



Form No. 3439-732 Rev A

Count on it.

Service Manual

G210 Engine Service Manual



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Revision History

Preface

This service manual was written expressly for Toro service technicians. The Toro Company has made every effort to make the information in this manual complete and correct.

Basic shop safety knowledge and mechanical/electrical skills are assumed. The Table of Contents lists the systems and the related topics covered in this manual.

We are hopeful that you will find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

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Bloomington, MN 55420

The Toro Company reserves the right to change product specifications or make changes to this manual without notice.

Service Procedure Icons

The following icons appear throughout this Service Manual to bring attention to specific important details of a service procedure.



Critical Process

This icon is used to highlight:

- Installing safety equipment (shields, guards, seat belts, brakes, and R.O.P.S. components) that may have been removed
- Dimensions or settings that must be maintained for proper machine operation
- A specific fastener tightening sequence
- Component orientation that may not be obvious



Critical Torque

This icon is used to highlight an assembly torque requirement that is different than what is recommended in the Standard Torque Tables.



Fluid Specifications

This icon is used to highlight fluid specifications and capacities that are less common, and may not appear on the machine service decal or in the machine *Operator's Manual*.

Note: Refer to the service decal on the machine and the machine *Operator's Manual* for commonly used fluid specifications and capacities.

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Safety Instructions



DANGER



This safety symbol means danger. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions could cause serious permanent injury, disability, or death.



WARNING



This safety symbol means warning. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions can result in serious injury.



CAUTION



This safety symbol means caution. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions can result in minor to moderate injury and/or damage to property or equipment.

Think Safety First

Avoid unexpected starting of engine...

Always turn off the engine, remove the ignition key and disconnect the spark plug wire(s) before cleaning, adjusting, or repair.

Avoid lacerations and amputations...

Stay clear of all moving parts whenever the engine is running. Treat all normally moving parts as if they were moving whenever the engine is running or has the potential to start.

Avoid burns...

Do not touch the engine, muffler, or other components, which may be hot during operation, while the unit is running or shortly after it has been running.

Avoid fires and explosions...

Use extreme care in handling fuel. It is flammable and its vapors are explosive. Extinguish all cigarettes, cigars, pipes, and other sources of ignition. Avoid spilling fuel and never smoke while working with any type of fuel or lubricant. Wipe up any spilled fuel or oil immediately. Never remove the fuel cap or add fuel when the engine is running. Always use approved, labeled containers for storing or transporting fuel and lubricants. Do not add or drain fuel in an enclosed space. Do not store the machine or fuel container where there is an open flame, spark, or pilot light, such as on a water heater or other appliance.

Avoid asphyxiation...

Do not operate an engine in a confined area without proper ventilation.

Avoid injury from batteries...

Think Safety First (continued)

Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes and clothing. Battery gases can explode. Keep cigarettes, sparks and flames away from the battery.

Avoid injury due to inferior parts...

Use only original equipment parts to ensure that important safety criteria are met.

Avoid injury to bystanders...

Always clear the area of bystanders before starting or testing powered equipment.

Avoid injury due to projectiles...

Always clear the area of sticks, rocks or any other debris that could be picked up and thrown by the powered equipment.

Avoid modifications...

Never alter or modify any part unless it is a factory approved procedure.

Avoid unsafe operation...

Always test the safety interlock system after making adjustments or repairs on the machine. Refer to the Electrical section in this manual for more information.

Avoid electrical shock...

Never touch electrical wires or components while the engine is running. They can be sources of shock. De-energize the system if you are having to do repairs. If testing electrical components ensure you are working in a dry environment.

Hydraulic System...

Release all pressure in the hydraulic system before performing any work on the system. Keep your body and hands away from pin-hole leaks or nozzles that eject hydraulic fluid under high pressure. Do not use your hands to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate under the skin and cause serious injury. Seek medical attention right away if hydraulic fluid gets in the skin.

Personal Protective Equipment...

Tie back long hair, and do not wear loose clothing or jewelry. Use appropriate personal protective equipment (PPE) for protecting yourself from potential hazards in the environment in which you will work. Each process outlined in this manual may need different PPE to protect the service person. Use the proper PPE for the task at hand.

Tools...

All tools should be in proper working order. Do not use tools that are broken or in disrepair. Use the proper tool for the proper application.

Lifts, Hoists, and Jacks...

All lifts, hoists, and jacks should be used in accordance with the manufacturer information. Inspect lifts, hoists, and jacks prior to use. Do not overload lifts, hoists, and jacks. Do not work under a suspended load. Ensure chock blocks are used on equipment that can move. Use lifts or jacks and jack stands that are rated to support the total weight of the machine and any attachments. Do not rely on jacks to support the machine. If you are unsure of the operation of any lifts, hoists, and jacks do not use.

Fire Extinguishers...

Think Safety First (continued)

The proper class of fire extinguisher should be used in case of fire.

Class A extinguishers are for ordinary combustible materials such as paper, wood, cardboard, and most plastics. The numerical rating on these types of extinguishers indicates the amount of water it holds and the amount of fire it can extinguish. Geometric symbol (green triangle).

Class B fires involve flammable or combustible liquids such as gasoline, kerosene, grease and oil. The numerical rating for class B extinguishers indicates the approximate number of square feet of fire it can extinguish. Geometric symbol (red square).

Class C fires involve electrical equipment, such as appliances, wiring, circuit breakers and outlets. Never use water to extinguish class C fires - the risk of electrical shock is far too great! Class C extinguishers do not have a numerical rating. The C classification means the extinguishing agent is non-conductive. Geometric symbol (blue circle).

ABC fire extinguishers are a dry chemical type used for multiple purposes. See above information for description. Ensure fire extinguishers are serviceable and replace any that are discharged or out of inspection dates



Specifications and Maintenance

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Specifications

G210FS-1 & G210FDS-1, G210FS-2 & G210FDS-2, and G210FS-4 & G210FDS-4 Engine Specifications

Model	G210FS-1 & G210FDS-1	G210FS-2 & G210FDS-2	G210FS-4 & G210FDS-4
Engine Name	Toro Snow Engine		
Type	OHV Single Cylinder, Four Stroke, Forced Air Cooling		
Bore X Stroke	70 × 55 mm (2.76 x 2.17 inch)		
Displacement	212 cc		
Compression Ratio	8.5 : 1		
Lubrication	Splash		
Starting	Recoil/Electric Start		
Rotation	Counter-Clockwise (from P.T.O. Side)		
Ignition System	Transistorized Magneto Ignition		
Fuel Type	Unleaded gasoline, 87 Octane, 10% Ethanol Gasoline		
Oil Capacity	0.5 L (16.9 oz)		
Engine Top No Load RPM	3300 ± 100 RPM	3300 ± 100 RPM	3700 ± 100 RPM
Dimension (L x W x H)	358 x 353.5 x 357 mm (14.1 x 13.9 x 14 inches)	404 x 306.7 x 357 mm (15.9 x 12 x 14 inches)	358 x 335.1 x 357 mm (14.1 x 13.2 x 14 inches)
Weight	Recoil = 15.9 kg (35.0 lb); Electric Start = 18.0 kg (39.7 lb)		

G210F (D) S-1, S-2, & S-4 Engine Part Specifications

Part	Item	Standard	Service Limit
Engine	Idle RPM (Only on S-1)	2000 ± 200 RPM	N/A
Cylinder Head	Warpage	N/A	0.05 mm (0.00197 inch)
Cylinder	Sleeve Taper/Out of Round (Inside Diameter)	70 mm (2.7559 inch)	70.165 mm (2.7612 inch)
Piston	Skirt Outside Diameter	69.985 mm (2.7553 inch)	69.845 mm (2.7498 inch)
	Cylinder Clearance	0.015-0.05 mm (0.000591-0.001969 inch)	0.12 mm (0.0047 inch)
	Piston Pin Bore Inside Diameter	18.002 mm (0.70874 inch)	18.048 mm (0.71055 inch)
	Piston Pin Clearance	0.002-0.014 mm (0.00008-0.00055 inch)	0.06 mm (0.00236 inch)
Piston Pin	Outside Diameter	18.0 mm (0.70866 inch)	17.954 mm (0.70685 inch)
Piston Rings	Ring to Groove (Top and Middle)	0.015-0.045 mm (0.00059-0.00177 inch)	0.15 mm (0.00591 inch)
	End Gap (Top and Middle)	0.2-0.4 mm (0.0079-0.0157 inch)	1.0 mm (0.0394 inch)
	Width (Top and Middle)	1.2 mm (0.04724 inch)	1.07 mm (0.04213 inch)
Connecting Rod	Small End Inside Diameter	18.002 mm (0.70874 inch)	18.07 mm (0.71141 inch)
	Large End Inside Diameter	30.22 mm (1.18976 inch)	30.246 mm (1.19079 inch)
	Large End Oil Clearance	0.040-0.063 mm (0.00157-0.00248 inch)	0.12 mm (0.00472 inch)
	Large End Side Clearance	0.1-0.7 mm (0.0039-0.0276 inch)	1.1 mm (0.04331 inch)

G210F (D) S-1, S-2, & S-4 Engine Part Specifications (continued)

Crankshaft	Rod Journal	30.16 mm (1.18740 inch)	30.1 mm (1.18503 inch)
Valve	Clearance (Cold) (Intake)	0.13-0.17 mm (0.005-0.007 inch)	N/A
	Clearance (Cold) (Exhaust)	0.18-0.22 mm (0.007-0.009 inch)	N/A
	Stem Diameter (Intake)	5.480 mm (0.2157 inch)	5.318 mm (0.2094 inch)
	Stem Diameter (Exhaust)	5.440 mm (0.2142 inch)	5.275 mm (0.2077 inch)
Valve Guides	Inside Diameter (Intake, Exhaust)	5.500 mm (0.2165 inch)	5.572 mm (0.2194 inch)
	Stem to Guide Clearance (Intake)	0.020-0.044 mm (0.00079-0.00173 inch)	0.10 mm (0.00394 inch)
	Stem to Guide Clearance (Exhaust)	0.060-0.087 mm (0.00236-0.00343 inch)	0.12 mm (0.00472 inch)
Valve Seat	Seat Width	0.8 mm (0.0315 inch)	2.0 mm (0.0787 inch)
Valve Spring	Free Length	35 mm (1.37795 inch)	32.5 mm (1.27953 inch)
Camshaft	Height (Intake)	27.70 mm (1.09055 inch)	27.45 mm (1.08071 inch)
	Height (Exhaust)	27.75 mm (1.09252 inch)	27.50 mm (1.08268 inch)
	Journal (Bearing)	13.984 mm (0.55055 inch)	13.916 mm (0.54787 inch)
Crankcase Cover	Camshaft Hole Diameter	14.0 mm (0.55118 inch)	14.048 mm (0.55307 inch)
Spark Plug	Gap	0.762 mm (0.030 inch)	N/A
Ignition Coil	Resistance (Primary)	1.0-1.2 Ω	N/A
	Resistance (Secondary)	5.1-6.1 Ω	N/A
	Gap to Flywheel	0.4 mm (0.016 inch)	N/A
Governor Assembly Clearance	Governor End Play	0.05 - 0.35 mm (0.002-0.013 inch)	N/A

G210 Engine Fastener Torque Specifications

Item	Screw Thread	Torque
Cylinder Head Bolt	M8	34 N • m (25 ft-lb)
Connecting Rod Bolt	M7	14 N • m (124 in-lb)
Flywheel Nut	M14	85 N • m (63 ft-lb)
Rocker Arm Pivot Lock Nuts	M6	10 N • m (89 in-lb)
Rocker Arm Studs	M8	29 N • m (21 ft-lb)
Crankcase Cover Bolt	M8	29 N • m (21 ft-lb)
Exhaust Stud	M8	29 N • m (21 ft-lb)
Governor Arm Nut	M6	10 N • m (89 in-lb)
Intake Stud	M6	10 N • m (89 in-lb)
Ignition Coil Bolt	M6	10 N • m (89 in-lb)
Muffler Nut	M8	29 N • m (21 ft-lb)
Air Box Nut	M6	10 N • m (89 in-lb)
Oil Drain Bolt	M10	22 N • m (195 in-lb)
Dipstick Tube Bolt	M6	11 N • m (97 in-lb)
Fuel Switch Knob Screw	M4	2.0 N • m (18 in-lb)

G210 Engine Fastener Torque Specifications (continued)

Fuel Filter	N/A	2.0 N • m (18 in-lb)
Recoil Mount Bolt	M6	10 N • m (89 in-lb)
Electric Start Switch Mount Screw	M4	1.4 N • m (12 in-lb)
Valve Cover Bolt	M6	10 N • m (89 in-lb)
Electric Starter Motor Bolt	M6	10 N • m (89 in-lb)
Spark Plug	N/A	29 N • m (21 ft-lb)
Shroud Mount Bolt or Nut	M6	10 N • m (89 in-lb)
Carburetor Bowl Screw	M8	7.5 N • m (66 in-lb)
Fuel Drain Screw	M6	7.5 N • m (66 in-lb)
Standard Torque Value Nuts or Bolts	M4	2 N • m (18 in-lb)
	M5	6 N • m (54 in-lb)
	M6	10 N • m (89 in-lb)
	M8	24 N • m (18 ft-lb)
	M10	38 N • m (28 ft-lb)
	M12	55 N • m (41 ft-lb)

Torque Specifications

The recommended fastener torque values are listed in the following tables. For critical applications, as determined by Toro, either the recommended torque or a torque that is unique to the application is clearly identified and specified in the service manual.

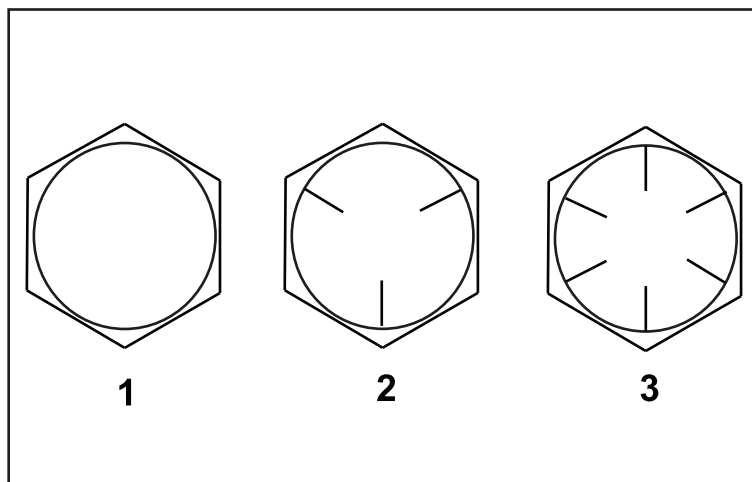
These torque specifications for the installation and tightening of fasteners shall apply for all fasteners which do not have a specific requirement identified in the service manual. The following factors shall be considered when applying torque: cleanliness of the fastener, use of a thread sealant (Loctite), degree of lubrication on the fastener, presence of a prevailing torque feature, hardness of the surface underneath of the fastener's head, or similar condition which affects the installation.

As noted in the following tables, torque values should be reduced by 25% for lubricated fasteners to achieve the similar stress as a dry fastener. Torque values may also have to be reduced when the fastener is threaded into aluminum or brass. The specific torque value should be determined based on the aluminum or brass material strength, fastener size, length of thread engagement, etc.

The standard method of verifying torque shall be performed by marking a line on the fastener (head or nut) and mating part, then back off fastener 1/4 of a turn. Measure the torque required to tighten the fastener until the lines match up.

Fastener Identification

Inch Series Bolts and Screws



g272208

Figure 1

- | | |
|------------|------------|
| 1. Grade 1 | 3. Grade 8 |
| 2. Grade 5 | |

Metric Bolts and Screws

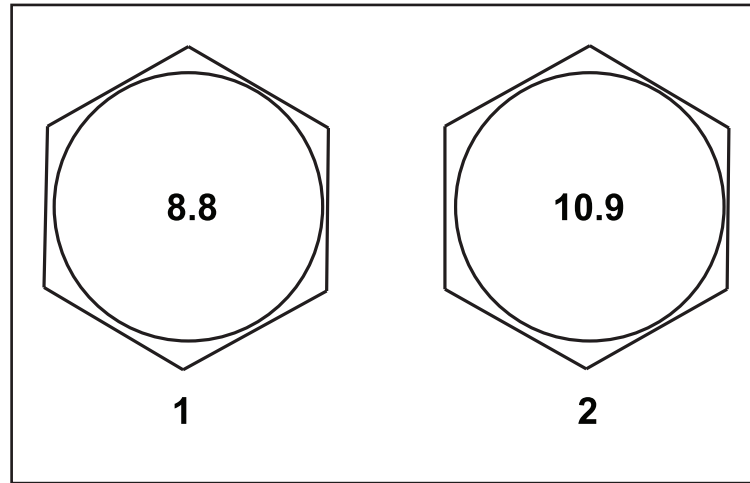


Figure 2

1. Class 8.8

2. Class 10.9

Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Inch Series)

Thread Size	Grade 1, 5, & 8 Fasteners with Thin Height Nuts	SAE Grade 1 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE Grade 2 or Better Nut)		SAE Grade 5 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE Grade 5 or Better Nut)		SAE Grade 8 Bolts, Screws, Studs & Sems with Regular Height Nuts (SAE Grade 8 or Better Nut)	
		in-lb	in-lb	N • cm	in-lb	N • cm	in-lb
#6-32 UNC	10 ± 2	13 ± 2	147 ± 23	15 ± 2	169 ± 23	23 ± 3	260 ± 34
#6-40 UNF				17 ± 2	192 ± 23	25 ± 3	282 ± 34
#8-32 UNC	13 ± 2	25 ± 5	282 ± 30	29 ± 3	328 ± 34	41 ± 5	463 ± 56
#8-36 UNF				31 ± 4	350 ± 45	43 ± 5	486 ± 56
#10-24 UNC	18 ± 2	30 ± 5	339 ± 56	42 ± 5	475 ± 56	60 ± 6	678 ± 68
#10-32 UNF				48 ± 5	542 ± 56	68 ± 7	768 ± 79
1/4-20 UNC	48 ± 7	53 ± 7	599 ± 79	100 ± 10	1130 ± 113	140 ± 15	1582 ± 169
1/4-28 UNF	53 ± 7	65 ± 10	734 ± 113	115 ± 12	1299 ± 136	160 ± 17	1808 ± 192
5/16-18 UNC	115 ± 15	105 ± 15	1186 ± 169	200 ± 25	2260 ± 282	300 ± 30	3390 ± 339
5/16-24 UNF	138 ± 17	128 ± 17	1446 ± 192	225 ± 25	2542 ± 282	325 ± 33	3672 ± 373
	ft-lb	ft-lb	N • m	ft-lb	N • m	ft-lb	N • m
3/8-16 UNC	16 ± 2	16 ± 2	22 ± 3	30 ± 3	41 ± 4	43 ± 5	58 ± 7
3/8-24 UNF	17 ± 2	18 ± 2	24 ± 3	35 ± 4	47 ± 5	50 ± 6	68 ± 8
7/16-14 UNC	27 ± 3	27 ± 3	37 ± 4	50 ± 5	68 ± 7	70 ± 7	95 ± 9
7/16-20 UNF	29 ± 3	29 ± 3	39 ± 4	55 ± 6	75 ± 8	77 ± 8	104 ± 11
1/2-13 UNC	30 ± 3	48 ± 7	65 ± 9	75 ± 8	102 ± 11	105 ± 11	142 ± 15
1/2-20 UNF	32 ± 4	53 ± 7	72 ± 9	85 ± 9	115 ± 12	120 ± 12	163 ± 16
5/8-11 UNC	65 ± 10	88 ± 12	119 ± 16	150 ± 15	203 ± 20	210 ± 21	285 ± 28
5/8-18 UNF	75 ± 10	95 ± 15	129 ± 20	170 ± 18	230 ± 24	240 ± 24	325 ± 33
3/4-10 UNC	93 ± 12	140 ± 20	190 ± 27	265 ± 27	359 ± 37	375 ± 38	508 ± 52
3/4-16 UNF	115 ± 15	165 ± 25	224 ± 34	300 ± 30	407 ± 41	420 ± 43	569 ± 58
7/8-9 UNC	140 ± 20	225 ± 25	305 ± 34	430 ± 45	583 ± 61	600 ± 60	813 ± 81
7/8-14 UNF	155 ± 25	260 ± 30	353 ± 41	475 ± 48	644 ± 65	667 ± 66	904 ± 89

Note: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as oil, graphite, or thread sealant such as Loctite.

Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

The nominal torque values listed above for Grade 5 and 8 fasteners are based on 75% of the minimum proof load specified in SAE J429. The tolerance is approximately ± 10% of the nominal torque value. Thin nuts include jam nuts.

Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Metric Series)

Thread Size	Class 8.8 Bolts, Screws, Studs with Regular Height Nuts (Class 8 or Stronger Nuts)		Class 10.9 Bolts, Screws, Studs with Regular Height Nuts (Class 10 or stronger Nuts)	
	in-lb	N • cm	in-lb	N • cm
M5 X 0.8	57 ± 6	644 ± 68	78 ± 8	881 ± 90
M6 X 1.0	96 ± 10	1085 ± 113	133 ± 14	1503 ± 158
	ft-lb	N • m	ft-lb	N • m
M8 X 1.25	19 ± 2	26 ± 3	28 ± 3	38 ± 4
M10 X 1.5	38 ± 4	52 ± 5	54 ± 6	73 ± 8
M12 X 1.75	66 ± 7	90 ± 10	93 ± 10	126 ± 14
M16 X 2.0	166 ± 17	255 ± 23	229 ± 23	310 ± 31
M20 X 2.5	325 ± 33	440 ± 45	450 ± 46	610 ± 62

Note: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as oil, graphite, or thread sealant such as Loctite.

Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

The nominal torque values listed above are based on 75% of the minimum proof load specified in SAE J1199. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

SAE Grade 8 Steel Set Screws

Thread Size	Recommended Torque	
	Square Head	Hex Socket
1/4 - 20 UNC	140 ± 20 in-lb	73 ± 12 in-lb
5/16 - 18 UNC	215 ± 35 in-lb	145 ± 20 in-lb
1/2 - 13 UNC	75 ± 15 ft-lb	50 ± 10 ft-lb
3/8 - 16 UNC	35 ± 10 ft-lb	18 ± 3 ft-lb

Wheel Bolts and Lug Nuts

Thread Size	Recommended Torque**	
7/16 - 20 UNF Grade 5	65 ± 10 ft-lb	88 ± 14 N • m
1/2 - 20 UNF Grade 5	80 ± 10 ft-lb	108 ± 14 N • m
M12 X 1.25 Class 8.8	80 ± 10 ft-lb	108 ± 14 N • m
M12 X 1.5 Class 8.8	80 ± 10 ft-lb	108 ± 14 N • m

**For steel wheels and non-lubricated fasteners.

Thread Cutting Screws (Zinc Plated Steel)

Type 1, Type 23, or Type F	
Thread Size	Baseline Torque*
No. 6 - 32 UNC	20 ± 5 in-lb
No. 8 - 32 UNC	30 ± 5 in-lb
No. 10 - 24 UNC	38 ± 7 in-lb
1/4 - 20 UNC	85 ± 15 in-lb
5/16 - 18 UNC	110 ± 20 in-lb
3/8 - 16 UNC	200 ± 100 in-lb

*Hole size, material strength, material thickness and finish must be considered when determining specific torque values. All torque values are based on non-lubricated fasteners.

Conversion Factors

$$\text{in-lb} \times 11.2985 = \text{N} \cdot \text{cm}$$

$$\text{ft-lb} \times 1.3558 = \text{N} \cdot \text{m}$$

$$\text{N} \cdot \text{cm} \times 0.08851 = \text{in-lb}$$

$$\text{N} \cdot \text{cm} \times 0.73776 = \text{ft-lb}$$

Thread Cutting Screws (Zinc Plated Steel)

Threads Size	Threads per Inch		Baseline Torque*
	Type A	Type B	
No. 6	18	20	20 ± 5 in-lb
No. 8	15	18	30 ± 5 in-lb
No. 10	12	16	38 ± 7 in-lb
No. 12	11	14	85 ± 15 in-lb

*Hole size, material strength, material thickness and finish must be considered when determining specific torque values. All torque values are based on non-lubricated fasteners.

Equivalents and Conversions

Decimal and Millimeter Equivalents

Fractions	Decimals	mm	Fractions	Decimals	mm
1/64	0.015625	0.397	33/64	0.515625	13.097
1/32	0.03125	0.794	16/32	0.53125	13.484
3/64	0.046875	1.191	35/64	0.546875	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.078125	1.984	37/64	0.578125	14.684
3/32	0.09375	2.381	19/32	0.59375	15.081
1/8	0.1250	3.175	5/8	0.6250	15.875
9/64	0.140625	3.572	41/64	0.640625	16.272
5/32	0.15625	3.969	21/32	0.65625	16.669
11/64	0.171875	4.366	43/64	0.671875	17.066
3/16	0.1875	4.762	11/64	0.6875	17.462
13/64	0.203125	5.159	45/64	0.703125	17.859
7/32	0.21875	5.556	23/32	0.71875	18.256
15/64	0.234375	5.953	47/64	0.734375	18.653
1/4	0.2500	6.350	3/4	0.7500	19.050
17/64	0.265625	6.747	49/64	0.765625	19.447
9/32	0.28125	7.144	25/32	0.78125	19.844
19/64	0.296875	7.541	51/64	0.796875	20.241
5/16	0.3125	7.541	13/16	0.8125	20.638
21/64	0.328125	8.334	53/64	0.828125	21.034
11/32	0.34375	8.731	27/32	0.84375	21.431
23/64	0.359375	9.128	55/64	0.859375	21.828
3/8	0.3750	9.525	7/8	0.8750	22.225
25/64	0.390625	9.922	57/64	0.890625	22.622
13/32	0.40625	10.319	29/32	0.90625	23.019
27/64	0.421875	10.716	59/64	0.921875	23.416
7/16	0.4375	11.112	15/16	0.9375	23.812
29/64	0.453125	11.509	61/64	0.953125	24.209
15/32	0.46875	11.906	31/32	0.96875	24.606
31/64	0.484375	12.303	63/64	0.984375	25.003
1/2	0.5000	12.700	1	1.000	25.400
1 mm = 0.03937 in.			0.001 in. = 0.0254 mm		

U.S. to Metric Conversions

	To Convert	Into	Multiply By
Linear Measurement	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
Area	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
Volume	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
Weight	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces	Grams	28.3495
Pressure	Pounds/Square Inch	Kilopascal	6.895
Work	Foot-Pounds	Newton-Meters	1.356
	Foot-Pounds	Kilogram-Meters	0.1383
	Inch-Pounds	Kilogram-Centimeters	1.152144
Liquid Volume	Quarts	Liters	0.9463
	Gallons	Liters	3.785
Liquid Flows	Gallons/Minute	Liters/Minute	3.785
Temperature	Fahrenheit	Celsius	1. Subtract by 32°
			2. Multiply by 5/9



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General Troubleshooting 3-3
Engine Model/Serial Number Location 3-10

GEARS

The Systematic approach to defining, diagnosing and solving problems.



G

Gather Information

- Information reported by the customer
- Information observed by you
- Establish the what, where and when of the issue



E

Evaluate Potential Causes

- Consider possible causes of the problem to develop a hypothesis
- Narrow down the focus of the problem



A

Assess Performance

- Ensure you have all the necessary tools for testing
- Test all potential causes of the failure
- Reevaluate and create new hypotheses if necessary



R

Repair

- Return the unit to service by repairing, rebuilding or replacing



S

Solution Confirmation

- Did the issue go away
- Was the root cause of the issue correctly repaired
- Are there any other new symptoms

General Troubleshooting

Problem	Possible Cause	Corrective Action
Engine does not start, hard start, or running poorly	Choke function	<ol style="list-style-type: none"> 1. Verify the choke is fully closed. 2. Check that the lever moves the choke butterfly open and close. 3. Replace components as necessary.
	Fuel delivery issue	<ol style="list-style-type: none"> 1. Verify fuel shut off is in ON position. 2. Check the fuel level in the tank, fuel filter, fuel lines, fuel tank venting, and carburetor. 3. Check for ice blocking the filter, lines, or in bowl of carburetor. 4. Clean and flush fuel system to remove debris. 5. Replace damaged components as necessary.
	Fuel quality	<ol style="list-style-type: none"> 1. Check the fuel condition: age, octane, ethanol percentage, water/ice or other contaminates. 2. Flush the fuel system, replace fuel with known good fuel. 3. Consider using Toro Fuel Treatment.
	Spark plug	<ol style="list-style-type: none"> 1. Verify the spark plug boot is installed correctly. 2. Check the spark plug number. 3. Check the spark plug gap. 4. Fully install the spark plug boot. 5. Replace as necessary.
	Weak or no spark	<ol style="list-style-type: none"> 1. Perform a spark test. 2. Verify the key is fully inserted and the throttle control is in the fast position. 3. Check the ignition coil air gap. Adjust as necessary. 4. Replace as necessary.
	Engine oil	<ol style="list-style-type: none"> 1. Check oil level and viscosity.

General Troubleshooting (continued)

Problem	Possible Cause	Corrective Action
Engine does not start, hard start, or running poorly (continued)	Insufficient compression	<ol style="list-style-type: none">1. Perform a leak down test.2. Check cylinder for wear.3. Check for valve(s) not seating.4. Check the valve clearance.5. Check the head gasket or intake gasket for leaking.6. Adjust the valve clearance.7. Replace damaged components as necessary.

General Troubleshooting (continued)

Problem	Possible Cause	Corrective Action
Engine runs but misses	Fuel quality	<ol style="list-style-type: none"> 1. Check the fuel condition: age, octane, ethanol percentage, water/ice or other contaminants. 2. Flush the fuel system, replace fuel with known good fuel. 3. Replace the fuel filter. 4. Consider using Toro Fuel Treatment.
	Fuel delivery issue	<ol style="list-style-type: none"> 1. Verify the fuel shut off is in the ON position. 2. Check the fuel level, fuel filter, fuel lines, fuel tank venting, and carburetor. 3. Check for ice blocking filter, lines, or in the bowl of the carburetor. 4. Verify the fuel tank cap is venting. 5. Clean debris from the fuel system. 6. Replace damaged components as necessary.
	Spark plug	<ol style="list-style-type: none"> 1. Check to verify the spark plug boot is installed correctly. 2. Check the spark plug number. 3. Check the spark plug gap. 4. Fully install the spark plug boot. 5. Replace as necessary.
	Weak or intermittent spark	<ol style="list-style-type: none"> 1. Perform a spark test. 2. Verify the key is fully inserted and the throttle control is in the fast position. 3. Check the ignition coil air gap. Adjust as necessary. 4. Replace as necessary.

General Troubleshooting (continued)

Problem	Possible Cause	Corrective Action
Engine runs but misses (continued)	Insufficient compression	<ol style="list-style-type: none"> 1. Perform a leak down test. 2. Check the cylinder for wear. 3. Check for valve(s) not seating. 4. Check the valve clearance. 5. Check the head gasket or intake gasket for leaking. 6. Adjust the valve clearance. 7. Replace damaged components as necessary.
	Engine overheated	<ol style="list-style-type: none"> 1. See engine overheating troubleshooting table section.
Engine does not crank	Recoil issue	<ol style="list-style-type: none"> 1. Recoil pawls are not engaged in the starter cup or the rope iced/frozen. 2. Clean and dry components. 3. Replace damaged components as necessary.
	Electric starter motor issues	<ol style="list-style-type: none"> 1. Check for ice/snow on the Bendix/flywheel teeth. 2. Check the electrical supply for correct power. 3. Bench test the starter assembly. 4. Clean and dry the components. 5. Replace damaged components as necessary.
	Flywheel issue	<ol style="list-style-type: none"> 1. Check the flywheel key. 2. Check to verify the flywheel is mounted properly. 3. Check the hardware assembly and torque the flywheel to specification. 4. Replace damaged components as necessary.

General Troubleshooting (continued)

Problem	Possible Cause	Corrective Action
Engine is oil leaking from the breather hose	Oil	<ol style="list-style-type: none"> 1. Check if the oil is overfilled or contaminated. 2. Check the oil viscosity. 3. Change the oil using correct viscosity. See the product Operator's Manual for oil changing procedures.
	Breather hose	<ol style="list-style-type: none"> 1. Check if the breather hose is open. 2. Check the breather hose routing. 3. Replace damaged components as necessary.
	Excessive crankcase pressure	<ol style="list-style-type: none"> 1. Perform a leak down test. 2. Check the cylinder for wear. 3. Check to verify the valves are seating properly. 4. Check the head gasket for leaking. 5. Replace damaged components as necessary.

General Troubleshooting (continued)

Problem	Possible Cause	Corrective Action
Engine overheats	Flywheel fan	<ol style="list-style-type: none"> 1. Check the flywheel fan for damage. 2. Replace damaged components as necessary.
	Cylinder cooling fins	<ol style="list-style-type: none"> 1. Check for debris build up under the engine shroud. 2. Clear debris from under the shrouds and between cooling fins 3. Replace damaged components as necessary.
	Oil	<ol style="list-style-type: none"> 1. Check if the oil level is low or contaminated. 2. Check the oil viscosity. 3. Change the oil using correct viscosity. See the product Operator's Manual for oil changing procedures.
	Engine gaskets leaking	<ol style="list-style-type: none"> 1. Check the head gasket for leaking. 2. Check the cylinder head for wear and exhaust leaks. 3. Replace damaged components as necessary.
	Muffler	<ol style="list-style-type: none"> 1. Check if the muffler is blocked, cracked, damaged or if exhaust air is going into the engine. 2. Replace damaged components as necessary.

General Troubleshooting (continued)

Problem	Possible Cause	Corrective Action
Engine Surges at Top No Load RPM	Fuel delivery issue	<ol style="list-style-type: none"> 1. Hold the throttle shaft to keep engine at RPM. If the engine shuts off, see the corrective actions below. 2. Verify the fuel shut off is in the ON position. 3. Check the fuel level, fuel filter, fuel lines, fuel tank venting, and carburetor. 4. Check the ice blocking filter, lines and bowl in the carburetor for damage. 5. Verify the fuel tank cap is venting. 6. Clean and flush the fuel system. 7. Replace damaged components as necessary.
	Air leak into intake	<ol style="list-style-type: none"> 1. Hold throttle shaft to keep the engine at RPM. If the engine surges, see the corrective actions below. 2. Check the intake gaskets for leaks. 3. Check the carburetor air leak for damage. 4. Replace damaged components as necessary.
	Governor and/or linkage bind	<ol style="list-style-type: none"> 1. Hold the throttle shaft to keep the engine at RPM. If the engine does not surge, see the corrective actions below. 2. Check the governor rod and throttle control spring for binding or ice build-up. 3. Verify the governor arm is free to move. 4. Check for engine oil contamination. 5. Change the oil. Clear ice/snow from the governor linkage and zero the governor. 6. Replace the damaged components as necessary.

Engine Model/Serial Number Location

The engine model and serial numbers are engraved into the crankcase. At the time of production, there is a disposable paper tag located on the engine block, above the oil drain.

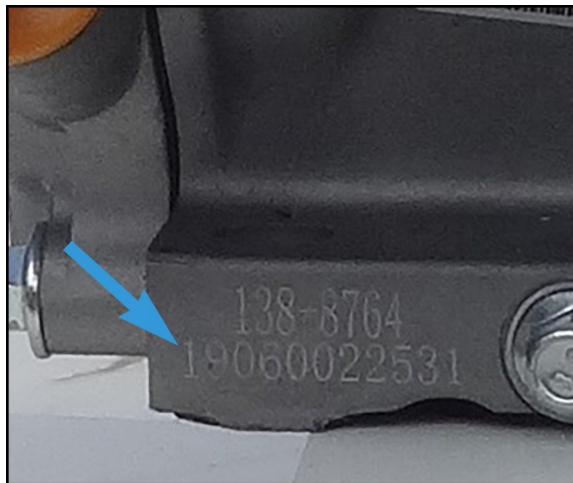
The engine model number is located in the top row.



g339493

Figure 3

The engine serial number is located in the bottom row. The first 4 digits represent the date the engine was manufactured. The first 2 digits represent the year and the following 2 digits represent the month.



g339494

Figure 4



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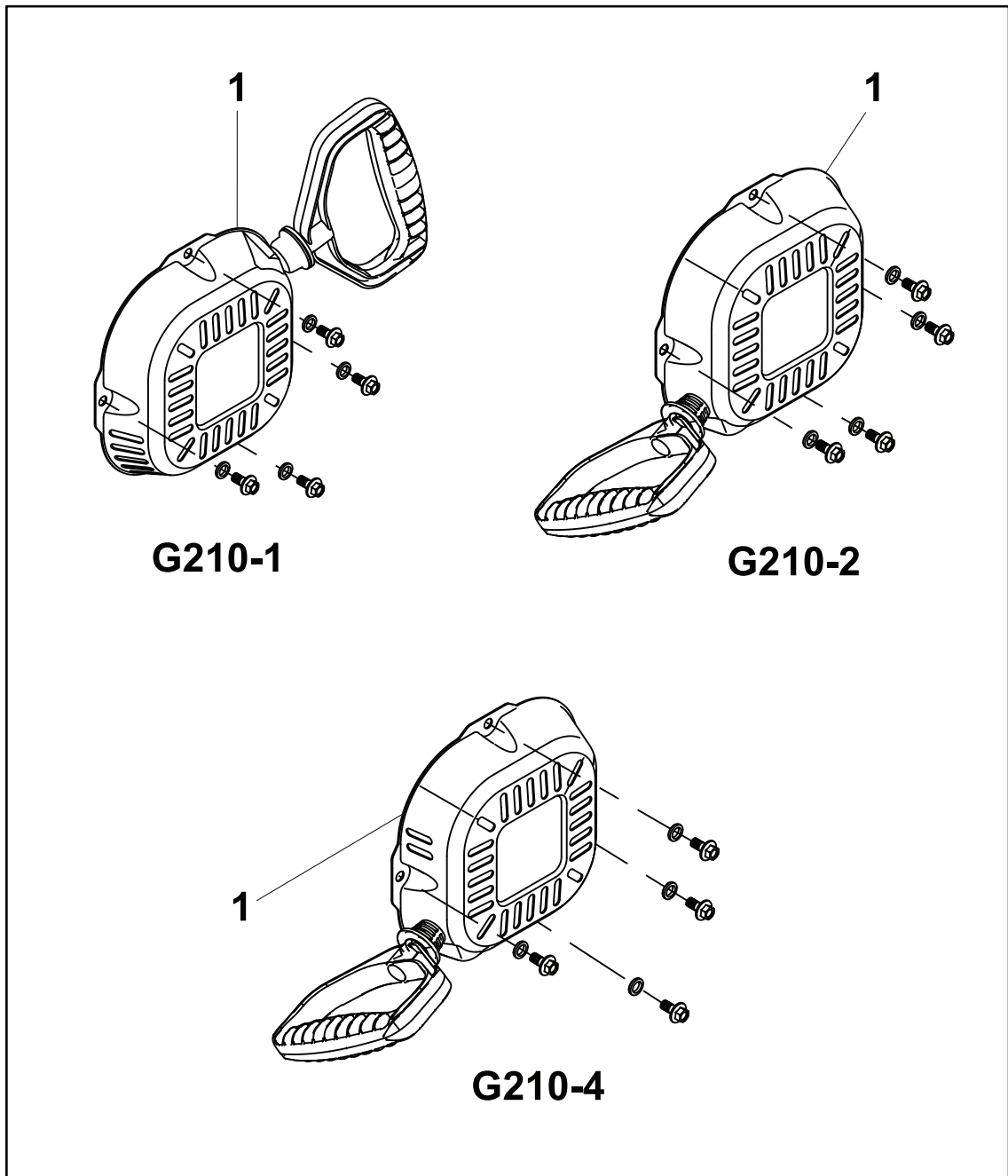
General Information	4-2
Service and Repairs	4-3
Recoil Replacement.....	4-4

General Information

This Starter System chapter covers the removal, inspection, and installation of the recoil assembly. There are two different orientations of the recoil for the different engine variations.

Service and Repairs

Recoil Starter Assembly



g322269

Figure 5

1. Recoil Starter Assembly

Recoil Replacement

Recoil Removal

1. Remove the 4 (M6 x 8) screws and 4 (M6) washers securing the recoil starter assembly to the blower shroud.



g322365

Figure 6

-
2. Remove the recoil starter assembly from the blower shroud.



g322362

Figure 7

Recoil Inspection

1. Inspect the starter cup for burrs, nicks, or if out of round. Replace the starter cup if damaged.

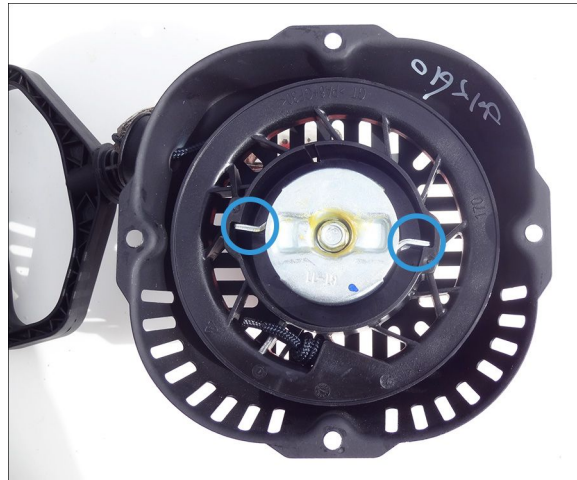
Recoil Inspection (continued)



g322366

Figure 8

2. Inspect the rope for fraying or wear. Replace the recoil starter assembly if damaged.
3. Inspect the starter pawl engagement. Hold the recoil in one hand and pull the rope with the other hand. Ensure both of the pawls smoothly extend fully to the stops.

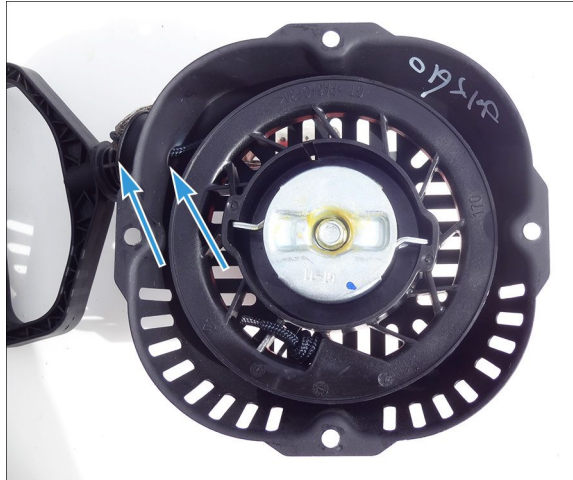


g322361

Figure 9

4. Pull the rope all the way out of the recoil assembly and slowly let it rewind while watching the rope pulley for smooth return. If the rope stops or jerks, replace the recoil assembly.
5. Inspect the rope grommet for sharp edges that might damage the rope. If sharp edges exist, replace the recoil assembly.

Recoil Inspection (continued)




g322359

Figure 10

Recoil Installation

1. Rotate the recoil assembly to match the chassis application.

Engine Model	Image
G210-1	 <p>g326030</p> <p>Figure 11</p>

Recoil Installation (continued)

G210-2



g326031

Figure 12

G210-4



g326032

Figure 13



2. Install the 4 (M8 x 8) screws and 4 (M6) washers securing the recoil starter assembly to the blower shroud. Torque the screws in an alternating pattern to 10 N • m (89 in-lb).



g322363

Figure 14

Recoil Installation (continued)

3. Test the recoil function by pulling the rope several times as if going to start the engine.



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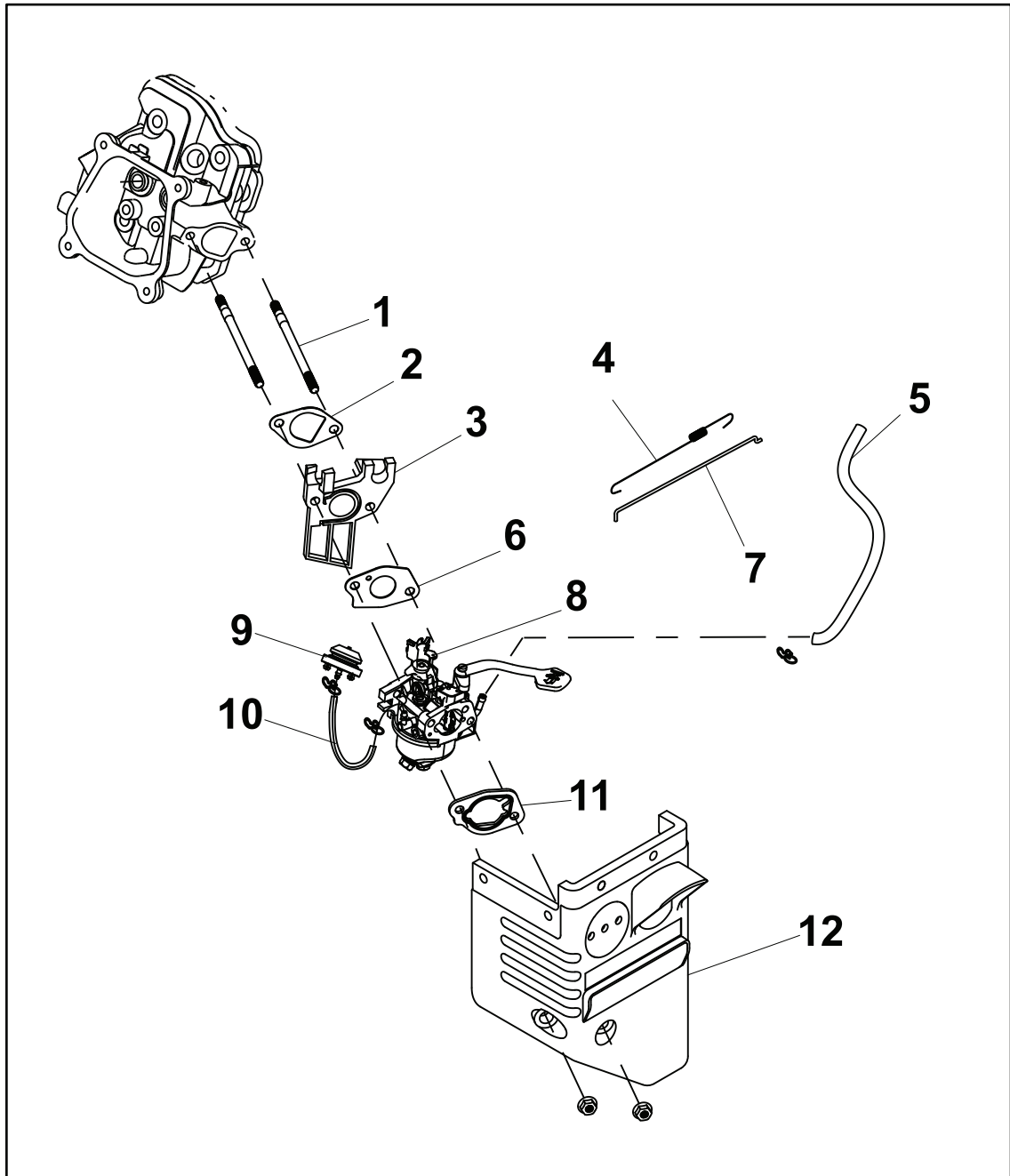
General Information	5-2
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Carburetor Replacement.....	5-6
Fuel Line System Replacement (G210-1, G210-2, & G210-4)	5-28
Primer Assembly Replacement.....	5-47

General Information

The Fuel System chapter includes the removal and installation of the carburetor, heater box, primer assembly, and two variations of the fuel line. One of the fuel lines has a fuel shut off valve.

