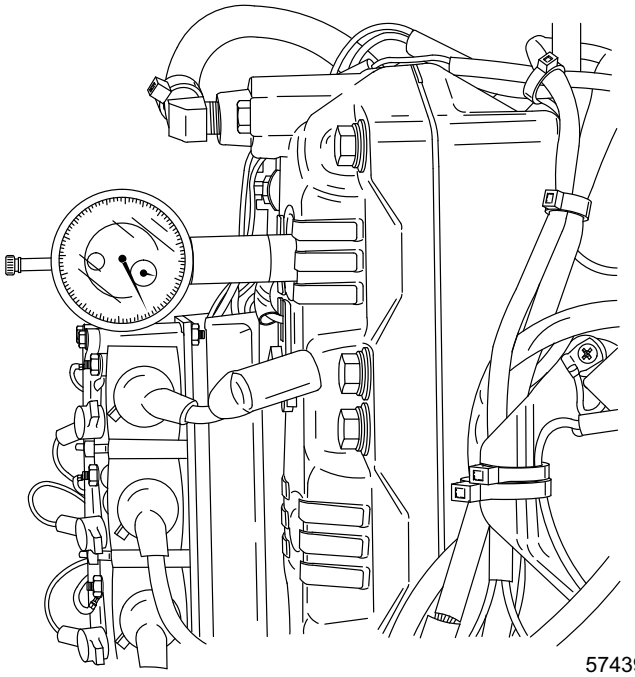
*May be obtained locally.

Timing Pointer Alignment

⚠ WARNING

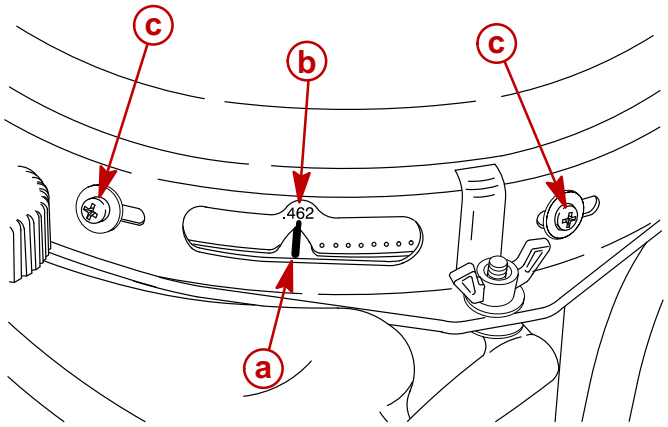
Engine could start when turning flywheel to check timing pointer alignment. Remove all spark plugs from engine to prevent engine from starting.

1. Remove spark plugs.
2. Install dial indicator into No.1 cylinder (top cylinder starboard bank).



57439

3. Turn flywheel clockwise until No.1 piston is at top dead center (TDC). Set dial indicator to “0” (zero).
4. Turn flywheel counterclockwise until dial indicator needle reads approximately .480” BTDC, then turn flywheel clockwise, so that needle reads .462” BTDC exactly.
5. Reposition timing pointer (a) (if necessary), so that timing pointer is aligned with .462” timing mark (b) on flywheel. Retighten pointer attaching screws (c).



57474

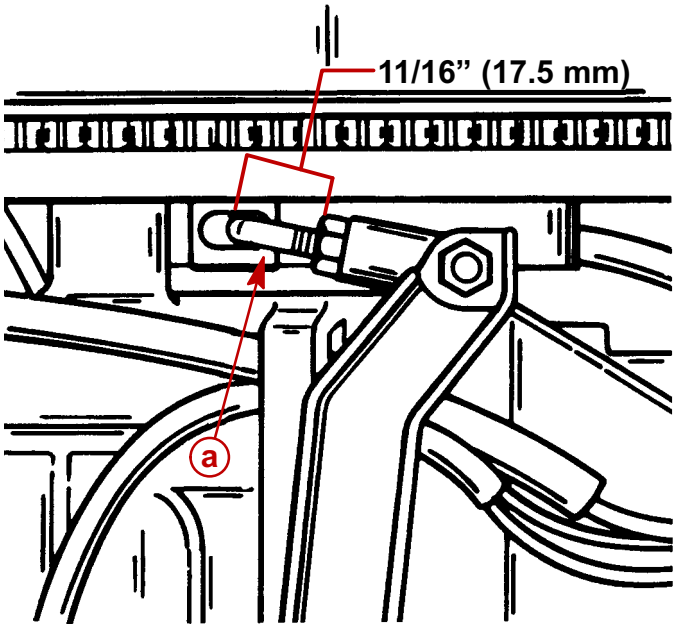
6. Remove dial indicator and reinstall spark plug and high tension spark plug lead of No. 1 cylinder (top cylinder starboard bank) only.

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.

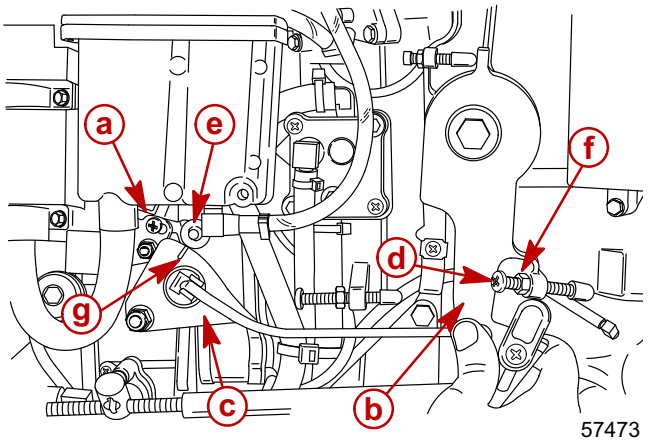
IMPORTANT: Control arm link rod (a) must maintain a length of 11/16" (17.5mm). Make any necessary adjustments to link rod before proceeding with timing adjustments.



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.

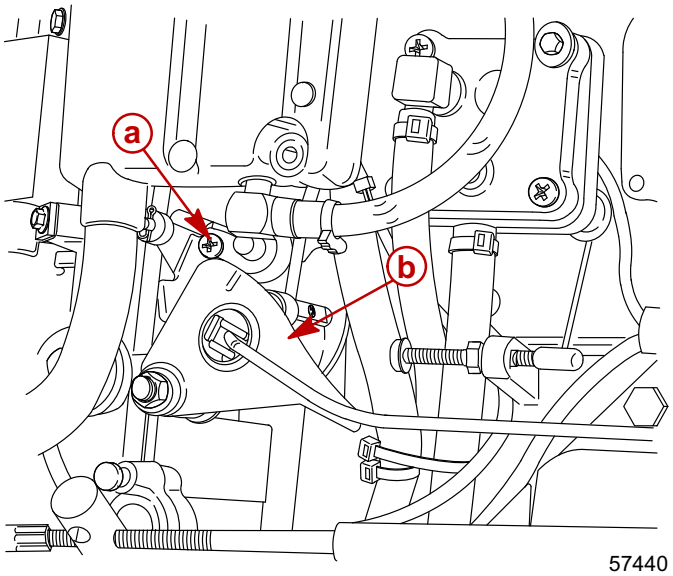
THROTTLE CAM ADJUSTMENT

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



57473

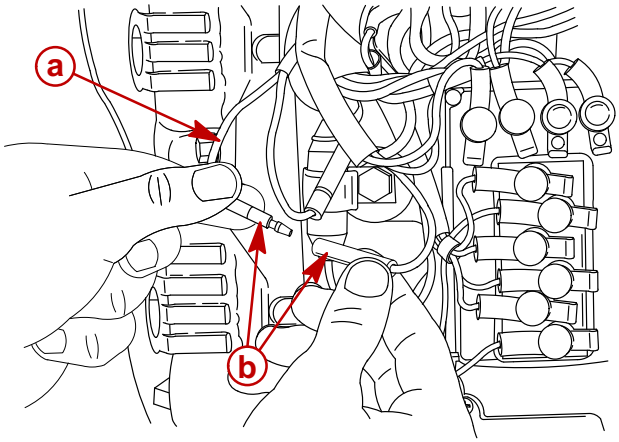
3. While holding throttle arm against idle stop, tighten cam follower screw (a) with roller lightly touching cam (b).