Service and Repairs

Carburetor Assembly

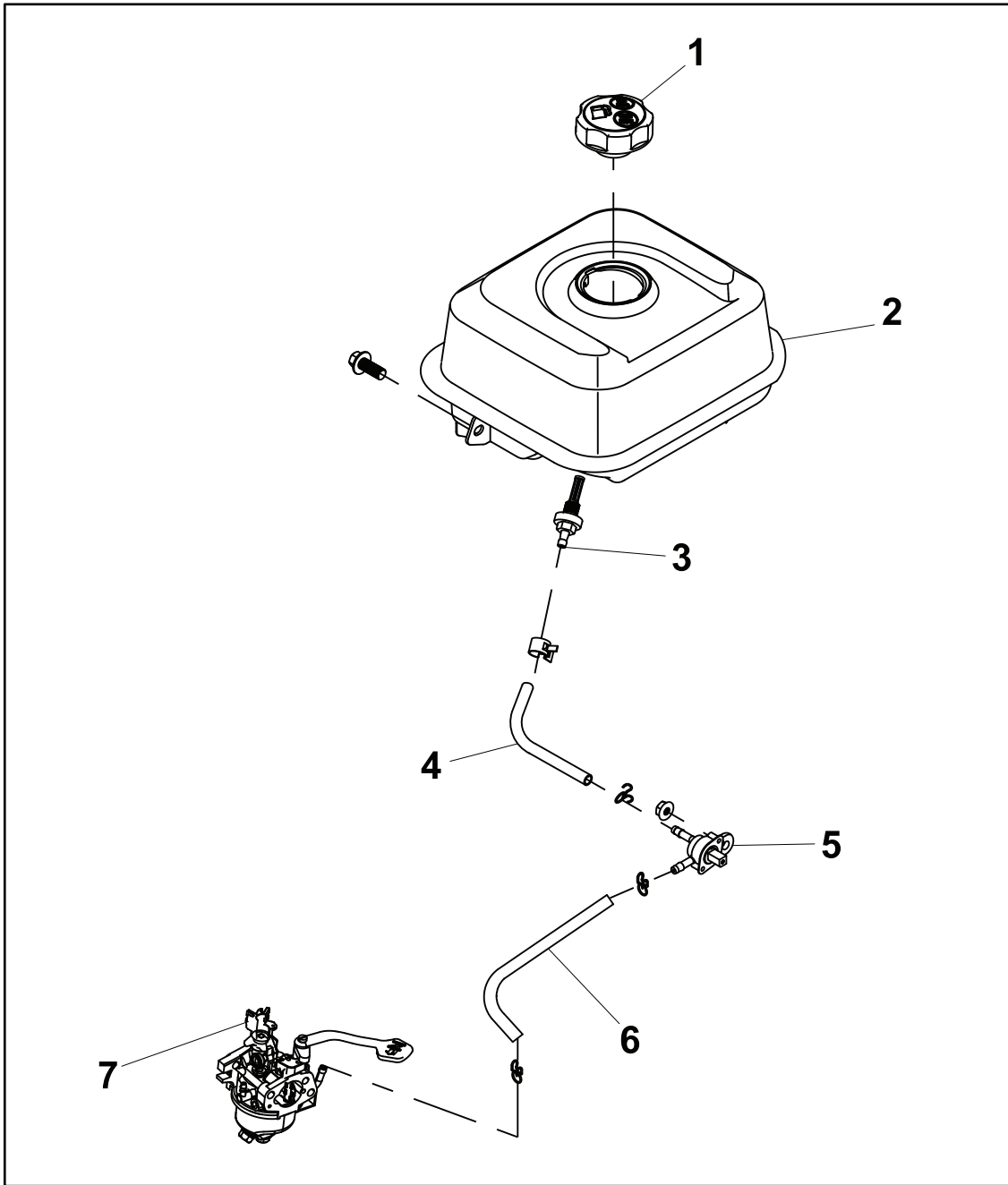


g324209

Figure 15

- | | |
|---------------------------|------------------------|
| 1. Intake Stud | 7. Governor Rod |
| 2. Carburetor Gasket | 8. Carburetor Assembly |
| 3. Carburetor Insulator | 9. Primer Bulb |
| 4. Throttle Return Spring | 10. Primer Hose |
| 5. Fuel Hose | 11. Carburetor Gasket |
| 6. Carburetor Gasket | 12. Heater Box |

G210-1 Fuel Line Assembly

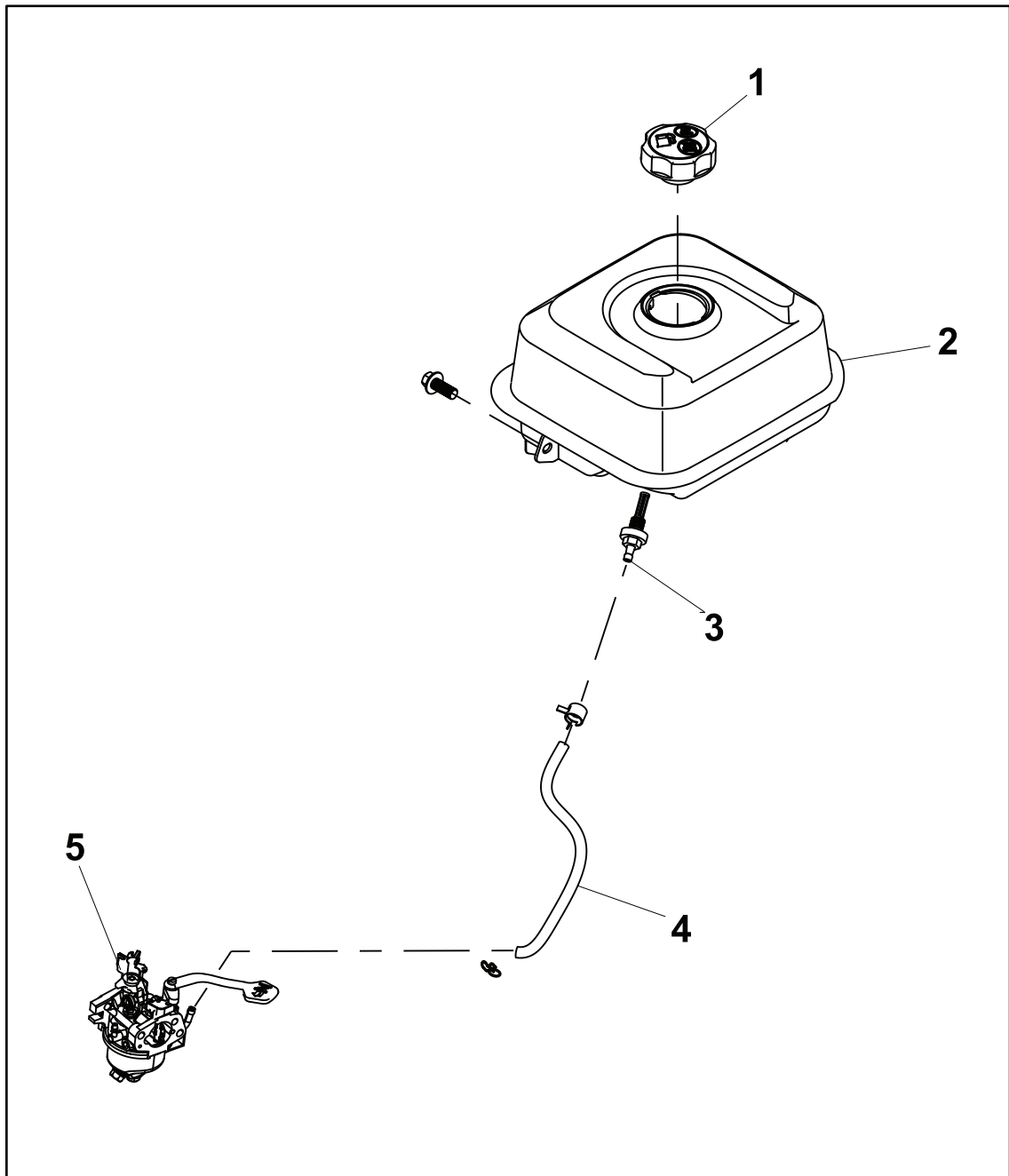


g326209

Figure 16

- | | |
|----------------------|------------------------|
| 1. Fuel Cap | 5. Fuel Valve |
| 2. Fuel Tank | 6. Fuel Hose (80 mm) |
| 3. Fuel Filter | 7. Carburetor Assembly |
| 4. Fuel Hose (90 mm) | |

G210-2 & G210-4 Fuel Line Assembly



g326210

Figure 17

- 1. Fuel Cap
- 2. Fuel Tank
- 3. Fuel Filter
- 4. Fuel Hose
- 5. Carburetor Assembly

Carburetor Replacement

Carburetor Removal

1. Drain the fuel into a suitable container.
2. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
3. Remove the 2 (M6) flange nuts securing the heater box to the intake studs.



g323684

Figure 18

-
4. Disconnect the 2 wires from the back of the key switch.



g323698

Figure 19

-
5. Slide the primer hose clamp away from the primer assembly. Remove the primer hose from the primer bulb base.

Carburetor Removal (continued)

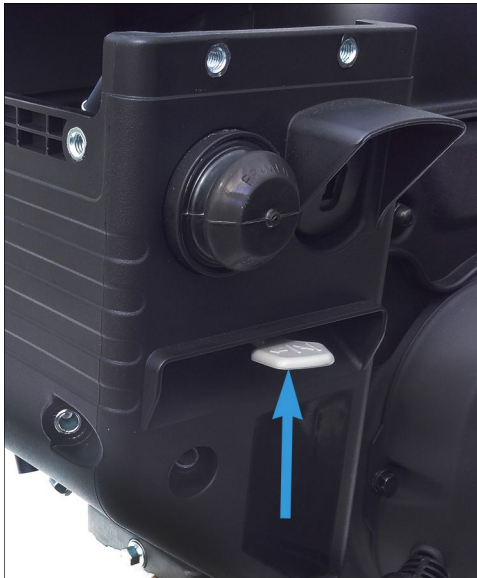


g323701

Figure 20

1. Primer Hose Clamp
2. Primer Hose

-
6. Position the choke lever in the middle of the heater box slot.

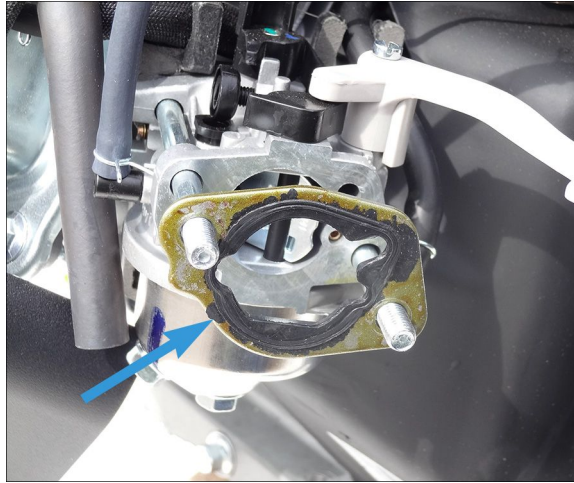


g323685

Figure 21

-
7. Slide and remove the heater box from the intake studs.
 8. Remove the metal carburetor gasket from the intake studs.

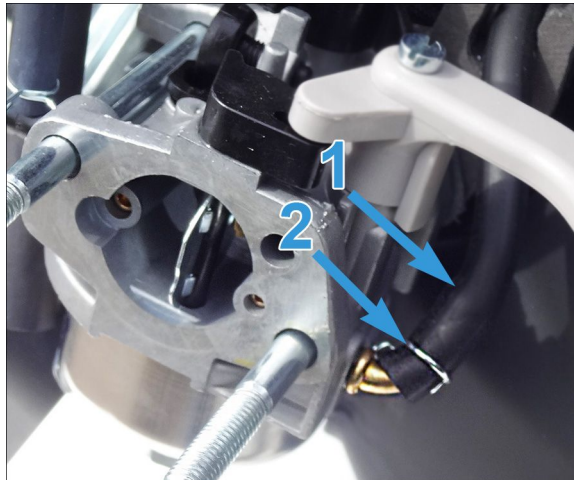
Carburetor Removal (continued)



g323683

Figure 22

9. Slide the fuel hose clamp away from the carburetor. Remove the fuel hose from the carburetor.



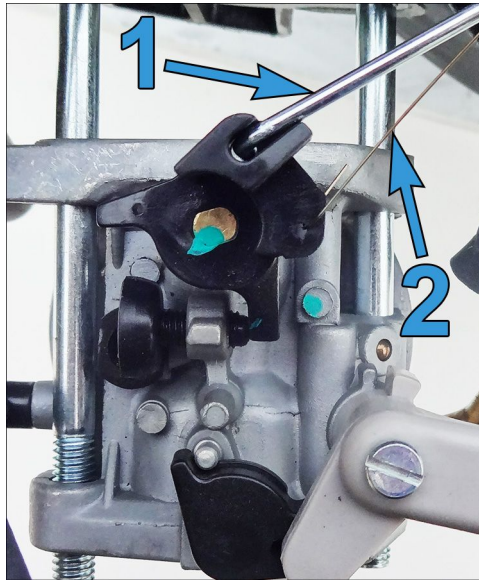
g323693

Figure 23

1. Fuel Hose
2. Fuel Hose Clamp

10. Slide the primer hose clamp away from the carburetor. Remove the primer hose from the carburetor.
11. Slide the carburetor partially away from the engine block. Rotate the throttle shaft to open the throttle and unhook the governor rod and throttle return spring from the carburetor throttle shaft.

Carburetor Removal (continued)



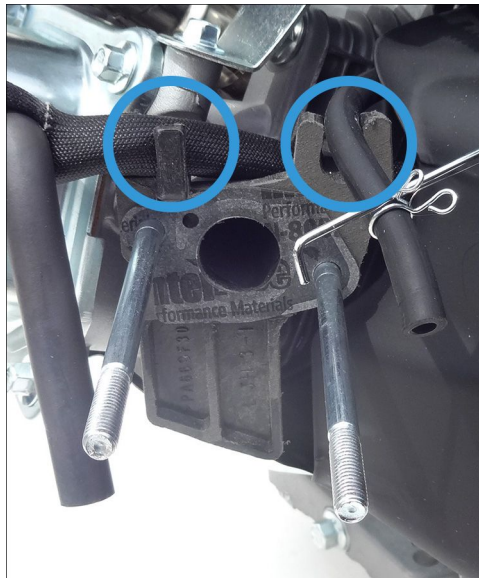
g324196

Figure 24

1. Governor Rod
2. Throttle Return Spring

12. Slide and remove the carburetor from the intake studs.

13. Remove the electrical harness and fuel hose from the insulator gasket holders.

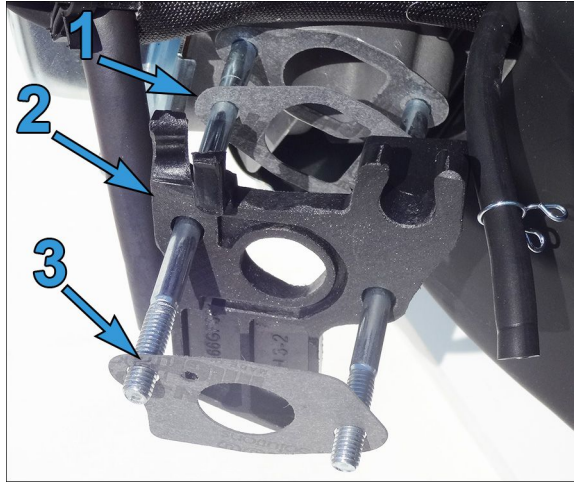


g323689

Figure 25

14. Remove the carburetor gasket, insulator, and carburetor gasket from the intake studs.

Carburetor Removal (continued)



g323695

Figure 26

1. Carburetor Gasket
2. Insulator
3. Carburetor Gasket

Carburetor Disassembly

1. Remove the bowl drain and gasket from the carburetor. Drain the fuel into a suitable container.



g323687

Figure 27

2. Remove the float bowl screw and gasket securing the float bowl to the carburetor. Remove the float bowl from the carburetor.

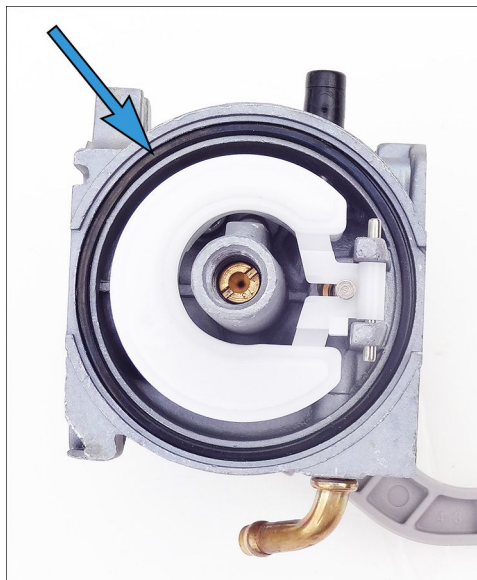
Carburetor Disassembly (continued)



g323691

Figure 28

3. Remove the float bowl gasket from the carburetor.

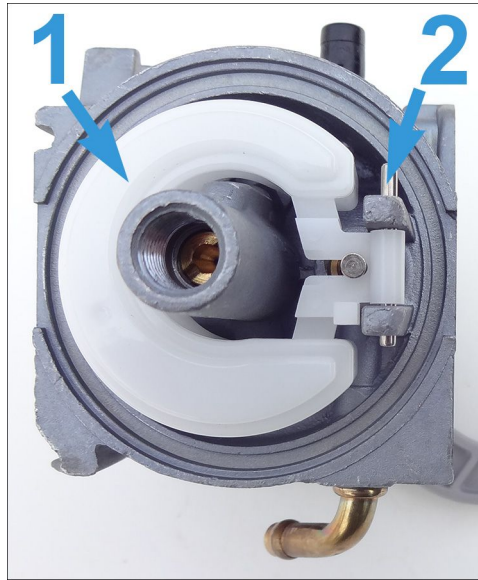


g323688

Figure 29

4. Slide and remove the float hinge pin securing the float to the carburetor. Remove the float from the carburetor.

Carburetor Disassembly (continued)

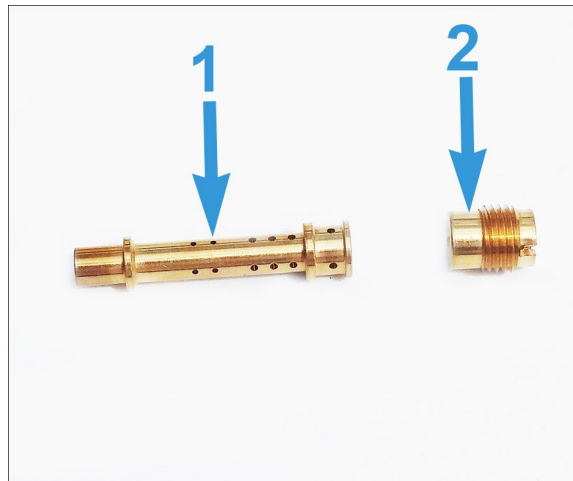


g324193

Figure 30

1. Float
2. Hinge Pin

-
5. Remove the needle from the float.
 6. Using a narrow tipped flat blade screwdriver, remove the main jet and nozzle from the carburetor body.



g323700

Figure 31

1. Nozzle
2. Jet

-
7. Using a flat blade screwdriver, remove the idle speed screw.

Carburetor Disassembly (continued)



g323696

Figure 32

8. Remove the pilot jet from the carburetor.

Note: Do not twist or turn the pilot jet when removing the pilot jet. Damage to the o-rings will occur.



g323697

Figure 33

9. Remove the screw securing the choke lever to the carburetor. Remove the choke lever from the carburetor.

Carburetor Disassembly (continued)



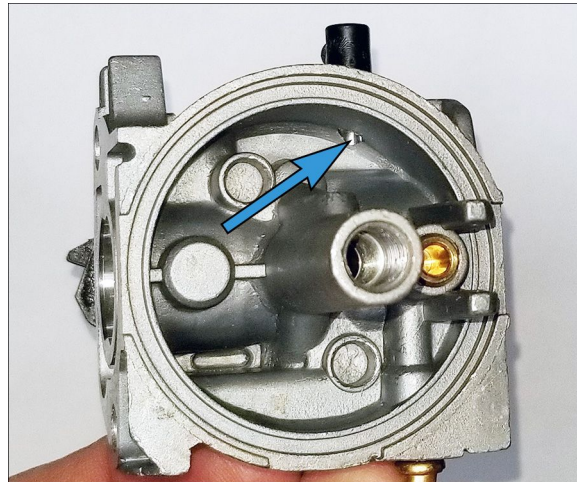
g323690

Figure 34

Carburetor Inspection

1. Inspect the carburetor and removed components prior to cleaning. Inspect the following components for damage and replace as necessary.
 - Jets and nozzles
 - Float
 - Air inlet circuit
 - Bowl vent circuit
2. Using an ultrasonic cleaner, clean the carburetor body and the removed components.
3. Rinse all of the parts with warm water to remove the cleaner residue.
4. Using compressed air, dry all of the parts.
5. Inspect the float for cracks or damage. Replace if damaged.
6. Inspect the jets and nozzle for blockage of the small passages. If blocked, a small sized fish line can be used to clear the passages. A second cleaning cycle may be required.
7. Inspect the carburetor body for blocked passages. Blow compressed air through the following fuel and air circuits:
 - Primer circuit

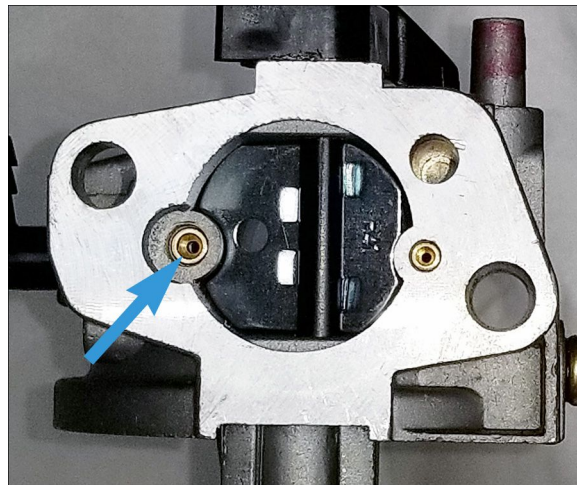
Carburetor Inspection (continued)



g340112

Figure 35

-
- Pilot circuit

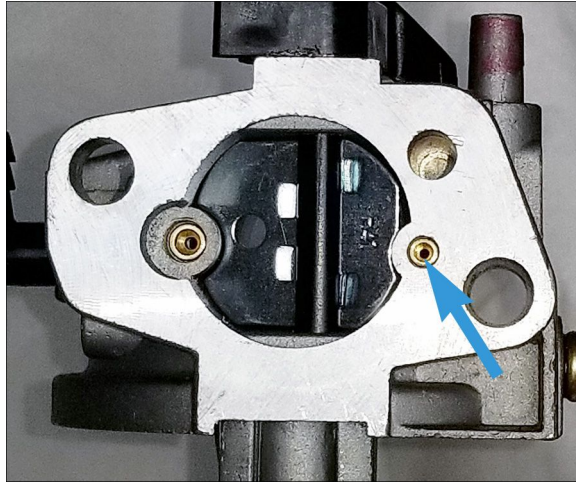


g340111

Figure 36

-
- Main circuit

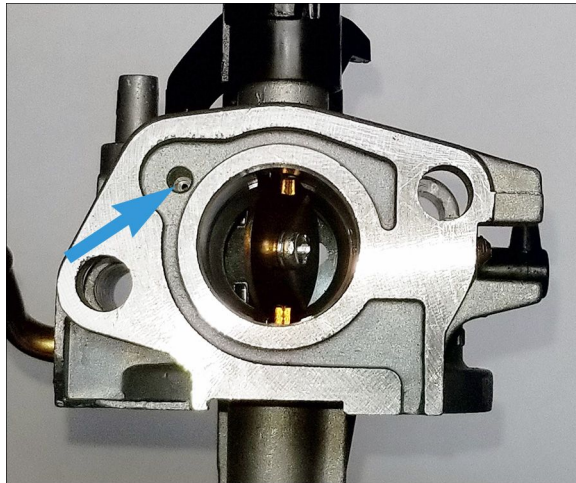
Carburetor Inspection (continued)



g340109

Figure 37

-
- Bowl vent circuit

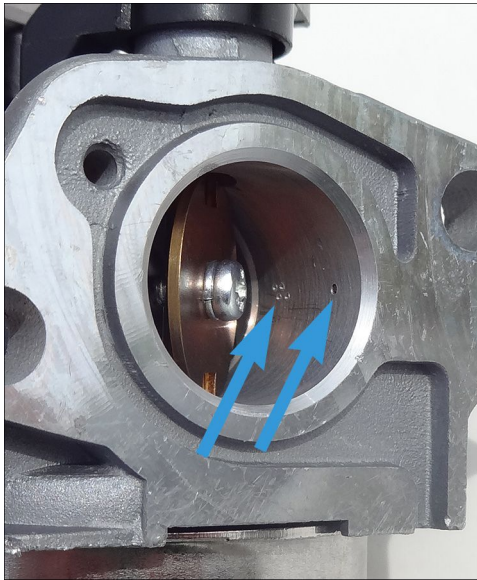


g340108

Figure 38

-
- Transfer ports near the throttle vents

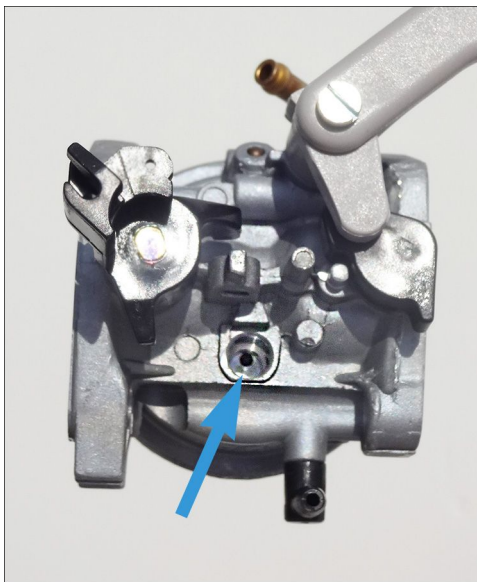
Carburetor Inspection (continued)



g333351

Figure 39

- Pilot jet cavity



g340110

Figure 40

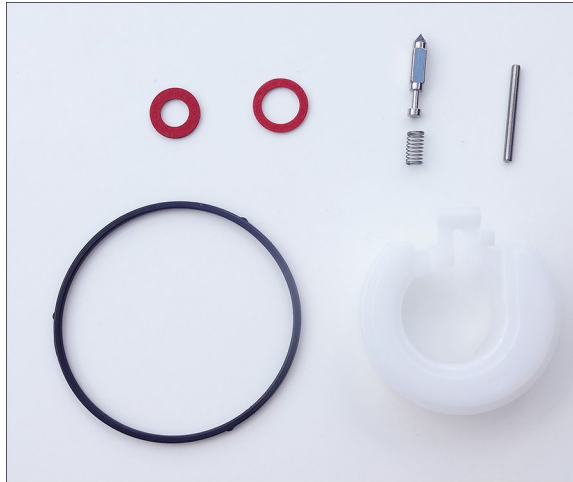
8. Inspect the carburetor throttle shaft and choke shaft. Verify the parts move freely and their discs do not rub on the carburetor throat. If rubbing exists, loosen the screw and rotate the disc to gain clearance, retighten the screw. If unable to adjust, replace the carburetor assembly.
9. Inspect the carburetor body for corrosion or pitting. If corrosion or pitting is found, replace the carburetor assembly.

Carburetor Assembly

For high altitude applications (above 5000 feet) Toro has an optional high altitude kit that contains installation instructions, main jet, bowl gasket, label, and Operators Manual addendum.

Carburetor Assembly (continued)

1. Use a new carburetor rebuild kit.



g326029

Figure 41

-
2. Install the choke lever to the carburetor. Install the screw securing the choke lever to the carburetor.



g323690

Figure 42

-
3. Lightly apply engine oil to both of the pilot jet o-rings. Align the flats of the pilot jet with the flats of the carburetor. Install the pilot jet.

Note: Do not twist the pilot jet while installing.

Carburetor Assembly (continued)



g323697

Figure 43

4. Install the idle speed screw into the carburetor next to the throttle shaft. Tighten until the head of the screw is centered over the pilot jet.

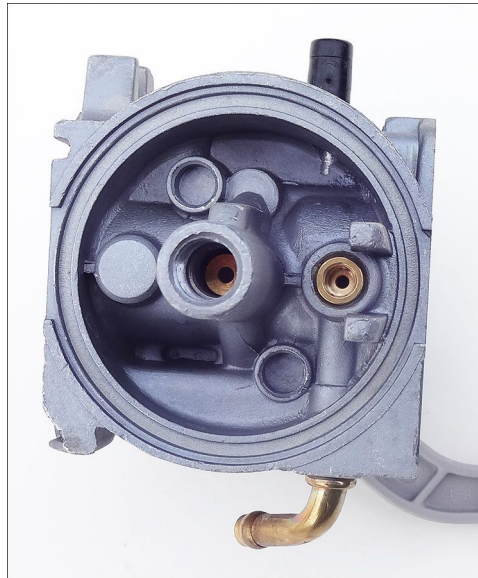


g339520

Figure 44

5. Install the nozzle into the carburetor by placing the double rings last.

Carburetor Assembly (continued)



g324195

Figure 45

-
- Using a flat blade screwdriver, install the main jet securing the nozzle to the carburetor.



g324194

Figure 46

-
- Install the needle and spring onto the float.

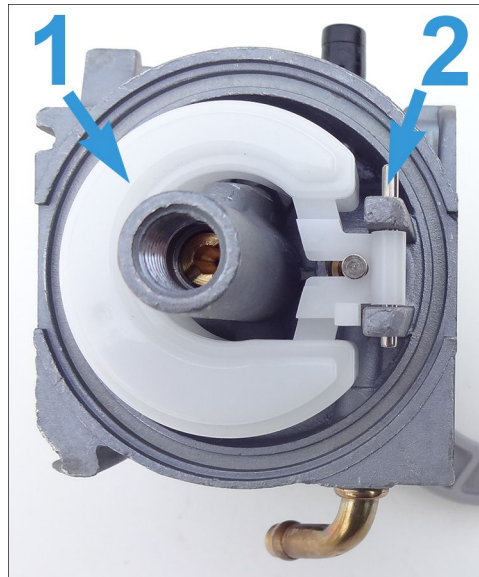
Carburetor Assembly (continued)



g339519

Figure 47

-
8. Install the float with a needle in the carburetor. Install the float hinge pin securing the float to the carburetor.



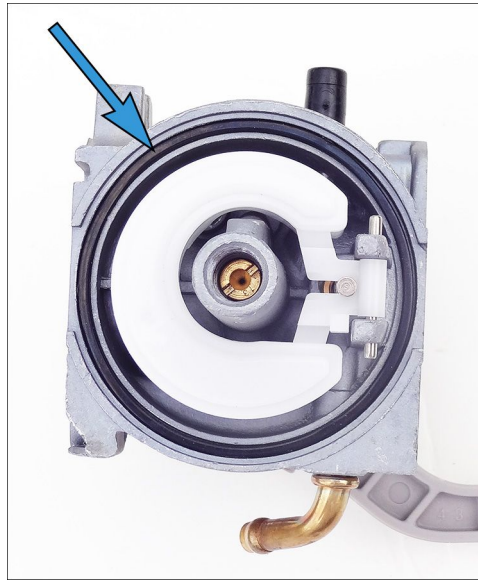
g324193

Figure 48

1. Float
2. Hinge Pin

-
9. Install the new float bowl gasket into the carburetor.

Carburetor Assembly (continued)



g323688

Figure 49

10. Install the float bowl onto the carburetor.



11. Install the new gasket and screw securing the float bowl onto the carburetor. Torque the screw to 7 N • m (66 in-lb).



g323691

Figure 50



12. Install the new gasket and drain screw onto the float bowl. Torque the screw to 7 N • m (66 in-lb).

Carburetor Assembly (continued)



g323687

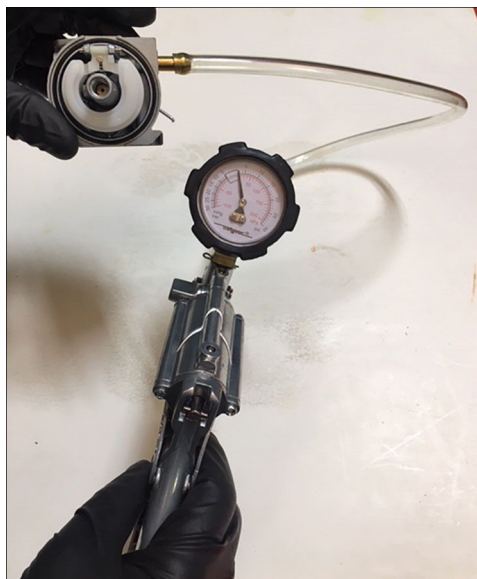
Figure 51

Carburetor Pop Off Test

1. With carburetor removed, position with float bowl upwards.
2. Using a hand pressure tester, apply pressure to the fuel inlet.
3. While pumping, observe the pressure increase.
4. Stop pumping, observe the pressure drop slightly, then stabilize as the float weight closes the needle and holds pressure. The pressure should not drop to zero.

Note: An exact pressure value isn't required to measure the integrity of the float and needle to hold pressure.

5. If pressure drops, evaluate the needle tip and seat condition. Replace needle or carburetor as needed.



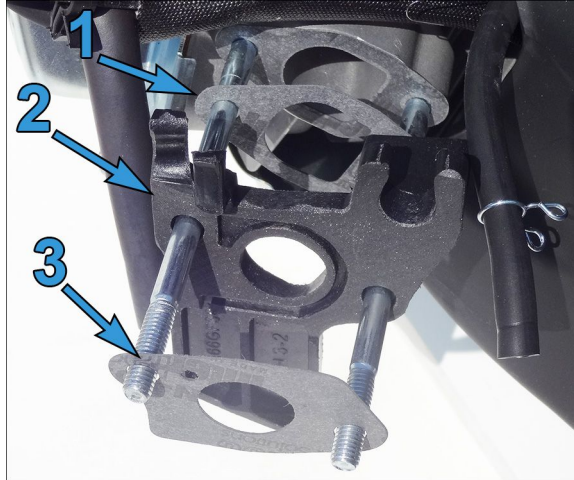
g291055

Figure 52

Carburetor Installation

1. Install the new carburetor gasket, insulator, and new carburetor gasket onto the intake studs.

Note: Ensure the carburetor gaskets and insulator are positioned correctly on the intake studs.

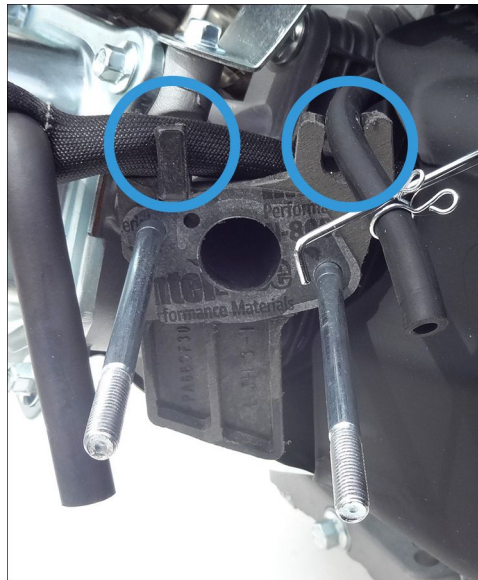


g323695

Figure 53

1. Carburetor Gasket
2. Insulator
3. Carburetor Gasket

-
2. Route the electrical harness and fuel hose through the insulator gasket holders.

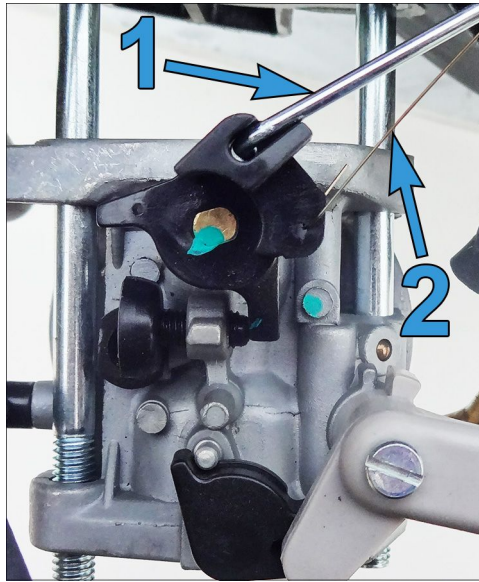


g323689

Figure 54

-
3. Slide the carburetor partially onto the intake studs.
 4. Rotate the throttle shaft to open the throttle and connect the governor rod and throttle return spring to the carburetor throttle shaft.

Carburetor Installation (continued)

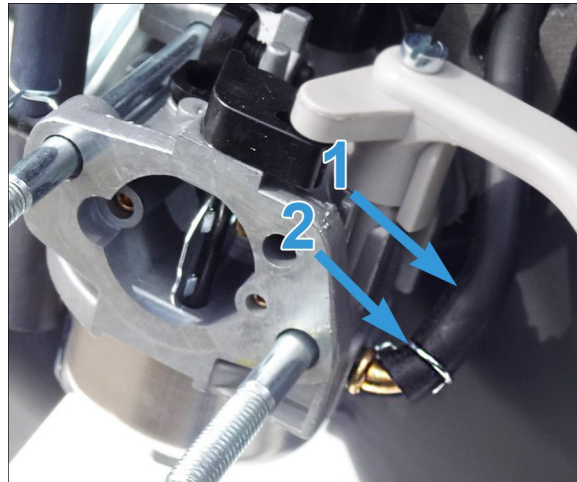


g324196

Figure 55

1. Governor Rod
2. Throttle Return Spring

-
5. Install the primer hose onto the carburetor, secure with the primer hose clamp.
 6. Install the fuel hose onto the inlet fitting of carburetor, secure with the fuel hose clamp.



g323693

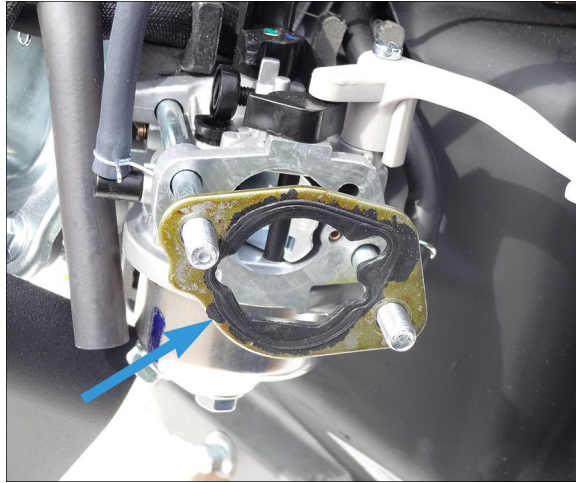
Figure 56

1. Fuel Hose
2. Fuel Hose Clamp

-
7. Install the metal carburetor gasket onto the intake studs.

Note: Ensure the metal carburetor gasket is positioned correctly on the intake studs.

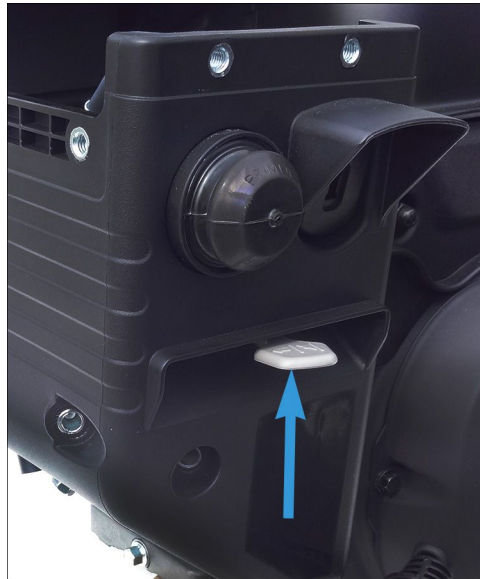
Carburetor Installation (continued)



g323683

Figure 57

8. Rotate the choke lever to partial choke and slide the heater box partially onto the intake studs and over choke lever.



g323685

Figure 58

9. Install the primer hose onto the primer bulb base, secure with the primer hose clamp.

Carburetor Installation (continued)



g323701

Figure 59

1. Primer Hose Clamp
2. Primer Hose

10. Connect the 2 wires to the key switch terminals.

Note: Verify the wires are not crossed.



g323698

Figure 60



11. Fully slide the heater box onto the intake studs. Install the 2 (M6) flange nuts securing the heater box to the intake studs. Torque the flange nuts to 10 N•m (89 in-lb)

Carburetor Installation (continued)



g323684

Figure 61

12. Install the muffler guard onto the cylinder head. Refer to the product Service Manual for the muffler guard installation procedures.

Carburetor Test

1. Add fuel to the fuel tank and verify no fuel leaks exist.
2. Verify engine oil is at a proper level.
3. Start the engine and let it get to operating temperature. Verify Top No Load RPM. [Specifications \(page 2-2\)](#)
4. G210-1 engine models only, use a tachometer to verify the engine idle speed RPM. [Specifications \(page 2-2\)](#)

Fuel Line System Replacement (G210-1, G210-2, & G210-4)

G210-1 Fuel Line Removal

1. Pull and remove the throttle control knob from the speed control assembly.



g333166

Figure 62

G210–1 Fuel Line Removal (continued)

2. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
3. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
4. Remove the 2 (M6) flange nuts securing the heater box to the intake studs.



g323684

Figure 63

-
5. Disconnect the 2 wires from the back of the key switch.



g323698

Figure 64

-
6. Slide the primer hose clamp away from the primer assembly. Remove the primer hose from the primer bulb base.

G210-1 Fuel Line Removal (continued)

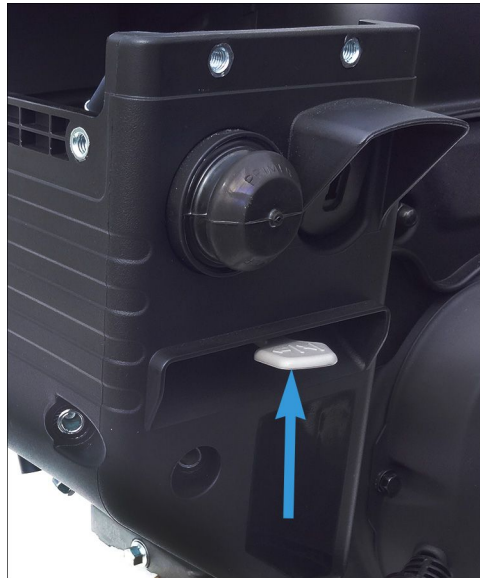


g323701

Figure 65

1. Primer Hose Clamp
2. Primer Hose

-
7. Position the choke lever in the middle of the heater box slot.

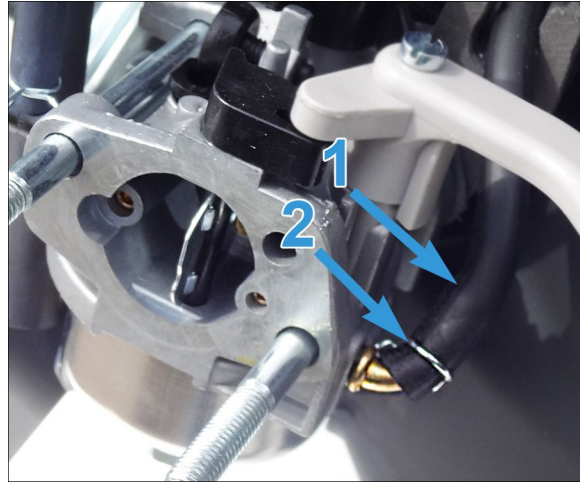


g323685

Figure 66

-
8. Slide and remove the heater box from the intake studs.
 9. Slide the fuel hose clamp away from the carburetor. Remove the fuel hose from the carburetor.

G210-1 Fuel Line Removal (continued)



g323693

Figure 67

1. Fuel Hose
2. Fuel Hose Clamp

-
10. Remove the cap from the fuel valve knob.
 11. Remove the screw (M4 x 18) securing the fuel valve knob to the control panel. Remove the fuel valve knob from the fuel valve.



g326081

Figure 68

G210–1 Fuel Line Removal (continued)



g326084

Figure 69

12. Remove the 2 (M6) acorn nuts securing the control panel to the engine block.

Note: If the studs loosen from the engine block, use a box wrench on the inside of the control panel to hold the studs from turning while removing the acorn nuts.

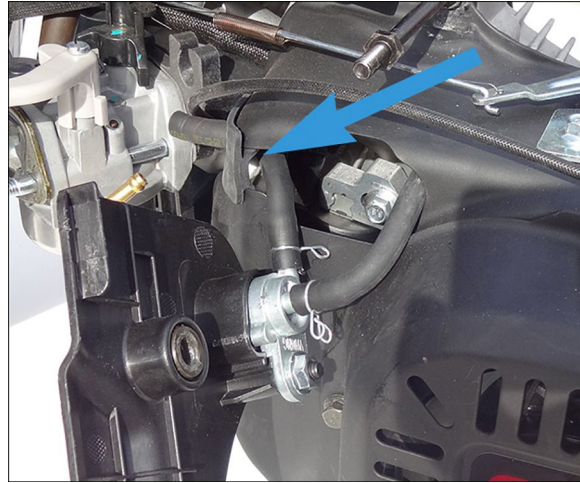


g326078

Figure 70

13. Engine equipped with an electric starter only, remove the electric starter switch box bracket from the RH blower mount stud.
14. Remove the control panel from the blower shroud.
15. Guide the fuel hose through the rubber block. Remove the control panel with the fuel shutoff valve and fuel hoses attached.

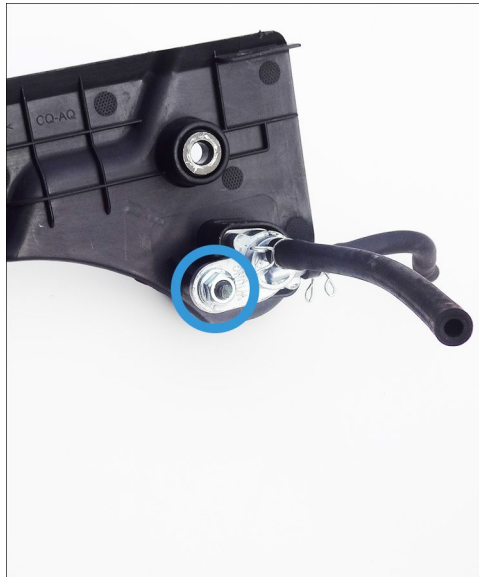
G210-1 Fuel Line Removal (continued)



g326080

Figure 71

-
16. Remove the (M6) flange nut securing the fuel shutoff valve to the control panel. Remove the fuel shutoff valve with the hoses from the control panel.

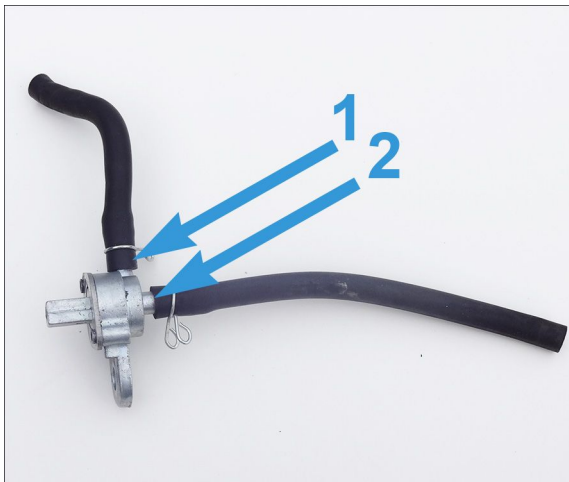


g326079

Figure 72

-
17. Slide the 2 clamps away from the fuel shutoff valve. Remove the fuel hoses from the inlet and outlet barbs.

G210-1 Fuel Line Removal (continued)



g326082

Figure 73

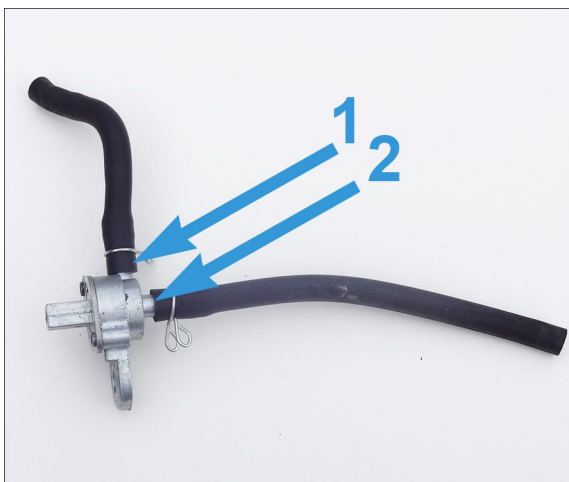
1. Outlet Barb
2. Inlet Barb

G210-1 Fuel Line Inspection

1. Verify the fuel valve rotates freely. Use compressed air to verify there is no blockage through the fuel valve. Inspect the fuel valve barbs for cracks or corrosion. Replace the fuel valve if not it is not functioning or is damaged.
2. If reusing the fuel hoses, inspect the fuel hoses for blockage, cracks, or deterioration. Replace the fuel hoses if damaged.
3. Verify the fuel hose clamps will clamp the hose to the barb tightly. Replace if damaged.

G210-1 Fuel Line Installation

1. Install the longer fuel hose onto the fuel shutoff valve inlet barb, secure with a clamp. Install the shorter fuel hose onto the fuel shutoff valve outlet barb, secure with a clamp.



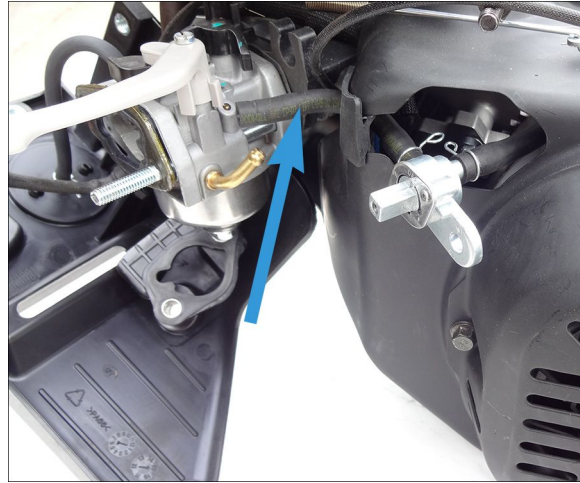
g326082

Figure 74

1. Outlet Barb
2. Inlet Barb

2. Route the short fuel hose through the rubber block and the longer fuel hose toward the fuel tank.

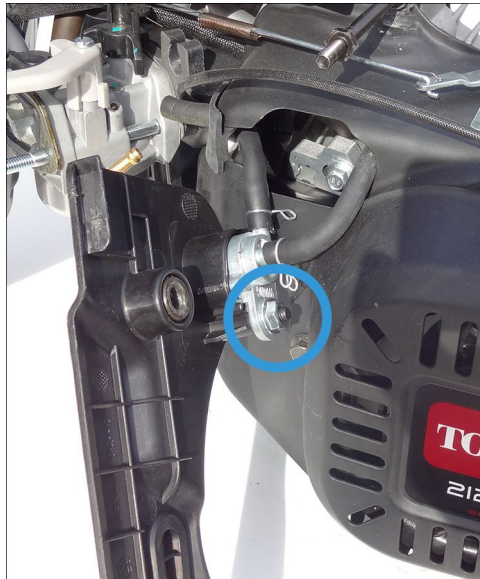
G210-1 Fuel Line Installation (continued)



g326144

Figure 75

3. Install the fuel shutoff valve onto the control plate, secure with a (M6) flange nut.

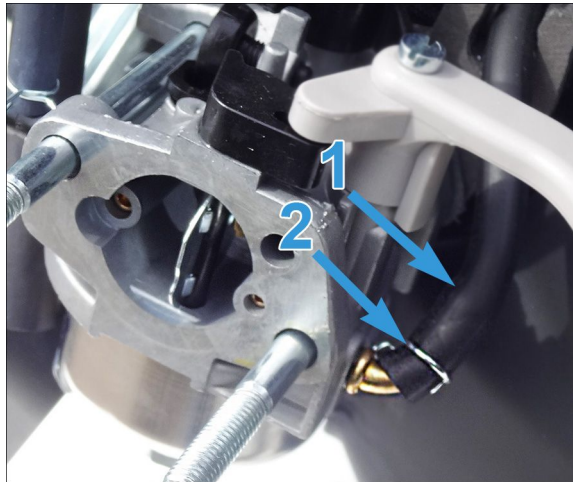


g326143

Figure 76

4. Install the short fuel hose onto the inlet fitting of carburetor, secure with a clamp.

G210-1 Fuel Line Installation (continued)



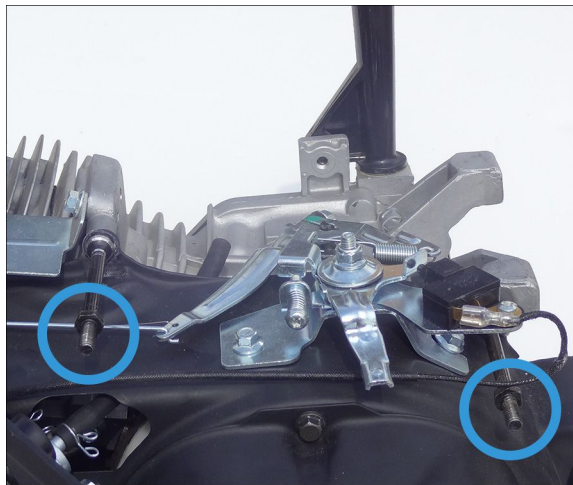
g323693

Figure 77

1. Fuel Hose
2. Fuel Hose Clamp



5. Verify the 2 (M6 x 89) mount studs are securely fastened to the engine block. If necessary, torque the mount studs to 10 N • m (89 in-lb).



g326145

Figure 78



6. Install the control plate onto the mount studs.
7. Engine equipped with an electric starter only, install the electric starter switch box bracket onto the RH blower mount stud.
8. Install the 2 (M6) acorn nuts securing the control plate to the engine block. Torque the acorn nuts to 10 N • m (89 in-lb).