57440

STATIC IDLE TIMING ADJUSTMENT (CRANKING ENGINE WITH STARTER)

1. Disconnect the white/black lead (a) from idle stabilizer box at bullet connector (b). Disconnect ECU harness for ignition timing procedure.



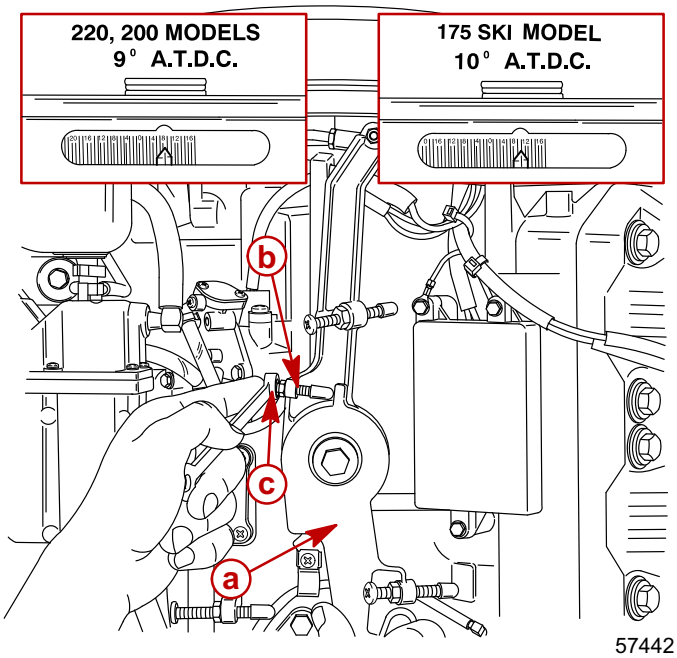
57441

⚠ WARNING

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

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

2. Connect timing light to cylinder number one spark plug lead. Crank engine with starter (about 300 RPM) while holding throttle arm (a) against idle stop. Adjust idle spark adjustment screw (b) to attain 9° ATDC (220, 200 models) or 10° ATDC (175 SKI model). Tighten locknut (c).

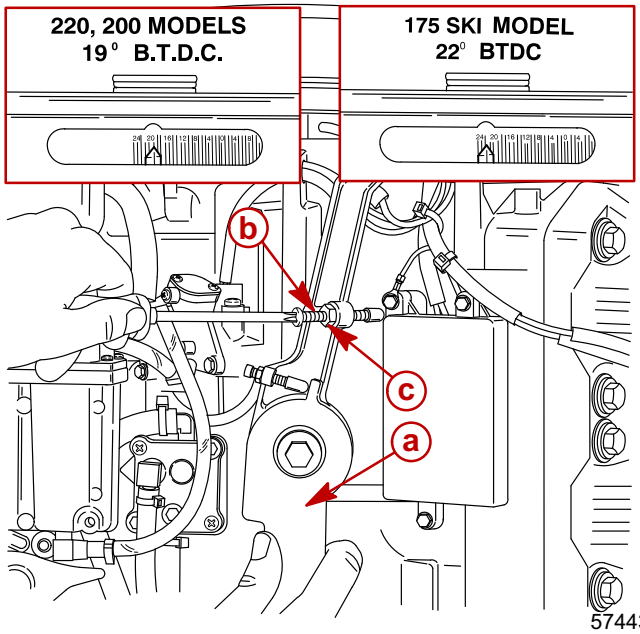


57442

STATIC MAXIMUM TIMING ADJUSTMENT (CRANKING ENGINE WITH STARTER)

NOTE: *White/Black lead and ECU harness remain disconnected for maximum timing adjustment. Timing light remains hooked up to cylinder number one.*