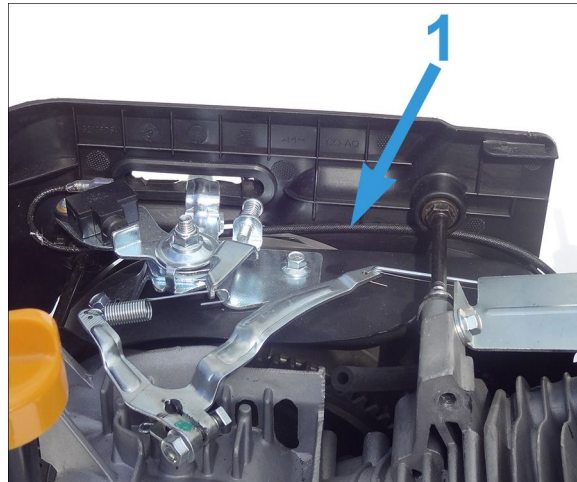
Note: Verify the fuel hoses are not kinked or pinched. Verify the ground wire is routed between the blower shroud and mount studs

G210-1 Fuel Line Installation (continued)



g326078

Figure 79



g326142

Figure 80

1. Ground Wire

9. Engines equipped with an electric starter only, install the electric starter switch box bracket to the blower shroud, secure with a (M6) acorn nut.



10. Install the fuel knob onto the fuel valve. Install the screw (M4 x 8) securing the fuel knob to the fuel valve. Torque the screw to 2 N • m (18 in-lb). Install the cap onto the fuel knob.

G210-1 Fuel Line Installation (continued)



g326081

Figure 81

11. Install the throttle control knob onto the speed control assembly.

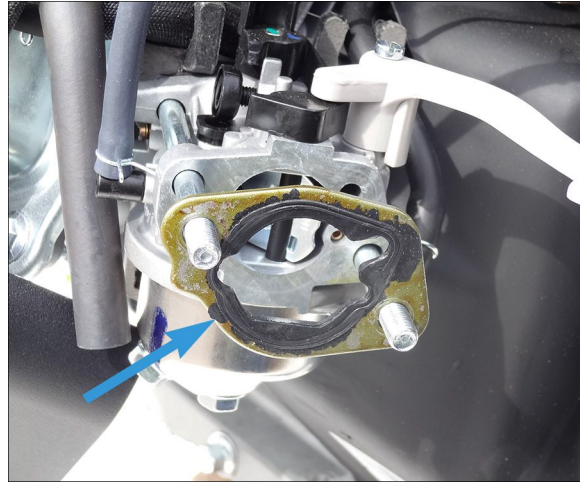


g325572

Figure 82

-
12. Verify the metal carburetor gasket is positioned correctly on the intake studs.

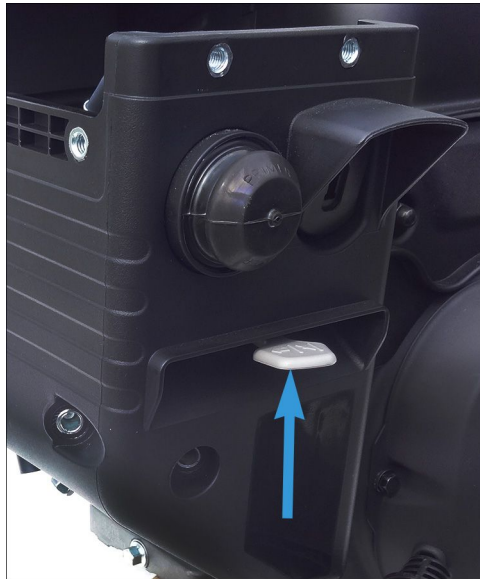
G210-1 Fuel Line Installation (continued)



g323683

Figure 83

-
- Slide the choke lever to partial choke. Slide the heater box partially onto intake studs and over choke lever.

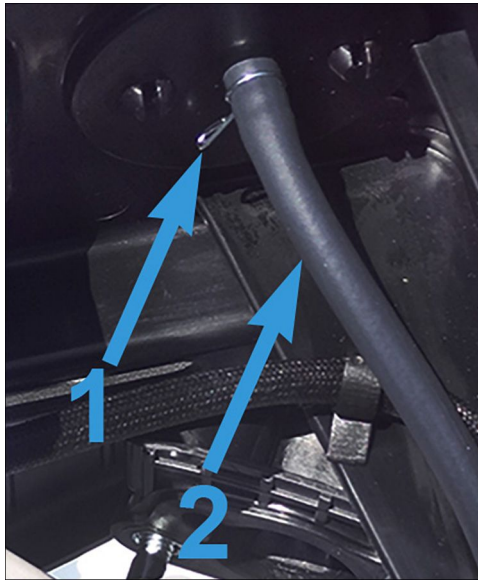


g323685

Figure 84

-
- Install the primer hose onto the primer bulb base, secure with the primer hose clamp.

G210-1 Fuel Line Installation (continued)



g323701

Figure 85

1. Primer Hose Clamp
2. Primer Hose

15. Connect the 2 wires to the key switch terminals.

Note: Verify the wires are not crossed.



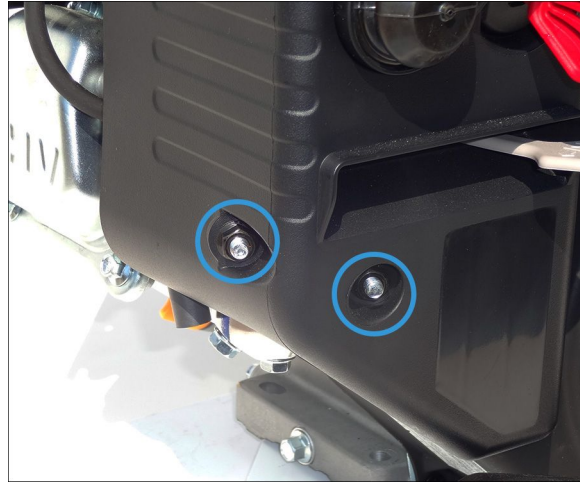
g323698

Figure 86



16. Fully slide the heater box onto the intake studs. Install the 2 (M6) flange nuts securing the heater box to the intake studs. Torque the nuts to 10 N • m (89 in-lb)

G210–1 Fuel Line Installation (continued)



g323684

Figure 87

17. Install the fuel tank onto the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
18. Install the muffler guard onto the cylinder head. Refer to the product Service Manual for the muffler guard installation procedures.

G210–1 Fuel Line Test

1. Verify no fuel leaks exist.
2. Test the speed control assembly by starting the engine and sliding the throttle to full stroke.

G210–2 & G210–4 Fuel Line Removal

1. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
2. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
3. Remove the 2 (M6) flange nuts securing the heater box to the intake studs.



g323684

Figure 88

4. Disconnect the 2 wires from the back of key switch.

G210-2 & G210-4 Fuel Line Removal (continued)



g323698

Figure 89

5. Slide the primer hose clamp away from the primer assembly. Remove the primer hose from the primer bulb base.



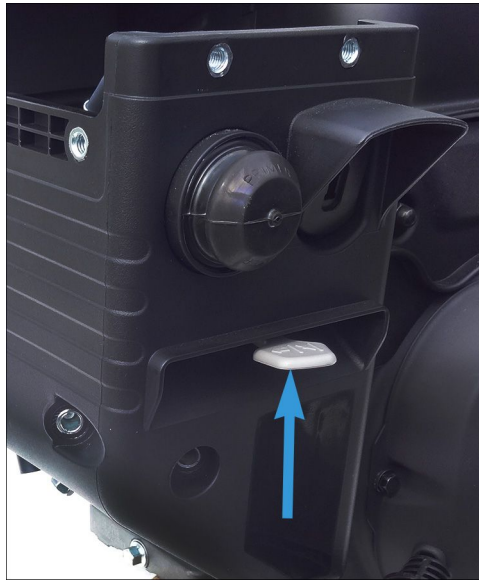
g323701

Figure 90

1. Primer Hose Clamp
2. Primer Hose

6. Position the choke lever in the middle of the heater box slot.

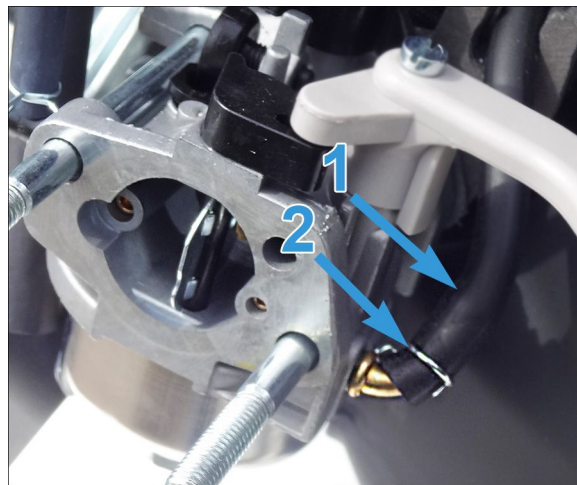
G210-2 & G210-4 Fuel Line Removal (continued)



g323685

Figure 91

7. Slide and remove the heater box from the intake studs.
8. Slide the fuel hose clamp away from the carburetor and remove the fuel hose from the carburetor.



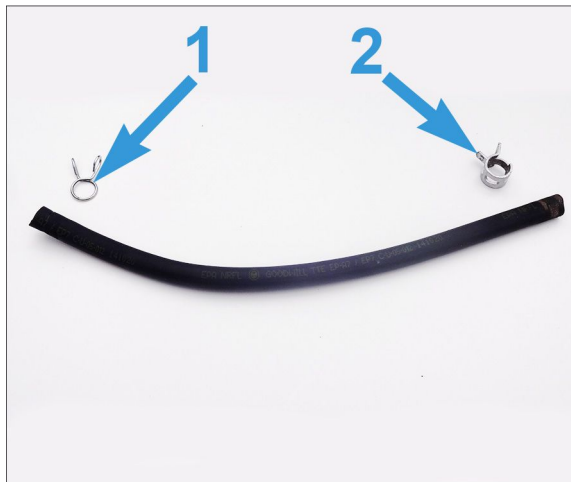
g323693

Figure 92

1. Fuel Hose
2. Fuel Hose Clamp

9. Remove the clamps from both ends of the fuel hose and remove the fuel hose from the engine block.

G210-2 & G210-4 Fuel Line Removal (continued)



g326156

Figure 93

1. Fuel Hose to Carburetor Clamp
2. Fuel Hose to Fuel Filter Fitting Clamp

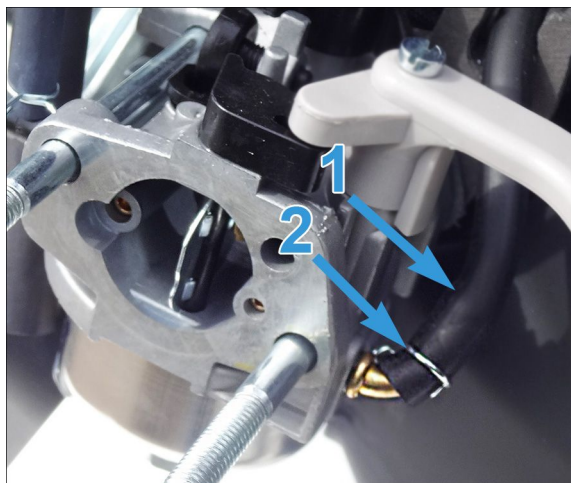
G210-2 & G210-4 Fuel Line Inspection

1. Verify the fuel valve rotates freely. Use compressed air to verify there is no blockage through the valve. Inspect the valve barbs for cracks or corrosion. Replace the valve if it is not functioning or is damaged.
2. If reusing the fuel hose, inspect the fuel hose for blockage, cracks, or deterioration. Replace the fuel hose if damaged.
3. Verify the hose clamps will clamp the hose to the barb tightly. Replace if damaged.

G210-2 & G210-4 Fuel Line Installation



1. Route the fuel hose from the fuel tank area to the carburetor.
2. Install a clamp onto the end of the fuel hose nearest to the carburetor. Route the fuel hose through the insulator notch. Install the fuel hose onto the carburetor inlet fitting, secure with the clamp.



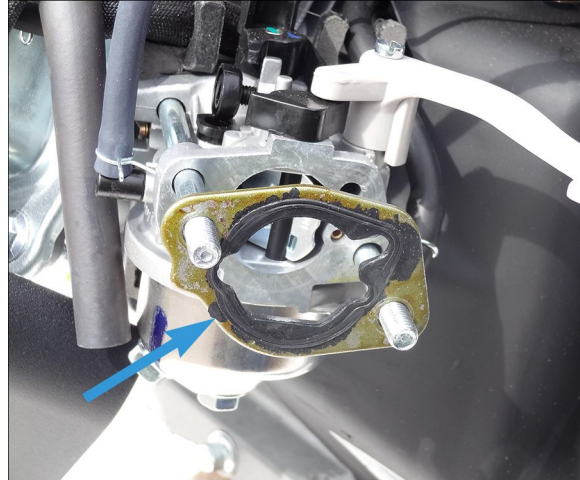
g323693

Figure 94

1. Fuel Hose
2. Fuel Hose Clamp

G210-2 & G210-4 Fuel Line Installation (continued)

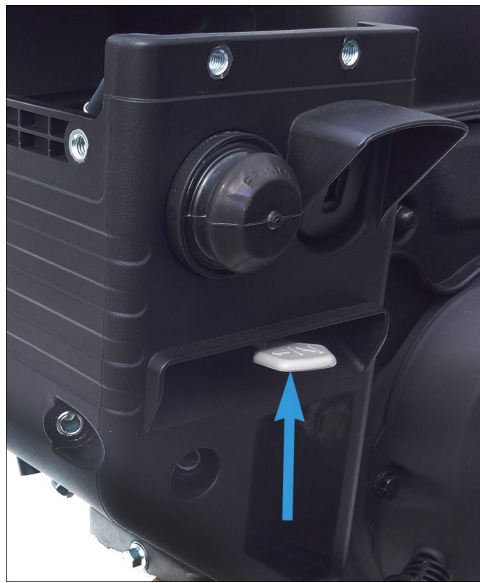
3. Verify the metal carburetor gasket is positioned correctly on the intake studs.



g323683

Figure 95

4. Slide the choke lever to partial choke. Slide the heater box partially onto the intake studs and over choke lever.

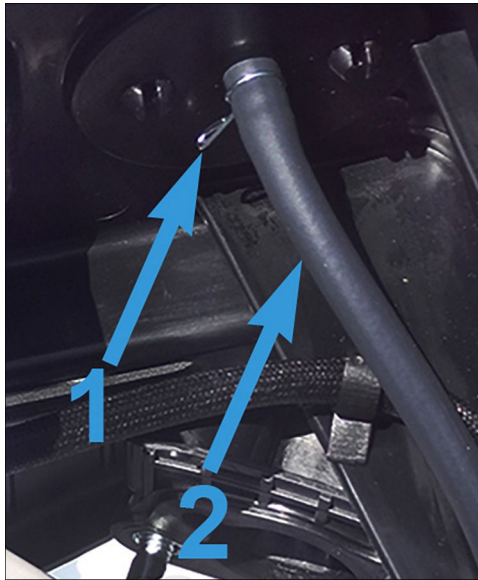


g323685

Figure 96

5. Install the primer hose onto the primer bulb base, secure with a clamp.

G210-2 & G210-4 Fuel Line Installation (continued)



g323701

Figure 97

1. Clamp
2. Primer Hose

-
6. Connect the 2 wires to the key switch terminals.

Note: Verify the wires are not crossed.



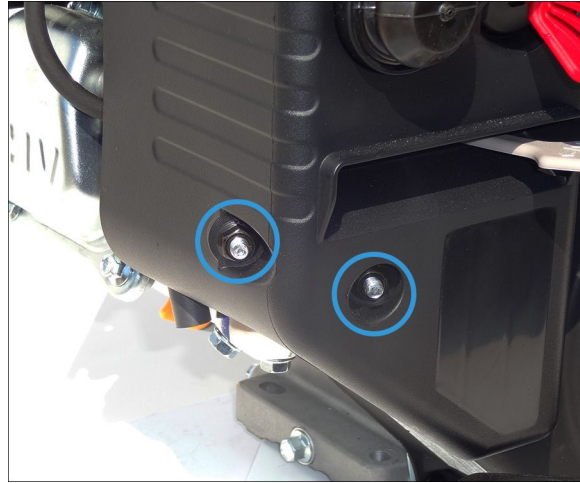
g323698

Figure 98



7. Fully slide the heater box onto the intake studs. Install the 2 (M6) flange nuts securing the heater box to the intake studs. Torque the nuts to 10 N • m (89 in-lb).

G210–2 & G210–4 Fuel Line Installation (continued)



g323684

Figure 99

8. Install the fuel tank onto the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
9. Install the muffler guard onto the cylinder head. Refer to the product Service Manual for the muffler guard installation procedures.

G210–2 & G210–4 Fuel Line Test

1. Verify no fuel leaks exist.
2. Test run the engine.
3. Using a tachometer, verify the engine speed is to specification. [Specifications \(page 2–2\)](#)

Primer Assembly Replacement

Primer Assembly Removal

1. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
2. Slide the primer hose clamp away from the primer assembly. Remove the primer hose from the primer bulb base.

Primer Assembly Removal (continued)



g323701

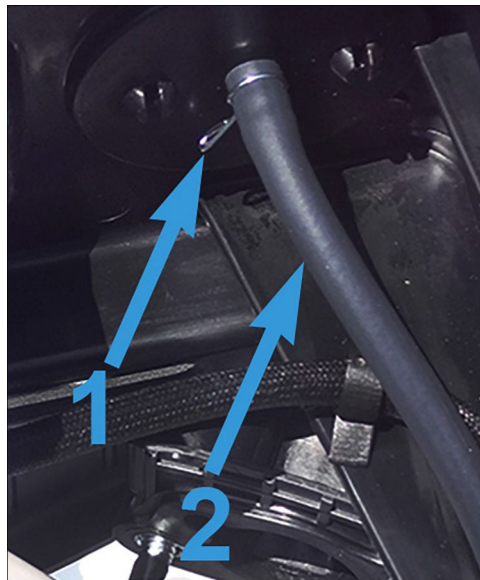
Figure 100

1. Primer Hose Clamp
2. Primer Hose

-
3. Squeeze the retaining tangs together. Remove the primer assembly from the heater box.

Primer Assembly Installation

1. Install the primer assembly into the heater box.
2. Install the primer hose onto the primer bulb base, secure with a clamp.



g323701

Figure 101

1. Clamp
2. Primer Hose

-
3. Install the muffler guard onto the cylinder head. Refer to the product Service Manual for the muffler guard installation procedures.



Table of Contents

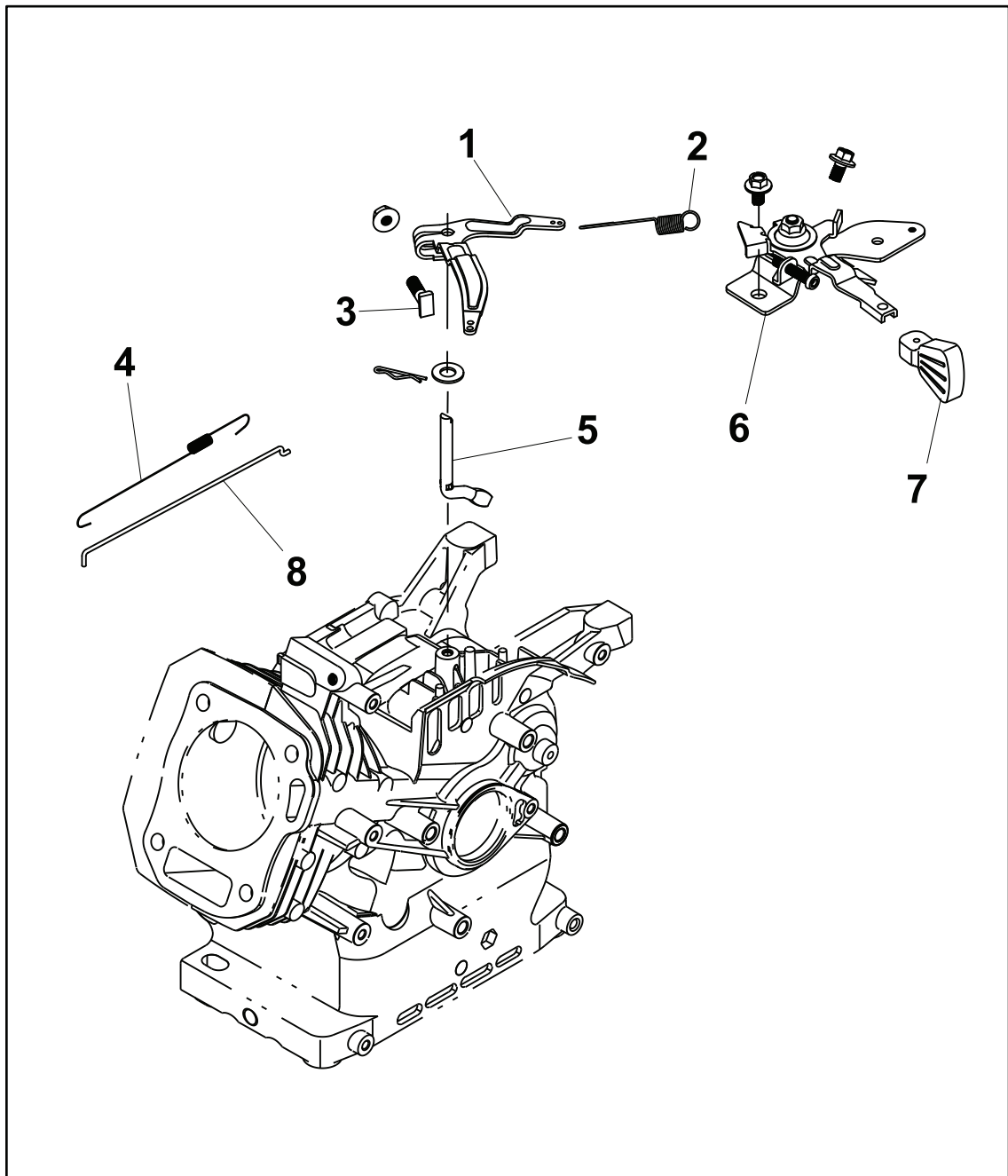
General Information	6-2
Service and Repairs	6-3
Speed Control Assembly Replacement (G210-1, G210-2, & G210-4).....	6-5
Governor Arm Replacement (G210-1, G210-2, & G210-4)	6-11

General Information

The Governor Controls chapter covers the removal, inspection, and installation of the engine speed control assembly, linkage, and the governor arm. It also includes sections on how to set Top No Load RPM and how to Zero the Governor. The G210-2 and G210-4 are constant RPM engines whereas the G210-1 has a throttle control that allows engine to operate at a fast or slow speed. The throttle control also shuts off the engine.

Service and Repairs

G210-1 Speed Control Assembly

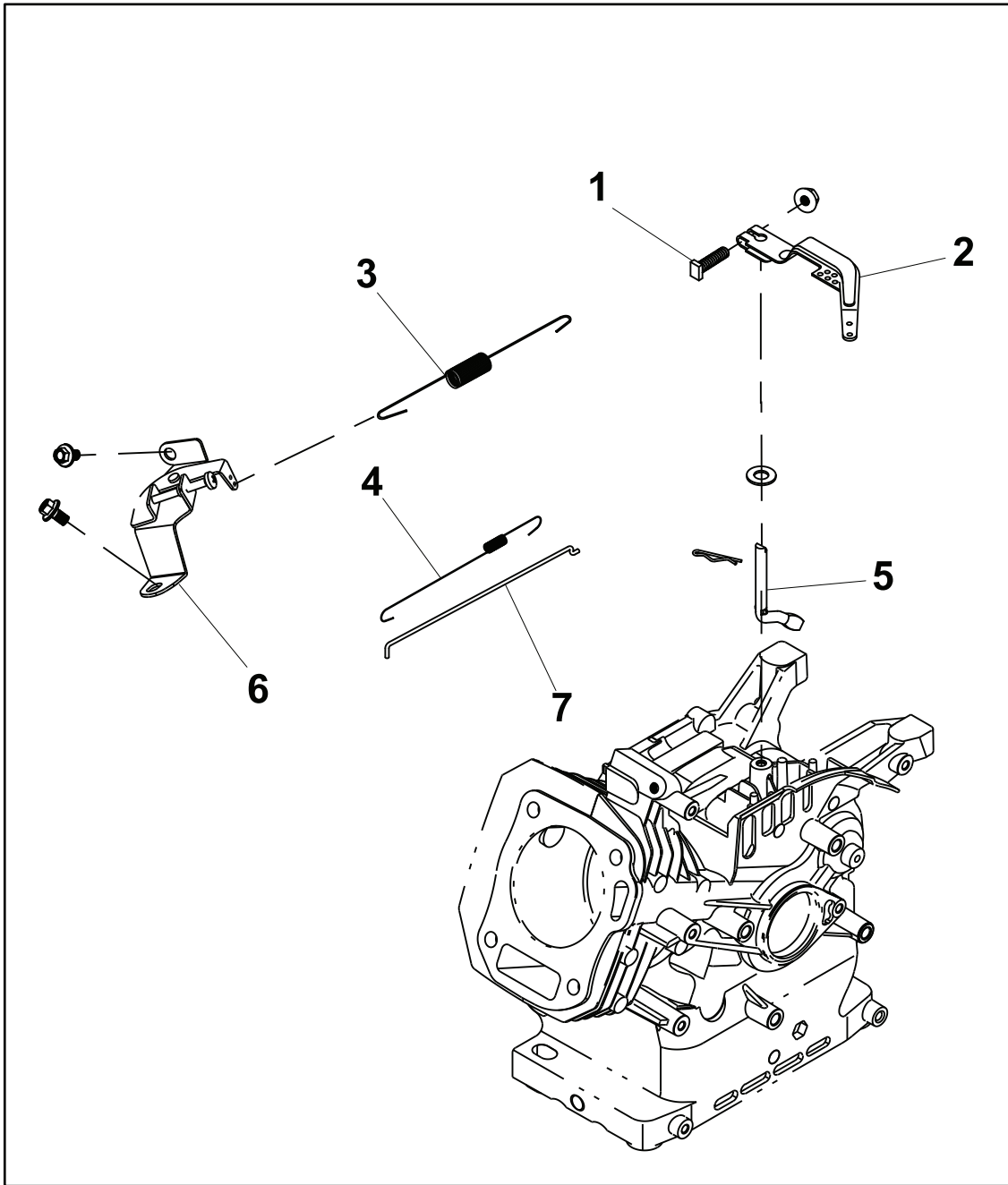


g325024

Figure 102

- | | |
|---------------------------|---------------------------|
| 1. Governor Arm | 5. Governor Shaft |
| 2. Governor Spring | 6. Speed Control Assembly |
| 3. Governor Arm Bolt | 7. Throttle Control Knob |
| 4. Throttle Return Spring | 8. Governor Rod |

G210-2 & G210-4 Speed Control Assembly



g325025

Figure 103

- | | |
|---------------------------|---------------------------|
| 1. Governor Arm Bolt | 5. Governor Shaft |
| 2. Governor Arm | 6. Speed Control Assembly |
| 3. Governor Spring | 7. Governor Rod |
| 4. Throttle Return Spring | |

Speed Control Assembly Replacement (G210-1, G210-2, & G210-4)

G210-1 Speed Control Assembly Removal

1. Drain the fuel into a suitable container.
2. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
3. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
4. Pull and remove the throttle control knob from the speed control assembly.



g333166

Figure 104

-
5. Remove the 2 (M6 x 10) screws securing the speed control assembly to the blower shroud.



g325571

Figure 105

-
6. Remove the ground wire from the kill switch.

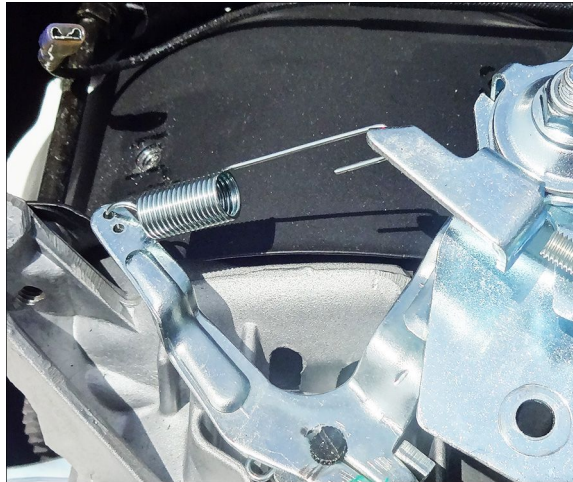
G210–1 Speed Control Assembly Removal (continued)



g325570

Figure 106

-
7. Unhook the governor spring from the speed control assembly and governor arm.



g325569

Figure 107

-
8. Remove the speed control assembly from the engine block.

G210–1 Speed Control Assembly Installation

1. Install the ground wire to the stop switch.

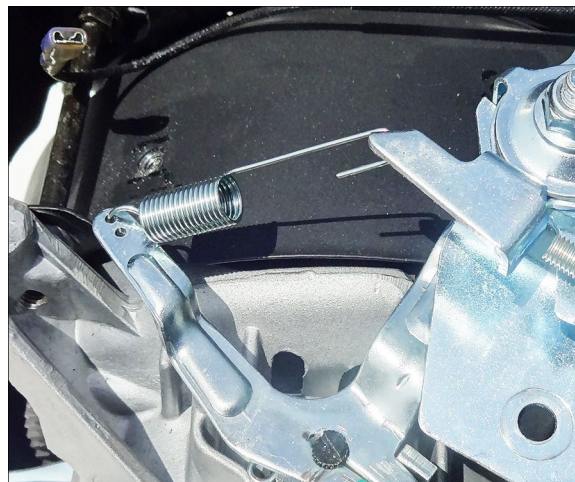
G210-1 Speed Control Assembly Installation (continued)



g325570

Figure 108

2. Connect the governor spring to the specified hole in the governor arm and speed control assembly.



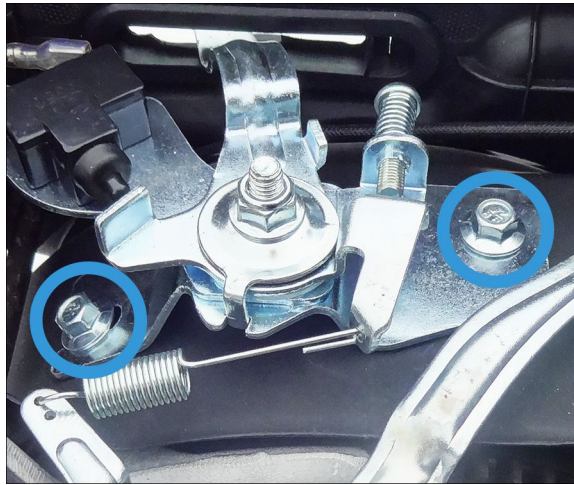
g325569

Figure 109



3. Position the speed control assembly to the blower shroud by inserting the lever through the slot. Install the 2 (M6 x 10) screws securing the speed control assembly to the blower shroud. Torque the screws to 10 N • m (89 in-lb).

G210–1 Speed Control Assembly Installation (continued)



g325571

Figure 110

4. Install the throttle control knob onto the speed control assembly.



g325572

Figure 111

5. Install the fuel tank to the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
6. Install the muffler guard to the engine block. Refer to the product Service Manual for the muffler guard installation procedures.
7. Refill the fuel.

G210–1 Speed Control Assembly Test

1. Verify are no fuel leaks exist.
2. Verify the oil is at a proper level.
3. Using a tachometer, verify Top No Load RPM. [Top No Load RPM \(page 6–18\)](#)

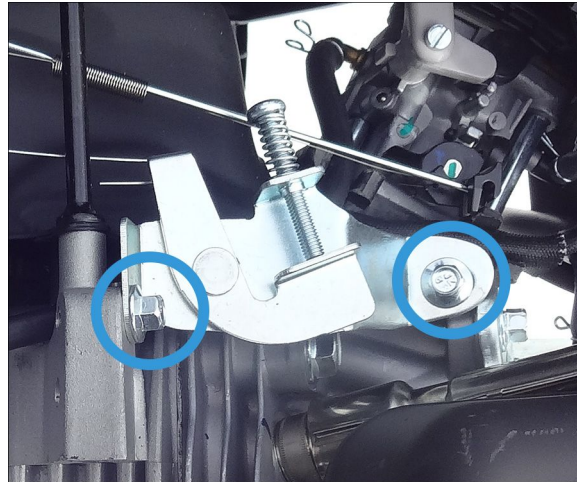
Note: Make all adjustments with the engine at a normal operating temperature.

G210–1 Speed Control Assembly Test (continued)

- Using a tachometer, verify the engine idle speed RPM. [Specifications \(page 2-2\)](#)

G210–2 & G210–4 Speed Control Assembly Removal

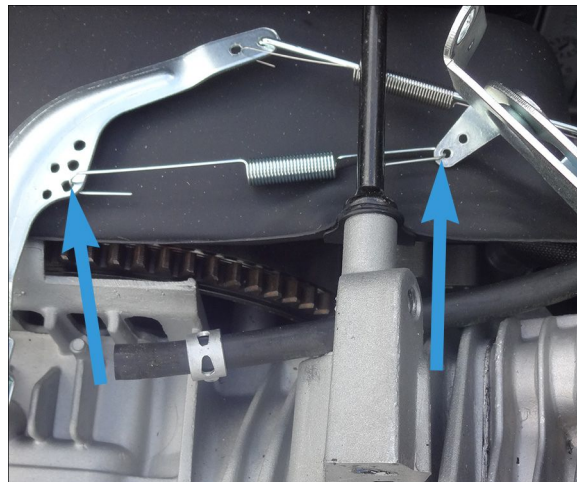
- Drain the fuel into a suitable container.
- Remove the muffler guard for the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
- Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
- Remove the 2 (M6 x 10) screws securing the speed control assembly to the engine block.



g325574

Figure 112

-
- Unhook the governor spring from the speed control assembly.



g325573

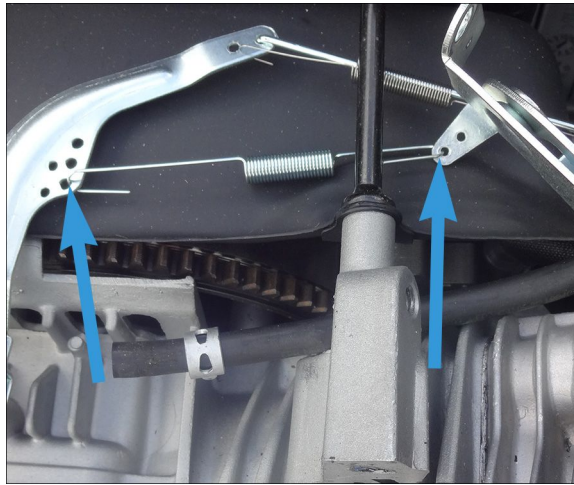
Figure 113

G210–2 & G210–4 Speed Control Assembly Installation

- Connect the governor spring to specified hole in the governor arm.

Note: Ensure the governor spring is between the shroud mount bolt and blower shroud.

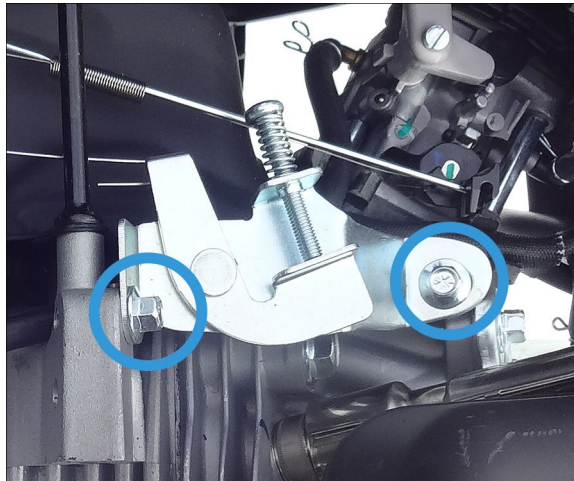
G210-2 & G210-4 Speed Control Assembly Installation (continued)



g325573

Figure 114

2. Install the 2 (M6 x 10) screws securing the speed control assembly to the engine block.



g325574

Figure 115

3. Install the fuel tank to the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
4. Install the muffler guard to the engine block. Refer to the product Service Manual for the muffler guard installation procedures.
5. Refill the fuel.

G210-2 & G210-4 Speed Control Assembly Test

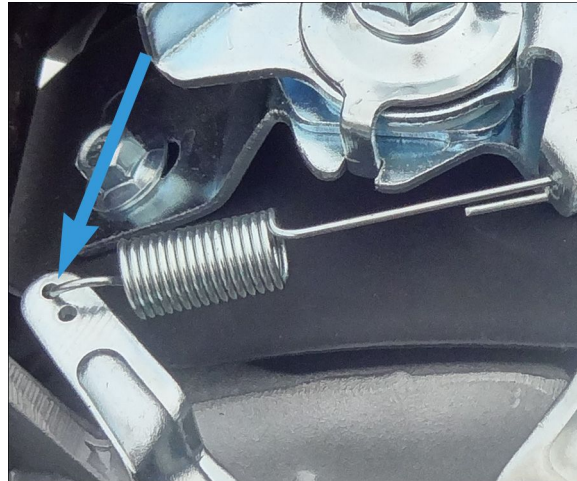
1. Verify no fuel leaks exist.
2. Verify the oil is at a proper level.
3. Using a tachometer, verify Top No Load RPM. [Top No Load RPM \(page 6-18\)](#)

Note: Make all adjustments with the engine at normal operating temperature.

Governor Arm Replacement (G210-1, G210-2, & G210-4)

G210-1 Governor Arm Removal

1. Drain the fuel into a suitable container.
2. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
3. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
4. Unhook the governor spring from the governor arm.



g325633

Figure 116

5. Loosen the (M6) flange nut secured to the governor arm bolt. Slide the governor arm off of the governor shaft.

Note: A small flat bladed screwdriver can be used to pry the clamp open to allow arm to lift up more easily.

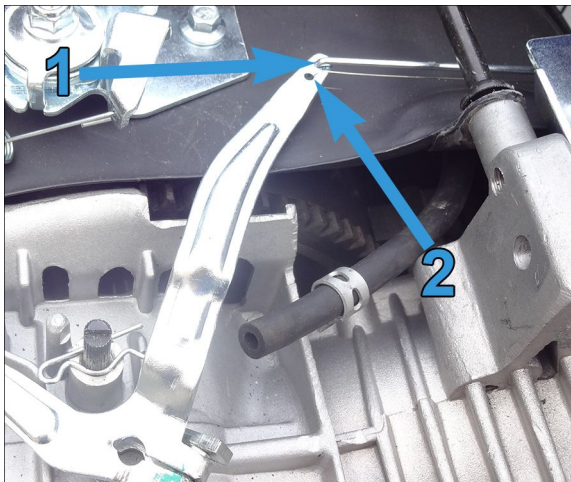


g325632

Figure 117

6. Unhook the governor rod and throttle return spring from the governor arm.

G210–1 Governor Arm Removal (continued)



g325634

Figure 118

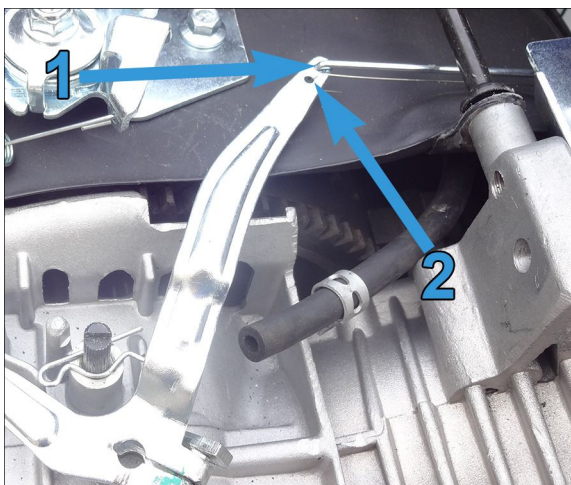
1. Governor Rod
 2. Throttle Return Spring
-

7. Remove the governor arm from the engine block.

Note: The clamping bolt and nut may fall out of the arm once the governor arm is removed.

G210–1 Governor Arm Installation

1. Connect the governor rod and throttle return spring to the governor arm.



g325634

Figure 119

1. Governor Rod
 2. Throttle Return Spring
-

2. Align the governor bolt and (M6) flange nut so that the bolt head is captured by the governor arm. Slide the governor arm over the governor shaft protruding from the top of the engine block. Loosely install the flange nut.

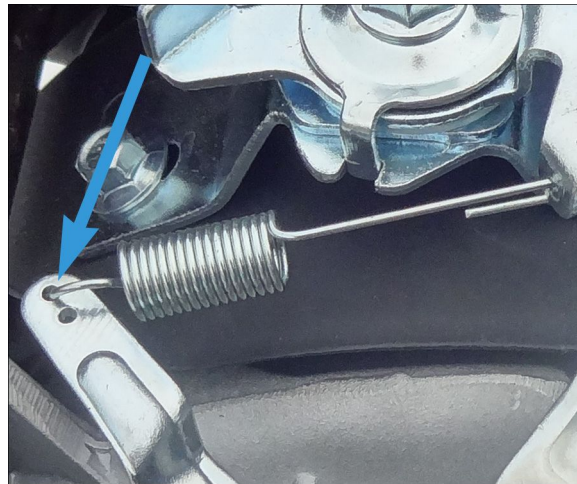
G210–1 Governor Arm Installation (continued)



g325632

Figure 120

3. Connect the governor spring to the governor arm and speed control assembly.



g325633

Figure 121

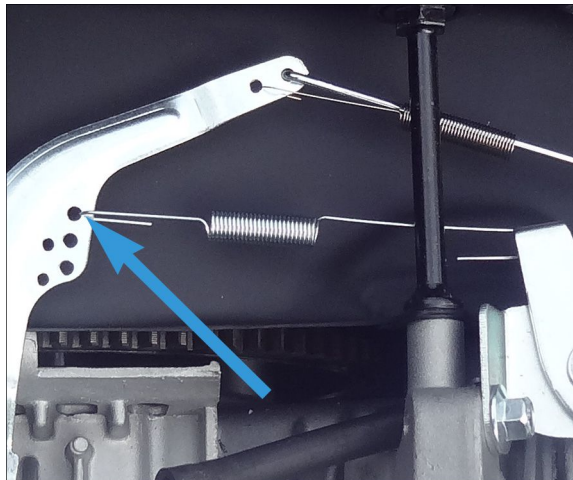
4. Zero the governor. [Zeroing the Governor \(page 6–16\)](#)
5. Install the fuel tank to the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
6. Install the muffler guard to the engine block. Refer to the product Service Manual for the muffler guard installation procedures.
7. Set Top No Load RPM. [Top No Load RPM \(page 6–18\)](#)

G210–2 & G210–4 Governor Arm Removal

1. Drain the fuel into a suitable container.
2. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
3. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.

G210-2 & G210-4 Governor Arm Removal (continued)

4. Unhook the governor spring from the governor arm.

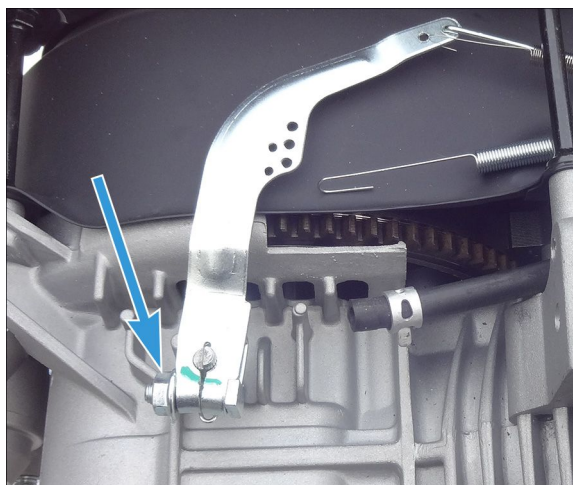


g325636

Figure 122

-
5. Loosen the (M6) flange nut secured to the governor arm bolt and slide the governor arm off of governor shaft.

Note: A small flat bladed screwdriver can be used to pry the clamp open to allow arm to lift up more easily.

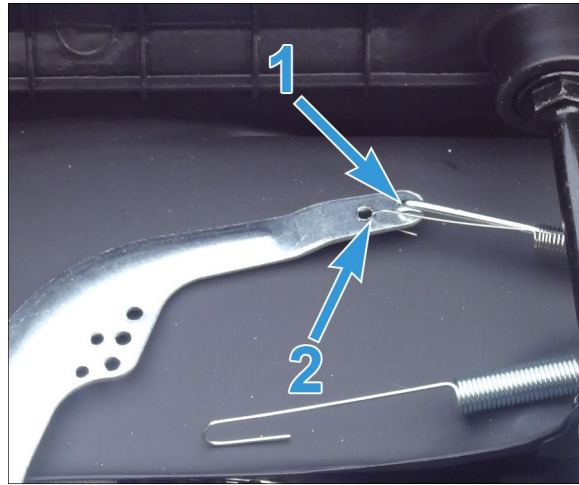


g325635

Figure 123

-
6. Unhook the governor rod and throttle return spring from the governor arm.

G210-2 & G210-4 Governor Arm Removal (continued)



g325637

Figure 124

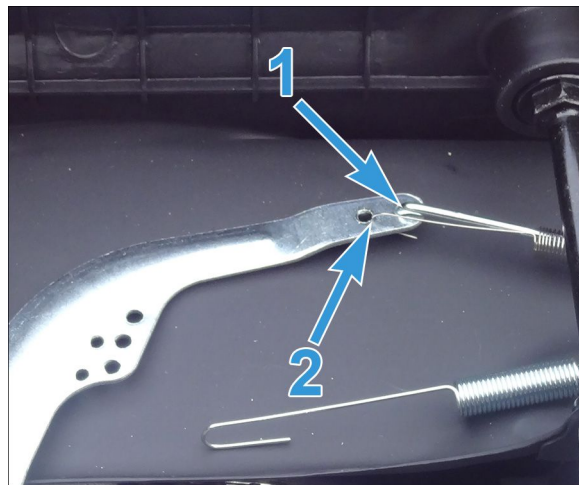
1. Governor Rod
 2. Throttle Return Spring
-

7. Remove the governor arm from the engine block.

Note: The clamping bolt and nut may fall out of the arm once the governor arm is removed.

G210-2 & G210-4 Governor Arm Installation

1. Connect the governor rod and throttle return spring to the governor arm.



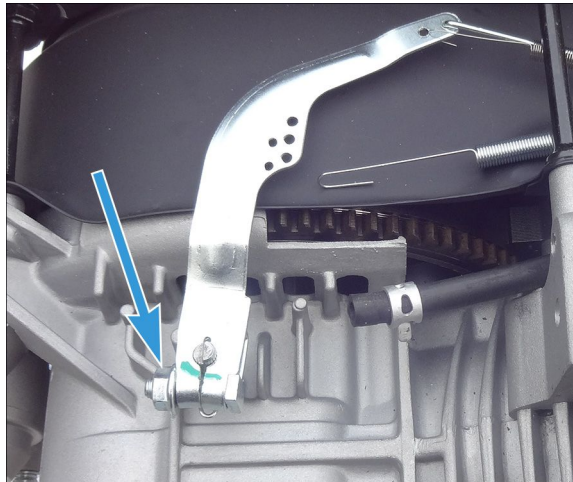
g325637

Figure 125

1. Governor Rod
 2. Throttle Return Spring
-

2. Align the governor bolt and (M6) flange nut so that the bolt head is captured by the governor arm. Slide the governor arm over the governor shaft protruding from the top of the engine block. Loosely install the flange nut.

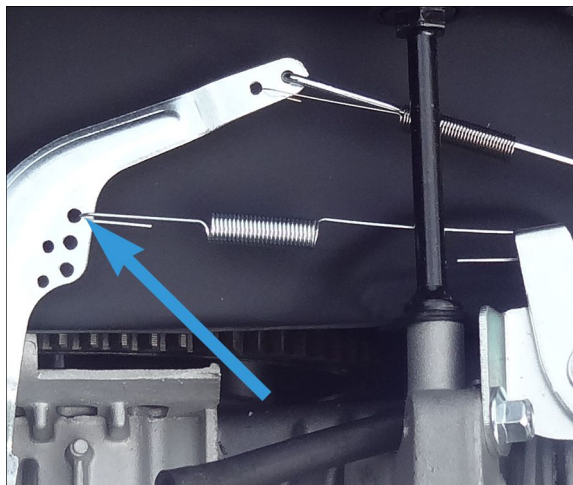
G210–2 & G210–4 Governor Arm Installation (continued)



g325635

Figure 126

3. Connect the governor spring to the governor arm and speed control assembly.



g325636

Figure 127

4. Zero the governor. [Zeroing the Governor \(page 6–16\)](#)
5. Install the fuel tank to the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
6. Install the muffler guard to the engine block. Refer to the product Service Manual for the muffler guard installation procedures.
7. Set Top No Load RPM. [Top No Load RPM \(page 6–18\)](#)

Zeroing the Governor

1. If necessary, remove the fuel tank. Refer to the product Service Manual for the fuel tank removal procedures.
2. Loosen the flange nut secured to the governor arm bolt.
Note: A small flat bladed screwdriver can be used to pry the clamp open to allow the governor arm to rotate on the governor shaft.
3. G210–1 engine models only, set the throttle control knob to the fast position. Verify the throttle shaft is in the wide open throttle position.

Zeroing the Governor (continued)



g325733

Figure 128



g325732

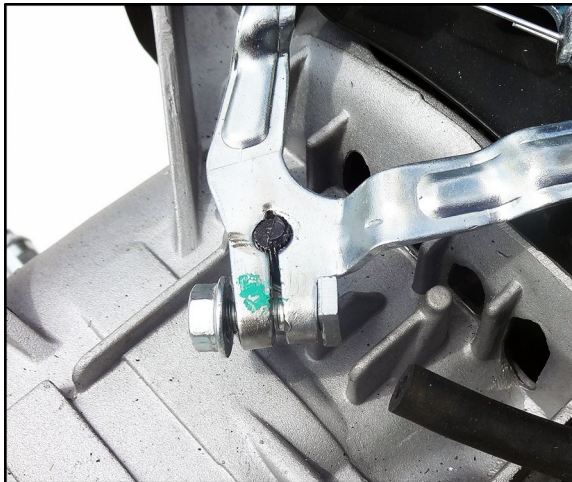
Figure 129



4. Ensure the governor shaft is completely through the governor arm clamp. Rotate the governor shaft clockwise and hold while tightening the (M6) flange nut. Torque the nut to 10 N • m (89 in-lb).

Note: Verify there is an air gap between each side of the clamp. If overtightened and the gap is closed, replace the governor arm.

Zeroing the Governor (continued)



g339523

Figure 130



g339524


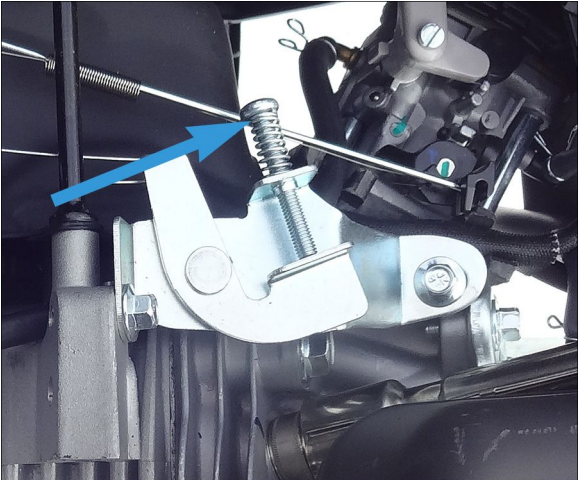
Figure 131

5. Verify the throttle control linkage is free to move by rotating the governor arm.
6. Install the fuel tank to the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
7. Refill the fuel.
8. Start and run engine to verify governor arm and throttle shaft move freely.

Top No Load RPM

1. Using a tachometer, verify Top No Load RPM. [Specifications \(page 2-2\)](#).
2. To adjust the RPM, turn the screw on the speed control assembly plate. Turn the screw clockwise to elongate the spring and increase the Top No Load RPM. Turn the screw counterclockwise to shorten the spring and reduce the Top No Load RPM.

Top No Load RPM (continued)

Engine Model	Image
G210-1	 <p>g325734</p> <p>Figure 132</p>
G210-2 & G210-4	 <p>g325735</p> <p>Figure 133</p>

3. Test run the engine to verify Top No Load RPM. [Specifications \(page 2-2\)](#)



Table of Contents

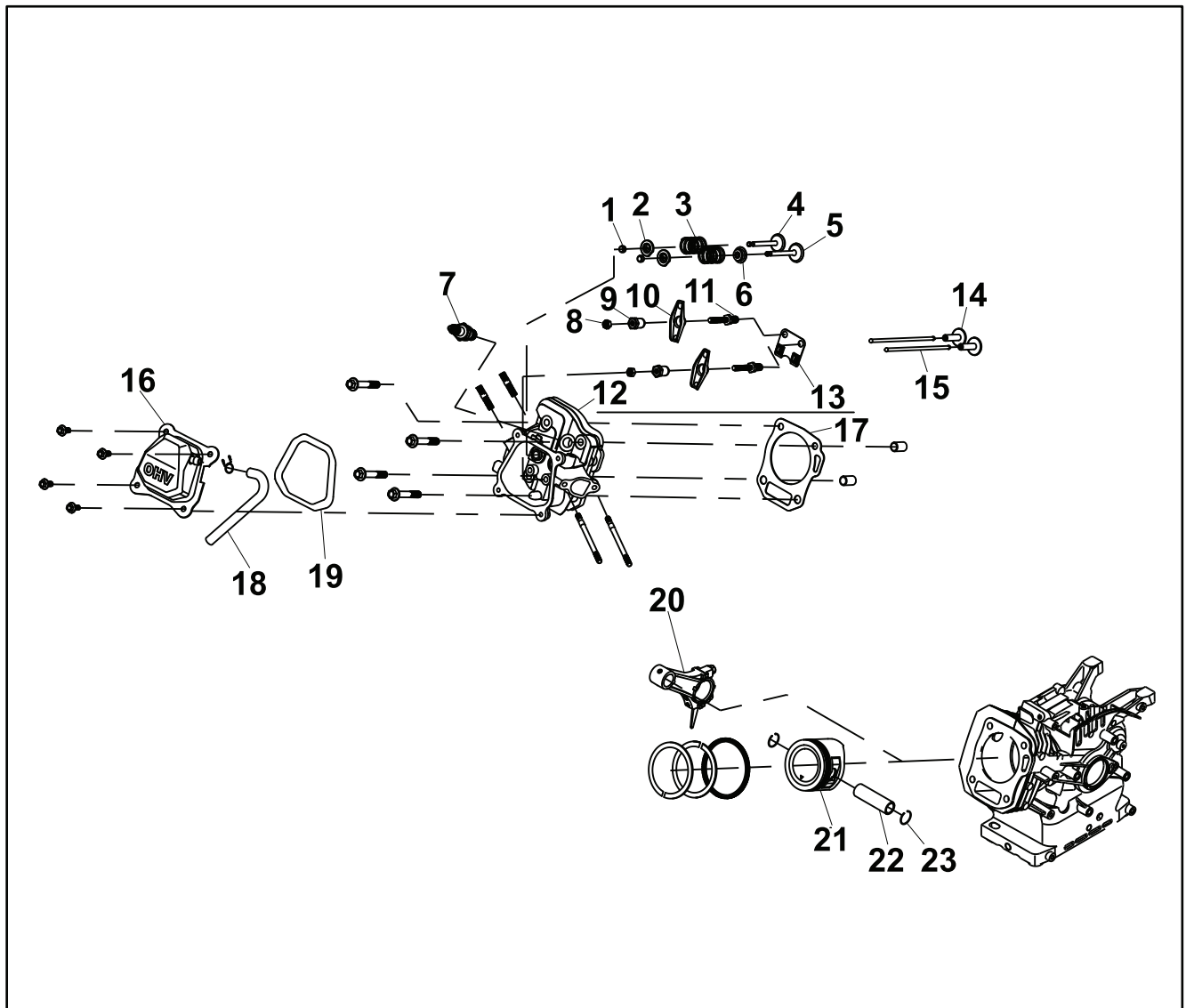
General Information	7-2
Service and Repairs	7-3
Cylinder Head Replacement (G210-1, G210-2, & G210-4)	7-6
Piston and Connecting Rod Replacement.....	7-38

General Information

The Compression System chapter includes detailed steps for two assemblies. The Cylinder Head Assembly section includes the removal and installation of the head assembly and the complete head rebuild with valve reconditioning and adjustment steps (valve seat cutting, valve face angles, and valve spring height). The Piston and Connecting Rod Assembly section includes the removal and installation of the piston and connecting rod. There are several critical inspection steps including the following measurement specifications: piston to ring, piston to pin, piston pin diameter, connecting rod bearing diameters, ring end gap, and ring thickness.

Service and Repairs

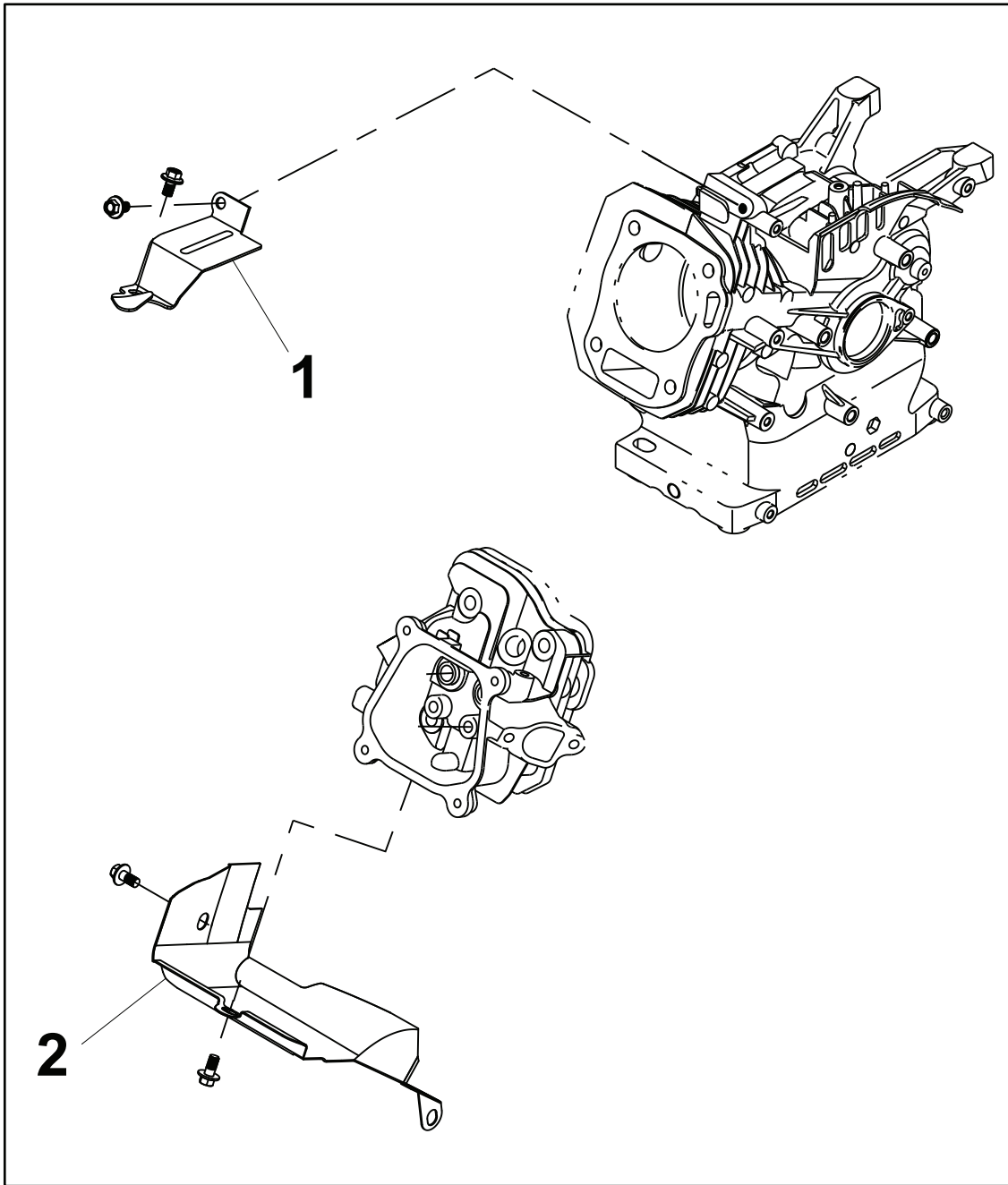
G210-1, G210-2, & G210-4 Cylinder Head and Piston Assembly 1



g328799

Figure 134

- | | |
|--------------------------|-----------------------------|
| 1. Valve Rotator | 13. Push Rod Guide Plate |
| 2. Valve Spring Retainer | 14. Valve Tappet |
| 3. Valve Spring | 15. Push Rod |
| 4. Exhaust Valve | 16. Valve Cover |
| 5. Intake Valve | 17. Cylinder Head Gasket |
| 6. Valve Stem Seal | 18. Breather Tube |
| 7. Valve Set | 19. Valve Cover Gasket |
| 8. Rocker Arm Nut | 20. Connecting Rod Assembly |
| 9. Rocker Pivot Nut | 21. Piston |
| 10. Rocker Arm | 22. Piston Pin |
| 11. Rocker Stud | 23. Piston Pin Clip |
| 12. Cylinder Head | |



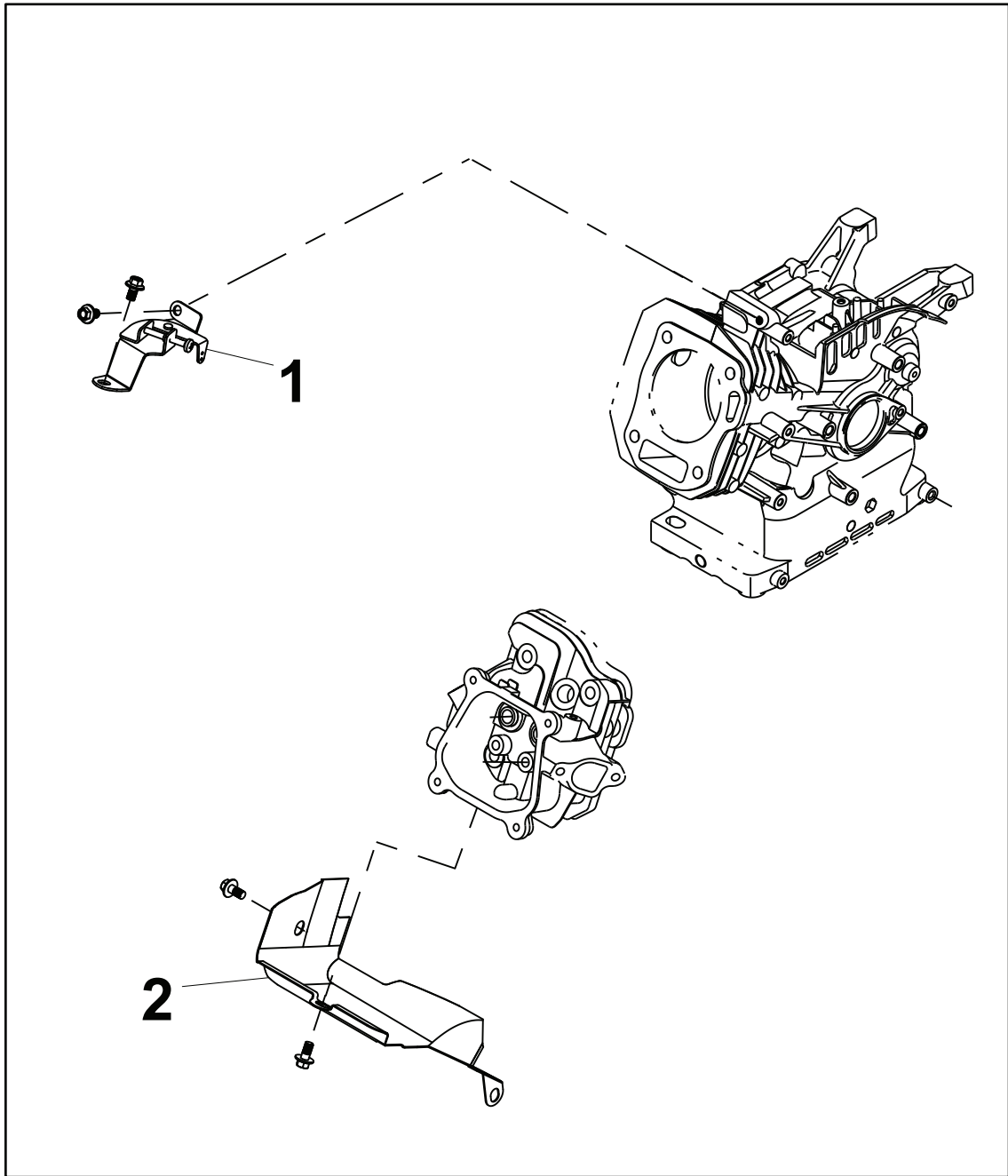
g328800

Figure 135

1. Baffle

2. Lower Shroud

G210-2 & G210-4 Cylinder Head Assembly 2



g328801

Figure 136

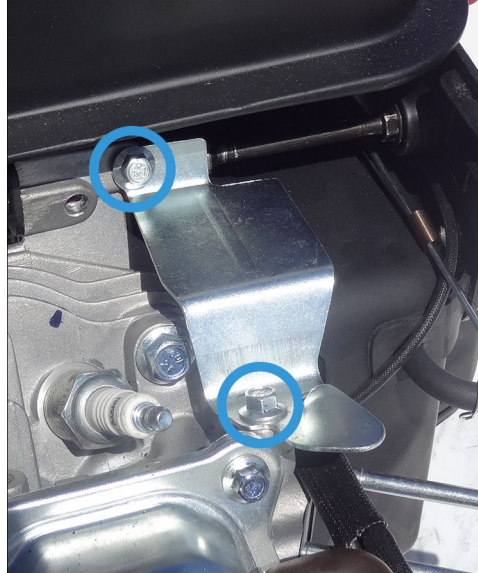
1. Speed Control Assembly

2. Lower Shroud

Cylinder Head Replacement (G210-1, G210-2, & G210-4)

G210-1 Cylinder Head Removal

1. Drain the fuel into suitable container.
2. Remove the muffler from the cylinder head. Refer to the product Service Manual for the muffler removal procedure.
3. Remove the carburetor from the cylinder head. [Carburetor Removal \(page 5-6\)](#)
4. Remove the spark plug wire from the spark plug.
5. Remove the 2 (M6 x 10) screws securing the baffle to the cylinder head and engine block.

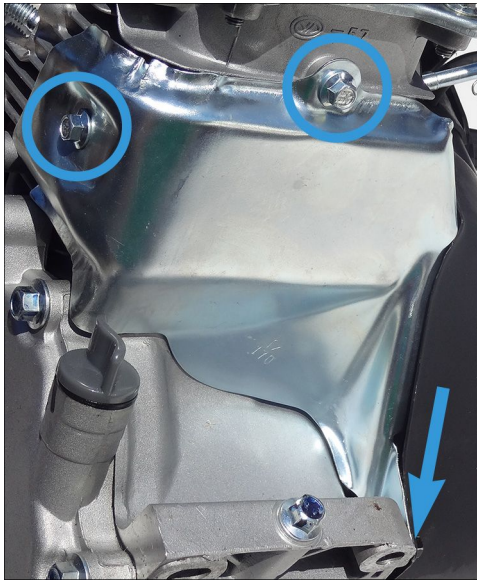


g327606

Figure 137

-
6. Remove the baffle from the cylinder head and engine block.
 7. Remove the 3 (M6 x 10) screws securing the lower shroud to the engine block.

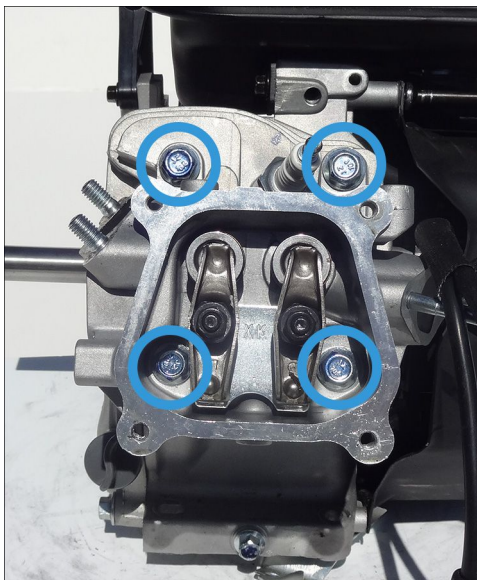
G210–1 Cylinder Head Removal (continued)



g327610

Figure 138

8. Remove the lower shroud from the engine block.
9. Remove the 4 (M6 x 16) screws securing the valve cover to the cylinder head.
10. Remove the valve cover from the cylinder head. Remove and discard the valve cover gasket.
11. Place the piston at the top of the compression stroke.
Note: Insert a wooden dowel into the spark plug hole to verify the piston is at the top of the compression stroke.
12. Remove the 4 (M8 x 60) screws securing the cylinder head to the engine block.

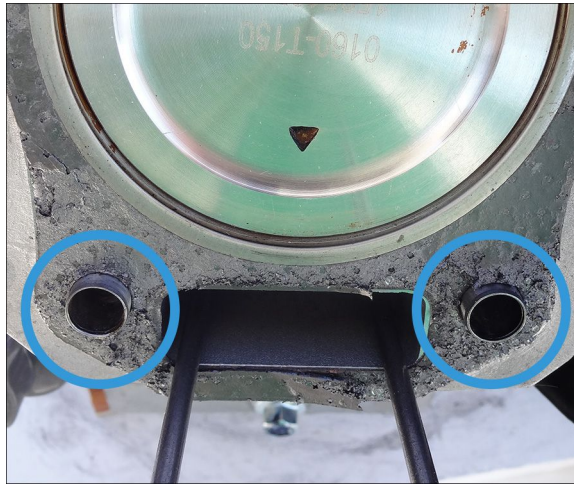


g327609

Figure 139

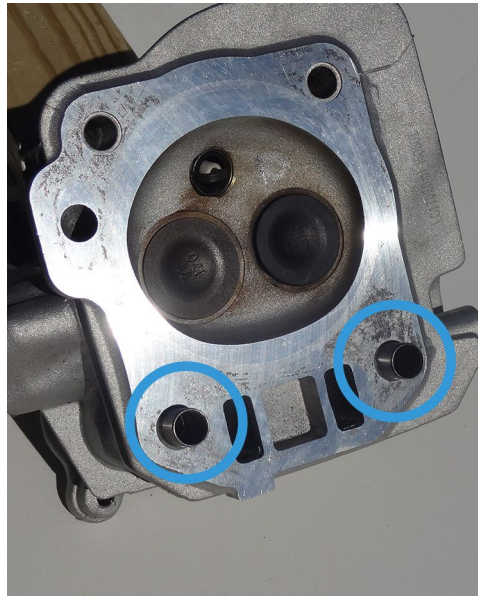
13. Remove the cylinder head from the engine block.
14. Remove the 2 dowels from the cylinder head or engine block.

G210-1 Cylinder Head Removal (continued)



g327607

Figure 140



g327608

Figure 141

15. Remove the 2 push rods from the engine block.

G210–1 Cylinder Head Removal (continued)



g327611

Figure 142



CAUTION



Do not use a metal scraper or wire brush to remove head gasket remnants from the cylinder head or engine block. Doing so may damage the cylinder head or engine block.

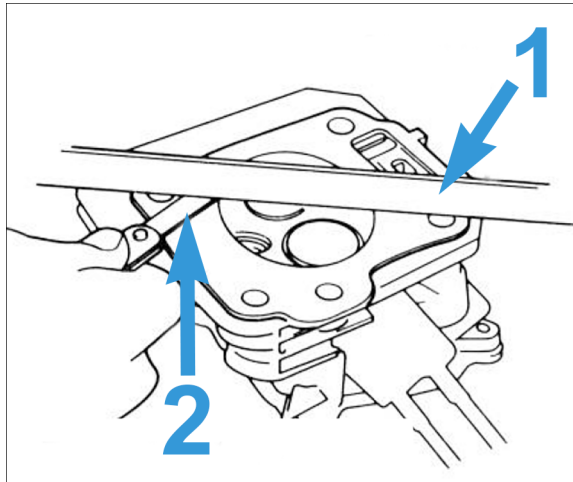
16. Using a wood or plastic scraper, remove the head gasket from the cylinder head and the engine block.

G210–1 Cylinder Head Inspection

1. Inspect the spark plug threads for damage. Replace the spark plug if damaged.
2. Remove carbon deposits from the cylinder head.
3. Inspect the cylinder head for broken cooling fins, cracks, or other damage. Replace the cylinder head if damaged.
4. Using a straight edge and feeler gauge, inspect the cylinder head for warping.

Service Limit: 0.055 mm (0.00197 inch)

G210–1 Cylinder Head Inspection (continued)



g327663

Figure 143

1. Straight Edge
2. Feeler Gauge

-
5. Inspect the pushrods. Replace the pushrods if they are bent or worn.

G210–1 Cylinder Head Disassembly

1. While holding the exhaust pivot nut with a wrench, remove the exhaust rocker arm nut from the rocker arm mounting stud. Repeat on the intake side of the cylinder head.



g338830

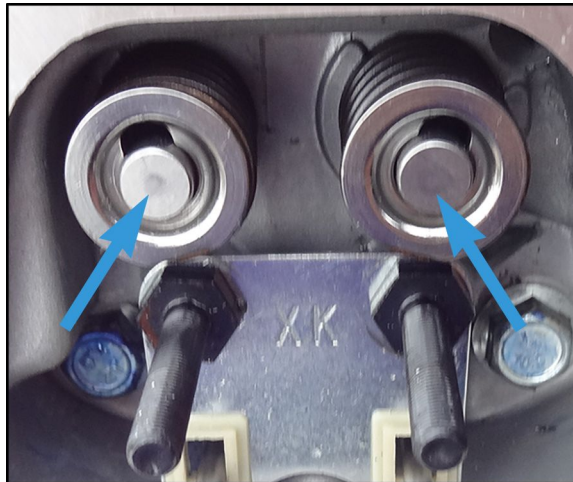
Figure 144

-
2. Remove the exhaust pivot nut and exhaust rocker arm. Repeat on the intake side of the cylinder head.

Note: Keep the exhaust and intake parts separated.

3. Remove the valve rotators from the end of each valve stem.

G210-1 Cylinder Head Disassembly (continued)



g338831

Figure 145

4. Place the cylinder head with the valve side facing downwards on a shop rag.
5. Using a valve spring compressor, compress the exhaust valve spring and exhaust. Remove the valve spring from the cylinder head. Repeat on the intake side of the cylinder head.

Note: Keep the exhaust and intake parts separated.

6. Remove the remaining valve components.

Note: Keep the exhaust and intake components separated.

- Valve springs
- Intake valve seal
- Exhaust valve
- Intake valve

7. Remove the rocker mounting studs from the cylinder head.
8. Remove the valve guide plate from the cylinder head.



g340490

Figure 146

G210–1 Cylinder Head Rocker Arm Components Inspection

1. Clean and inspect the rocker arm nuts, pivot nuts, rocker arms, and valve rotators for damage. Replace the rocker arm assembly if components are damaged.
2. Inspect the rocker arm mounting studs for damage. Replace the rocker arm assembly if the rocker arm mounting studs are damaged.
3. Clean and inspect the guide plate. Replace if cracked, worn, or bent.

G210–1 Cylinder Head Valve Seat Inspection

1. Thoroughly clean the cylinder head to remove carbon deposits.
2. Inspect the valve seats for loose seat, proper valve face contact, and proper seat width.

G210–1 Valve Face Contact Test

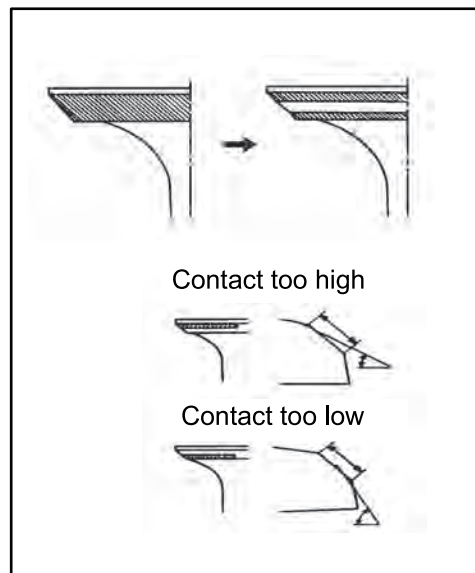
1. Apply a light coat of Prussian Blue or erasable ink to the valve face.
2. Insert the valve, lift the valve and snap it closed against the seat several times.

Note: Verify the valve does not rotate on the seat.

3. Inspect the transferred marking compound for any area of the seat that is not concentric.

Standard: 0.8 mm (0.0315 inch)

Service Limit: 2.0 mm (0.0787 inch)



g338826

Figure 147

4. If valve seat is found out of specification, attempt to recondition valve seat. [G210–1 Valve Seat Reconditioning \(page 7–14\)](#). If unable to correct with reconditioning, replace the cylinder head assembly.
5. Repeat the procedure on all valves and seats.

G210–1 Valve Guide Inspection

1. Measure and verify the inside diameter of the valve guide is to specification. Replace the cylinder head assembly if out of specification.

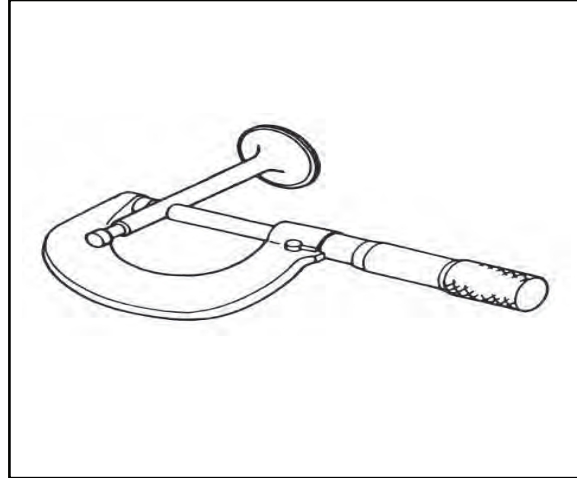
Inside Diameter (Intake and Exhaust) Standard: 5.500 mm (0.2165 inch)

Service Limit: 5.572 mm (0.2194 inch)

G210–1 Valve Inspection

1. Clean the carbon from the valves.
2. Inspect the valve stems for pitting, wear, or if bent.
3. Measure and verify the valve stem diameter is to specification.

Stem Diameter	Standard	Service Limit
Intake	5.480 mm (0.2157 inch)	5.318 mm (0.2094 inch)
Exhaust	5.440 mm (0.2142 inch)	5.275 (0.2077 inch)



g338827

Figure 148

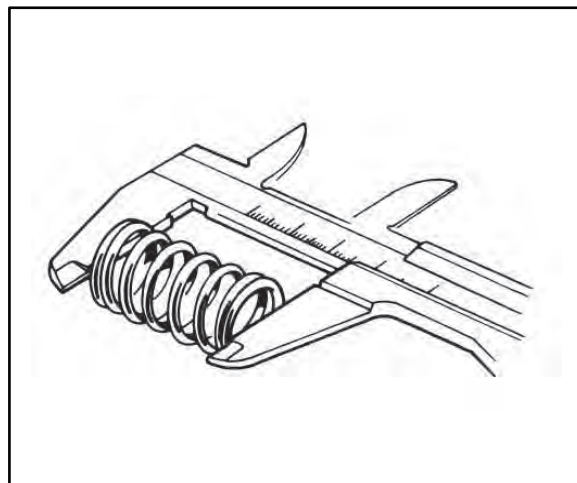
4. Inspect the valve face for pitting, wear, or corrosion.
5. Replace the valve set if either valve is out of specification or damaged.
6. Repeat the inspection for both valves.

G210–1 Valve Spring Inspection

1. Inspect the free length of the valve spring and verify it is to specification.

Standard: 35 mm (1.37795 inch)

Service Limit: 32.5 mm (1.27953 inch)



g338829

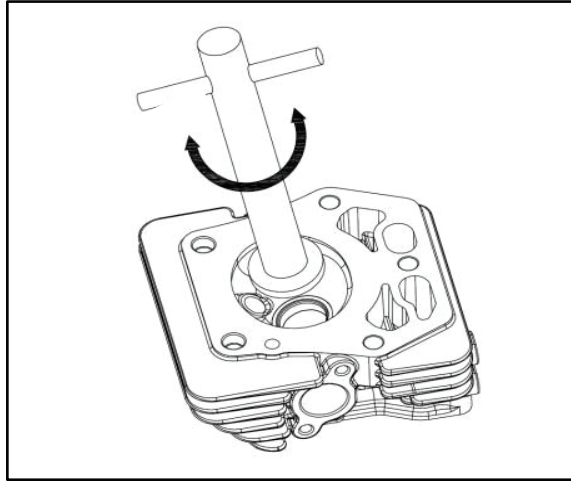
Figure 149

2. Inspect the valve spring from bent coils (the spring should stand straight).
3. Clean and inspect the spring retainers. Replace if damaged.

G210–1 Valve Seat Reconditioning

1. Using a 45–46° cutter, remove enough material to produce a smooth, concentric seat. Follow the valve seat cutter manufacturer's instructions.

Note: Always turn the cutter clockwise. Continue to turn the cutter while lifting from the valve seat.



g338833

Figure 150

-
2. Using 30–32° and 60° cutter, narrow and adjust the valve seat. The valve should contact the middle of the valve face. Ensure the width of the finished valve is to specification.

Standard: 0.8 mm (0.0315 inch)

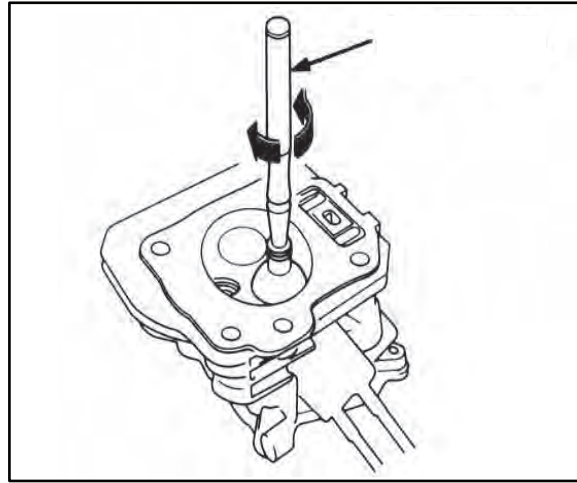
Service Limit: 2.0 mm (0.0787 inch)

3. After resurfacing the seats, inspect for even valve seating. [G210–1 Valve Face Contact Test \(page 7–12\)](#)
4. Replace the valve set if not making full contact.
5. Repeat the procedure on other valve seat.

G210–1 Valve Lapping

1. Perform valve lapping if any of the following were performed:
 - New valve
 - Reground valve
 - Valve seat was reconditioned
2. Using a hand valve-lapping tool, attach the suction cup to the end of the valve.

G210–1 Valve Lapping (continued)



g338828

Figure 151

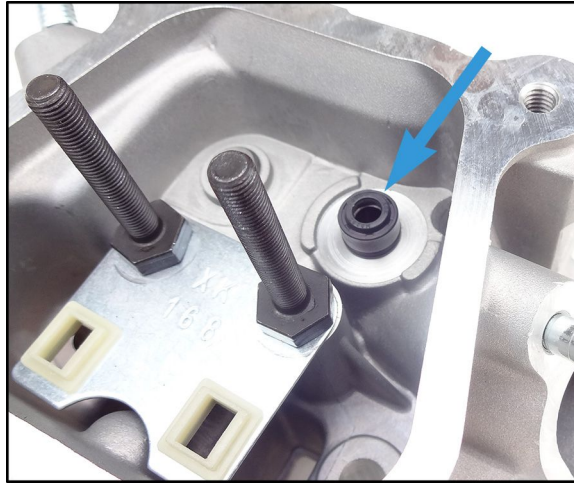
3. Apply a light coat of valve grind compound to the valve face.
4. Insert the valve into the matching valve guide.
5. Rotate the valve on the seat with the valve-lapping tool until the valve face and valve seat have smooth surfaces.
6. Repeat lapping on the other valve.
7. Use hot soapy water to remove the grinding compound from the entire cylinder head and all of the valves.
8. After drying, apply a light coat of engine oil to the entire cylinder head.
9. Ensure all of the grinding compound is removed from the cylinder head and valve components.

G210–1 Cylinder Head Assembly



1. Install the guide plate over the holes in the cylinder head, secure with the 2 rocker arm mounting studs. Torque the studs to 2.9 N • m (21 ft-lb).
2. Orient the cylinder head so the intake is on the right and the exhaust is on the left.
Note: The exhaust studs have larger threads than the intake studs. The intake studs are longer than the exhaust studs.
3. Lubricate a new valve guide seal. Install the valve guide seal over the intake guide (RH valve guide).

G210-1 Cylinder Head Assembly (continued)



g339528

Figure 152

4. Lubricate both valve stems with engine oil.
5. Install the intake and exhaust valves into the cylinder head.

Note: Exhaust valve has a slightly smaller valve head.



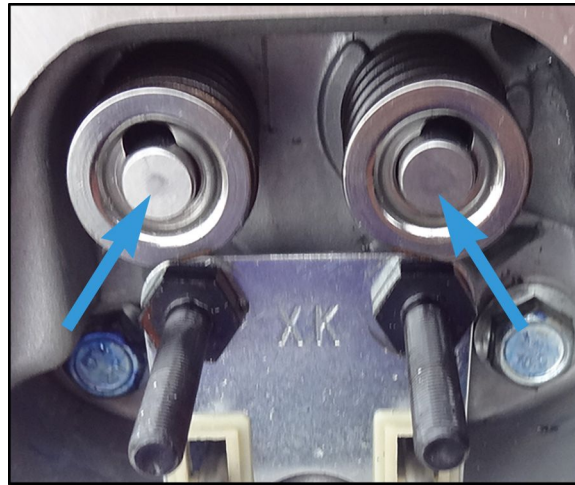
g339540

Figure 153

1. Intake Valve
2. Exhaust Valve

6. Install the valve springs and valve spring retainers.
7. Verify the notch in the valve stem is fully seated in the middle of the valve spring retainer.
8. Install the valve rotators onto the end of each valve stem.

G210-1 Cylinder Head Assembly (continued)



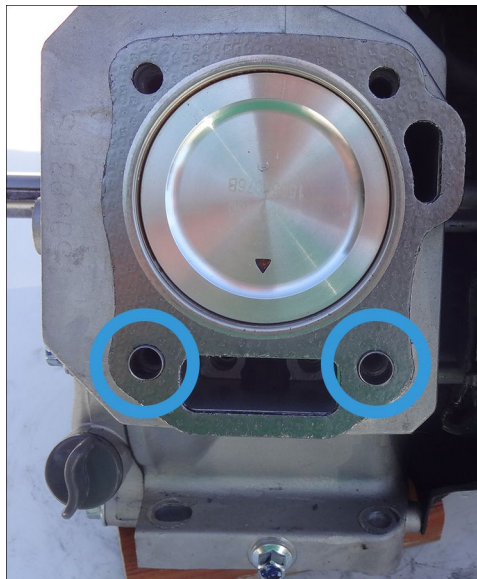
g338831

Figure 154

9. Install the exhaust rocker arm onto the exhaust rocker arm stud. Position the rocker arm so the ball socket is over the push rod installation site. Repeat on the intake side of the cylinder head.
10. Thread the exhaust pivot nut onto the exhaust rocker arm stud until the nut contacts the rocker arm. Repeat on the intake side of the cylinder head.
11. Install the exhaust rocker arm nut onto the exhaust rocker arm stud. Repeat on the intake side of the cylinder head.

G210-1 Cylinder Head Installation

1. Install the 2 dowel pins into the lower holes of the engine block.



g339608

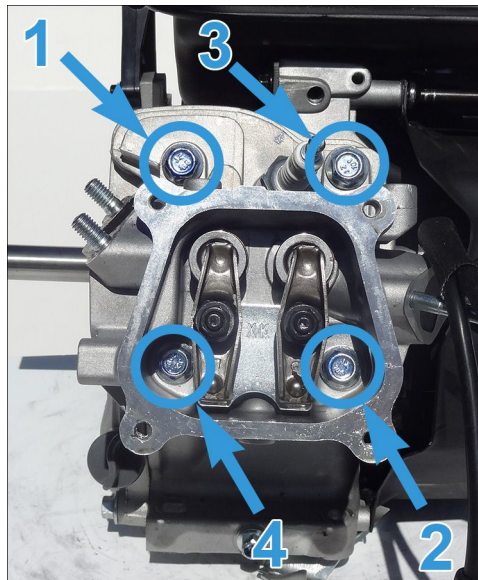
Figure 155

2. Install a new head gasket over the dowel pins.
3. Install the cylinder head on the dowels. Loosely install the 4 (M8 x 60) screws securing the cylinder head to engine block. Torque the 4 screws in an alternating pattern in specification order below.



G210-1 Cylinder Head Installation (continued)

- Torque all of the screws to 11.3 N • m (100 in-lb)
- Torque all of the screws to 22.6 N • m (200 in-lb)
- Torque all of the screws to 33.9 N • m (300 in-lb)



g327614

Figure 156



4. Install the 2 push rods and align the rocker arms over the push rods. If necessary, loosen the rocker lock nuts or push down on the valve spring to position the rocker arms over the push rods. Verify the 2 valve rotators are installed on each valve stem.

Note: If the valve rotator is not in position, the valve may drop into cylinder during operation.



g327612

Figure 157

G210–1 Cylinder Head Installation (continued)

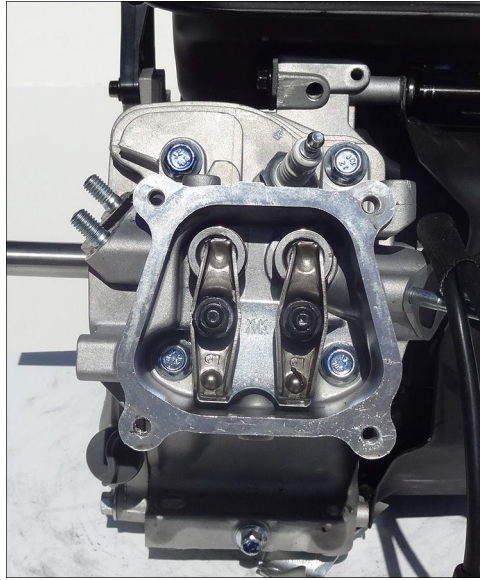


Figure 158

5. Place the piston at the top of the compression stroke.

Note: Insert a wooden dowel into the spark plug hole to verify the piston is at the top of the compression stroke.

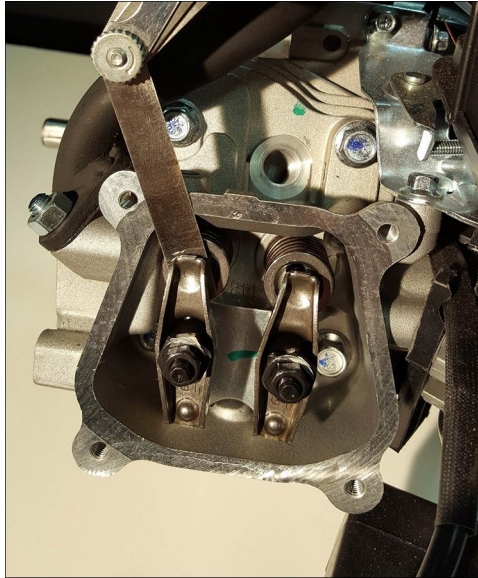
6. Using a flat feeler gauge, check the intake and exhaust valve clearances.
 - To adjust the valve clearance, loosen the lock nut while holding the adjuster nut. Loosen the adjuster nut to increase the clearance or tighten the adjuster nut to decrease the clearance.
 - Once the clearance is set, tighten the lock nut to specification while holding the pivot nut.

Note: This engine has Automatic Compression Release (ACR) on the exhaust valve.

Intake Valve Clearance: 0.13–1.17 mm (0.005–0.007 inch)

Exhaust Valve Clearance: 0.18–0.22 mm (0.007–0.009 inch)

G210-1 Cylinder Head Installation (continued)



g327613

Figure 159

7. Verify the rocker arms are free to rock.
8. Rotate the engine two revolutions to verify the valve train opens and closes for all four strokes.

Note: The engine has ACR which opens the exhaust valve partially for a short time on compression stroke.

9. Install the new valve cover gasket to the cylinder head.

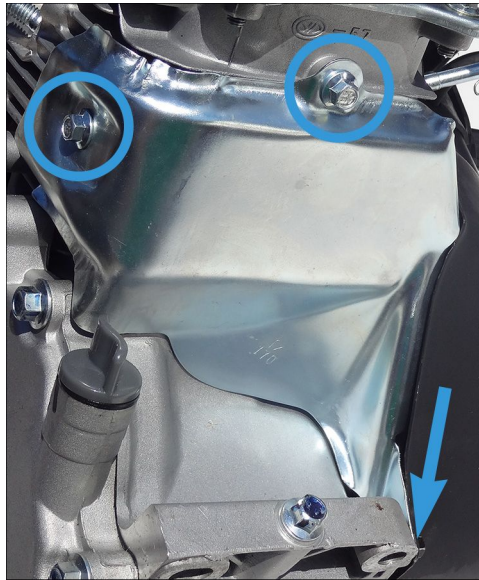


10. Install the valve cover onto the cylinder head. Install the 4 (M6 x 16) screws securing the valve cover to the cylinder head. Torque the screws to 10 N • m (89 in-lb).



11. Install the lower shroud onto the engine block. Install the 3 (M6 x 10) screws securing the lower shroud to the engine block. Torque the screws to 10 N • m (89 in-lb).

G210-1 Cylinder Head Installation (continued)



g327610

Figure 160



12. Install the baffle onto the engine block. Install the 2 (M6 x 10) screws securing the baffle to the engine block. Torque the screws to 10 N • m (89 in-lb).



g327606

Figure 161

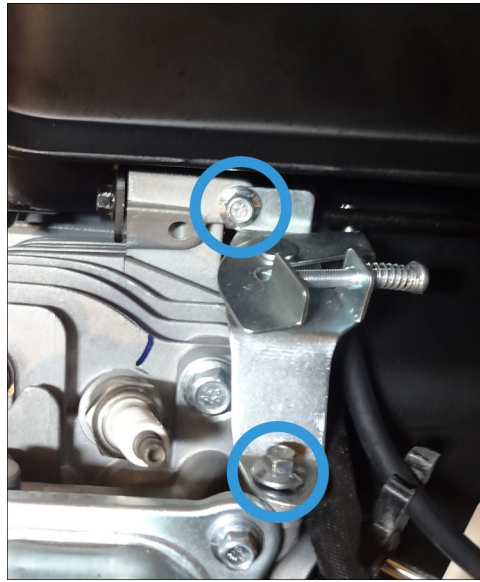
13. Route the spark plug wire under the breather hose and install the spark plug wire to the spark plug.
14. Install the carburetor onto the cylinder head. [Carburetor Installation \(page 5-24\)](#)
15. Install the muffler onto the cylinder head. Refer to the product Service Manual for the muffler installation procedure.
16. Add fuel to the fuel tank.

G210–1 Cylinder Head Test

1. Start the engine and test the operation of the engine.
2. Using a tachometer, verify the engine is operating at the correct RPM.
[Specifications \(page 2–2\)](#)

G210–2 & G210–4 Cylinder Head Removal

1. Drain the fuel into a suitable container.
2. Remove the muffler from the cylinder head. Refer to the product Service Manual for the muffler removal procedure.
3. Remove the carburetor from the cylinder head. [Carburetor Removal \(page 5–6\)](#)
4. Remove the spark plug wire from the spark plug.
5. Remove the 2 (M6 x 10) screws securing the speed control assembly to the engine block.

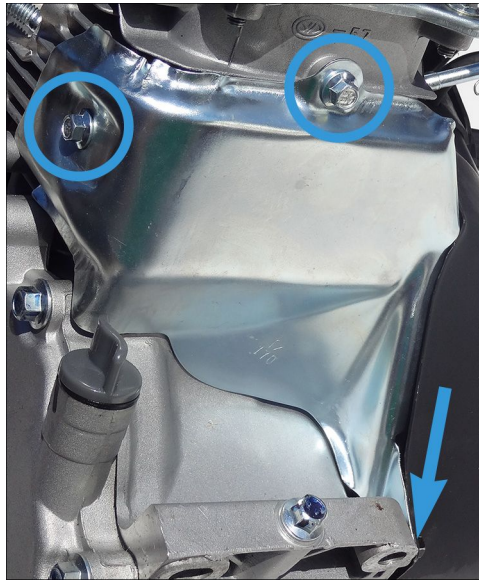


g340494

Figure 162

-
6. Remove the 3 (M6 x 10) screws securing the lower shroud to the engine block.

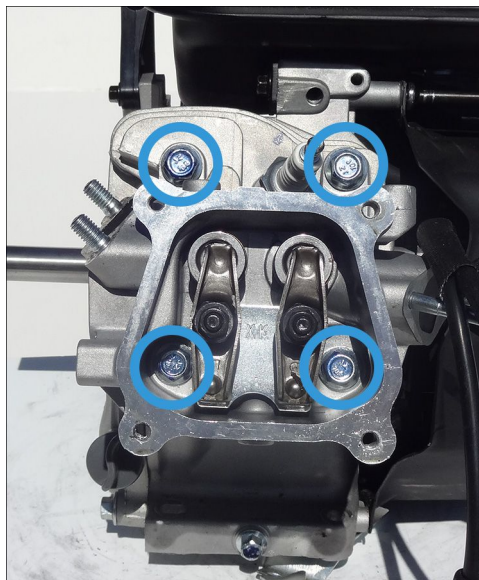
G210-2 & G210-4 Cylinder Head Removal (continued)



g327610

Figure 163

7. Remove the lower shroud from the engine block.
8. Remove the 4 (M6 x 16) screws securing the valve cover to the cylinder head.
9. Remove the valve cover from the cylinder head. Remove and discard the valve cover gasket.
10. Place the piston at the top of the compression stroke.
Note: Insert a wooden dowel into the spark plug hole to verify the piston is at the top of the compression stroke.
11. Remove the 4 (M8 x 60) screws securing the cylinder head to the engine block.

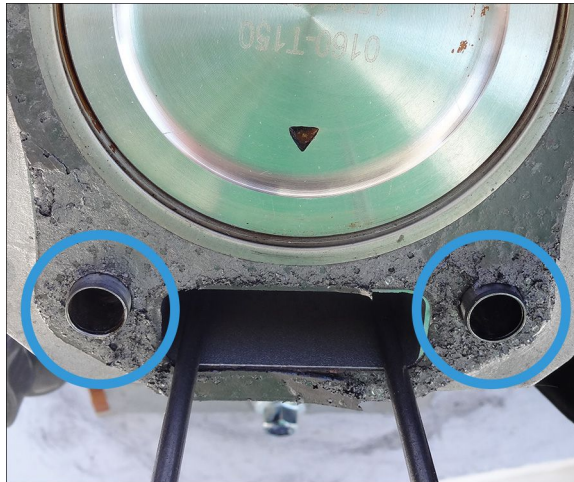


g327609

Figure 164

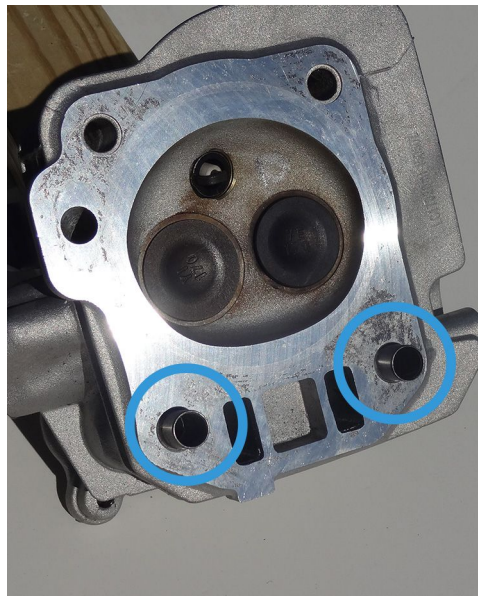
12. Remove the cylinder head from the engine block.
13. Remove the 2 dowels from the cylinder head or engine block.