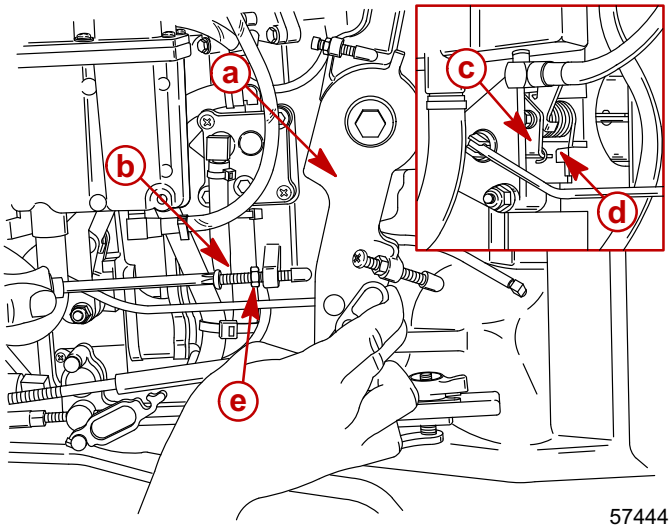
1. Hold throttle arm (a) so that maximum spark advance screw (b) is against stop. Crank engine with starter. Adjust maximum spark advance screw (b) to set timing to attain 19° BTDC (220, 200 models) or 22° BTDC (175 SKI model). Tighten maximum spark adjustment locknut (c).



57443

MAXIMUM THROTTLE

1. Hold throttle arm (a) against full throttle stop screw (b). Ad just 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).



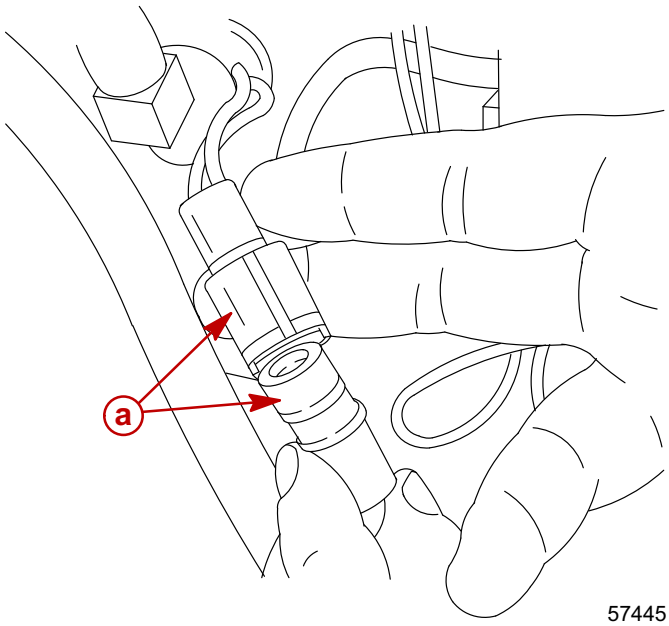
57444

2. Check for slight freeplay (roller lifted from cam) between roller and cam at full throttle to prevent linkage from binding. Readjust full throttle stop screw if necessary.
3. Reconnect white/black lead from idle stabilizer box. Reconnect ECU harness. Disconnect timing light and install spark plugs and fuel line.