G210-2 & G210-4 Cylinder Head Removal (continued)



g327607

Figure 165

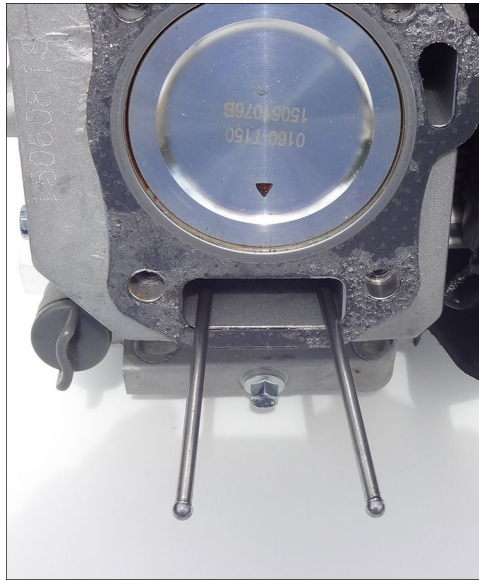


g327608

Figure 166

14. Remove the 2 push rods from the engine block.

G210–2 & G210–4 Cylinder Head Removal (continued)



g327611

Figure 167



CAUTION



Do not use a metal scraper or wire brush to remove head gasket remnants from the cylinder head or engine block. Doing so may damage the cylinder head or engine block.

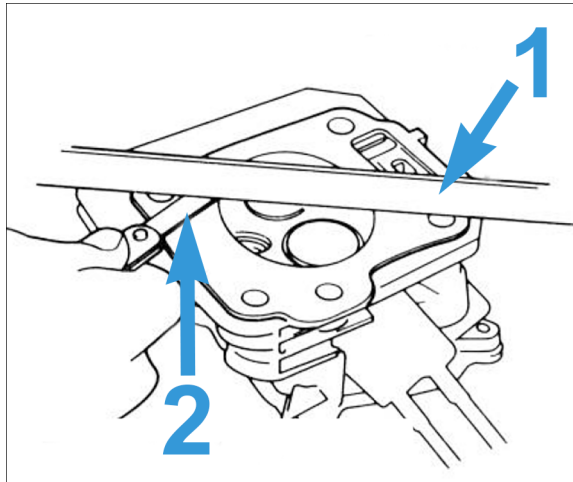
15. Using a wood or plastic scraper, remove the head gasket from the cylinder head and the engine block.

G210–2 & G210–4 Cylinder Head Inspection

1. Inspect the spark plug threads for damage. Replace the spark plug if damaged.
2. Remove the carbon deposits from the combustion chamber of the cylinder head.
3. Inspect the cylinder head for broken cooling fins, cracks, or other damage. Replace the cylinder head if damaged.
4. Using a straight edge and feeler gauge, inspect the cylinder head for warping.

Service Limit: 0.05 mm (0.00197 inch)

G210-2 & G210-4 Cylinder Head Inspection (continued)



g327663

Figure 168

1. Straight Edge
 2. Feeler Gauge
-

G210-2 & G210-4 Cylinder Head Disassembly

1. While holding the exhaust pivot nut with a wrench, remove the exhaust rocker arm nut from the rocker arm mounting stud. Repeat on the intake side of the cylinder head.



g338830

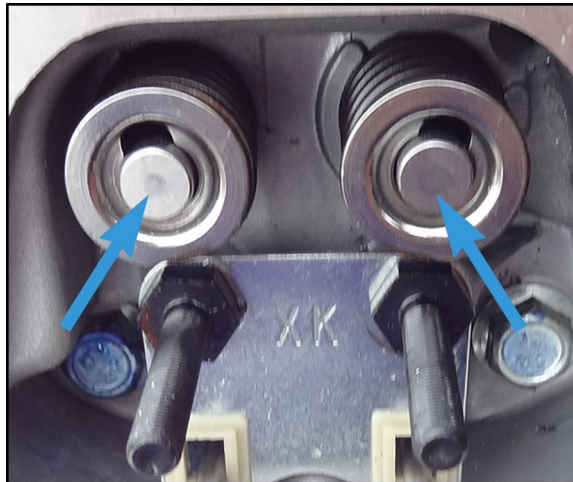
Figure 169

2. Remove the exhaust pivot nut and exhaust rocker arm. Repeat on the intake side of the cylinder head.

Note: Keep the exhaust and intake parts separated.

3. Remove the valve rotators from the end of each valve stem.

G210-2 & G210-4 Cylinder Head Disassembly (continued)



g338831

Figure 170

4. Place the cylinder head with the valve side facing downwards on a shop rag.
5. Using a valve spring compressor, compress the exhaust valve spring and exhaust. Remove the valve spring from the cylinder head. Repeat on the intake side of the cylinder head.

Note: Keep the exhaust and intake parts separated.

6. Remove the remaining valve components.

Note: Keep the exhaust and intake components separated.

- Valve springs
 - Intake valve seal
 - Exhaust valve
 - Intake valve
7. Remove the rocker mounting studs from the cylinder head.
 8. Remove the valve guide plate from the cylinder head.



g340490

Figure 171

G210–2 & G210–4 Cylinder Head Rocker Arm Components Inspection

1. Clean and inspect the rocker arm nuts, pivot nuts, rocker arms, and valve rotators for damage. Replace the rocker arm assembly if components are damaged.
2. Inspect the rocker arm mounting studs for damage. Replace the rocker arm assembly if the rocker arm mounting studs are damaged.
3. Clean and inspect the guide plate. Replace the guide plate if cracked, worn, or bent.

G210–2 & G210–4 Cylinder Head Valve Seat Inspection

1. Thoroughly clean the cylinder head to remove carbon deposits.
2. Inspect the valve seats for loose seat, proper valve face contact, and proper seat width.

G210–2 & G210–4 Valve Face Contact Test

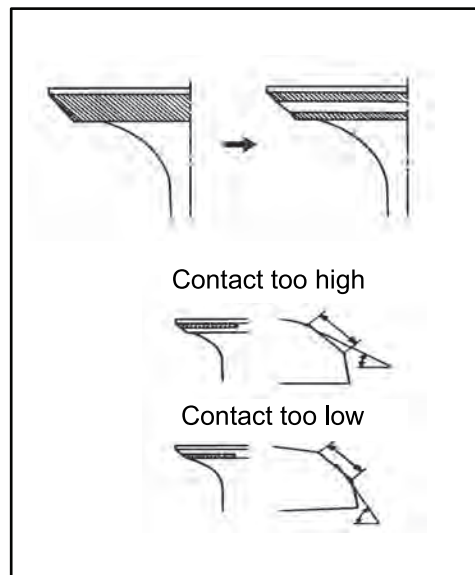
1. Apply a light coat of Prussian Blue or erasable ink to the valve face.
2. Insert the valve, lift the valve and snap it closed against the seat several times.

Note: Verify the valve does not rotate on the seat.

3. Inspect the transferred marking compound for any area of the seat that is not concentric.

Standard: 0.8 mm (0.0315 inch)

Service Limit: 2.0 mm (0.0787 inch)



g338826

Figure 172

4. If valve seat is found out of specification, attempt to recondition the valve seat. [G210–1 Valve Seat Reconditioning \(page 7–14\)](#). If unable to correct with reconditioning, replace the cylinder head assembly.
5. Repeat the procedure on all valves and seats.

G210–2 & G210–4 Valve Guide Inspection

1. Measure and verify the inside diameter of the valve guide is to specification. Replace the cylinder head assembly if out of specification.

Inside Diameter (Intake and Exhaust) Standard: 5.500 mm (0.2165 inch)

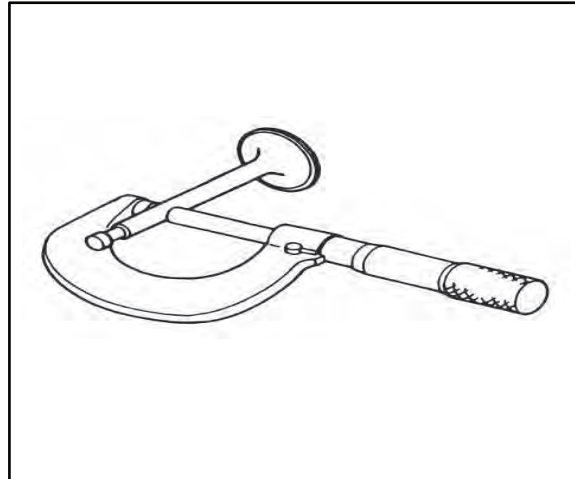
G210–2 & G210–4 Valve Guide Inspection (continued)

Service Limit: 5.572 mm (0.2194 inch)

G210–2 & G210–4 Valve Inspection

1. Clean the carbon from the valves.
2. Inspect the valve stem for pitting, wear, or if bent.
3. Measure and verify the valve stem diameter is to specification.

Stem Diameter	Standard	Service Limit
Intake	5.480 mm (0.2157 inch)	5.318 mm (0.2094 inch)
Exhaust	5.440 mm (0.2142 inch)	5.275 (0.2077 inch)



g338827

Figure 173

4. Inspect the valve face for pitting, wear, or corrosion.
5. Replace the valve set if either valve is out of specification or damaged.
6. Repeat the inspection for both of the valves.

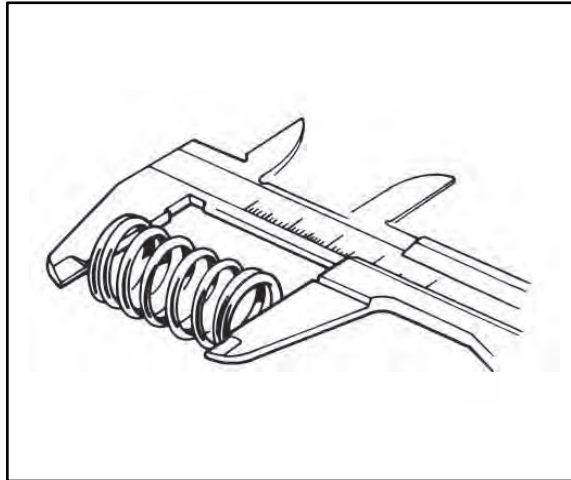
G210–2 & G210–4 Valve Spring Inspection

1. Inspect the free length of the valve spring and verify it is to specification.

Standard: 35 mm (1.37795 inch)

Service Limit: 32.5 mm (1.27953 inch)

G210–2 & G210–4 Valve Spring Inspection (continued)



g338829

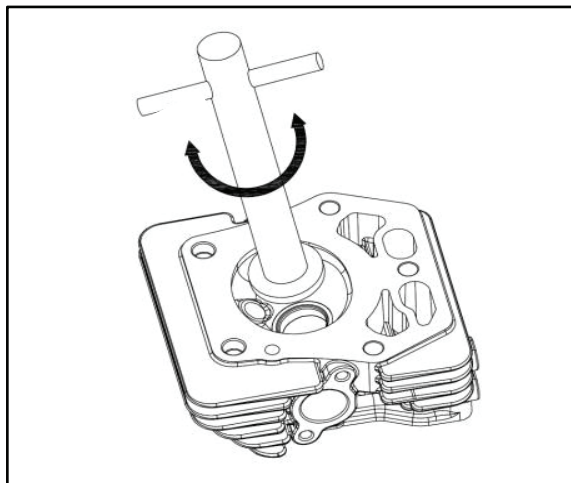
Figure 174

2. Inspect the valve spring for bent coils (the spring should stand straight).
3. Clean and inspect the spring retainers. Replace if damaged.

G210–2 & G210–4 Valve Seat Reconditioning

1. Using a 45–46° cutter, remove enough material to produce a smooth, concentric seat. Follow the valve seat cutter manufacturer's instructions.

Note: Always turn the cutter clockwise. Continue to turn the cutter while lifting from the valve seat.



g338833

Figure 175

2. Using 30–32° and 60° cutter, narrow and adjust the valve seat. The valve should contact the middle of the valve face. Ensure the width of the finished valve is to specification.

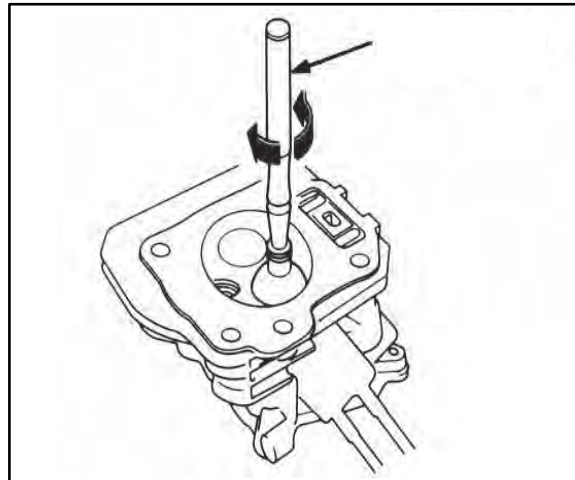
Standard: 0.8 mm (0.0315 inch)

Service Limit: 2.0 mm (0.0787 inch)

3. After resurfacing the seats, inspect for even valve seating. [G210–1 Valve Face Contact Test \(page 7–12\)](#)
4. Replace the valve set if not making full contact.
5. Repeat the procedure on the other valve seat.

G210–2 & G210–4 Valve Lapping

1. Perform the valve lapping if any of the following were performed:
 - New valve
 - Reground valve
 - Valve seat was reconditioned
2. Using a hand valve-lapping tool, attach the suction cup to the end of the valve.



g338828

Figure 176

3. Apply a light coat of valve grind compound to the valve face.
4. Insert the valve into the matching valve guide.
5. Rotate the valve on the seat with the valve-lapping tool until the valve face and valve seat have smooth surfaces.
6. Repeat lapping on the other valve.
7. Use hot soapy water to remove the grinding compound from the entire cylinder head and all of the valves.
8. After drying, apply a light coat of engine oil to the entire cylinder head.
9. Ensure all the grinding compound is removed from the cylinder head and valve components.

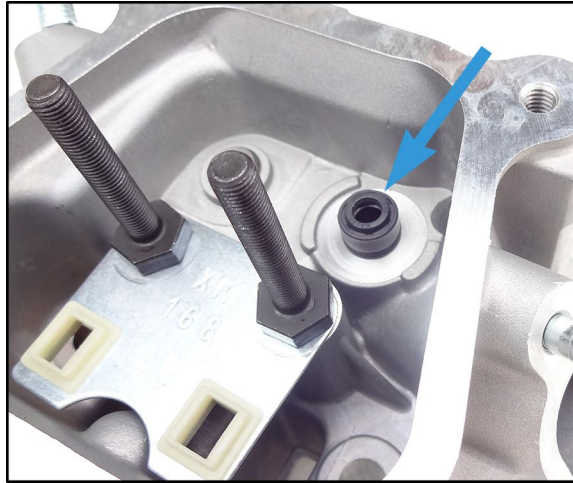
G210–2 & G210–4 Cylinder Head Assembly



1. Install the guide plate over the holes in the cylinder head and secure with the 2 rocker arm mounting studs. Torque the studs to 2.9 N • m (21 ft-lb).
2. Orient the cylinder head so the intake is on the right and the exhaust is on the left.

Note: The exhaust studs have larger threads than the intake studs. The intake studs are longer than the exhaust studs.
3. Lubricate a new valve guide seal and install over the intake guide (RH valve guide).

G210-2 & G210-4 Cylinder Head Assembly (continued)



g339528

Figure 177

4. Lubricate both of the valve stems with engine oil.
5. Install the intake and exhaust valves into the cylinder head.

Note: Exhaust valve has a slightly smaller valve head.



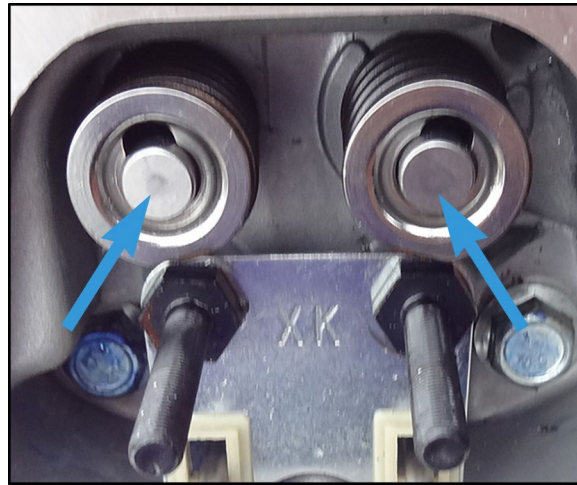
g339540

Figure 178

1. Intake Valve
2. Exhaust Valve

6. Install the valve springs and valve spring retainers.
7. Verify the notch in the valve stem is fully seated in the middle of the valve spring retainer.
8. Install the valve rotators onto the end of each valve stem.

G210-2 & G210-4 Cylinder Head Assembly (continued)



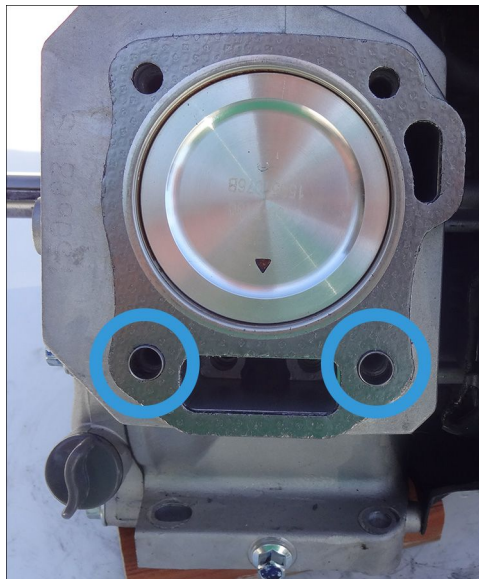
g338831

Figure 179

9. Install the exhaust rocker arm onto the exhaust rocker arm stud. Position the rocker arm so the ball socket is over the push rod installation site. Repeat on the intake side of the cylinder head.
10. Thread the exhaust pivot nut onto the exhaust rocker arm stud until the nut contacts the rocker arm. Repeat on the intake side of the cylinder head.
11. Install the exhaust rocker arm nut onto the exhaust rocker arm stud. Repeat on the intake side of the cylinder head.

G210-2 & G210-4 Cylinder Head Installation

1. Install the 2 dowel pins into the lower 2 holes of the engine block.



g339608

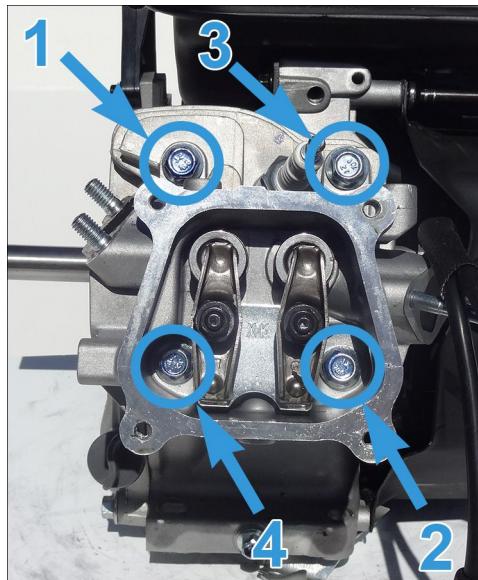
Figure 180

2. Install a new head gasket over the dowel pins.
3. Install the cylinder head on the dowels. Loosely install the 4 (M8 x 60) screws securing the cylinder head to engine block. Torque the 4 screws in a alternating pattern in the specification order below.



G210-2 & G210-4 Cylinder Head Installation (continued)

- Torque all of the screws to 11.3 N • m (100 in-lb)
- Torque all of the screws to 22.6 N • m (200 in-lb)
- Torque all of the screws to 33.9 N • m (300 in-lb)



g327614

Figure 181



4. Install the 2 push rods. Align the rocker arms over the push rods. If necessary, loosen rocker lock nuts or push down on valve spring to position the rocker arms over the push rods. Verify the 2 valve rotators are installed on each valve stem.

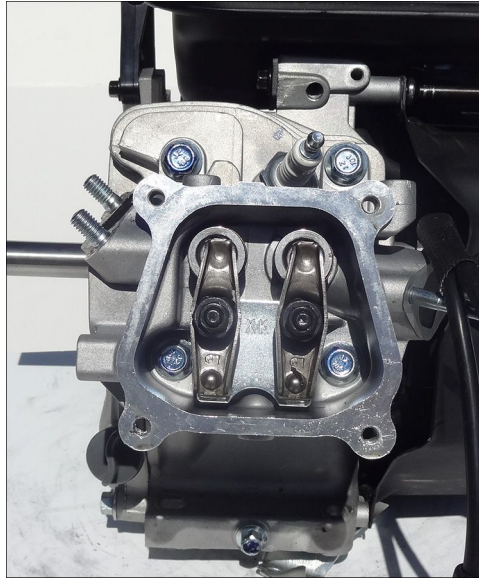
Note: If the valve rotator is not in position the valve may drop into the cylinder during operation.



g327612

Figure 182

G210-2 & G210-4 Cylinder Head Installation (continued)



g334746

Figure 183

-
5. Place the piston at the top of the compression stroke.

Note: Insert a wooden dowel into the spark plug hole to verify the piston is at the top of the compression stroke.

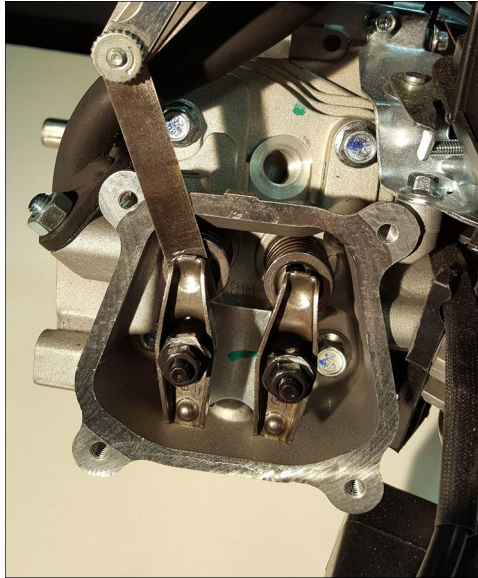
6. Using a flat feeler gauge, check the intake and exhaust valve clearances.
 - To adjust the valve clearance, loosen the lock nut while holding the adjuster nut. Loosen the adjuster nut to increase the clearance or tighten the adjuster nut to decrease the clearance.
 - Once the clearance is set, tighten the lock nut to specification while holding the pivot nut.

Note: This engine has Automatic Compression Release (ACR) on the exhaust valve.

Intake Valve Clearance: 0.13–1.17 mm (0.005–0.007 inch)

Exhaust Valve Clearance: 0.18–0.22 mm (0.007–0.009 inch)

G210-2 & G210-4 Cylinder Head Installation (continued)



g327613

Figure 184

7. Verify the rocker arms are free to rock.
8. Rotate the engine 2 revolutions to verify the valve train opens and closes for all 4 strokes.

Note: The engine has ACR which opens the exhaust valve partially for a short time on compression stroke.

9. Install the new valve cover gasket to the cylinder head.

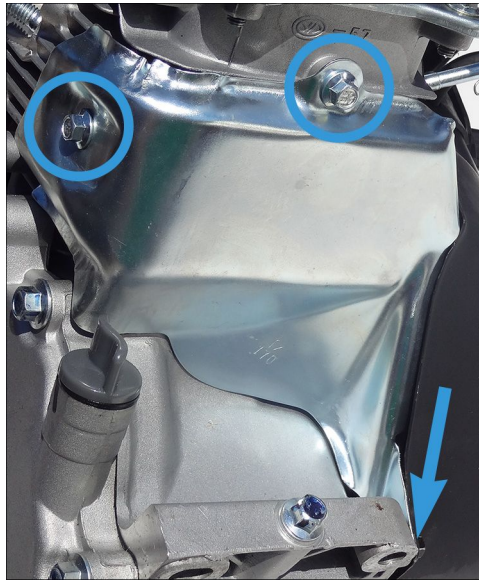


10. Install the valve cover to the cylinder head. Install the 4 (M6 x 16) screws securing the valve cover to the cylinder head. Torque the screws to 10 N • m (89 in-lb).



11. Install the lower shroud onto the engine block. Install the 3 (M6 x 10) screws securing the lower shroud to the engine block. Torque the screws to 10 N • m (89 in-lb).

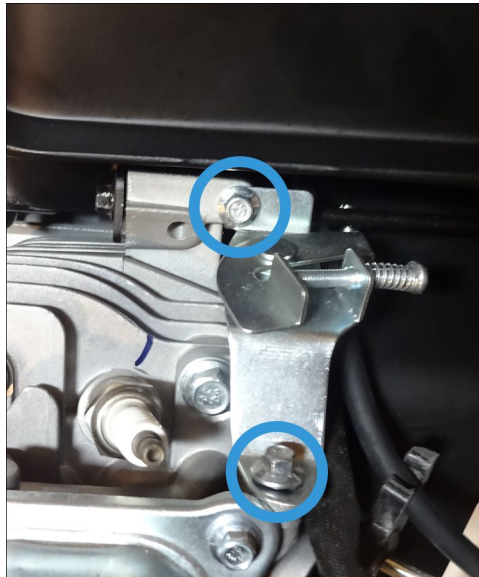
G210-2 & G210-4 Cylinder Head Installation (continued)



g327610

Figure 185

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12. Install the 2 (M6 x 10) screws securing the speed control assembly to the engine block. Torque the 2 screws to 10 N • m (89 in-lb).



g340494

Figure 186

-
13. Route the spark plug wire under the breather hose. Install the spark plug wire to the spark plug.
 14. Install the carburetor onto the cylinder head. [Carburetor Installation \(page 5-24\)](#)
 15. Install the muffler onto the cylinder. Refer to the product Service Manual for the muffler installation procedure.
 16. Refill the fuel.

G210-2 & G210-4 Cylinder Head Test

1. Start the engine and test the operation of the engine.

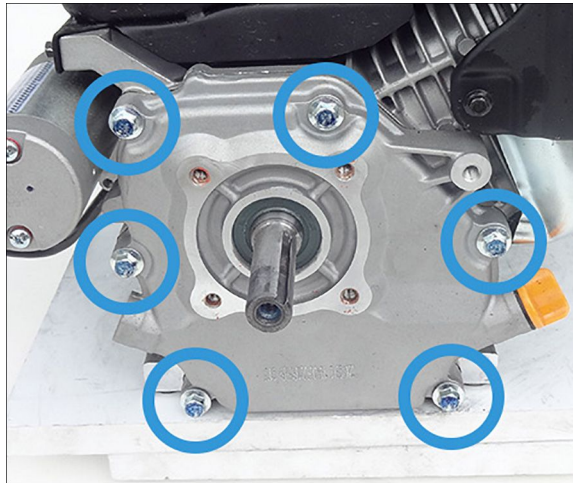
G210-2 & G210-4 Cylinder Head Test (continued)

- Using a tachometer, verify the engine is operating at the correct RPM.
[Specifications \(page 2-2\)](#)

Piston and Connecting Rod Replacement

Piston and Connecting Rod Removal

- Drain the oil and fuel into a suitable container.
- G210-1 engine models only, remove the G210-1 cylinder head. [G210-1 Cylinder Head Removal \(page 7-6\)](#)
- G210-2 & G210-4 engine models only, remove the G210-2 & G210-4 cylinder head. [G210-1 Cylinder Head Removal \(page 7-6\)](#)
- Remove the 6 (M8 x 32) screws securing the crankcase cover to the crankcase.

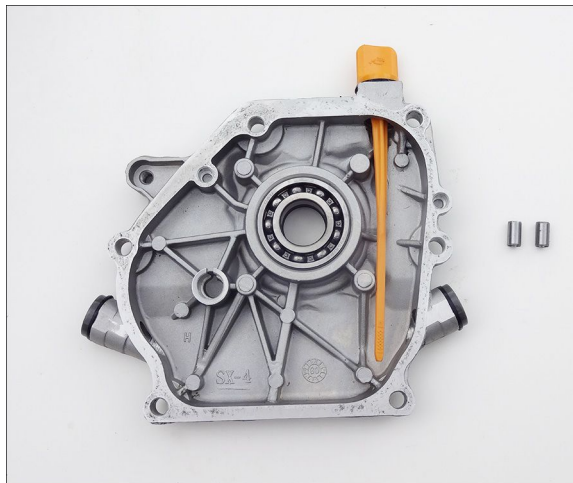


g331674

Figure 187

- Using a plastic hammer, loosen the crankcase cover from the crankcase by alternately taping each side of the fill ports.
- Remove the crankcase cover and 2 dowel pins from the crankcase.

Note: The ball bearing should remain in the crankcase cover.



g331672

Figure 188

Piston and Connecting Rod Removal (continued)

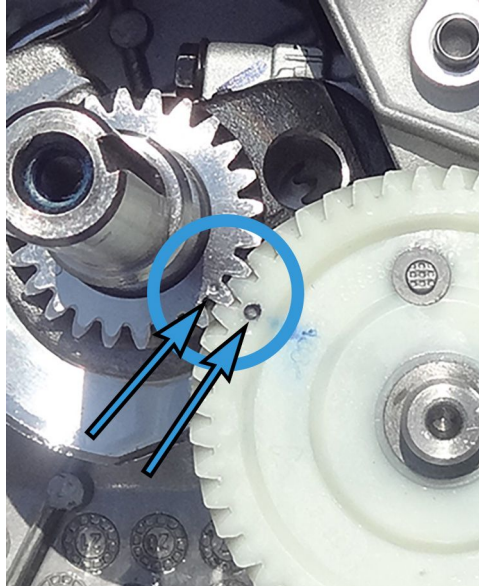


CAUTION



Do not use a metal scraper to remove the gasket. Doing so may damage the aluminum surface.

7. Using a wooden tool or liquid gasket remover, remove the remaining crankcase cover gasket from the crankcase cover and crankcase.
8. Remove and discard the oil seal from the crankcase cover.
9. Rotate the crankshaft until the timing marks are aligned.



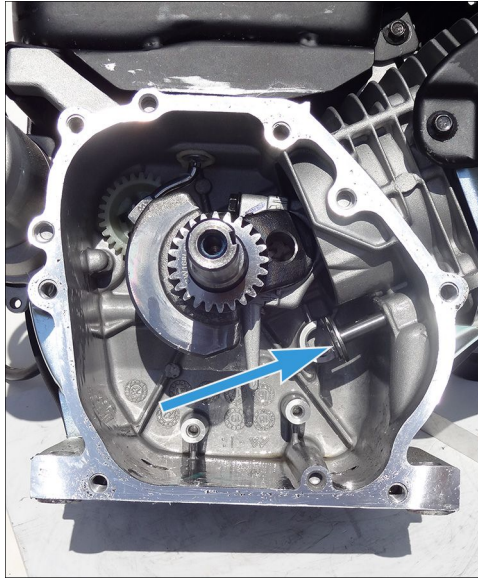
g331668

Figure 189

10. Remove the camshaft from the crankcase.
11. Mark the intake and exhaust valve tappets using a permanent marker. Remove the 2 valve tappets from the crankcase.

Note: The intake is closest to the crankcase cover and exhaust is closest to the flywheel.

Piston and Connecting Rod Removal (continued)



g332955

Figure 190

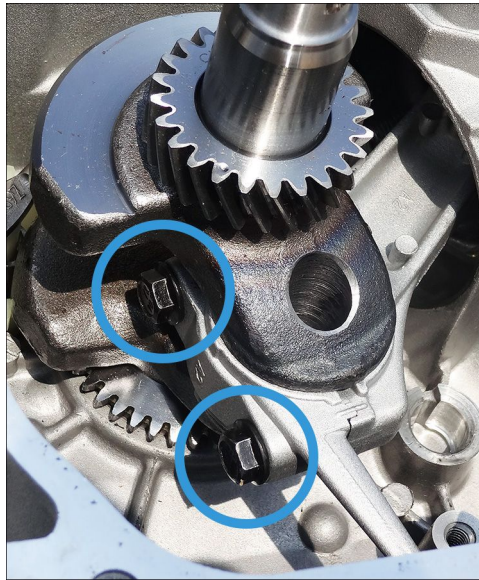


g332956

Figure 191

12. Remove the 2 bolts securing the connecting rod cap to the connecting rod.
Remove the connecting rod cap.

Piston and Connecting Rod Removal (continued)



g338328

Figure 192

13. Rotate the crankshaft to push the piston and connecting rod assembly toward Top Center.
14. Slide and remove the connecting rod and piston from the cylinder.
15. Install the connecting rod cap to the connecting rod. Loosely install the 2 bolts.

Note: This protects the bearing surface of the connecting rod if being reused.



g338341

Figure 193

Piston and Connecting Rod Disassembly

1. Remove the piston clips from each side of the piston.

Piston and Connecting Rod Disassembly (continued)



g338327

Figure 194

2. Remove the piston pin from the piston and connecting rod.

Note: The piston pin is not a press fit into the piston or connecting rod.



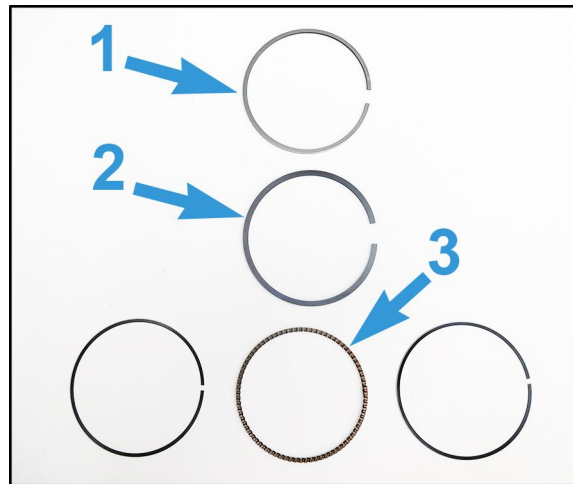
g338326

Figure 195

3. Slide the connecting rod out of the piston.
4. Remove the 2 bolts securing the connecting rod cap to the connecting rod.
5. Remove each piston ring from the dome end of the piston. Start with the top ring, followed by the middle ring, and then the 3 piece oil ring.

Note: The piston rings will break if twisted or overexpanded.

Piston and Connecting Rod Disassembly (continued)



g338343

Figure 196

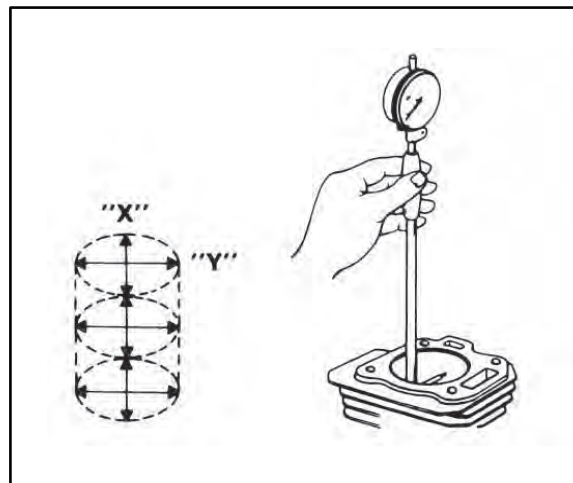
1. Top Ring
2. Middle Ring
3. Oil Ring

Piston and Connecting Rod Inspection

1. Inspect the cylinder bore for damage. Replace the engine if the cylinder bore is damaged or out of specification.
 - Inspect the cylinder bore for surface wear, pitting, or scratches.
 - Inspect the cylinder taper and cylinder out of round.
 - Measure and verify the cylinder bore is to specification.

Standard: 70 mm (2.7559 inch)

Service Limit: 70.165 mm (2.7612 inch)



g338330

Figure 197

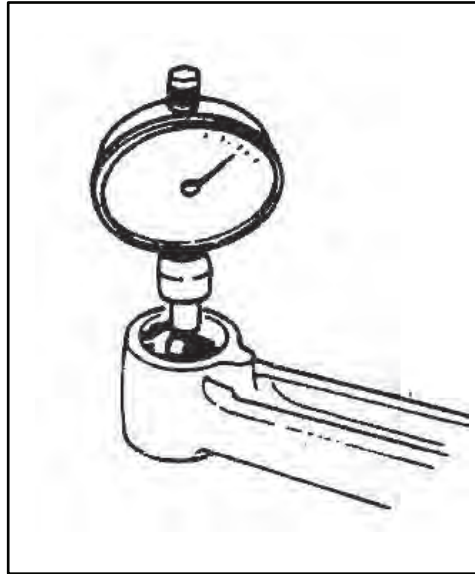
2. Inspect the connecting rod for damage. Replace the connecting rod assembly damaged.
 - Using a straight edge, verify the connecting rod is not bent or twisted.
 - Inspect the connecting rod for overheating damage. A good connecting rod will be bright aluminum in color.

Piston and Connecting Rod Inspection (continued)

- Inspect both ends of the connecting rod for scuffs, pitting, or scoring.
3. Clean the end of the piston pin. Measure and verify the inside diameter of the piston pin end is to specification.

Standard: 18.0 mm (0.70866 inch)

Service Limit: 17.954 mm (0.70685 inch)



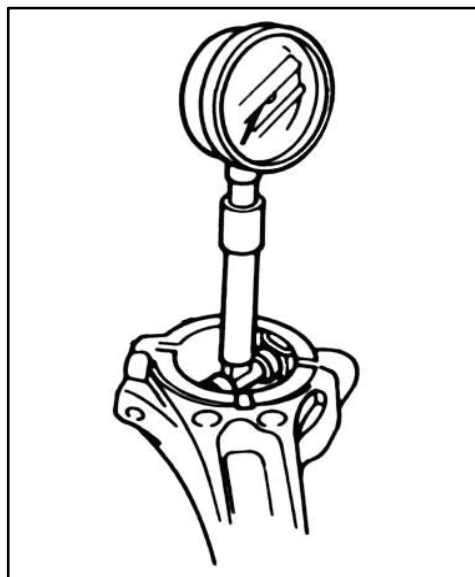
g338336

Figure 198

-
4. Measure and verify the inside diameter of the crankshaft end is to specification.

Standard: 30.22 mm (1.18976 inch)

Service Limit: 30.246 mm (1.19079 inch)



g338337

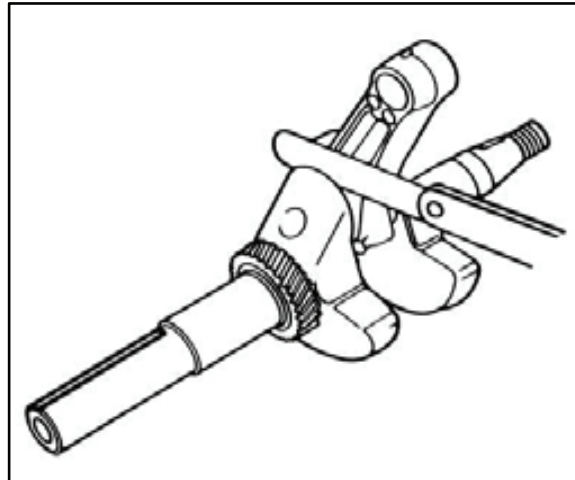
Figure 199

-
5. Measure and verify the end of the crankshaft side/thrust clearance is to specification.

Piston and Connecting Rod Inspection (continued)

Standard: 0.1–0.7 mm (0.0039–0.00276 inch)

Service Limit: 1.1 mm (0.04331 inch)



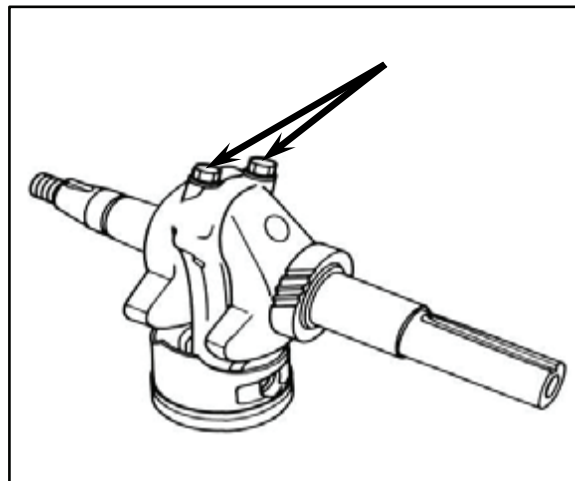
g338339

Figure 200



6. Inspect the oil clearance (radial) of the large end of the connecting rod.
 - Clean the oil from the crankshaft rod journal and thrust side.
 - Install a piece of plastic gauge on the crankshaft rod journal. Install the connecting rod and match the cap/rod marks. Install the 2 bolts securing the connecting rod cap to the crankshaft. Torque the 2 bolts to 14 N • m (124 in-lb).

Note: Do not rotate the crankshaft while tightening the connecting rod bolts.



g338338

Figure 201

- Remove the 2 screws securing the connecting rod cap to the crankshaft. Remove the connecting rod cap and plastic gauge.
- Measure the plastic gauge and verify it is to specification.

Standard: 0.040–0.063 mm (0.00157–0.00248 inch)

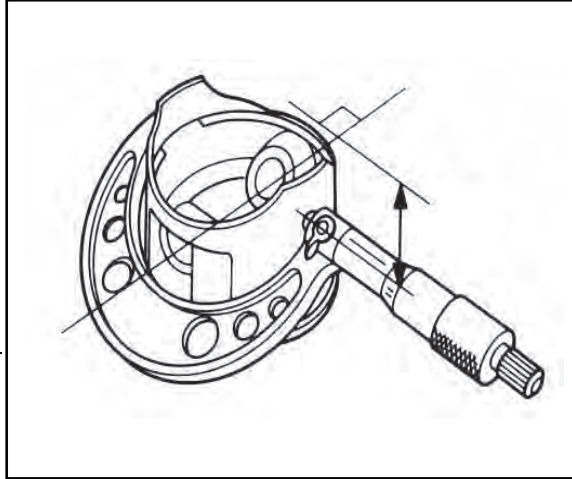
Service Limit: 0.12 mm (0.00472 inch)

Piston and Connecting Rod Inspection (continued)

- If the clearance of the plastic gauge is greater than the service limit, replace the connecting rod and recheck the clearance with the new connecting rod. If the clearance still exceeds the service limit, replace the crankshaft and repeat the procedure to check the clearances of the new crankshaft.
7. Clean the piston to remove carbon and debris from the piston dome and ring lands.
 8. Inspect the piston for damage. If damaged, replace the piston assembly.
 9. Measure and verify the outside diameter of the piston skirt is to specification. If the piston skirt diameter is not to specification, replace the piston assembly.

Standard: 69.985 mm (2.7553 inch)

Service Limit: 69.845 mm (2.7498 inch)



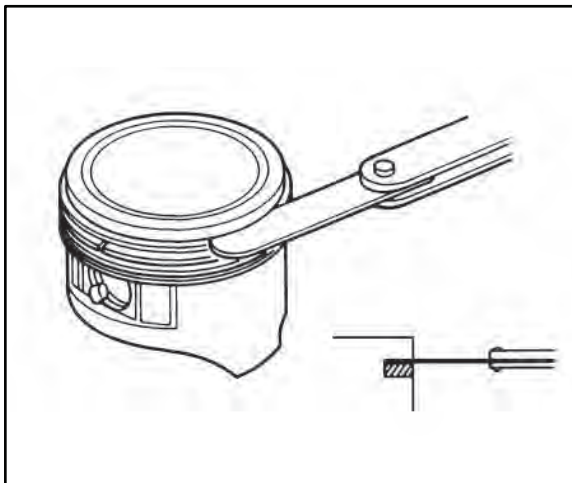
g338331

Figure 202

10. Measure and verify the clearance of the ring land side is to specification. If the ring land side is not to specification, replace the piston assembly.

Standard: 0.015–0.045 mm (0.00059–0.0017 inch)

Service Limit: 0.15 mm (0.00591 inch)



g338332

Figure 203

11. Measure and verify the piston to cylinder wall clearance is to specification. If the clearance is not to specification, replace the piston and recheck the

Piston and Connecting Rod Inspection (continued)

clearance. If the clearance is still not to specification, replace the engine assembly.

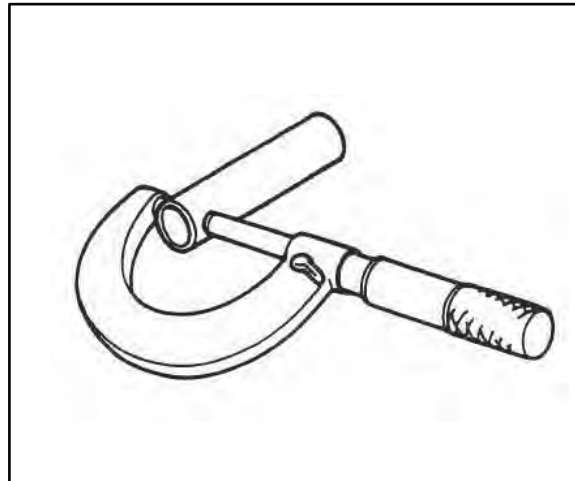
Standard: 0.015–0.05 mm (0.000591–0.001969 inch)

Service Limit: 0.12 mm (0.0047 inch)

12. Measure and verify the piston pin is to specification. If the piston pin is not to specification, replace the piston pin.

Standard: 18.0 mm (0.70866 inch)

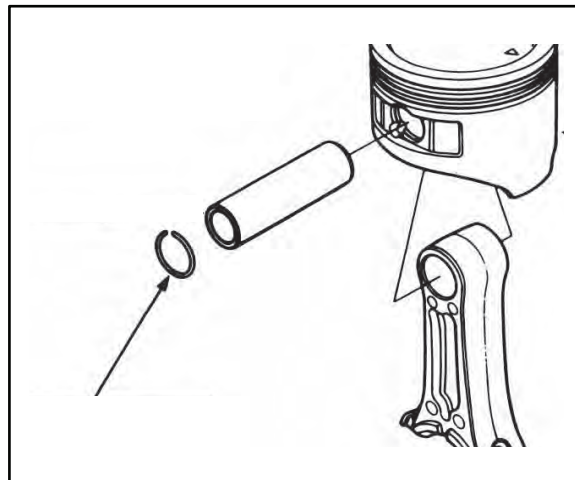
Service Limit: 17.954 mm (0.70685 inch)



g338333

Figure 204

-
13. Inspect the piston pin clips for damage. Replace the piston pin clips if damaged or out of round.

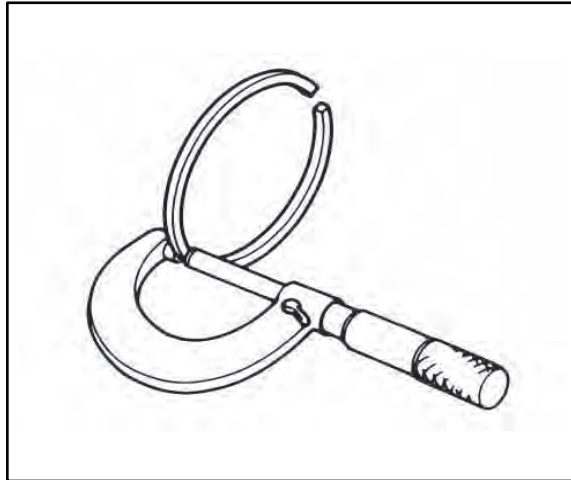


g338334

Figure 205

-
14. Inspect the piston rings. Replace the piston ring set if any ring is not to specification or is damaged.
 - Inspect each piston ring for surface wear, broken, pitting, or scratches.
 - Measure and verify each piston ring width is to specification.

Piston and Connecting Rod Inspection (continued)



g338335

Figure 206

Piston Ring Thickness		
Ring	Standard	Service Limit
Width (Top)	1.2 mm (0.04724 inch)	1.07 mm (0.04213 inch)
Width (Middle)	1.2 mm (0.04724 inch)	1.07 mm (0.04213 inch)

- Measure and verify the piston ring end gap is to specification.

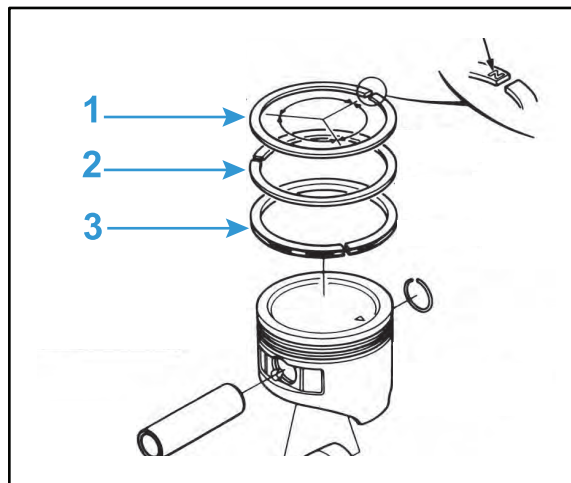
Standard: 0.2–0.4 mm (0.0079–0.0157 inch)

Service Limit: 1.0 mm (0.0394 inch)

Piston and Connecting Rod Assembly

1. Install each piston ring onto the dome end of the piston. Start with the 3 piece oil ring, followed by the middle ring, and then the top ring. The upper two rings are stamped near the ring gap, assemble with the stamp mark facing the piston dome.

Note: The piston rings will break if twisted or overexpanded.



g338340

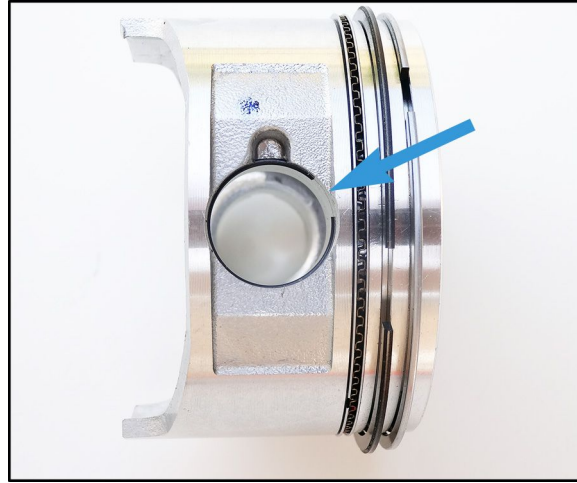
Figure 207

1. Top Ring
2. Middle Ring

3. Oil Ring

Piston and Connecting Rod Assembly (continued)

2. Stagger the ring gaps approximately 120° apart.
3. Install a piston pin clip into the piston so that the gap of the piston pin does not match the opening in the piston skirt



g338329

Figure 208

4. Rotate the piston so the piston pin clip is facing downward.
5. Install the connecting rod cap onto the connecting rod and loosely secure with 2 bolts. Ensure the connecting rod cap and connecting rod marks are matched up.