THROTTLE POSITION INDICATOR (TPI) ADJUSTMENT

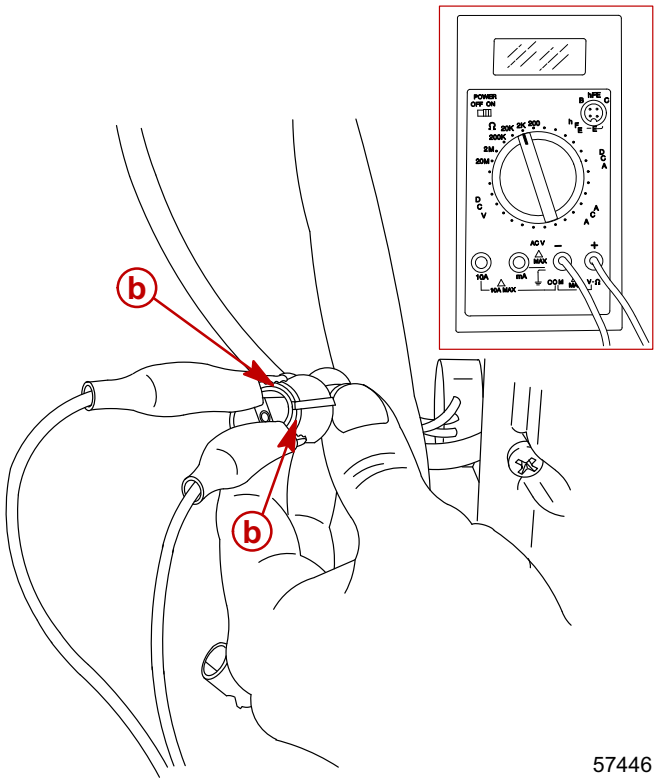
IMPORTANT: TPI can only be adjusted using a digital ohmmeter. Analog (needle) type meter can cause damage to TPI.

1. Disconnect TPI from EFI harness (a).



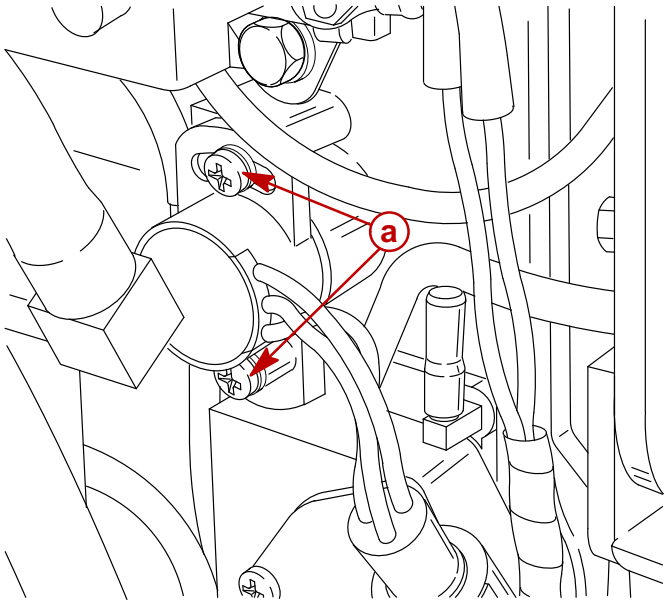
57445

2. Connect digital ohmmeter (using clip jumper lead) to pins of TPI connector (b). Set ohmmeter to two (2) K scale.



57446

3. Loosen screws (a) securing TPI to manifold.



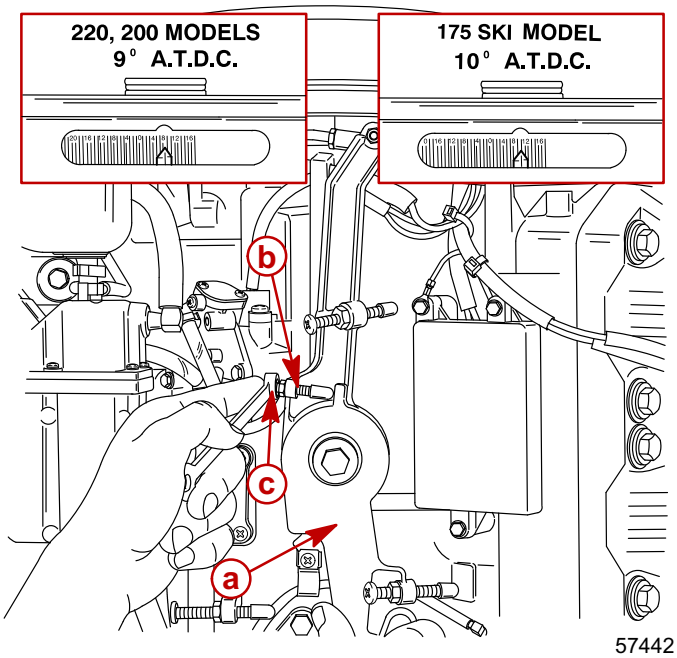
57447

4. Rotate TPI fully clockwise, (holding throttle shaft in closed position). Ohmmeter should read zero. Rotate TPI counterclockwise until ohmmeter reads between 400 and 500 ohms (220,200 models) or 550 and 600 ohms (175 SKI model).
5. Tighten TPI screws (holding correct tolerance). Reconnect TPI to EFI harness.