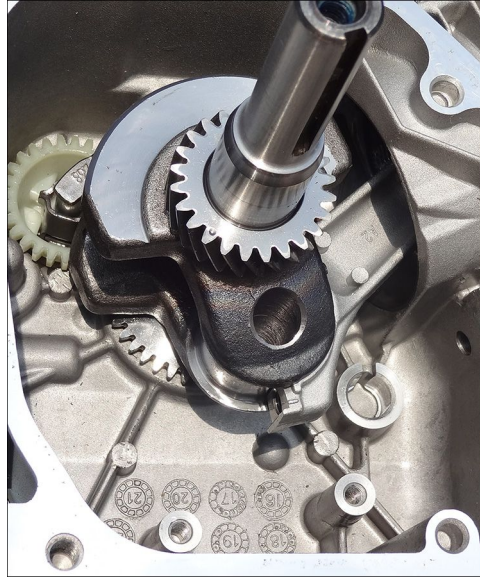
g338325

Figure 209

6. Align the dipper of the connecting rod cap with the triangle on the piston dome. Install the small hole of the connecting rod into the piston.
7. Lightly oil the piston pin and install into the piston and connecting rod.
8. Install the second piston pin clip into the piston so that the gap of the piston pin does not match the opening in the piston skirt
9. Verify the connecting rod is free to move and rotate on the piston pin in the piston.

Piston and Connect Rod Installation

1. Remove the 2 bolts securing the connecting rod cap to the connecting rod. Remove the connecting rod cap.
2. Lightly oil the piston, piston rings, cylinder walls, and crankshaft journal.
3. Using a ring compressor, insert the piston assembly into the cylinder with the piston dome triangle mark pointing downwards.
4. Push the piston into the bore until the connecting rod is at the crankshaft journal.



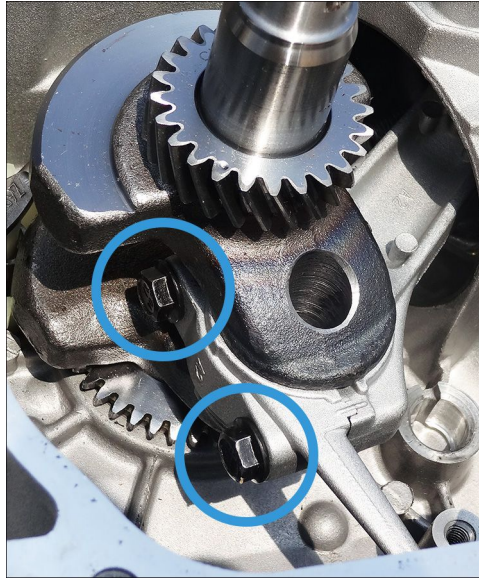
g338344

Figure 210

-
5. Match the connecting rod cap marks to the connecting rod.
 6. Loosely install the 2 connecting rod bolts securing the connecting rod cap to the journal. Torque the 2 bolts in an alternating pattern in specification order below.
 - 5 N • m (44 in-lb)
 - 10 N • m (88 in-lb)
 - 14 N • m (124 in-lb).



Piston and Connect Rod Installation (continued)



g338328

Figure 211

7. Verify the piston is installed with the triangle on the piston dome pointing downwards.



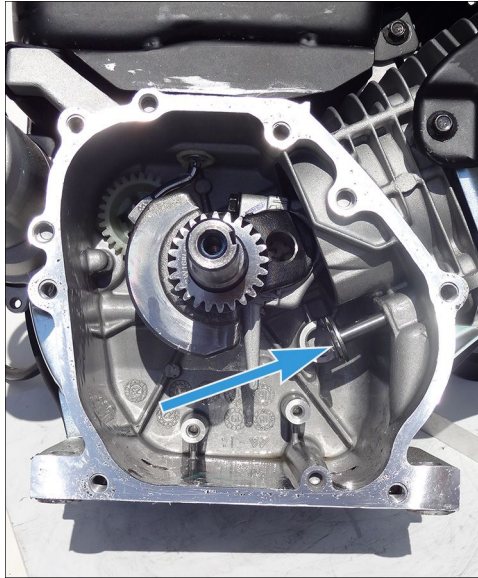
g338342

Figure 212

8. Verify the crankshaft and piston move by rotating the crankshaft 2 revolutions.
9. Apply engine oil to both of the entirety of the valve tappets.
10. Install the intake and exhaust valve tappets into the crankcase.

Note: The intake is closest to the side cover and the exhaust is closest to the flywheel.

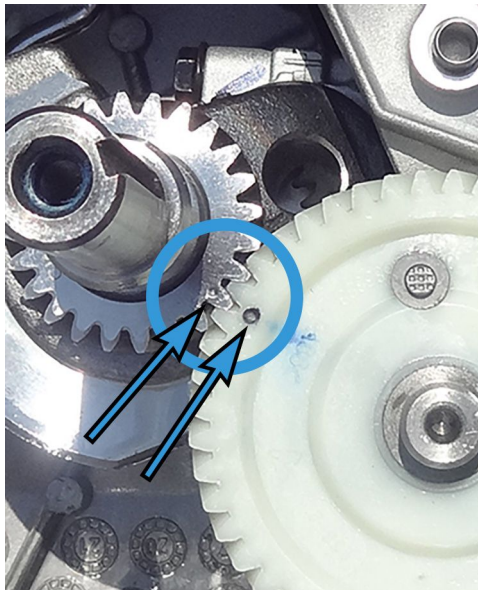
Piston and Connect Rod Installation (continued)



g332955

Figure 213

-
11. Apply engine oil to the entire camshaft and install the camshaft into the crankcase matching the timing marks on the crankshaft gear.

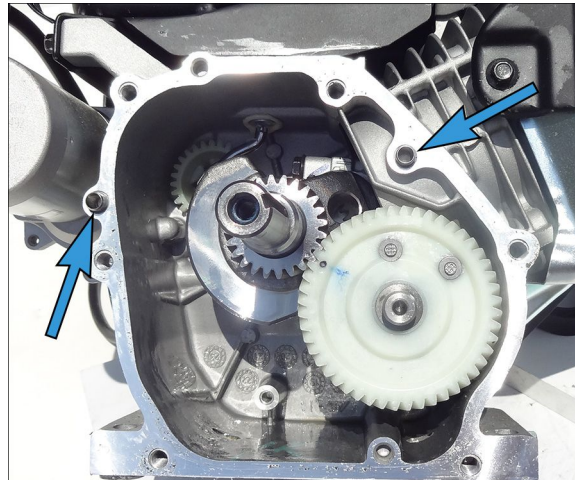


g331668

Figure 214

-
12. Install the 2 dowel pins into the crankcase.

Piston and Connect Rod Installation (continued)



g331671

Figure 215

13. Install the new crankcase cover gasket onto the crankcase.
14. If ball bearing was removed, apply a light coat of engine oil on the outside diameter of the ball bearing. Support the crank case cover around the opening and press the ball bearing into the cover until bottomed out against the shoulder of the cover.

Note: The ball bearing has a press-fit tolerance to the side cover and should not fit loosely in the crankcase cover.

15. Slowly slide the crankcase cover onto the crankshaft until flush against the gasket and crankcase.

Note: If necessary, rotate the crankshaft slightly to assist with the crankcase cover installation.

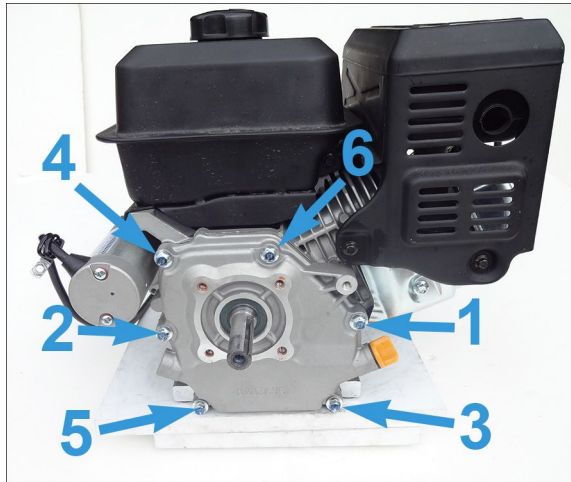


16. Loosely install the 6 (M8 x 32) screws securing the crankcase cover to the crankcase. Torque the 6 screws in an alternating pattern in specification order below.

Note: Do not use the screws to pull the crankcase cover to the crankcase.

- Torque all of the screws to 15 N • m (132 in-lb)
- Torque all of the screws to 29 N • m (252 in-lb)

Piston and Connect Rod Installation (continued)

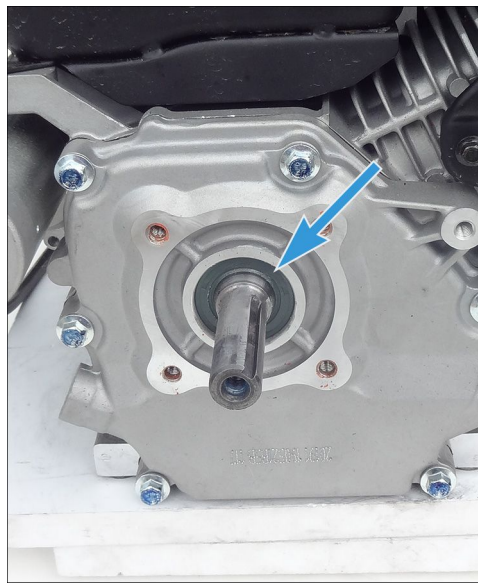


g331673

Figure 216

17. Apply a light coat of engine oil onto the oil seal. Install the oil seal into the crankcase cover until just below flush.

Note: Install the oil seal with the lipped side facing inward.



g331669

Figure 217

18. G210-1 engine models only, install the G210-1 cylinder head. [G210-1 Cylinder Head Installation \(page 7-17\)](#)
19. G210-2 & G210-4 engine models only, install the G210-2 & G210-4 cylinder head. [G210-1 Cylinder Head Installation \(page 7-17\)](#)
20. Refill the oil and fuel.

Piston and Connecting Rod Test

1. Start and run the engine to verify Top No Load RPM. [Specifications \(page 2-2\)](#)
2. Verify no oil leaks exist.



Table of Contents

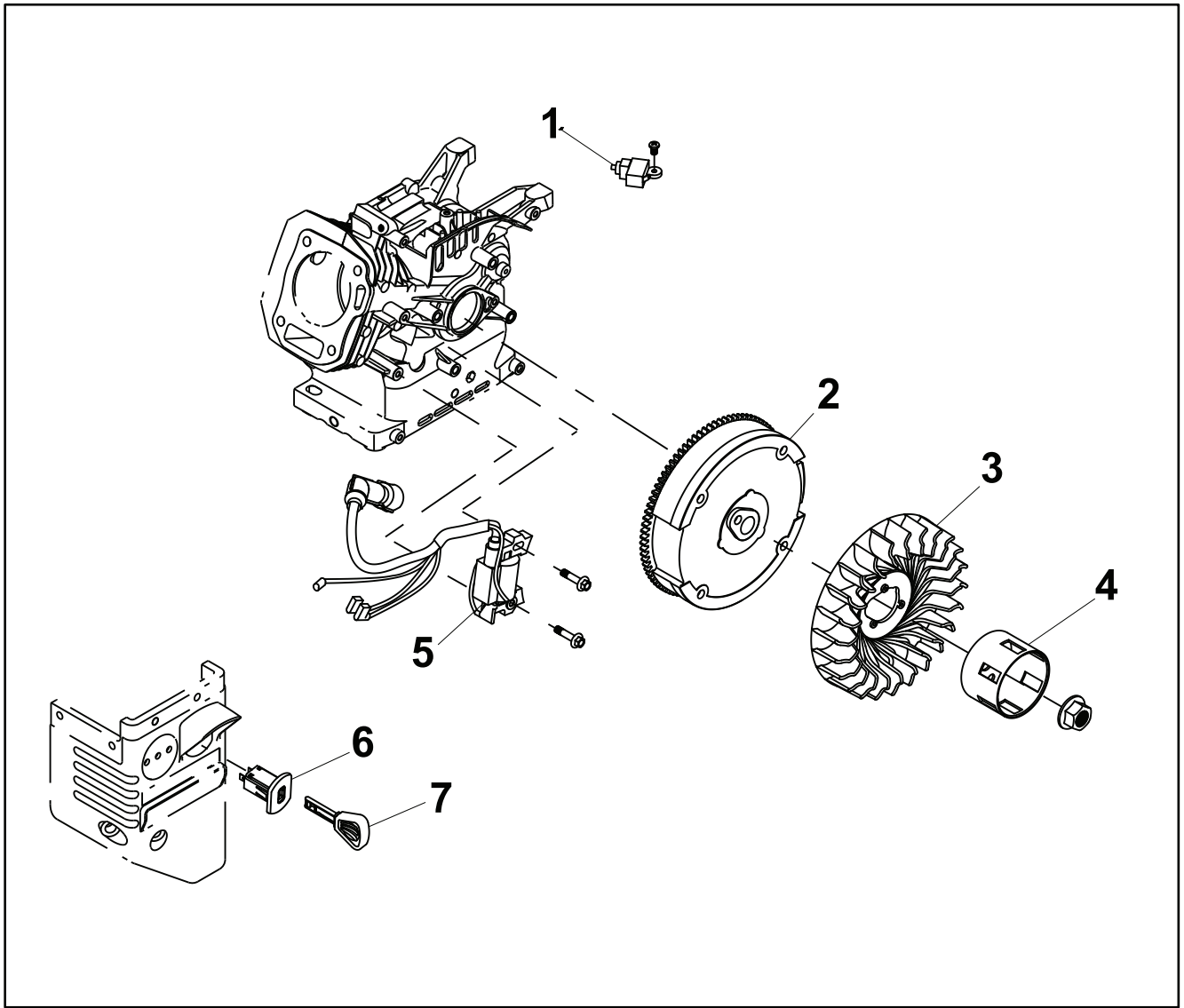
General Information	8-2
Service and Repairs	8-3
Flywheel Replacement (G210-1, G210-2, & G210-4)	8-7
Ignition Coil Replacement (G210-1, G210-2, & G210-4)	8-34
Key Switch Replacement	8-62
G210-1 Stop Switch Replacement	8-64

General Information

The Electrical chapter contains steps to remove, inspect, and install the flywheel, ignition coil & harness, key switch, and throttle turn off switch (G210-1 only). It also has steps for removal and installation of all components that need to be removed to access these electrical components.

Service and Repairs

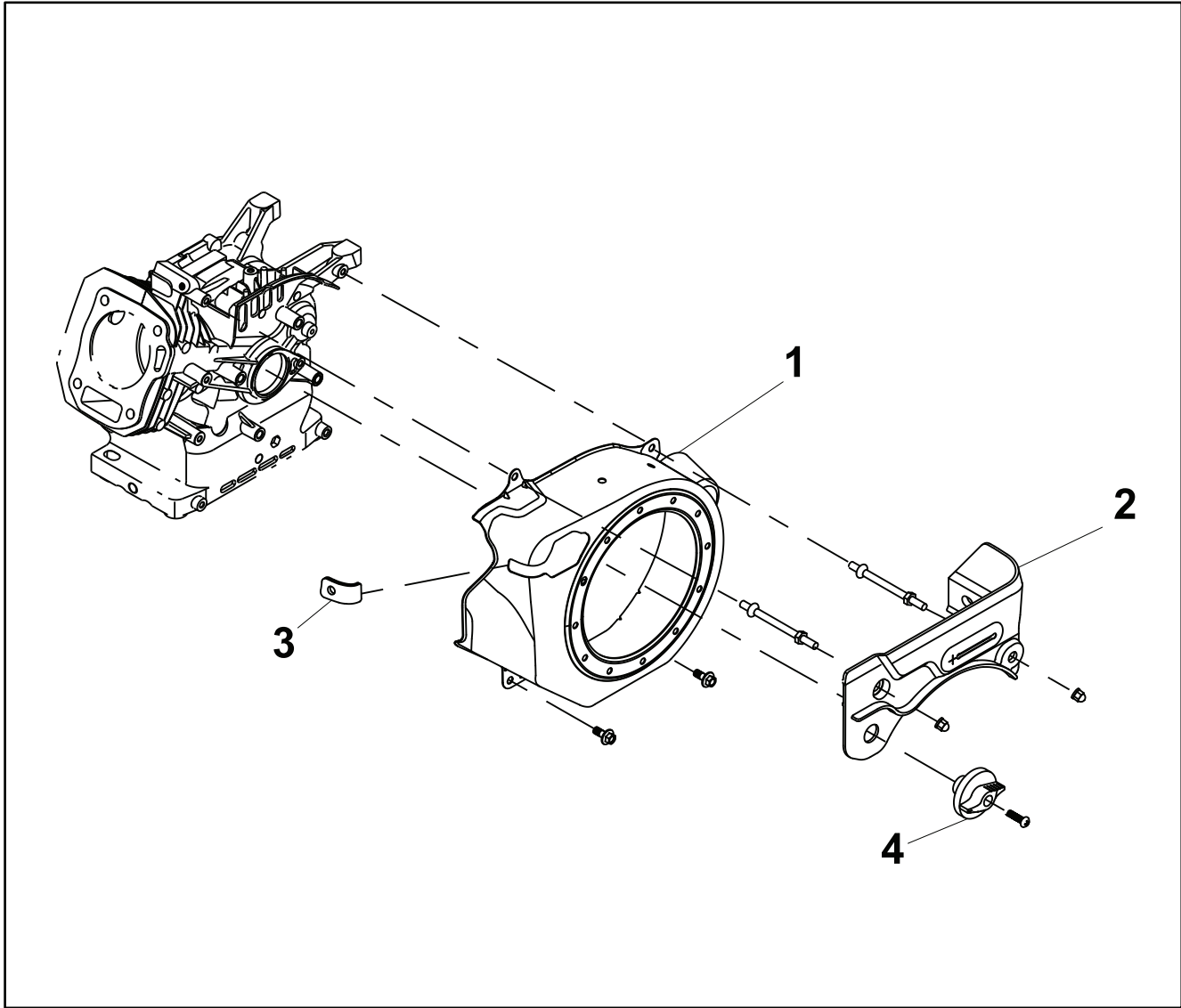
G210-1 Electrical System Assembly 1



g330761

Figure 218

- | | |
|-----------------------|---------------------------|
| 1. Engine Stop Switch | 5. Ignition Coil Assembly |
| 2. Flywheel | 6. Key Switch |
| 3. Fan | 7. Key |
| 4. Starter Cup | |

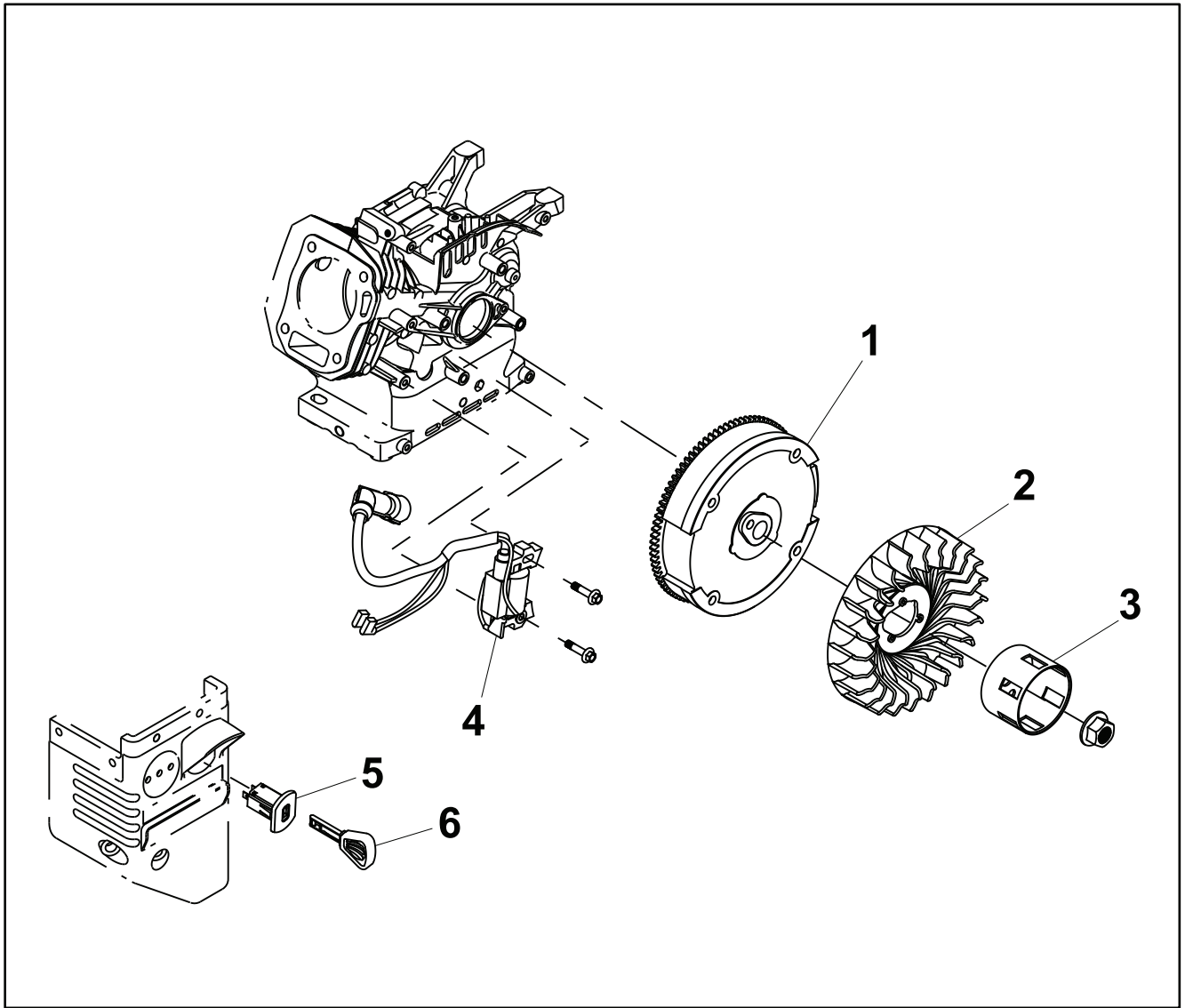


g330762

Figure 219

- 1. Blower Shroud
- 2. Control Panel

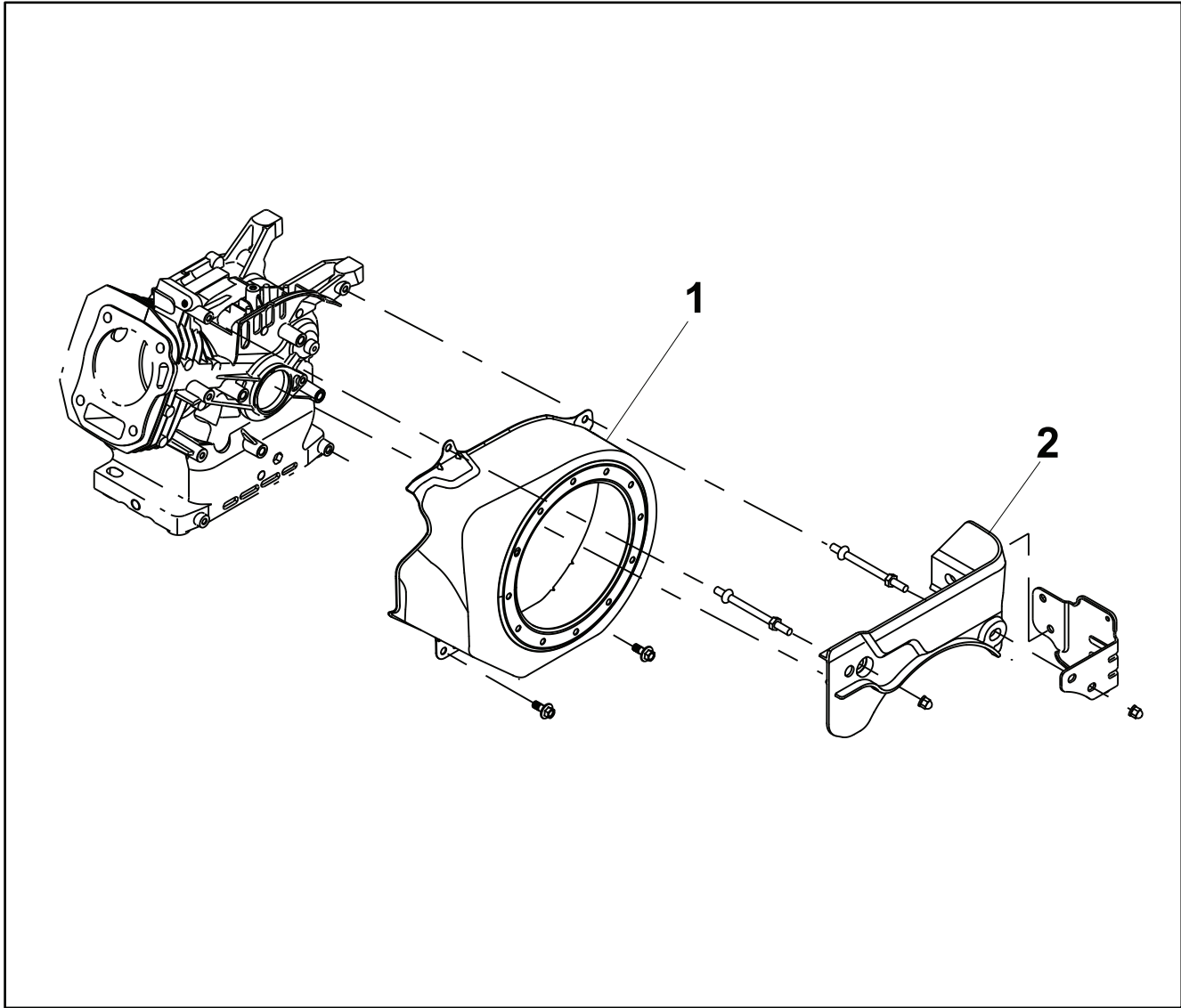
- 3. Rubber Block



g330763

Figure 220

- | | |
|----------------|---------------------------|
| 1. Flywheel | 4. Ignition Coil Assembly |
| 2. Fan | 5. Key Switch |
| 3. Starter Cup | 6. Key |



g330764

Figure 221

1. Blower Shroud

2. Front Panel

Flywheel Replacement (G210-1, G210-2, & G210-4)

G210-1 Flywheel Removal

1. Drain the fuel into a suitable container.
2. Pull and remove the throttle control knob from the speed control assembly.



g333166

Figure 222

3. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
4. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
5. Remove the 2 (M6) flange nuts securing heater box to intake studs.



g323684

Figure 223

6. Disconnect the 2 wires from the back of the key switch.

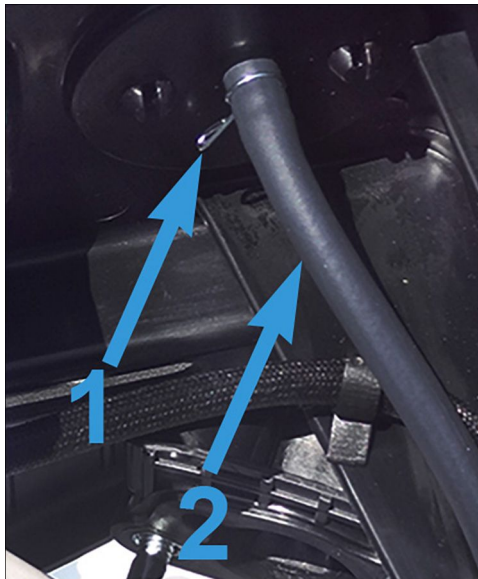
G210-1 Flywheel Removal (continued)



g323698

Figure 224

7. Slide the primer hose clamp away from the primer assembly and remove the primer hose from the primer bulb base.



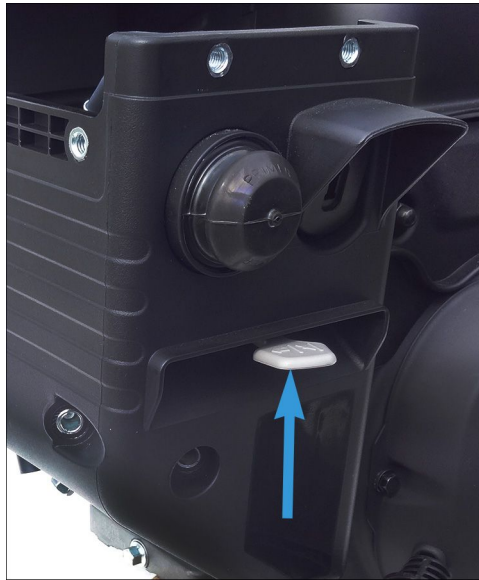
g323701

Figure 225

1. Primer Hose Clamp
2. Primer Hose

8. Position the choke lever in the middle of the heater box slot.

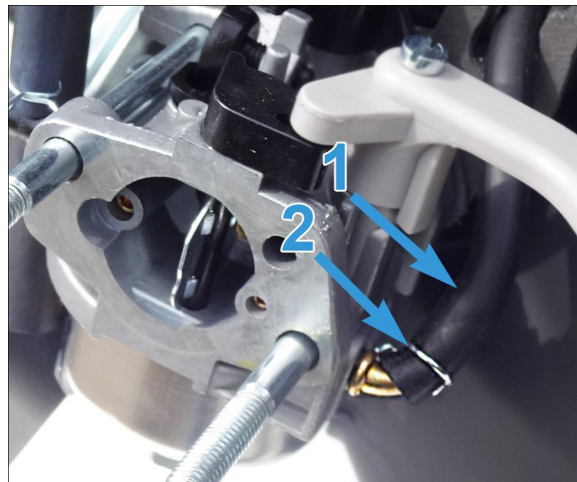
G210–1 Flywheel Removal (continued)



g323685

Figure 226

9. Slide and remove the heater box from the intake studs.
10. Slide the fuel hose clamp away from the carburetor.



g323693

Figure 227

1. Fuel Hose
2. Fuel Hose Clamp

11. Remove the fuel hose from the carburetor.
12. Remove the fuel hose clamp from the fuel hose.
13. Remove the cap from the fuel valve knob.

G210-1 Flywheel Removal (continued)



g330766

Figure 228

-
14. Remove the screw (M4 x 18) securing the fuel valve knob to the control panel. Remove the fuel valve knob from the fuel valve.



g326084

Figure 229

-
15. Engines equipped with an electric starter only, remove the electric starter switch box bracket from the RH blower mount stud.
 16. Remove the 2 (M6) acorn nuts securing the control panel to the blower shroud.

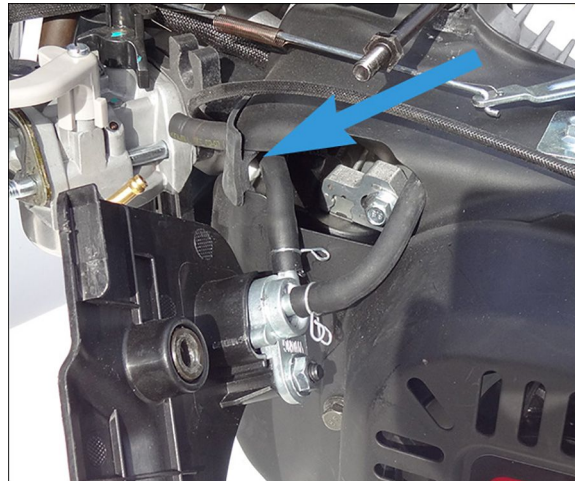
G210-1 Flywheel Removal (continued)



g326078

Figure 230

17. Remove the control panel from the blower shroud.
18. Guide the short fuel hose through the rubber block. Remove the control panel with the fuel valve and hoses attached.

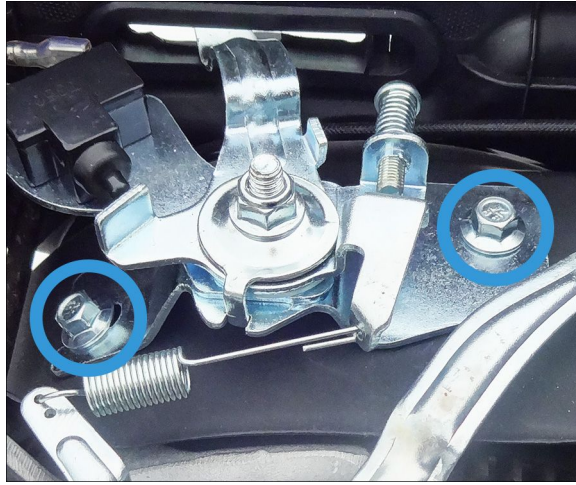


g326080

Figure 231

-
19. Remove the 2 (M6 x 10) screws securing the speed control assembly to the blower shroud.

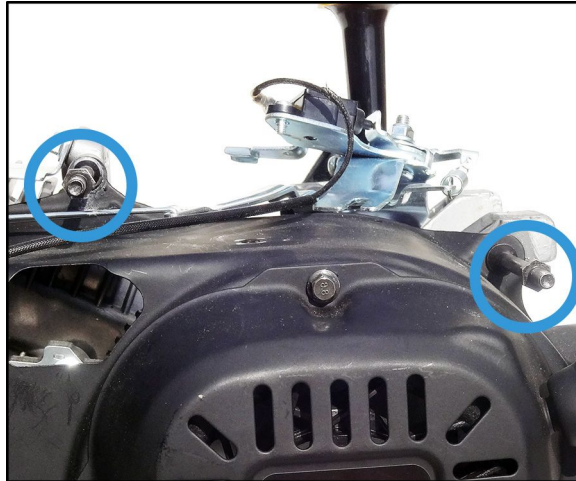
G210-1 Flywheel Removal (continued)



g325571

Figure 232

-
20. Remove the 2 (M6 x 89) mount studs securing the blower shroud to the engine block.



g339596

Figure 233

-
21. Remove the 2 (M6 x 12) screws securing the bottom blower shroud to the engine block.

G210–1 Flywheel Removal (continued)



g339595

Figure 234

22. Remove the blower shroud with the recoil assembly attached.

Note: Tip the blower shroud so the upper part of the blower shroud goes under the governor rod.

23. Remove the 2 (M6 x 25) screws securing the ignition coil assembly to the engine block. Move the ignition coil assembly away from the flywheel, towards the carburetor.



g340492

Figure 235

24. Using a strap wrench to keep the flywheel and crankshaft from turning, remove the (M14 x 1.5) flange nut securing the starter cup to the flywheel. Remove the starter cup from the fan.

G210-1 Flywheel Removal (continued)

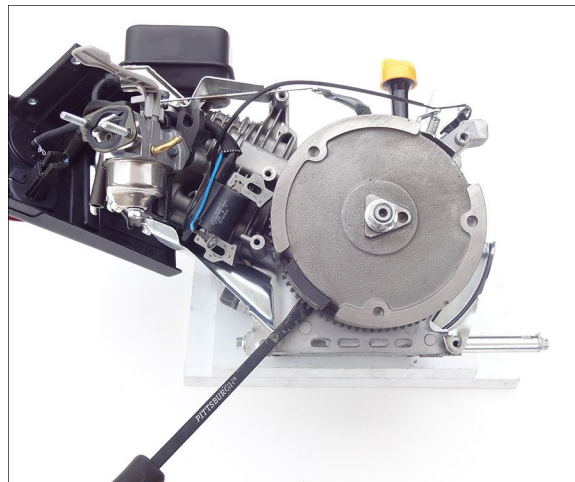


g340493

Figure 236

-
25. Remove the fan from the flywheel.
 26. To loosen the flywheel, install the flange nut until flush with the end of the crankshaft. Pry up under the flywheel while using a plastic hammer to hit the end of the crankshaft.

Note: If the flywheel does not come loose after 1 or 2 hits, rotate the flywheel to align the flywheel key to where prying.

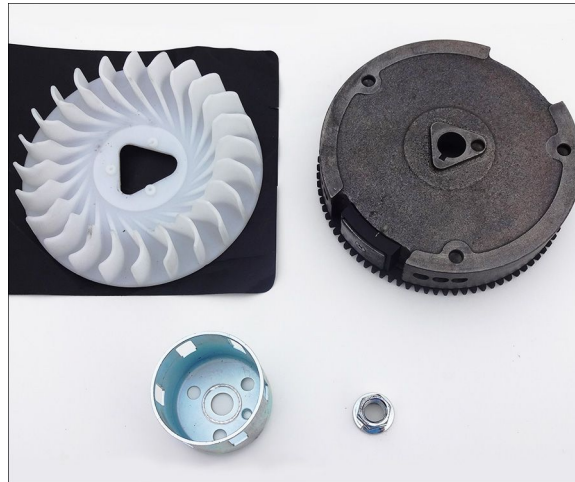


g333067

Figure 237

-
27. Remove the flange nut and flywheel from the engine block.

G210–1 Flywheel Removal (continued)



g328427

Figure 238

28. Using a side cutter, remove the flywheel key.



g328425

Figure 239

G210–1 Flywheel Inspection

1. Inspect the starter cup for burrs, nicks, cracks, anchor post damage, or if out of round. Replace the starter cup if damaged.
2. Inspect the fan for cracks, breakage, or anchor tab damage. Replace the flywheel fan if damaged.
3. Inspect the flywheel for cracks, breakage, or damage. Replace the flywheel if damaged.
4. Inspect the crankshaft threads and keyway for damage. Replace the crankshaft if damaged.
5. Inspect the flywheel key for damage. Replace the flywheel key if damaged.

G210–1 Flywheel Installation

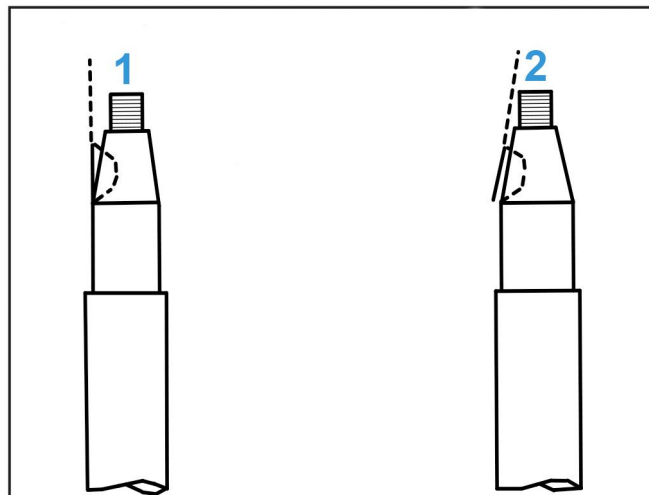
1. Clean the taper of the crankshaft and flywheel inside diameter to remove all the grease and oil.
2. Install the flywheel key into the slot on the crankshaft taper.

Note: The long flat of the flywheel key should be parallel to the length of the crankshaft.



g328425

Figure 240



g330765

Figure 241

1. Correct

2. Incorrect

3. Install the flywheel onto the crankshaft by aligning the keyway of the flywheel with the key in the crankshaft.
4. Match up the 3 alignment tabs to the holes in the flywheel. Install the fan on the flywheel.
5. Match up the alignment tab of the starter cup to the hole in the flywheel.

G210-1 Flywheel Installation (continued)



g328424

Figure 242



6. Using a strap wrench to keep the flywheel and crankshaft from turning, install the (M6) flange nut to the crankshaft. Torque the nut to 85 N • m (63 ft-lb).

Note: Do not lubricate the crankshaft or threads of flange nut.

7. Loosely install the 2 (M6 x 25) screws securing the ignition coil to the engine block. Slide the ignition coil to the end of the slot away from the flywheel and tighten the screws.



g340492

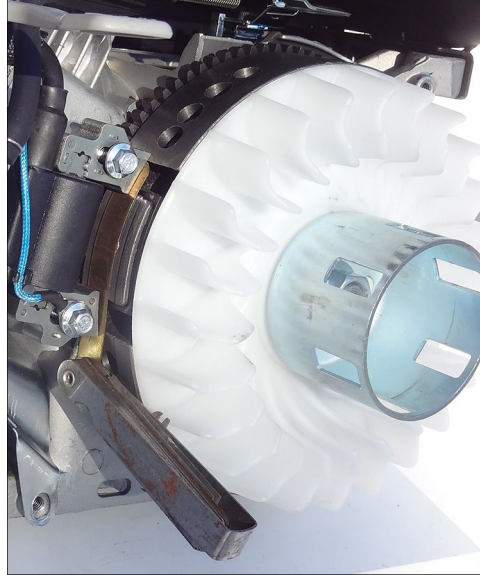
Figure 243



8. Using a non-metallic feeler gauge, adjust the air gap between the ignition coil and the flywheel to 0.4 mm (0.016 inch). Torque the screws 10 N • m (89 in-lb).

G210–1 Flywheel Installation (continued)

- Rotate the flywheel to align the magnets to both legs of the ignition coil. Insert the feeler gauge between the flywheel and coil legs.
- Loosen both screws allowing the coil to pinch the feeler gauge to the magnets.
- Tighten the 2 screws and remove the feeler gauge.
- Verify the air gap is to specification.



g339646

Figure 244

-
9. Insert the top of the blower shroud under the governor rod.
 10. Install the blower shroud onto the engine block.
 11. Loosely install the 2 (M6 x 12) screws securing the bottom of the blower shroud to the engine block.

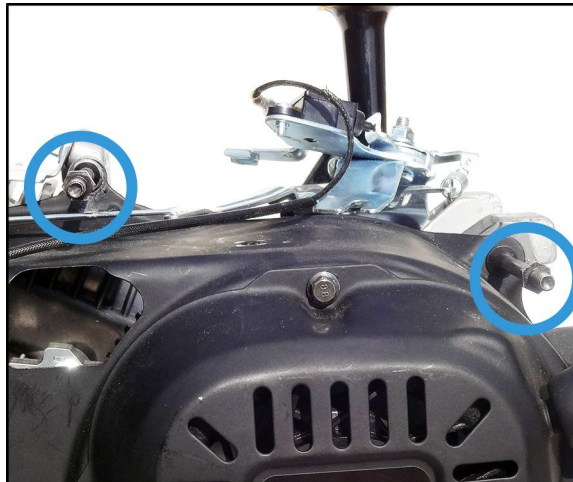


g339595

Figure 245

-
12. Loosely install the 2 (M6 x 89) mount studs securing the top of the blower shroud to the engine block.

G210-1 Flywheel Installation (continued)

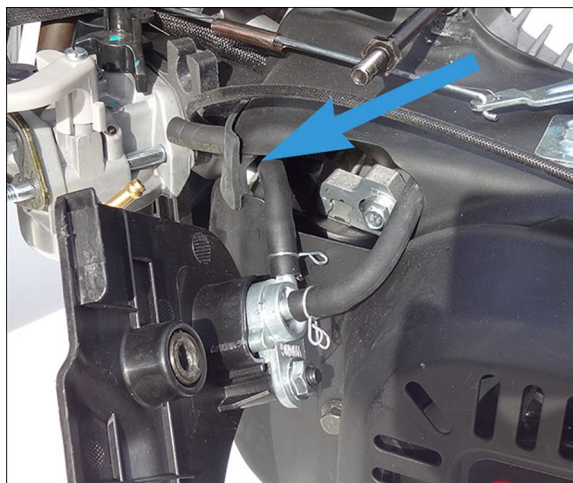


g339596

Figure 246



13. Route the stop switch wire between the left stud and top of the blower shroud.
14. Torque the lower blower shroud screws to 10 N • m (89 in-lb).
15. Torque the 2 mount studs to 10 N • m (89 in-lb).
16. Route the short fuel hose through the rubber block and the longer fuel hose toward the fuel tank.

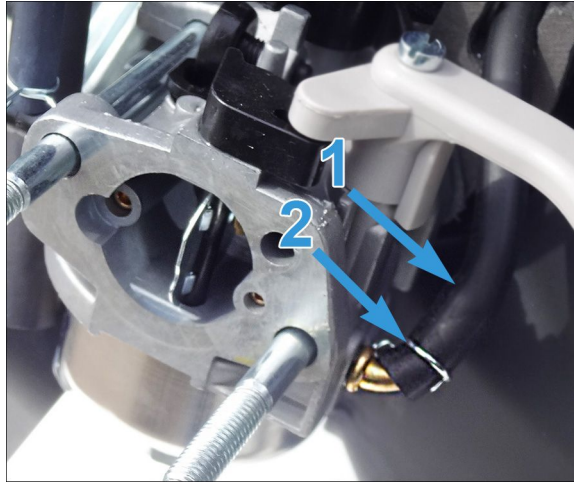


g326080

Figure 247

17. Install the clamp onto the short fuel hose located near the carburetor.
18. Install the short fuel hose onto the carburetor and secure with the clamp.

G210-1 Flywheel Installation (continued)



g323693

Figure 248

1. Fuel Hose

2. Fuel Hose Clamp



19. Install the control panel onto the mount studs. Install the 2 (M6) acorn nuts securing the control panel to the engine block. Torque the acorn nuts to 10 N • m (89 in-lb).

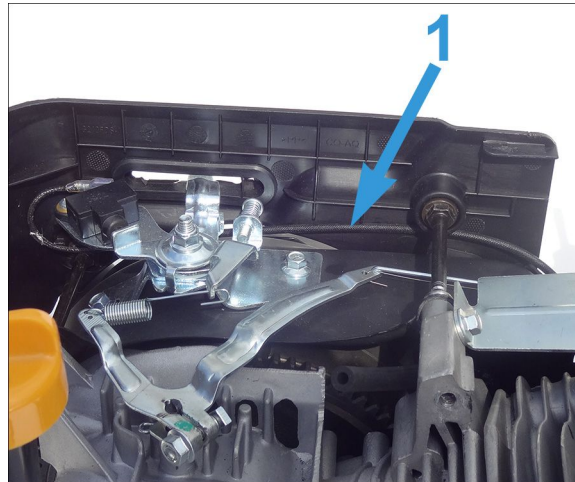
Note: Verify the fuel hoses are not kinked or pinched. Verify ground wire is routed between the blower shroud and mount studs.



g326078

Figure 249

G210-1 Flywheel Installation (continued)



g326142

Figure 250

1. Ground Wire

20. Engines equipped with an electric starter only, install the electric starter switch box bracket to the blower shroud, retain with an (M6) acorn nut.



21. Install the fuel valve knob on the fuel valve, retain with a screw (M4 x 18). Torque the screw to 2 N • m (18 in-lb). Install the cap onto the fuel valve knob.



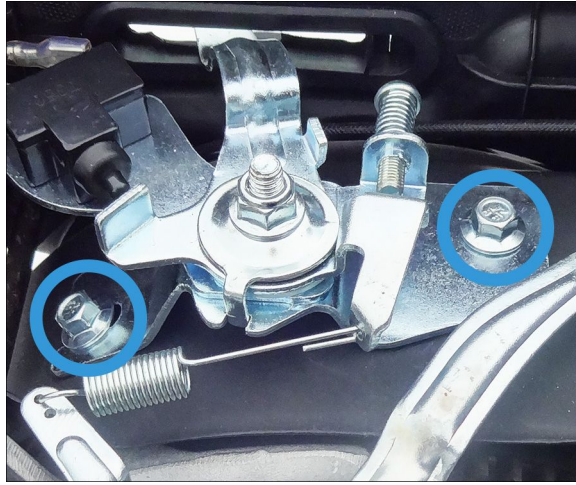
g326081

Figure 251



22. Install the speed control assembly onto the blower shroud. Install the 2 (M6 x 10) screws securing the speed control assembly to the blower shroud. Torque the screws to 10 N • m (89 in-lb).

G210-1 Flywheel Installation (continued)



g325571

Figure 252

23. Install the throttle control knob to the speed control assembly.

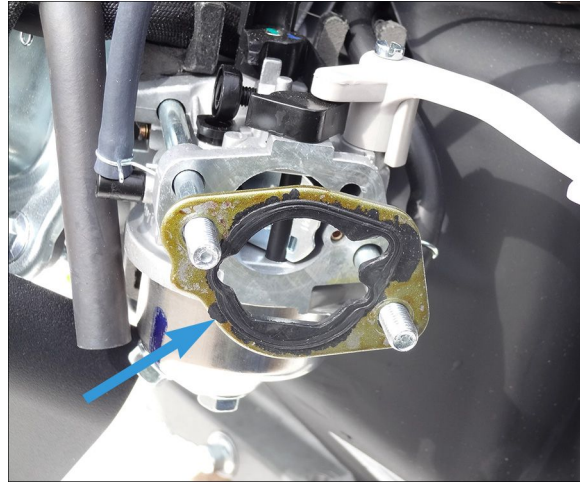


g325572

Figure 253

24. Verify the metal carburetor gasket is positioned correctly on the intake studs.

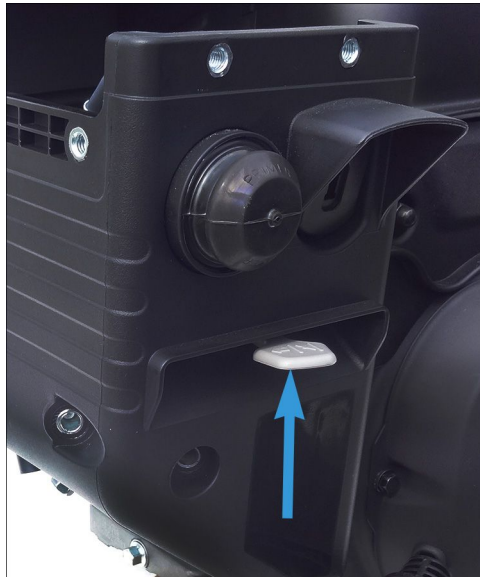
G210-1 Flywheel Installation (continued)



g323683

Figure 254

-
25. Slide the choke lever to partial choke. Install the heater box partially onto the intake studs and over the choke lever.



g323685

Figure 255

-
26. Install the primer hose onto the primer bulb base and secure with the primer hose clamp.

G210–1 Flywheel Installation (continued)



g323701

Figure 256

1. Primer Hose Clamp
2. Primer Hose

27. Connect the 2 wires to the key switch terminals.

Note: Ensure the wires are not crossed.



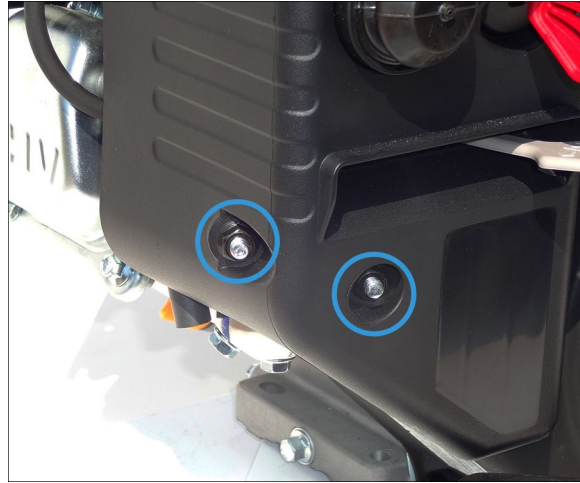
g323698

Figure 257



28. Fully slide the heater box onto the intake studs. Install the 2 (M6) flange nuts securing the heater box to the intake studs. Torque the nuts to 10 N • m (89 in-lb).

G210–1 Flywheel Installation (continued)



g323684

Figure 258

29. Install the fuel tank onto the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
30. Install the muffler guard onto the cylinder head. Refer to the product Service Manual for the muffler guard installation procedures.

G210–1 Flywheel Test

1. Start the engine and test the operation of the engine.
2. Test the throttle control by sliding the throttle full stroke.
3. Using a tachometer, verify the engine is operating at the correct RPM. [Specifications \(page 2–2\)](#)

G210–2 & G210–4 Flywheel Removal

1. Remove the 2 (M6) acorn nuts securing the control panel to the blower shroud.

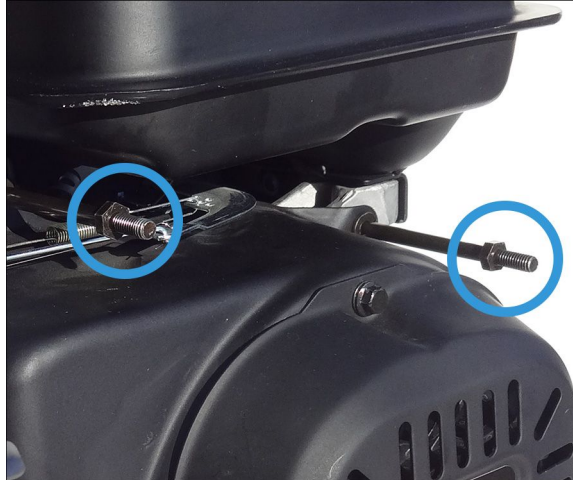


g328134

Figure 259

G210–2 & G210–4 Flywheel Removal (continued)

- Engines equipped with an electric starter only, remove the bolt securing the electric starter switch box bracket to the blower shroud. Remove the electric starter switch box bracket.
- Remove the control panel from the blower shroud.
- Remove the 2 (M6 x 89) mount studs securing the blower shroud to the engine block.



g328138

Figure 260

- Remove the 2 (M6 x 12) screws securing the bottom of the blower shroud to the engine block.

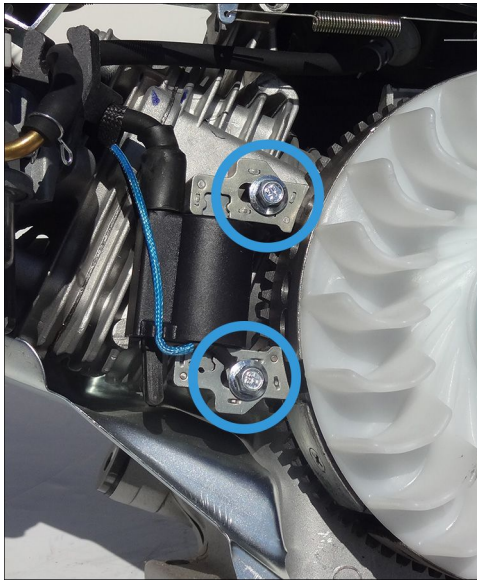


g328137

Figure 261

- Remove the blower shroud with the recoil assembly attached.
Note: Tip the blower shroud so the upper part of the blower shroud goes under the governor rod.
- Remove the 2 (M6 x 25) screws securing the ignition coil assembly to the engine block. Move the ignition coil assembly away from the flywheel, towards the carburetor.

G210-2 & G210-4 Flywheel Removal (continued)



g328136

Figure 262

- Using a strap wrench to keep the flywheel and crankshaft from turning, remove the (M14 x 1.5) flange nut securing the starter cup to the flywheel. Remove the starter cup from the fan.



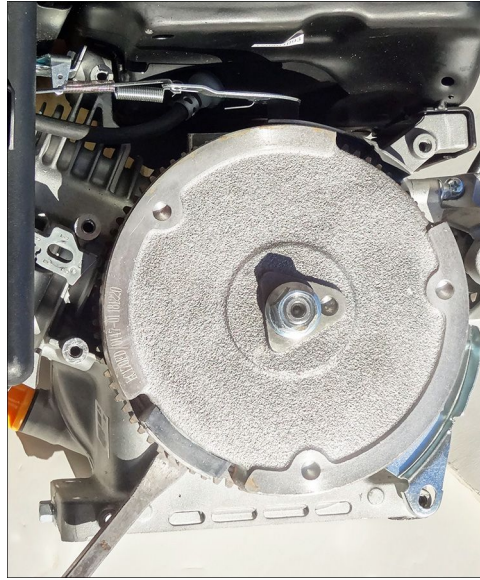
g328426

Figure 263

- Remove the fan from the flywheel.
- To loosen the flywheel, install the flange nut until flush with the end of the crankshaft. Pry up under the flywheel while using a plastic hammer to hit the end of the crankshaft.

Note: If the flywheel does not come loose after 1 or 2 hits, rotate the flywheel to align the flywheel key to where prying.

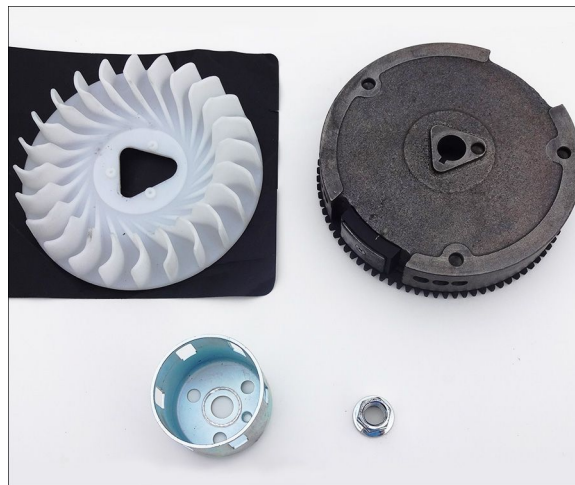
G210-2 & G210-4 Flywheel Removal (continued)



g340732

Figure 264

11. Remove the flange nut and flywheel from the engine block.



g328427

Figure 265

12. Using a side cutter, remove the flywheel key.

G210–2 & G210–4 Flywheel Removal (continued)



g328425

Figure 266

G210–2 & G210–4 Flywheel Inspection

1. Inspect the starter cup for burrs, nicks, cracks, anchor post damage, or if out of round. Replace the starter cup if damaged.
2. Inspect the fan for cracks, breakage, or anchor tab damage. Replace the flywheel fan if damaged.
3. Inspect the flywheel for cracks, breakage, or damage. Replace the flywheel if damaged.
4. Inspect the crankshaft threads and keyway for damage. Replace the crankshaft if damaged.
5. Inspect the flywheel key for damage. Replace the flywheel key if damaged.

G210–2 & G210–4 Flywheel Installation

1. Remove all grease and oil from the crankshaft and inside diameter of the flywheel.
2. Install the flywheel key into the slot on the crankshaft taper.

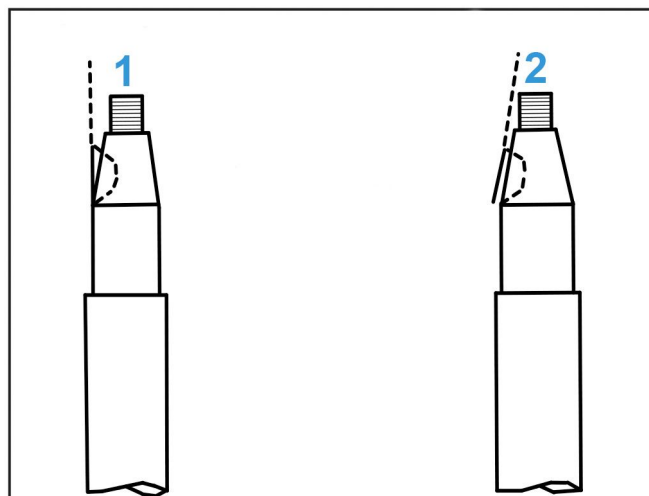
Note: The long flat of the key should be parallel to the length of the crankshaft.

G210-2 & G210-4 Flywheel Installation (continued)



g328425

Figure 267



g330765

Figure 268

1. Correct

2. Incorrect

3. Install the flywheel onto the crankshaft by aligning the keyway of the flywheel with the key in the crankshaft.
4. Match up the 3 alignment tabs to the holes in the flywheel and install the fan on the flywheel .
5. Match up the alignment tab of the starter cup to the hole in the flywheel.

G210-2 & G210-4 Flywheel Installation (continued)



g328424

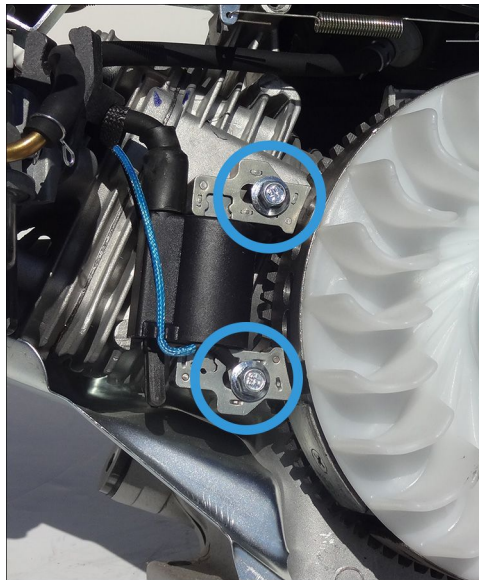
Figure 269



6. Using a strap wrench to keep the flywheel and crankshaft from turning, install the (M6) flange nut to the crankshaft. Torque the nut to 85 N • m (63 ft-lb).

Note: Do not lubricate the crankshaft or threads of the flange nut.

7. Loosely install the 2 (M6 x 25) screws securing the ignition coil to the engine block. Slide the ignition coil to the end of the slot away from flywheel and tighten the screws.



g328136

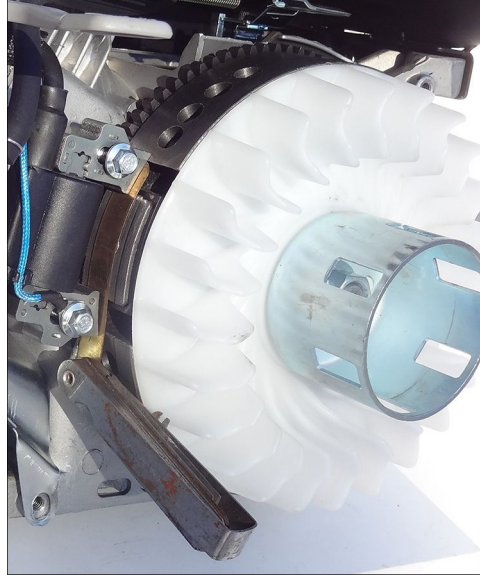
Figure 270



8. Using a non-metallic feeler gauge, adjust the air gap between the ignition coil and the flywheel to 0.4 mm (0.016 inch). Torque the screws 10 N • m (89 in-lb).

G210–2 & G210–4 Flywheel Installation (continued)

- Rotate the flywheel to align the magnets to both legs of the ignition coil. Insert the feeler gauge between the flywheel and coil legs.
- Loosen both screws allowing the coil to pinch the feeler gauge to the magnets.
- Tighten the 2 screws and remove the feeler gauge.
- Verify the air gap is to specification.



g339646

Figure 271

-
9. Insert the top of the blower shroud under the governor rod.
 10. Install the blower shroud onto the engine block.
 11. Loosely install the 2 (M6 x 12) screws securing the bottom of the blower shroud to the engine block.

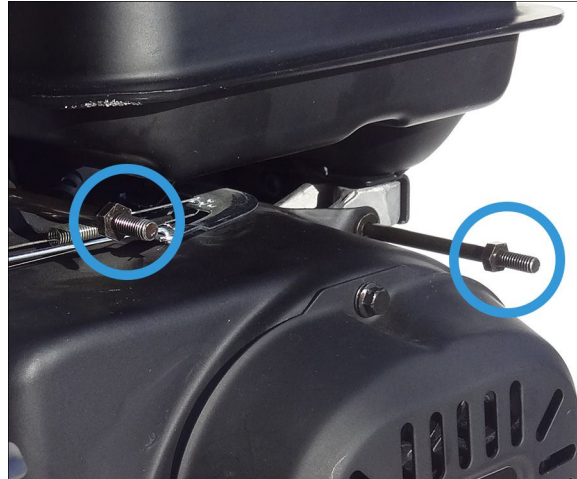


g328137

Figure 272

G210-2 & G210-4 Flywheel Installation (continued)

12. Loosely install the 2 (M6 x 89) mount studs securing the top of the blower shroud to the engine block.



g328138

Figure 273



13. Torque the lower blower shroud screws to 10 N • m (89 in-lb).



14. Torque the 2 mount studs to 10 N • m (89 in-lb).

15. Install the control panel onto the mount studs.

16. Engines equipped with an electric starter only, install the electric starter switch box bracket onto the RH blower mount stud.



17. Install the 2 (M6) acorn nuts securing the control panel to the engine block. Torque the nuts to 10 N • m (89 in-lb).



g328134

Figure 274

18. Engines equipped with an electric starter only, install the electric starter switch box bracket to the blower shroud, retain with the (M6) acorn nut.

G210-2 & G210-4 Flywheel Test

1. Start the engine and test the operation of the engine.
2. Using a tachometer, verify the engine is operating at the correct RPM.
[Specifications \(page 2-2\)](#)

Ignition Coil Replacement (G210-1, G210-2, & G210-4)

G210-1 Ignition Coil Removal

1. Drain the fuel into a suitable container.
2. Pull and remove the throttle control knob from the speed control assembly.



g333166

Figure 275

3. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
4. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
5. Remove the 2 (M6) flange nuts securing the heater box to the intake studs.



g323684

Figure 276

G210-1 Ignition Coil Removal (continued)

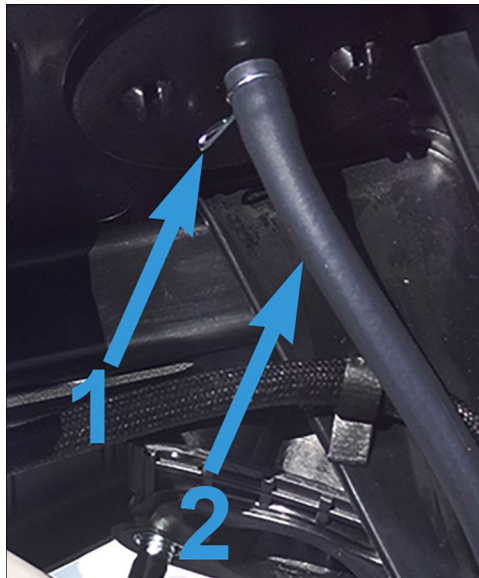
6. Disconnect the 2 wires from the back of the key switch.



g323698

Figure 277

7. Slide the primer hose clamp away from the primer assembly. Remove the primer hose from the primer bulb base.



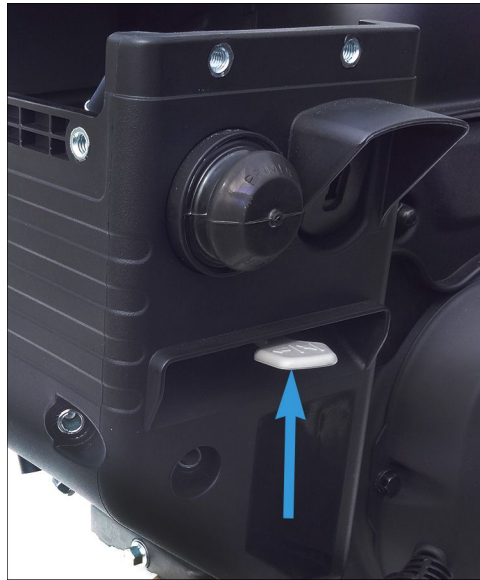
g323701

Figure 278

1. Primer Hose Clamp
2. Primer Hose

8. Position the choke lever in the middle of the heater box slot.

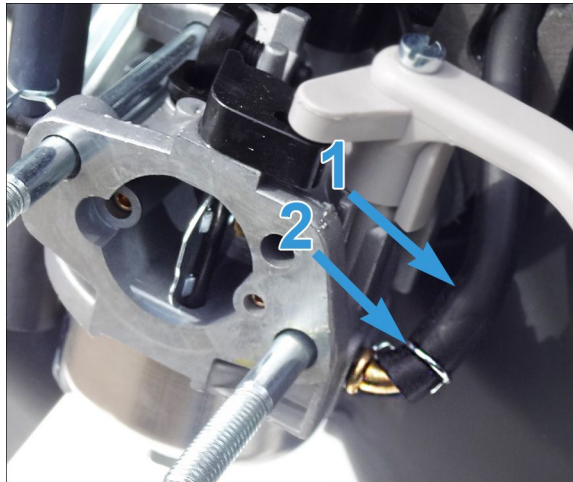
G210–1 Ignition Coil Removal (continued)



g323685

Figure 279

-
9. Slide and remove the heater box from the intake studs.
 10. Slide the fuel hose clamp away from the carburetor.



g323693

Figure 280

1. Fuel Hose
2. Fuel Hose Clamp

-
11. Remove the fuel hose from the carburetor.
 12. Remove the fuel hose clamp from the fuel hose.
 13. Remove the cap from the fuel valve knob.

G210-1 Ignition Coil Removal (continued)



g330766

Figure 281

1. Cap

-
14. Remove the (M4 x 18) screw securing the fuel valve knob to the control panel. Remove the fuel valve knob from the fuel valve.



g326084

Figure 282

-
15. Remove the 2 (M6) acorn nuts securing the control panel to the blower shroud.

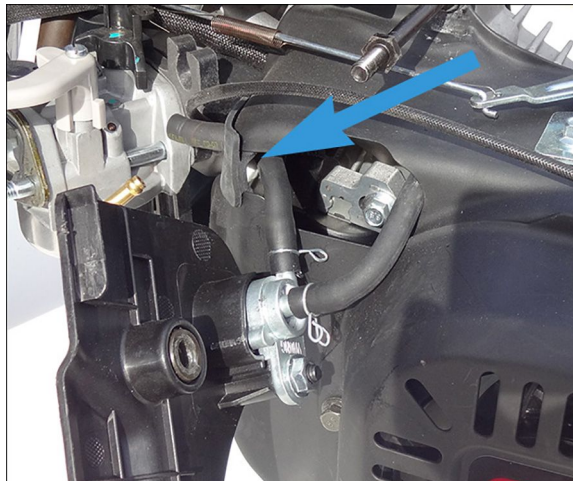
G210–1 Ignition Coil Removal (continued)



g326078

Figure 283

16. Engines equipped with an electric starter only, remove the electric starter switch box bracket from the RH blower mount stud.
17. Remove the control panel from the blower shroud.
18. Guide the short fuel hose through the rubber block. Remove the control panel with the fuel valve and hoses attached.

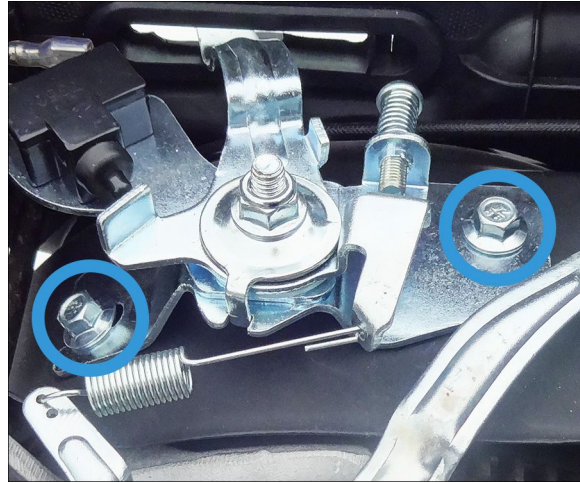


g326080

Figure 284

-
19. Remove the 2 (M6 x 10) screws securing the speed control assembly to the blower shroud.

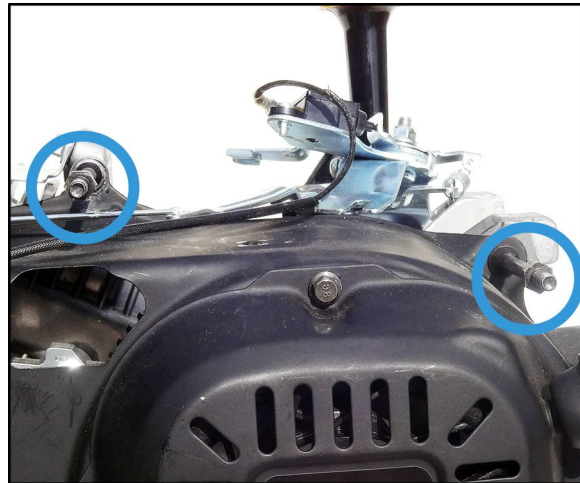
G210-1 Ignition Coil Removal (continued)



g325571

Figure 285

-
20. Remove the 2 (M6 x 89) mount studs securing the blower shroud to the engine block.



g339596

Figure 286

-
21. Remove the 2 (M6 x 12) screws securing the bottom of the blower shroud to the engine block.

G210–1 Ignition Coil Removal (continued)



g339595

Figure 287

-
22. Remove the blower shroud with the recoil assembly attached.

Note: Tip the blower shroud so the upper part of the blower shroud goes under the governor rod.

23. Remove the 2 (M6 x 25) screws securing the ignition coil assembly to the engine block.



g340492

Figure 288

-
24. Remove the spark plug wire from the spark plug.
25. Remove the wires from the stop switch on the heater box.
26. Remove the wire harness from the carburetor insulator gasket.

G210–1 Ignition Coil Removal (continued)



g340731

Figure 289

-
27. Remove the stop wire connected to the throttle control switch.
 28. Remove the ignition coil from the engine block.



g340733

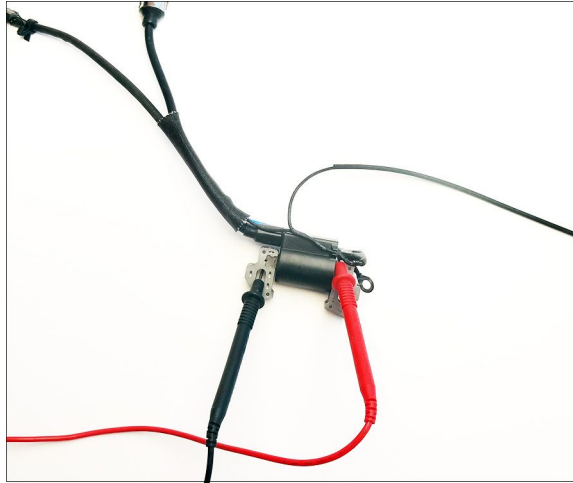
Figure 290

G210–1 Ignition Coil Test

1. Using a digital volt ohm meter (set to ohms), place one lead on the ignition coil spade connector and the other lead on the ignition coil frame. Verify the primary circuit resistance is to specification.

Primary Circuit Resistance: 1.0–1.2 Ω

G210–1 Ignition Coil Test (continued)

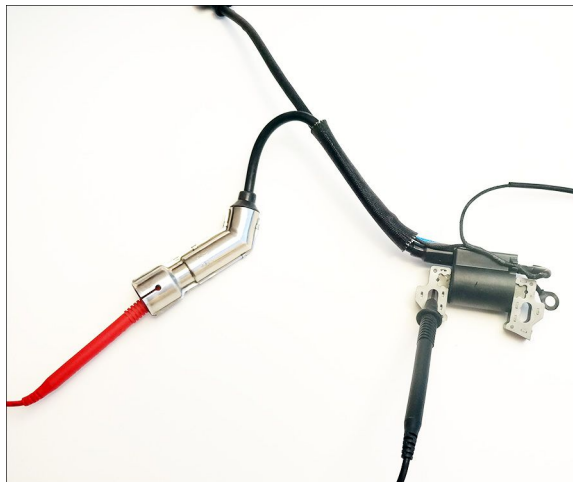


g340717

Figure 291

- Using a digital volt ohm meter (set to ohms), place one lead inside the spark plug connector and the other lead on the ignition coil frame. Verify the secondary circuit resistance is to specification.

Secondary Circuit Resistance: 5.1–6.1 Ω



g340718

Figure 292

G210–1 Ignition Coil Installation

- Weave the wire harness under the fuel line and over the top of the carburetor insulator gasket. Route the spark plug wire under the breather hose. Secure the wire harness under the insulator gasket.

G210-1 Ignition Coil Installation (continued)



g340731

Figure 293

2. Route and connect the stop wire to the throttle control switch.
3. Loosely install the 2 (M6 x 25) screws securing the ignition coil to the engine block. Slide the ignition coil to the end of the slot away from the flywheel and tighten the screws.



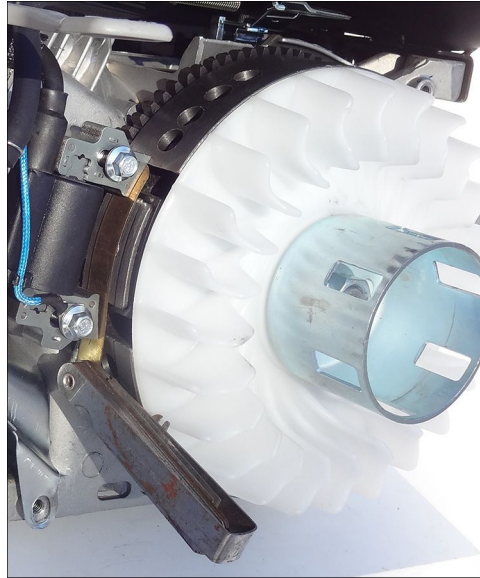
g340492

Figure 294



4. Using a non-metallic feeler gauge, adjust the air gap between the ignition coil and the flywheel to 0.4 mm (0.016 inch). Torque the screws 10 N • m (89 in-lb).
 - Rotate the flywheel to align the magnets to both legs of the ignition coil. Insert the feeler gauge between the flywheel and coil legs.
 - Loosen both screws allowing the coil to pinch the feeler gauge to the magnets.
 - Tighten the 2 screws and remove the feeler gauge.
 - Verify the air gap is to specification.

G210–1 Ignition Coil Installation (continued)



g339646

Figure 295

5. Insert the top of the blower shroud under the governor rod.
6. Install the blower shroud onto the engine block.
7. Loosely install the 2 (M6 x 12) screws securing the bottom of the blower shroud to the engine block.

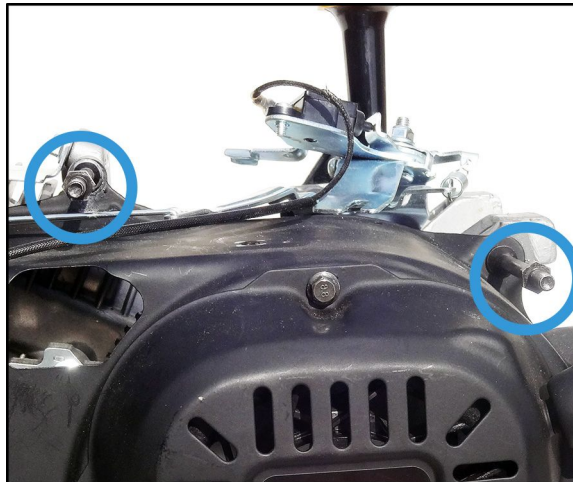


g339595

Figure 296

8. Loosely install the 2 (M6 x 89) mount studs securing the top of the blower shroud to the engine block.

G210-1 Ignition Coil Installation (continued)

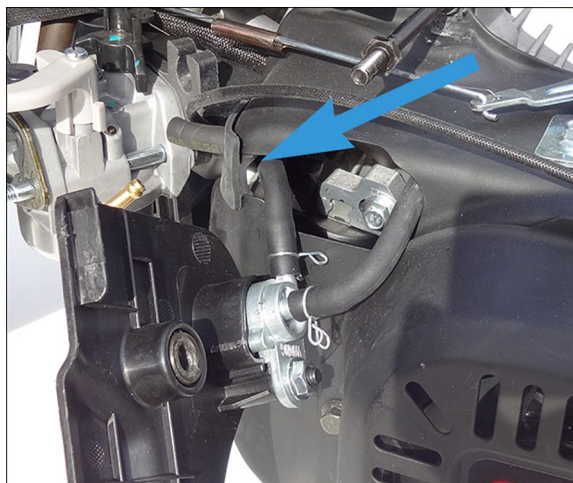


g339596

Figure 297



9. Route the stop switch wire between the left stud and top of the blower shroud.
10. Torque the lower blower shroud screws to 10 N • m (89 in-lb).
11. Torque the mount studs to 10 N • m (89 in-lb).
12. Route the short fuel hose through the rubber block and the longer fuel hose toward the fuel tank.

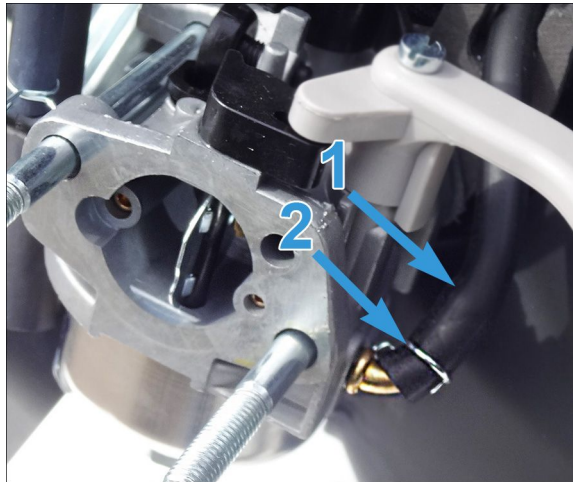


g326080

Figure 298

13. Install the clamp onto the fuel hose located near the carburetor.
14. Install the short fuel hose onto the carburetor, secure with the clamp.

G210–1 Ignition Coil Installation (continued)



g323693

Figure 299

1. Fuel Hose
2. Fuel Hose Clamp

15. Install the control panel onto the mount studs.
16. Engines equipped with an electric starter only, install the electric starter switch box bracket onto the RH blower mount stud.
17. Install the 2 (M6) acorn nuts securing the control panel to the engine block. Torque the nuts to 10 N • m (89 in-lb).



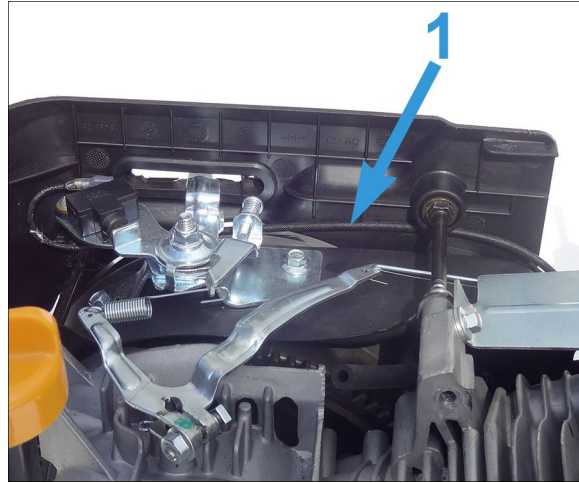
Note: Verify the fuel hoses are not kinked or pinched. Verify the ground wire is routed between the blower shroud and mount studs.



g326078

Figure 300

G210–1 Ignition Coil Installation (continued)



g326142

Figure 301

1. Ground Wire



18. Install the fuel valve knob on the fuel valve, retain with a screw (M4 x 18). Torque the screw to 2 N • m (18 in-lb). Install the cap onto the fuel valve knob.



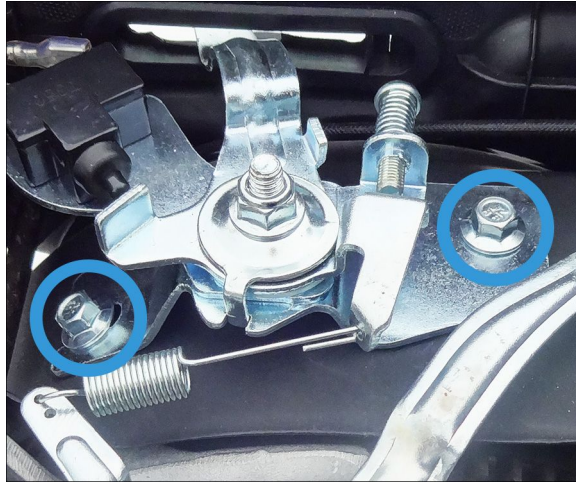
g326081

Figure 302



19. Install the speed control assembly onto the blower shroud. Install the 2 (M6 x 10) screws securing the speed control assembly to the blower shroud. Torque the screws to 10 N • m (89 in-lb).

G210–1 Ignition Coil Installation (continued)



g325571

Figure 303

20. Install the throttle control knob to the speed control assembly.

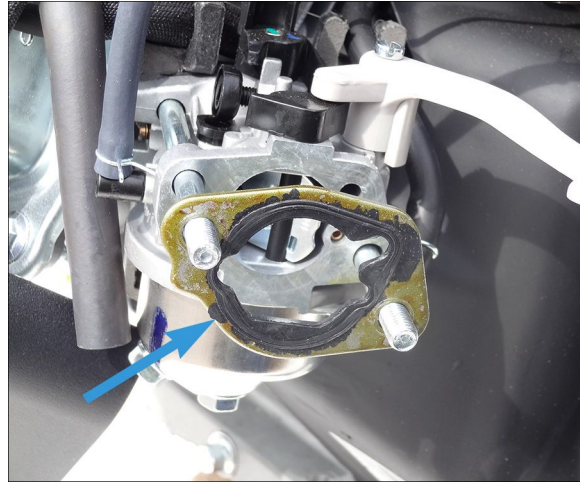


g325572

Figure 304

21. Verify the metal carburetor gasket is positioned correctly on the intake studs.

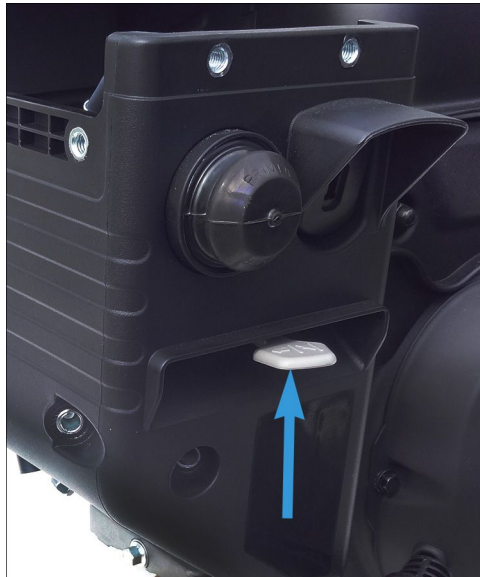
G210-1 Ignition Coil Installation (continued)



g323683

Figure 305

-
22. Slide the choke lever to partial choke. Install the heater box partially onto intake studs and over choke lever.



g323685

Figure 306

-
23. Install the primer hose onto the primer bulb base, secure with the primer hose clamp.

G210–1 Ignition Coil Installation (continued)



g323701

Figure 307

1. Primer Hose Clamp
2. Primer Hose

24. Connect the 2 wires to the key switch terminals.

Note: Verify the wires are not crossed.



g323698

Figure 308



25. Fully slide the heater box onto the intake studs. Install the 2 (M6) flange nuts securing the heater box to the intake studs. Torque the nuts to 10 N • m (89 in-lb).

G210–1 Ignition Coil Installation (continued)



g323684

Figure 309

26. Install the fuel tank onto the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
27. Install the muffler guard onto the cylinder head. Refer to the product Service Manual for the muffler guard installation procedures.
28. Install the spark plug boot onto the spark plug.

Note: Verify the spark plug wire is positioned correctly into the carburetor insulator gasket and routed under the breather hose.

G210–2 & G210–4 Ignition Coil Removal

1. Remove the muffler guard from the engine block. Refer to the product Service Manual for the muffler guard removal procedures.
2. Remove the 2 (M6) flange nuts securing the heater box to intake studs.



g323684

Figure 310

3. Disconnect the 2 wires from the back of the key switch.

G210-2 & G210-4 Ignition Coil Removal (continued)



g323698

Figure 311

4. Slide the primer hose clamp away from primer assembly. Remove the primer hose from the primer bulb base.



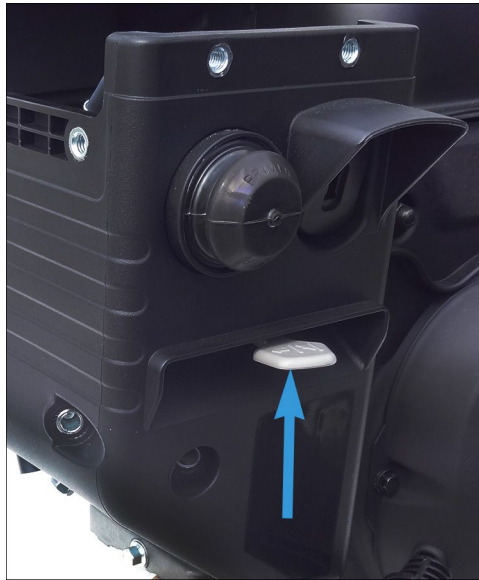
g323701

Figure 312

1. Primer Hose Clamp
2. Primer Hose

5. Position the choke lever in the middle of the heater box slot.

G210–2 & G210–4 Ignition Coil Removal (continued)



g323685

Figure 313

6. Slide and remove the heater box from the intake studs.
7. Remove the 2 (M6) acorn nuts securing the control panel to the blower shroud.

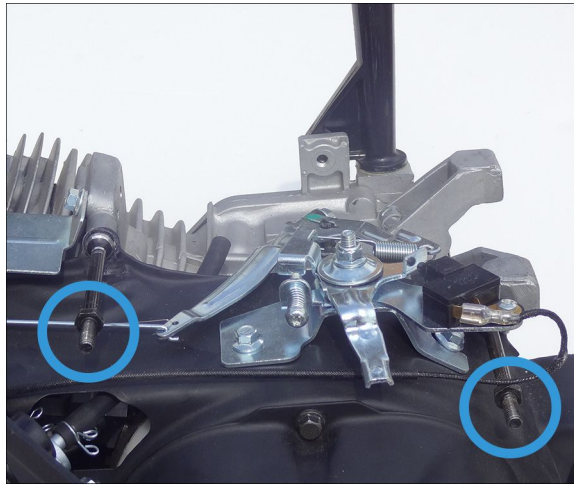


g328134

Figure 314

8. Engines equipped with an electric starter only, remove the electric starter switch box bracket from the RH blower mount stud.
9. Remove the control panel from the blower shroud.
10. Remove the 2 (M6 x 89) mount studs securing the blower shroud to the engine block.

G210-2 & G210-4 Ignition Coil Removal (continued)



g326145

Figure 315

11. Remove the 2 (M6 x 12) screws securing the bottom of the blower shroud to the engine block.



g328137

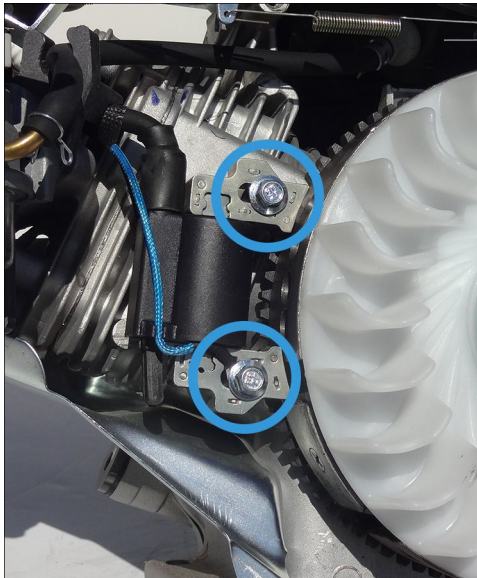
Figure 316

12. Remove the blower shroud with the recoil assembly attached.

Note: Tip the blower shroud so the upper part of the blower shroud goes under the governor rod.

13. Remove the 2 (M6 x 25) screws securing the ignition coil assembly to the engine block.

G210-2 & G210-4 Ignition Coil Removal (continued)



g328136

Figure 317

-
14. Remove the spark plug wire from the spark plug.
 15. Remove the wires from the stop switch on the heater air box.
 16. Remove the wire harness from the carburetor insulator gasket.
 17. Remove the ignition coil from the engine block.



g328135

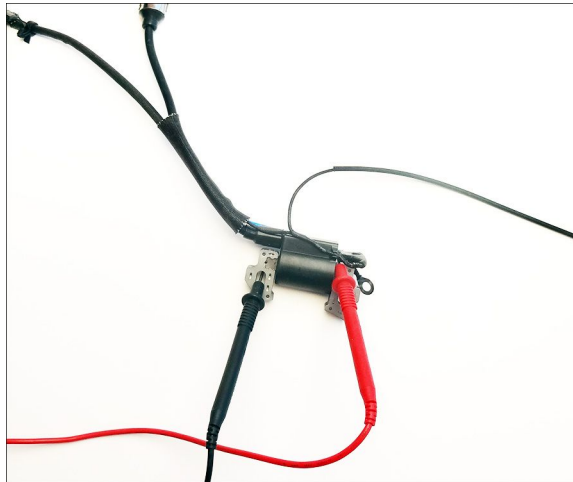
Figure 318

G210-2 & G210-4 Ignition Coil Test

1. Using a digital volt ohm meter (set to ohms), place one lead on the ignition coil spade connector and the other lead on the ignition coil frame. Verify the primary circuit resistance is to specification.

Primary Circuit Resistance: 1.0–1.2 Ω

G210-2 & G210-4 Ignition Coil Test (continued)

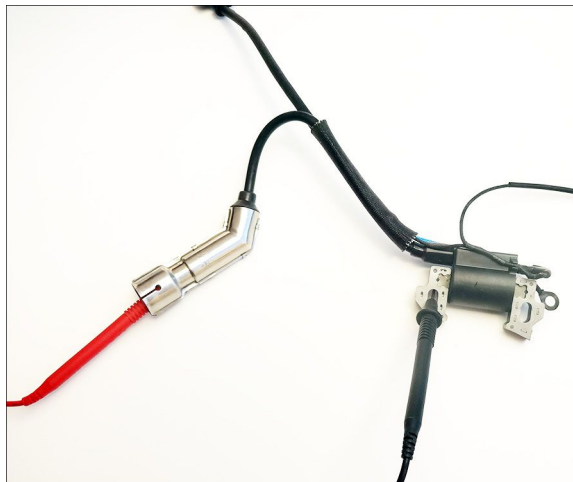


g340717

Figure 319

2. Using a digital volt ohm meter (set to ohms), place one lead inside the spark plug connector and the other lead on the ignition coil frame. Verify the secondary circuit resistance is to specification.

Secondary Circuit Resistance: 5.1–6.1 Ω



g340718

Figure 320

G210-2 & G210-4 Ignition Coil Installation

1. Weave the wire harness under the fuel line and over the top of the carburetor insulator gasket. Route the spark plug wire under the breather hose. Secure the wire harness under the insulator gasket.

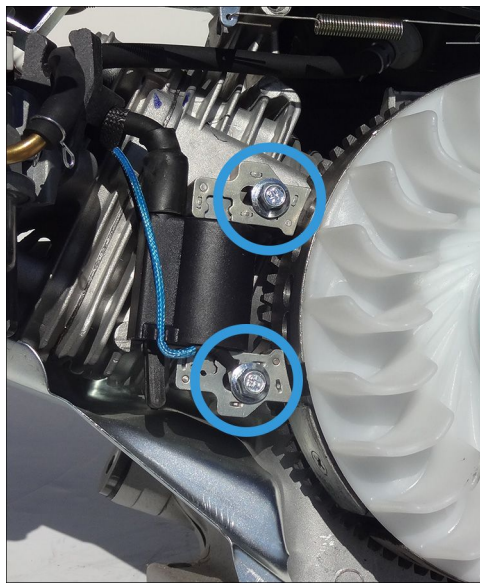
G210-2 & G210-4 Ignition Coil Installation (continued)



g328139

Figure 321

2. Loosely install the 2 (M6 x 25) screws securing the ignition coil to the engine block. Slide the ignition coil to the end of the slot away from the flywheel and tighten the screws.



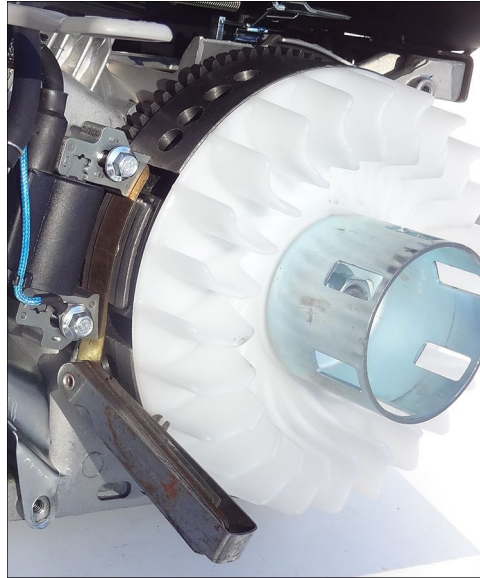
g328136

Figure 322



3. Using a non-metallic feeler gauge, adjust the air gap between the ignition coil and the flywheel to 0.4 mm (0.016 inch). Torque the screws 10 N • m (89 in-lb).
 - Rotate the flywheel to align the magnets to both legs of the ignition coil. Insert the feeler gauge between the flywheel and coil legs.
 - Loosen both screws allowing the coil to pinch the feeler gauge to the magnets.
 - Tighten the 2 screws and remove the feeler gauge.
 - Verify the air gap is to specification.

G210-2 & G210-4 Ignition Coil Installation (continued)



g339646

Figure 323

4. Insert the top of the blower shroud under the governor rod.
5. Install the blower shroud onto the engine block.
6. Loosely install the 2 (M6 x 12) screws securing the bottom of the blower shroud to the engine block.

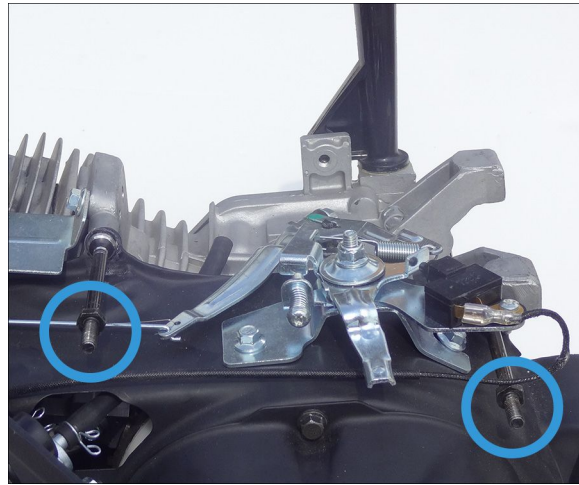


g328137

Figure 324

7. Loosely install the 2 (M6 x 89) mount studs securing the top of the blower shroud to the engine block.

G210-2 & G210-4 Ignition Coil Installation (continued)



g326145

Figure 325



8. Torque the lower blower shroud screws to 10 N • m (89 in-lb).



9. Torque the mount studs to 10 N • m (89 in-lb).

10. Install the control panel onto the mount studs.

11. Engines equipped with an electric starter only, install the electric starter switch box bracket onto the RH blower mount stud.



12. Install the 2 (M6) acorn nuts securing the control panel to the engine block. Torque the nuts to 10 N • m (89 in-lb).

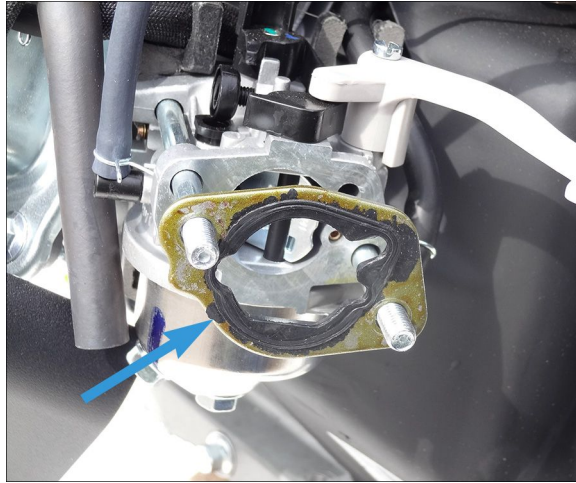


g328134

Figure 326

13. Verify the metal carburetor gasket is positioned correctly on the intake studs.

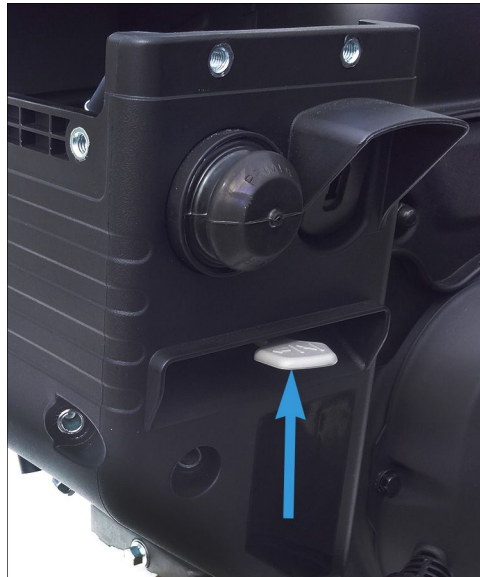
G210-2 & G210-4 Ignition Coil Installation (continued)



g323683

Figure 327

-
- Slide the choke lever to partial choke. Install the heater box partially onto intake studs and over choke lever.

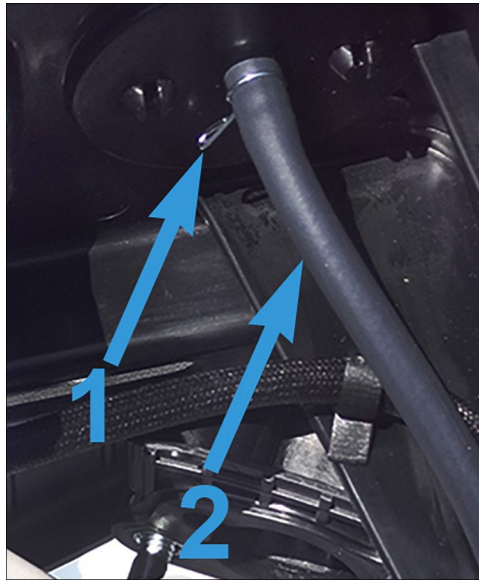


g323685

Figure 328

-
- Install the primer hose onto the primer bulb base, secure with the primer hose clamp.