NOTE: *If engine appears to run too rich or too lean TPI can be readjusted. Decreasing resistance yields leaner mixture (200 ohms minimum resistance); increasing resistance yields richer mixture (700 ohms maximum resistance).*

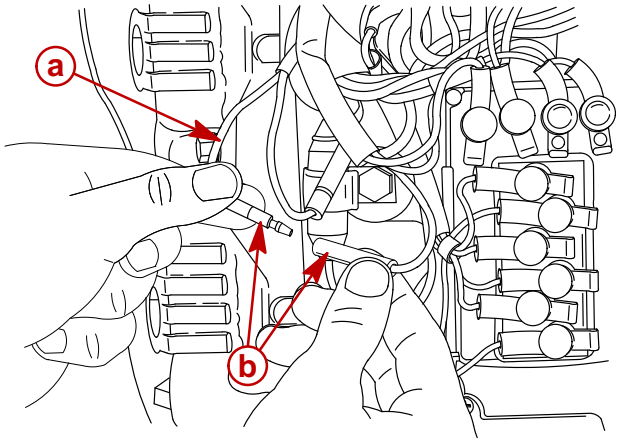
IDLE TIMING (RUNNING)

1. White/Black lead from idle stabilizer must be disconnected.
2. With engine in water, start engine and allow to warm up.
3. Shift engine into forward gear.
4. Hold throttle arm (a) against idle stop (throttle cable barrel removed from barrel retainer). Adjust idle timing screw (b) to align the 9° ATDC timing mark on flywheel with timing pointer (220,200 models) or 10° ATDC (175 SKI model). Tighten lock nut (c).



57442

5. Reconnect WHITE/BLACK lead (a) of idle stabilizer at bullet connector (b).



57441

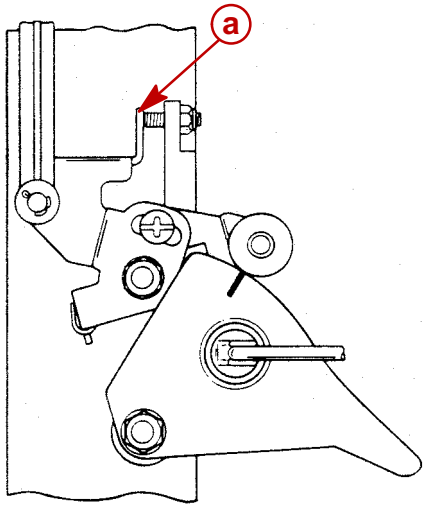
Idle Adjustment

1. With outboard in water, start and allow to warm up.
2. Idle speed in gear (while boat is moving) is 600 to 675. Idle speed in gear (while boat is stationary) is 540 to 600.

IMPORTANT: TPI setting and cam follower must be readjusted following air valve opening adjustment on all 220, 200 models.

3. Loosen cam follower screw, allowing free movement of cam. Hold throttle arm against idle stop. Adjust idle speed by increasing or decreasing air valve opening (shown below).

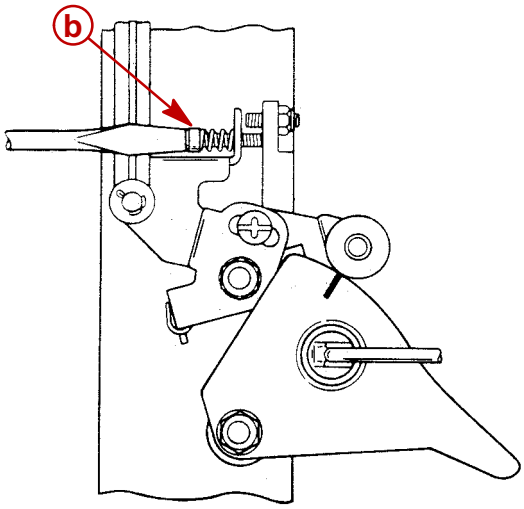
220 Model (early models)



50268

a - Bend idle tab to attain recommended idle RPM.

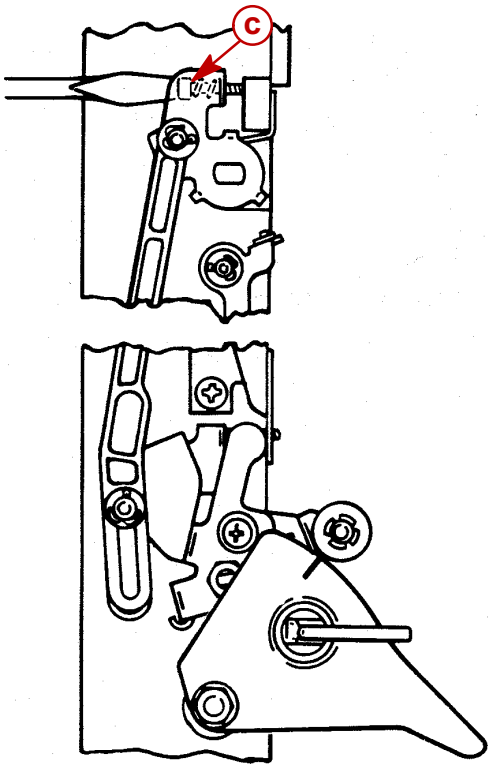
220 (later models), 200 Models



50268

b - Adjust idle speed screw to attain recommended idle RPM.

175 SKI Model



50268

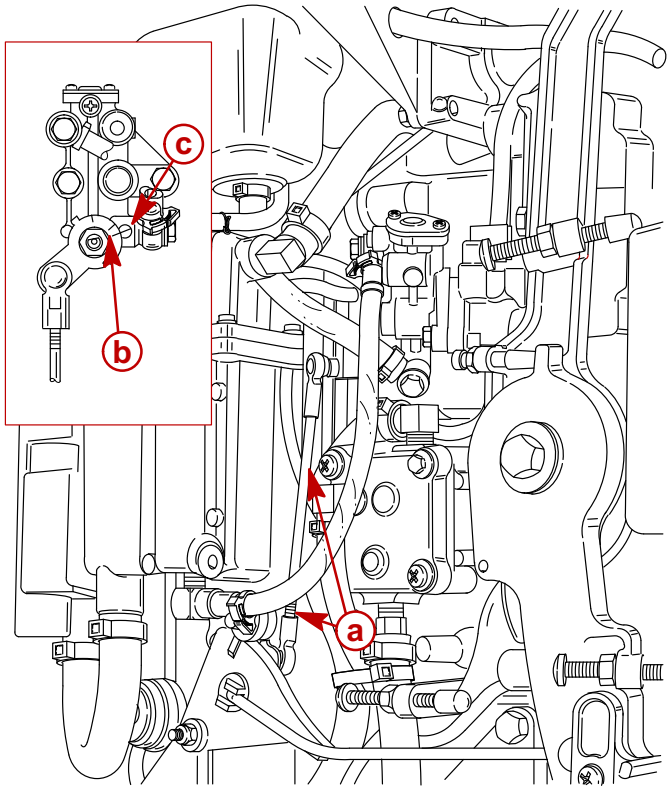
c - Adjust idle speed screw to attain recommended idle RPM.

IMPORTANT: Steps 4 and 5 apply only to 220, 200 models and MUST be followed after air valve opening adjustment.

4. Repeat Throttle Cam Adjustment step and Maximum Throttle step.
5. Readjust TPI to appropriate setting. See TPI Adjustment.

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.



57448

THROTTLE CABLE INSTALLATION

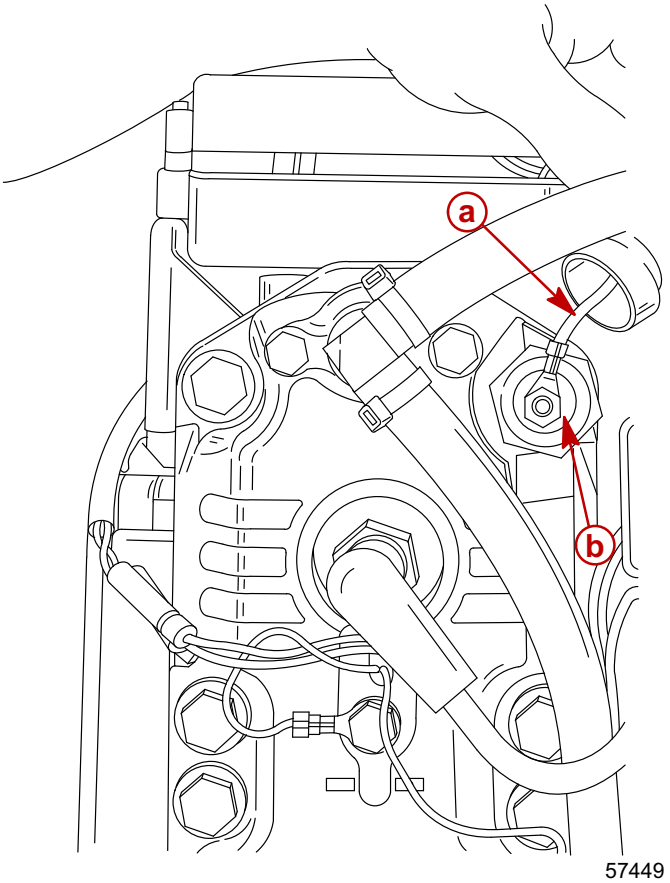
1. With end of throttle cable connected to throttle lever, hold throttle lever against idle stop. Adjust throttle cable barrel to slip into barrel recess of control cable anchor bracket. with a light preload of throttle lever against idle stop. Lock barrel in place.

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

2. 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 throttle cable barrel, if necessary.)

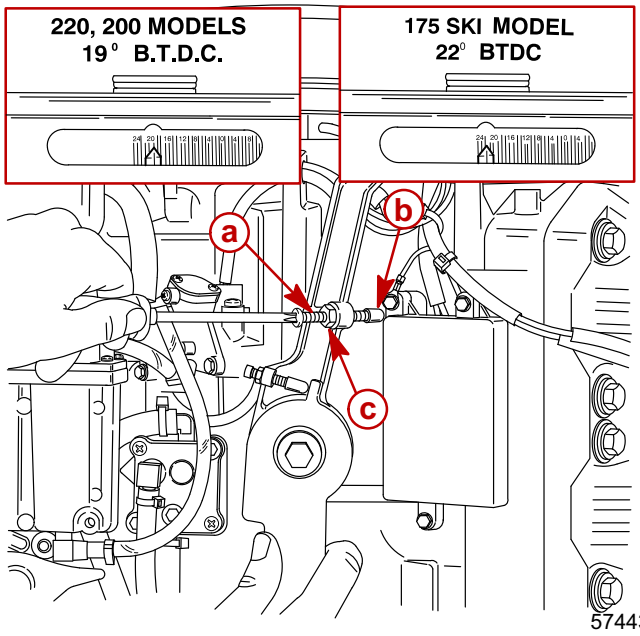
MAXIMUM TIMING ADJUSTMENT (RUNNING)

1. Disconnect WHITE/BLUE lead (a) from detonation sensor (b) (220, 200 models).



57449

2. Outboard running in gear advance throttle arm until maximum spark adjustment screw (a) contacts spark stop (b), typically around 2500 RPM. Spark timing should be 19° BTDC (220, 200 models) or 22° BTDC (175 SKI model). Ad just maximum spark adjustment screw if needed. Tighten locknut (c) and turn engine off.



57443

3. Reconnect white/blue lead (220, 200 models) from detonation control unit to detonation sensor and restart engine.

DETONATION CONTROL (220, 200 MODELS)

1. With outboard running in gear advance throttle to 3500 RPM and check that spark timing has electronically advanced timing to 25° BTDC. This indicates knock control circuit is functioning.