G210-2 & G210-4 Ignition Coil Installation (continued)



g323701

Figure 329

1. Primer Hose Clamp
2. Primer Hose

16. Connect the 2 wires to the key switch terminals.

Note: Verify the wires are not crossed.



g323698

Figure 330



17. Fully slide the heater box onto the intake studs. Install the 2 (M6) flange nuts securing the heater box to the intake studs. Torque the nuts to 10 N • m (89 in-lb).

G210–2 & G210–4 Ignition Coil Installation (continued)



g323684

Figure 331

18. Install the muffler guard onto the cylinder head. Refer to the product Service Manual for the muffler guard installation procedures.
19. Install the spark plug boot onto the spark plug.

Note: Verify the spark plug wire is positioned correctly into the carburetor insulator gasket and routed under the breather hose.

Key Switch Replacement

Key Switch Removal

1. Remove the key from the key switch.



g339647

Figure 332

2. Remove the muffler guard from the engine block. Refer to the project Service Manual for muffler guard removal procedures.
3. Disconnect the 2 wires from the back of the key switch.

Key Switch Removal (continued)



g323698

Figure 333

4. Squeeze and slide the key switch from the heater box.

Key Switch Installation

1. Install the key switch into the heater box.
2. Connect the 2 wires to the back of the key switch terminals

Note: Verify the wires are not crossed.



g323698

Figure 334

3. Install the muffler guard onto the cylinder head. Refer to the product Service Manual for the muffler guard installation procedures.
4. Install the key into the key switch.

Key Switch Installation (continued)



g339647

Figure 335

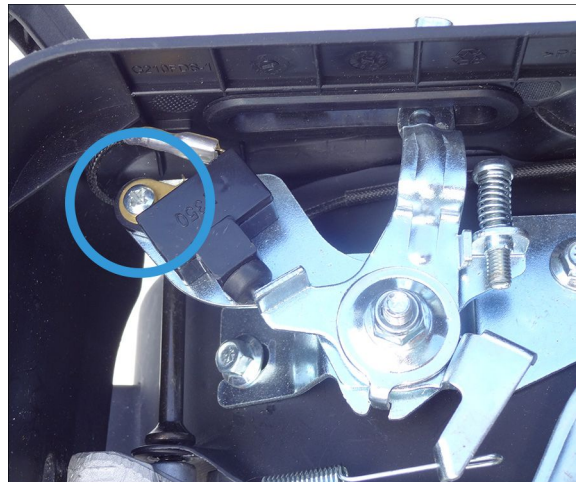
Key Switch Test

1. Start the engine.
2. Remove the key to stop the engine and verify the key switch function.

G210–1 Stop Switch Replacement

G210–1 Stop Switch Removal

1. Drain the fuel into a suitable container.
2. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
3. Remove the (M4 x 10) screw securing the stop switch to the speed control assembly.

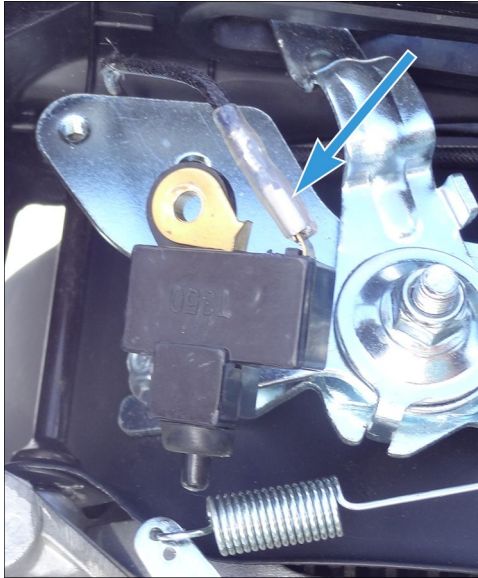


g330206

Figure 336

4. Remove the stop switch wire from the stop switch.

G210-1 Stop Switch Removal (continued)



g330208

Figure 337

-
5. Remove the stop switch from the speed control assembly.



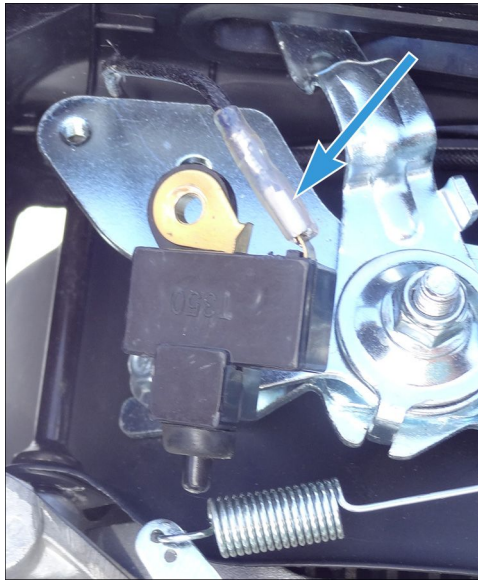
g330207

Figure 338

G210-1 Stop Switch Installation

1. Install the stop switch wire to the stop switch.

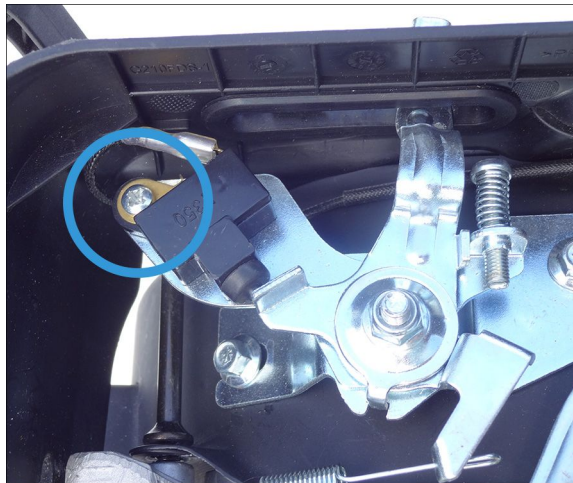
G210–1 Stop Switch Installation (continued)



g330208

Figure 339

2. Match the pin on the bottom of the stop switch to the hole in the speed control assembly.
3. Install the (M4 x 10) screw securing the stop switch to the speed control assembly.



g330206

Figure 340

4. Install the fuel tank onto the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
5. Refill the fuel.

G210–1 Stop Switch Test

1. Start the engine.
2. Slide the throttle from fast to slow and then to the OFF position. Verify the engine stops when sliding throttle control to the OFF position.



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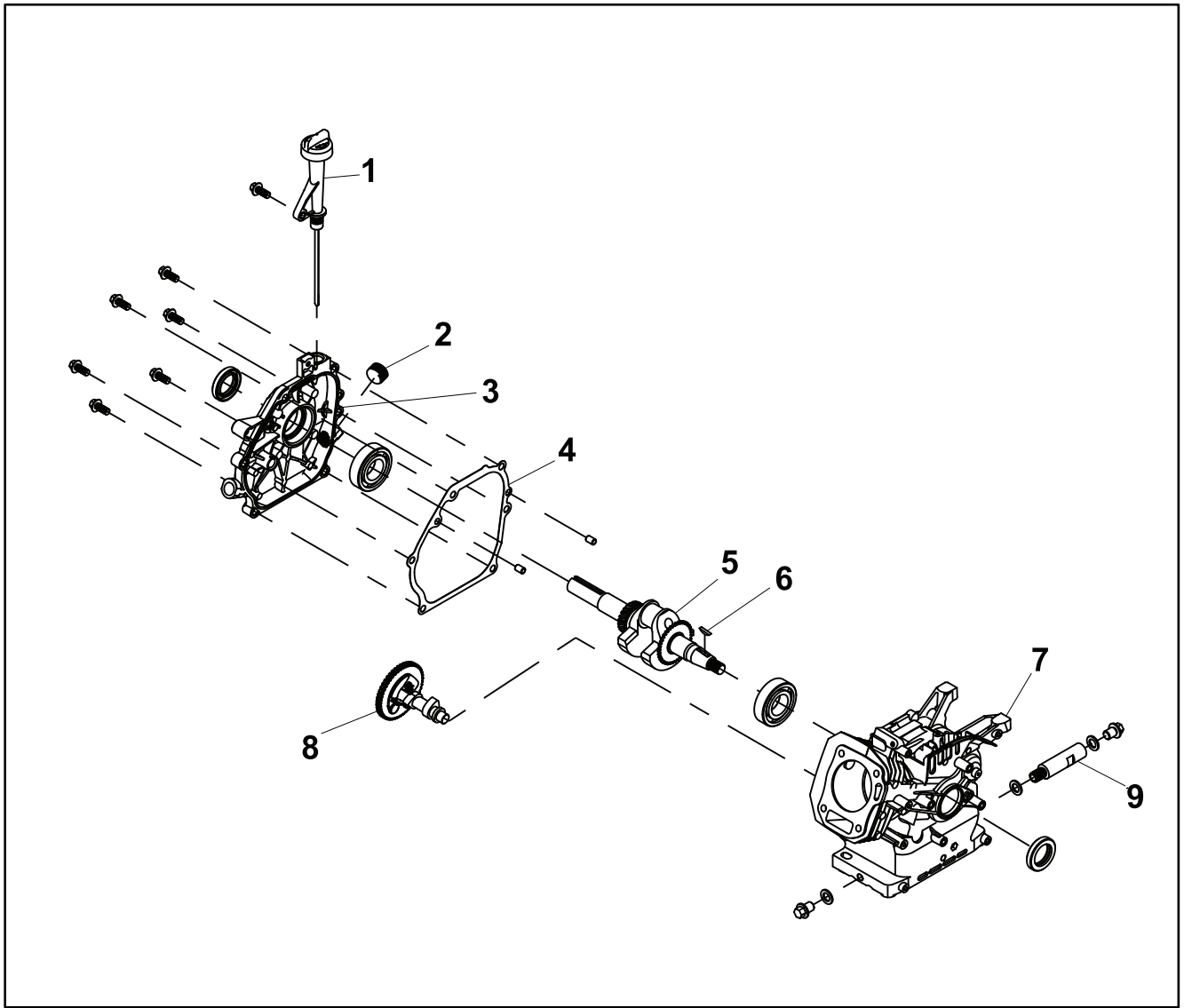
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General Information

The Engine Lower End chapter contains steps to remove, inspect, and install the internal components of the crankcase and components mounted to the crankcase. The components include the crankshaft, bearings & seals, camshaft & followers, governor shaft & governor gear assembly, and crankcase cover & oil drain pipe.

Service and Repairs

G210-1 Crankcase Cover Assembly

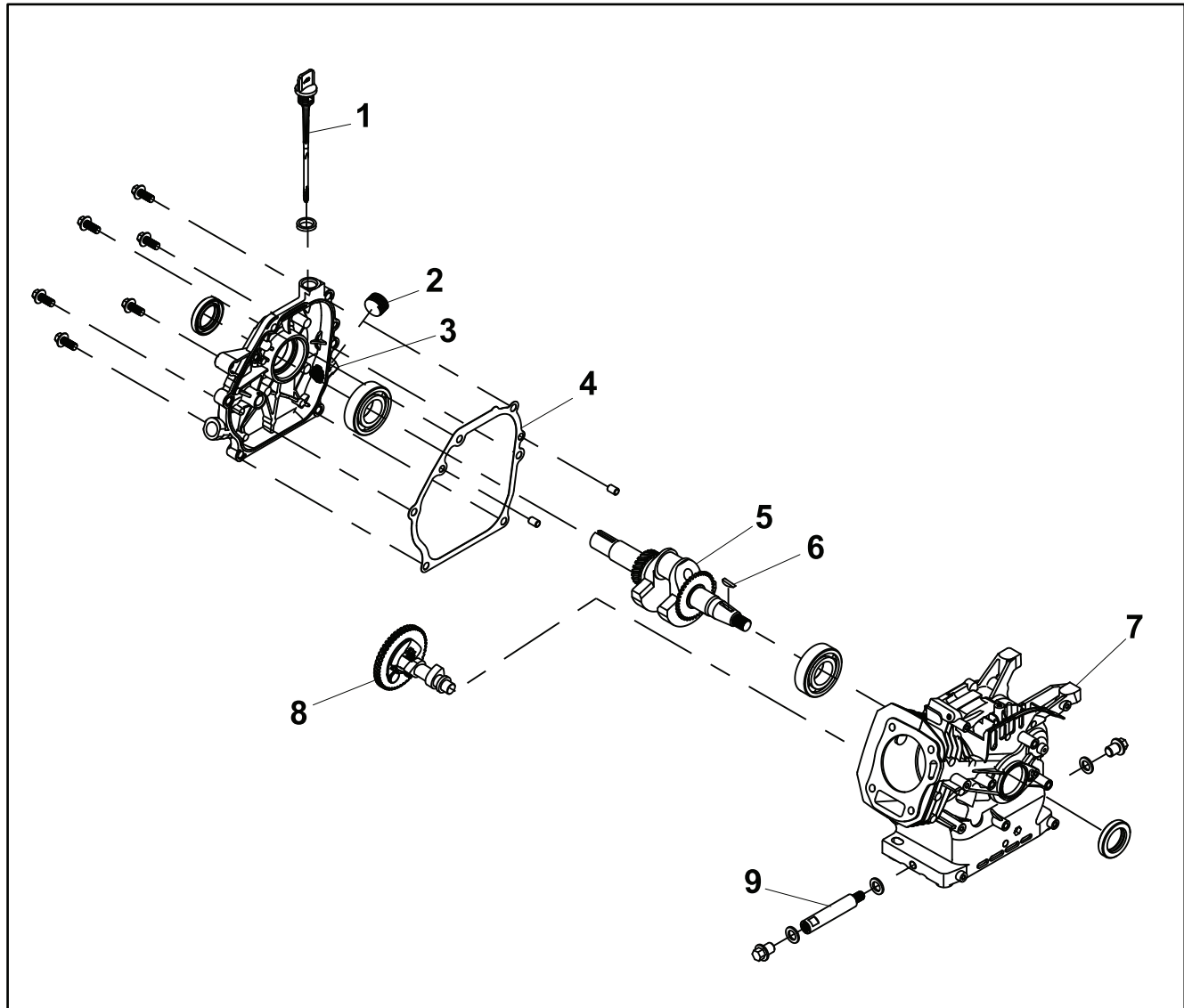


g331498

Figure 341

- | | |
|---------------------------|-------------------|
| 1. Oil Dipstick | 6. Woodruff Key |
| 2. Drain Plug | 7. Crankcase |
| 3. Crankcase Cover | 8. Camshaft |
| 4. Crankcase Cover Gasket | 9. Oil Drain Tube |
| 5. Crankshaft | |

G210-2 Crankcase Cover Assembly

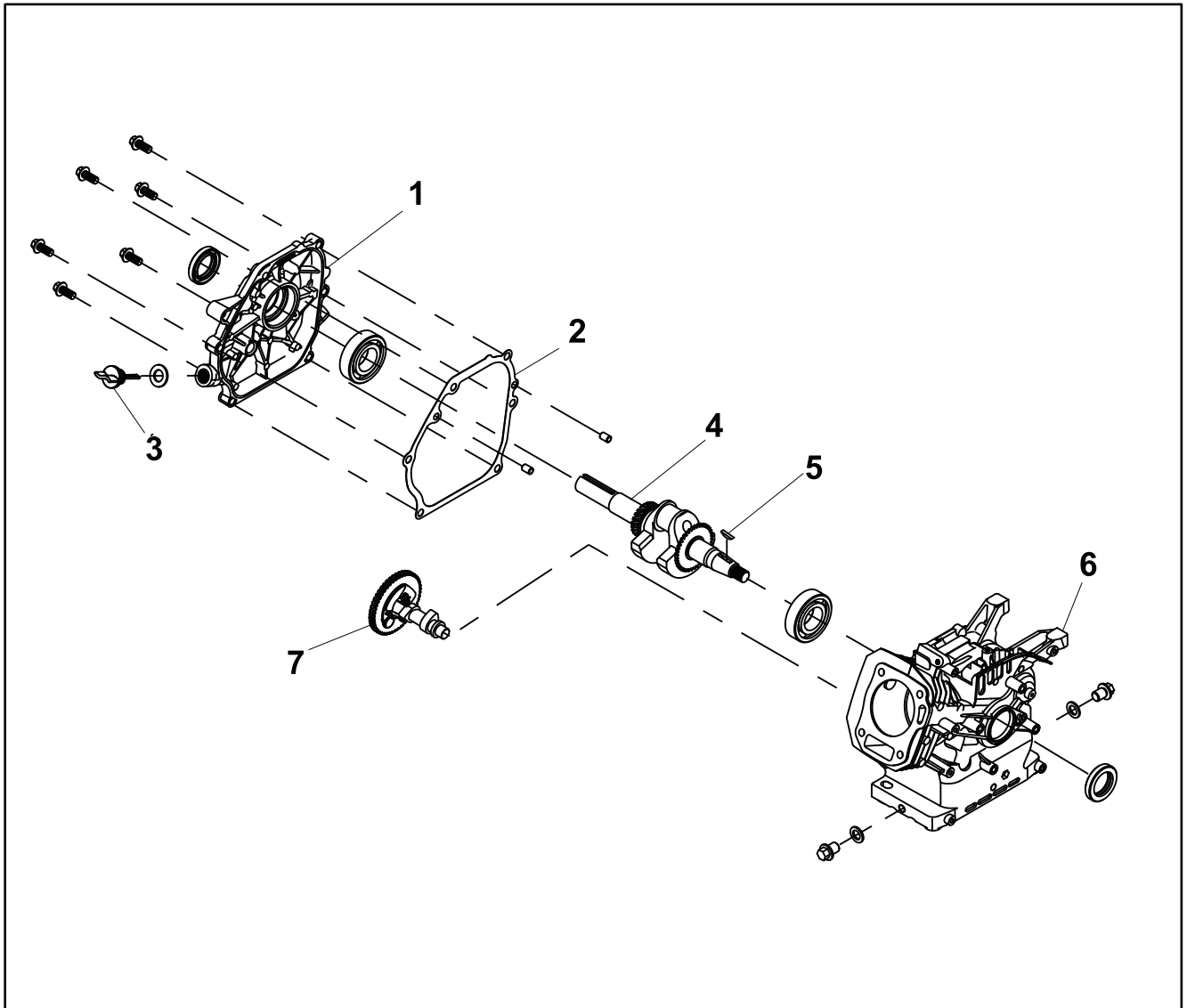


g331499

Figure 342

- | | |
|---------------------------|-------------------|
| 1. Oil Dipstick | 6. Woodruff Key |
| 2. Drain Plug | 7. Crankcase |
| 3. Crankcase Cover | 8. Camshaft |
| 4. Crankcase Cover Gasket | 9. Oil Drain Tube |
| 5. Crankshaft | |

G210-4 Crankcase Cover Assembly



g331500

Figure 343

- | | |
|---------------------------|-----------------|
| 1. Crankcase Cover | 5. Woodruff Key |
| 2. Crankcase Cover Gasket | 6. Crankcase |
| 3. Oil Dipstick | 7. Camshaft |
| 4. Crankshaft | |

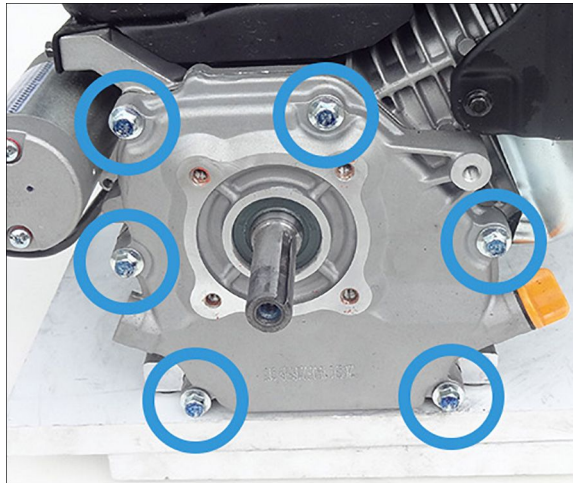
Crankcase Cover Replacement

Crankcase Cover Removal

1. Drain the oil into a suitable container.
2. Clean the crankshaft of rust and debris.
3. Place the piston at the top of the compression stroke.

Note: Insert a wooden dowel into the spark plug hole to verify the piston is at the top of the compression stroke.

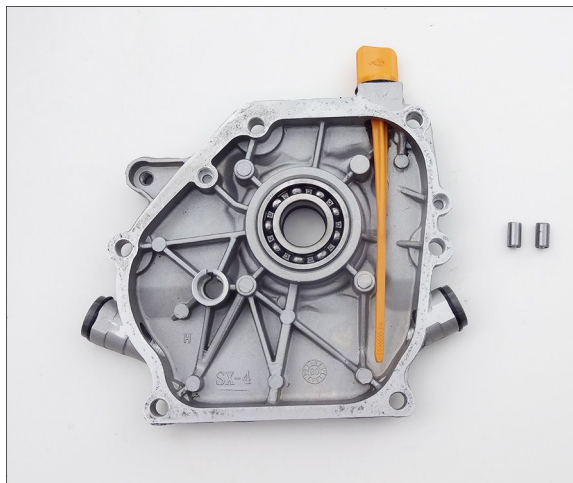
4. Remove the 6 (M8 x 32) screws securing the crankcase cover to the crankcase.



g331674

Figure 344

-
5. Using a plastic hammer, loosen the crankcase cover from the crankcase by alternately taping each side of the fill ports.
 6. Remove the crankcase cover and 2 dowel pins from the crankcase.



g331672

Figure 345

-
7. Remove the ball bearing from the crankcase cover.

Note: The ball bearing has a press-fit tolerance to the side cover and should not fit loosely in the crankcase cover.

Crankcase Cover Removal (continued)



CAUTION



Do not use a metal scraper to remove the gasket. Doing so may damage the aluminum surface.

8. Using a wooden tool or liquid gasket remover, remove the crankcase cover gasket from the crankcase cover and crankcase.
9. Remove and discard the oil seal from the crankcase cover.

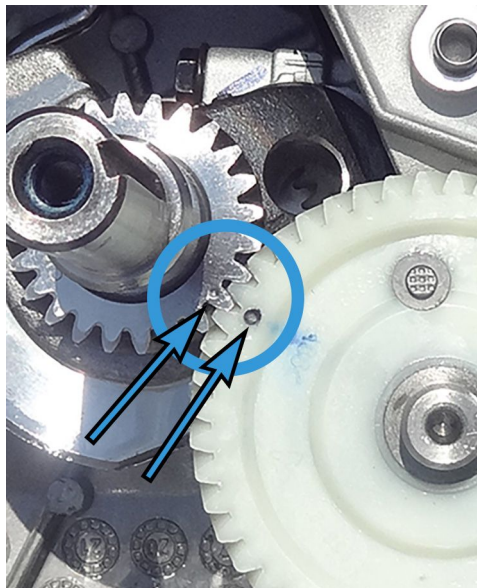
Crankcase Cover Inspection

1. Clean and inspect both the crankcase cover and crankcase surfaces for nicks and deep scratches.
2. Inspect the crankcase cover for cracks or warpage. Replace the crankcase cover if damaged.
3. Inspect the dipstick and tube for damage. Replace the dipstick or tube if damaged.
4. Inspect dipstick/tube mounting threads in crankcase cover. Replace the crankcase cover if damaged.
5. Inspect the ball bearing for corrosion or pitting. Replace the ball bearing if damaged.
6. Inspect the crankcase cover bearing mounting area for corrosion or pitting. Replace the crankcase cover if damaged.

Crankcase Cover Installation

1. Clean both sides of the crankcase cover and crankcase.
2. Verify the camshaft timing mark is matched to the crankshaft timing mark.

Note: If timing marks are not matched, refer to camshaft installation for reassembly. [Camshaft Installation \(page 9–14\)](#)

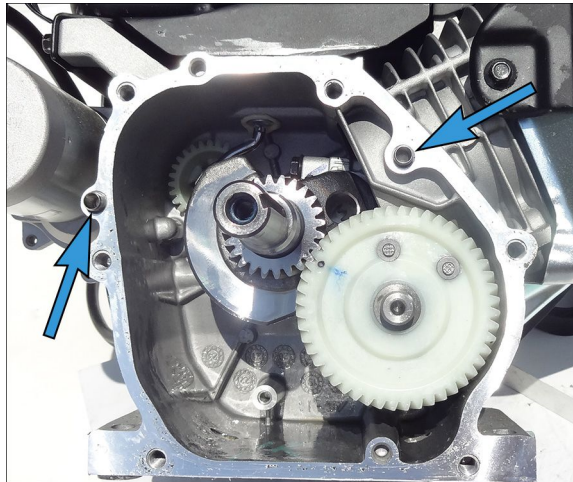


g331668

Figure 346

3. Install the 2 dowel pins into the crankcase.

Crankcase Cover Installation (continued)



g331671

Figure 347

4. Install the new crankcase cover gasket over the dowels and onto the crankcase.
5. Lightly apply engine oil to the outside diameter of the ball bearing. Support the crankcase cover around the opening and press the bearing into the cover until bottomed out against the shoulder of the cover.

Note: The ball bearing has a press-fit tolerance to the side cover and should not fit loosely in the crankcase cover.

6. Slowly slide the crankcase cover onto the crankshaft until flush against the gasket and crankcase.

Note: If necessary, rotate the crankshaft slightly to assist with the crankcase cover installation.

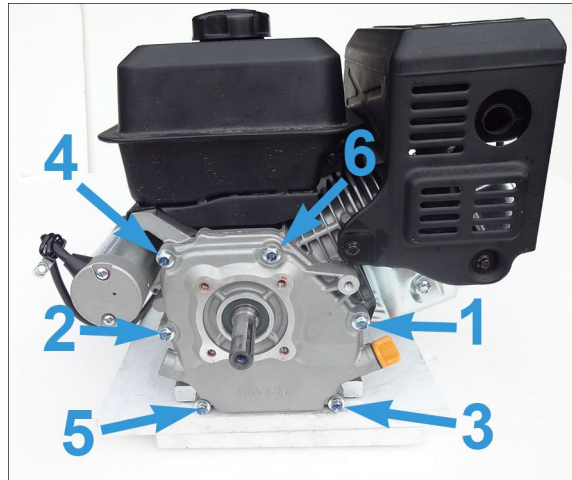


7. Loosely install the 6 (M8 x 32) screws securing the crankcase cover to the crankcase. Torque the screws in an alternating pattern in specification order below.

Note: Do not use the screws to pull the crankcase cover to the crankcase.

- Torque all of the screws to 15 N • m (132 in-lb)
- Torque all of the screws to 29 N • m (252 in-lb)

Crankcase Cover Installation (continued)

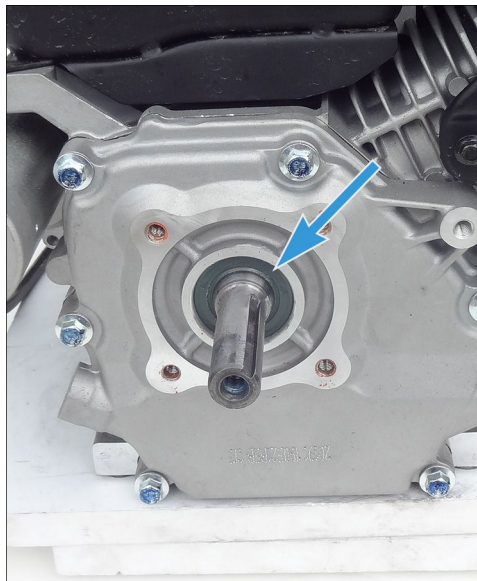


g331673

Figure 348

8. Apply a light coat of engine oil onto the oil seal. Install the oil seal into the crankcase cover until just below flush.

Note: Install the oil seal with the lip side facing inward.



g331669

Figure 349

9. Refill the oil.

Crankcase Cover Test

1. Test run the engine and verify no oil leaks exist.

Camshaft Replacement

Camshaft Removal

1. Drain the oil into a suitable container.
2. Remove the 4 (M6 x 16) screws securing the valve cover to the cylinder head.

Camshaft Removal (continued)

3. Remove the valve cover from the cylinder head. Remove and discard the valve cover gasket.
4. Place the piston at the top of the compression stroke.

Note: Insert a wooden dowel into the spark plug hole to verify the piston is at the top of the compression stroke.

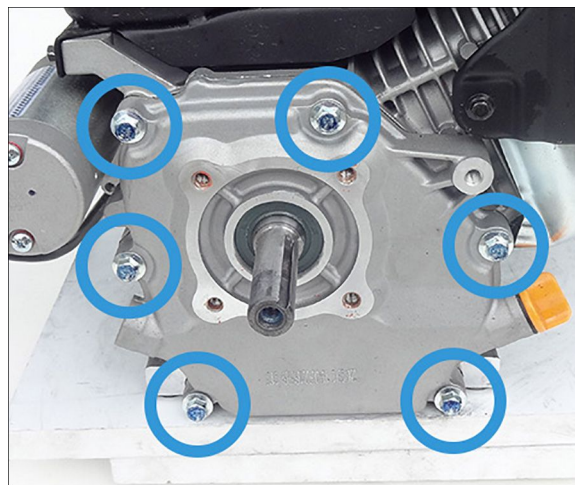
5. Move the rocker arms to the side and remove the push rods.



g327612

Figure 350

-
6. Clean the crankshaft of rust and debris.
 7. Remove the 6 (M8 x 32) screws securing the crankcase cover to the crankcase.



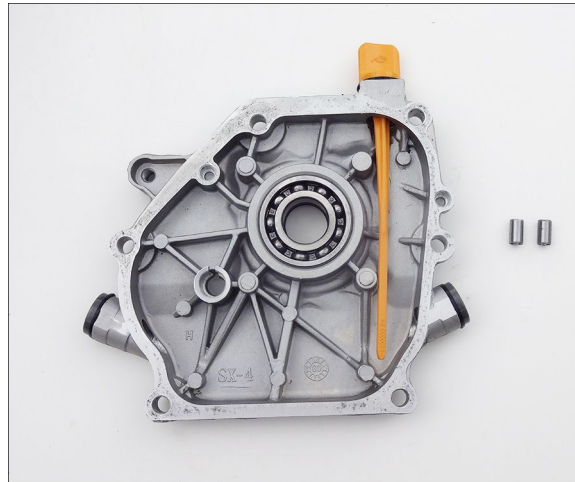
g331674

Figure 351

-
8. Using a plastic hammer, loosen the crankcase cover from the crankcase by alternately tapping each side of the fill ports.
 9. Remove the crankcase cover and the 2 dowel pins from the crankcase.

Note: The ball bearing should remain in the crankcase cover.

Camshaft Removal (continued)



g331672

Figure 352

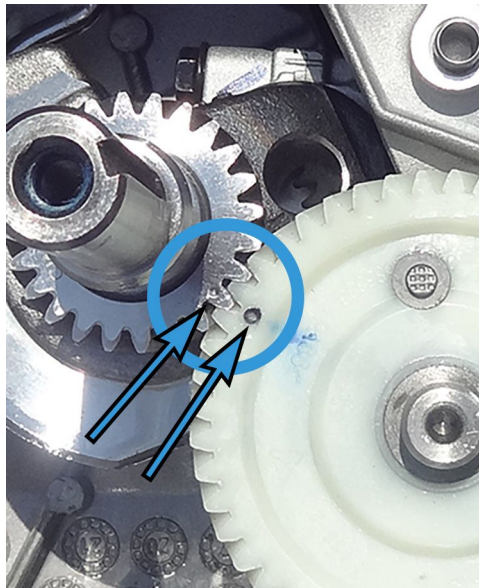


CAUTION



Do not use a metal scraper to remove the gasket. Doing so may damage the aluminum surface.

10. Using a wooden tool or liquid gasket remover, remove the remaining crankcase cover gasket from the crankcase cover and crankcase.
11. Remove and discard the oil seal from the crankcase cover.
12. Rotate the crankshaft until the timing marks are aligned.



g331668

Figure 353

13. Remove the camshaft from the crankcase.

Camshaft Removal (continued)

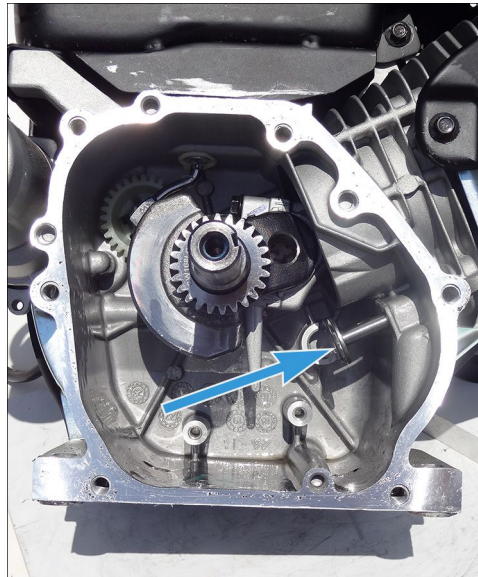


g340489

Figure 354

-
14. Mark the intake and exhaust valve tappets using a permanent marker. Remove the 2 valve tappets from the crankcase.

Note: The intake is closest to the crankcase cover and exhaust is closest to the flywheel.



g332955

Figure 355

Camshaft Removal (continued)



g332956

Figure 356

Camshaft Inspection

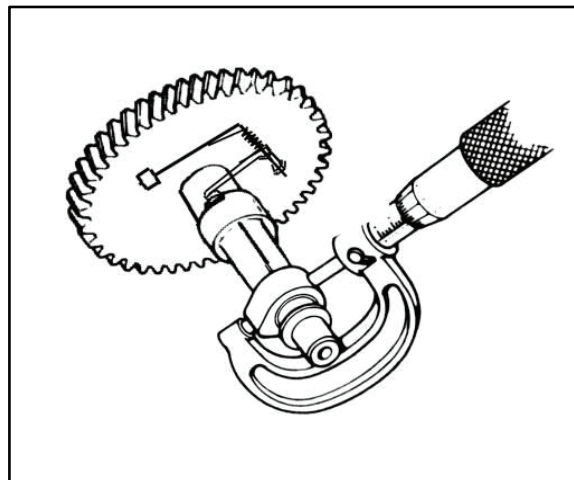
1. Verify the automatic compression release (ACR) is free to move.
2. Inspect the cam gear teeth for damage. Replace the camshaft if damaged.
3. Verify both of the cam lobes are to specification. If not to specification, replace the camshaft.

Intake Lobe Standard: 27.70 mm (1.09055 inches)

Intake Lobe Service Limit: 27.45 mm (1.08071 inches)

Exhaust Lobe Standard: 27.75 mm (1.09252 inches)

Exhaust Lobe Service Limit: 27.50 mm (1.08268 inches)



g338940

Figure 357

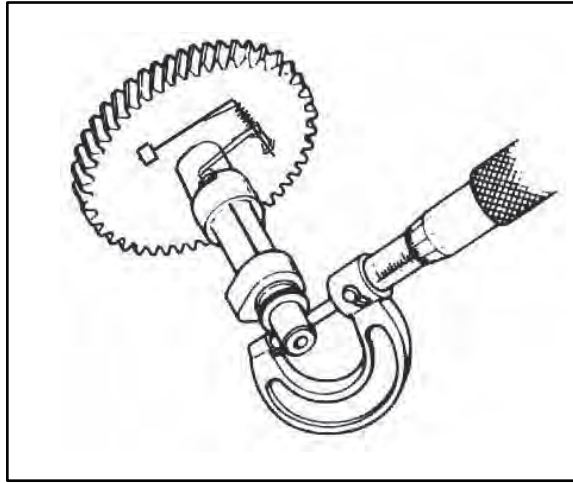
4. Verify both camshaft bearings are to specification. If not to specification, replace the camshaft.

Note: Replace the camshaft if the ACR is sticking or the spring is damaged.

Camshaft Inspection (continued)

Standard: 13.984 mm (0.55055 inch)

Service Limit: 13.916 mm (0.54787 inch)



g338941

Figure 358

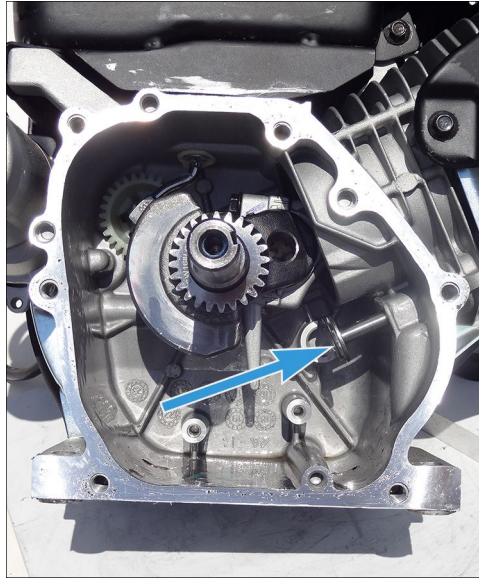
-
5. Inspect the crankcase cover. [Crankcase Cover Inspection \(page 9–7\)](#)
 6. Verify the camshaft bearing in the crankcase cover is to specification. Replace crankcase cover if out of specification.
Standard: 14 mm (0.55118 inch)
Service Limit: 14.048 mm (0.55307 inch)
 7. Inspect the push rods. If the push rods are bent or worn, replace the push rods.
 8. Inspect the valve tappets for damage. Replace the valve tappets if damaged.

Camshaft Installation

1. Apply engine oil to the entirety of the 2 valve tappets.
2. Install the intake and exhaust valve tappets into the crankcase.

Note: The intake is closest to the side cover and the exhaust is closest to the flywheel.

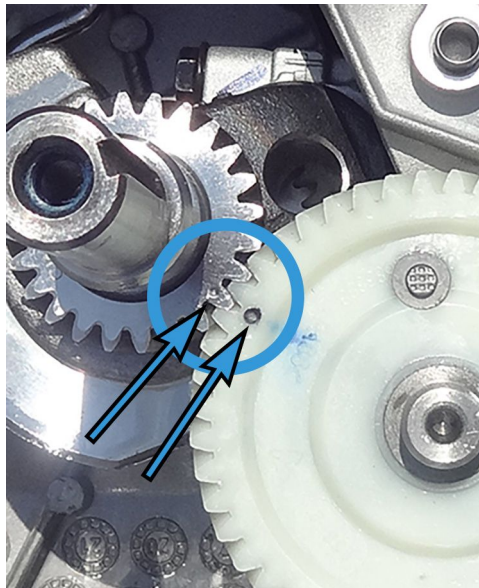
Camshaft Installation (continued)



g332955

Figure 359

3. Apply engine oil to the entire camshaft. Install the camshaft into the crankcase matching the timing marks on the crankshaft gear.

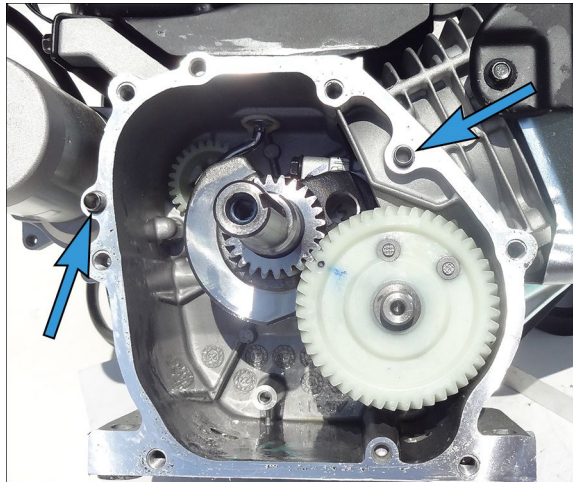


g331668

Figure 360

4. Install the 2 dowel pins into the crankcase.

Camshaft Installation (continued)



g331671

Figure 361

5. Install the new crankcase cover gasket onto the crankcase.
6. If ball bearing was removed, apply a light coat of engine oil on the outside diameter of the ball bearing. Support the crank case cover around the opening and press the ball bearing into the cover until bottomed out against the shoulder of the cover.

Note: The ball bearing has a press-fit tolerance to the side cover and should not fit loosely in the crankcase cover.

7. Slowly slide the crankcase cover onto the crankshaft until flush against the gasket and crankcase.

Note: If necessary, rotate the crankshaft slightly to assist with the crankcase cover installation.

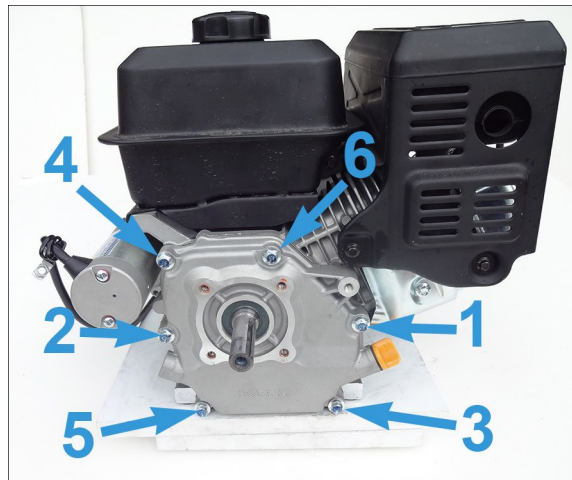


8. Loosely install the 6 (M8 x 32) screws securing the crankcase cover to the crankcase. Torque the screws in a alternating pattern in specification order below.

Note: Do not use the screws to pull the crankcase cover to the crankcase.

- Torque all of the screws to 15 N • m (132 in-lb)
- Torque all of the screws to 29 N • m (252 in-lb)

Camshaft Installation (continued)

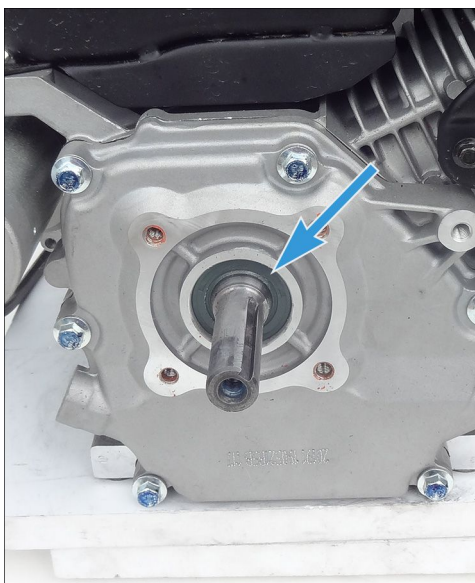


g331673

Figure 362

9. Apply a light coat of engine oil onto the oil seal. Install the oil seal into the crankcase cover until just below flush.

Note: Install the oil seal with the lipped side facing inward.



g331669

Figure 363



10. Install the 2 push rods and align the rocker arms over the push rods. If necessary, loosen the rocker lock nuts or push down on the valve spring to position the rocker arms over the push rods. Verify the 2 valve rotators are installed on each valve stem.

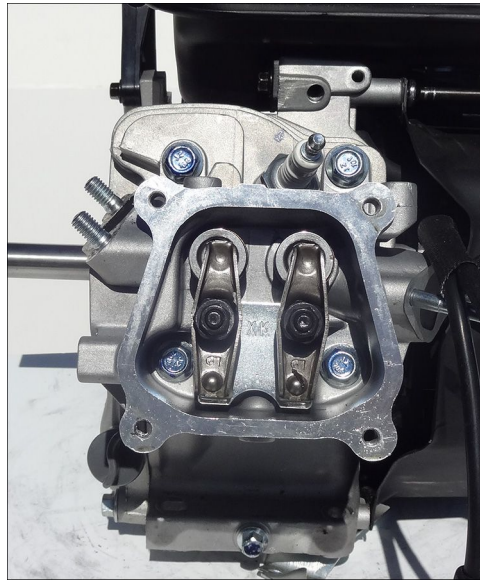
Note: If the valve rotator is not in position, the valve may drop into the cylinder during operation.

Camshaft Installation (continued)



g327612

Figure 364



g334746

Figure 365

11. Place the piston at the top of the compression stroke.

Note: Insert a wooden dowel into the spark plug hole to verify the piston is at the top of the compression stroke.

12. Using a flat feeler gauge, check the intake and exhaust valve clearances.

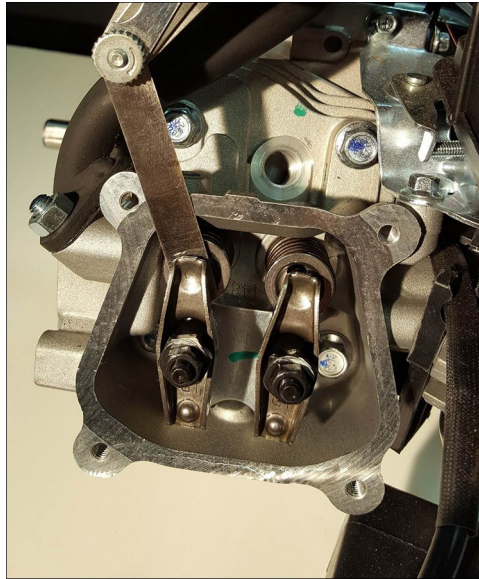
- To adjust the valve clearance, loosen the lock nut while holding the adjuster nut. Loosen the adjuster nut to increase the clearance or tighten the adjuster nut to decrease the clearance.
- Once the clearance is set, tighten the lock nut to specification while holding the pivot nut.

Note: This engine has Automatic Compression Release (ACR) on the exhaust valve.

Camshaft Installation (continued)

Intake Valve Clearance: 0.13–1.17 mm (0.005–0.007 inch)

Exhaust Valve Clearance: 0.18–0.22 mm (0.007–0.009 inch)



g327613

Figure 366

13. Verify the rocker arms are free to rock.
14. Rotate the engine 2 revolutions to verify the valve train opens and closes for all 4 strokes.

Note: The engine has ACR opens the exhaust valve partially for a short time on compression stroke.

15. Install the new valve cover gasket to the cylinder head.



16. Install the valve cover to the cylinder head. Install the 4 (M6 x 16) screws securing the valve cover to the cylinder head. Torque the screws to 10 N • m (89 in-lb).
17. Refill the oil.

Camshaft Test

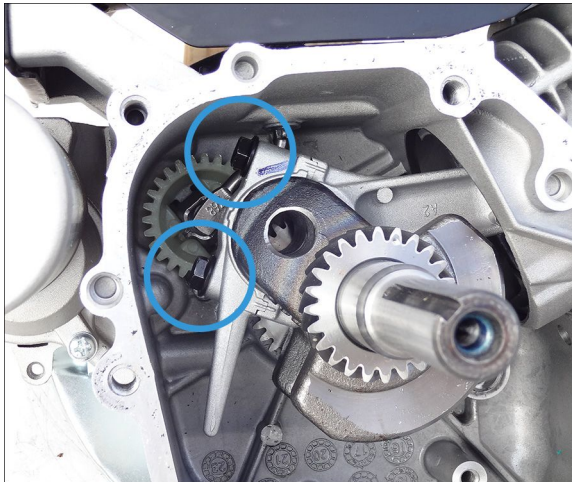
1. Test run the engine and verify no oil leaks exist.

Crankshaft Replacement

Crankshaft Removal

1. Drain the oil into a suitable container.
2. G210–1 engine models only. Remove the G210–1 flywheel. [G210–1 Flywheel Removal \(page 8–7\)](#)
3. G210–2 & G210–4 engine models only, Remove the G210–4 flywheel. [G210–2 & G210–4 Flywheel Removal \(page 8–25\)](#)
4. Remove the camshaft from the engine block. [Camshaft Removal \(page 9–9\)](#)
5. Rotate the crankshaft to gain access to the connecting rod bolts.
6. Remove the 2 connecting rod bolts and connecting rod cap.

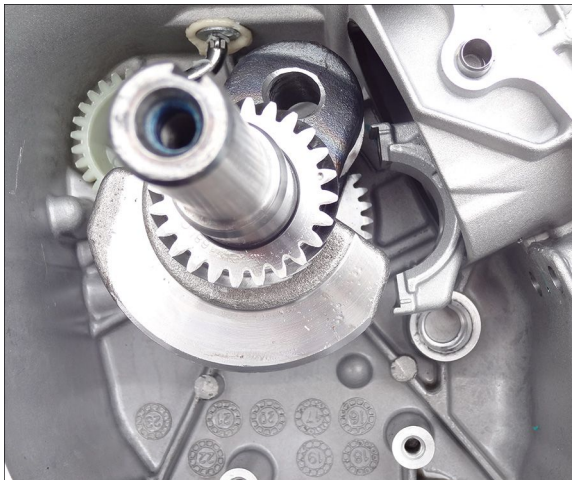
Crankshaft Removal (continued)



g333029

Figure 367

-
7. Rotate the crankshaft to push the piston and rod to Top Center.
 8. Rotate the crankshaft to move the end of the rod away from the crankshaft.



g333032

Figure 368

-
9. Slide and remove the crankshaft from crankcase.

Note: G210-1, G210-2, and G210-4 engine models have different versions crankshafts.

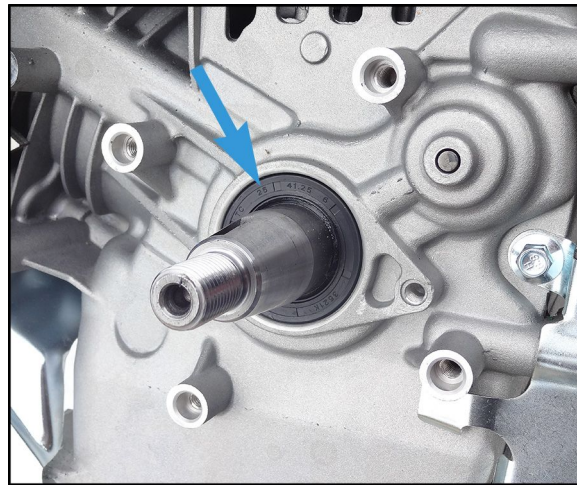
Crankshaft Removal (continued)



g340489

Figure 369

-
10. Remove the oil seal from the outside of the crankcase and discard.



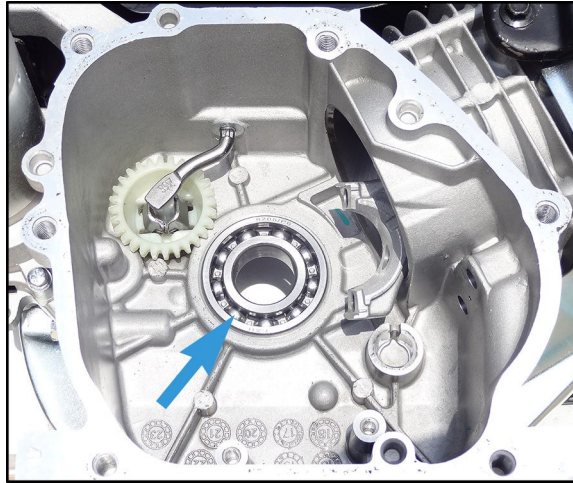
g334871

Figure 370

-
11. Remove the ball bearing from the crankcase.

Note: The ball bearing has a press-fit tolerance to the crankcase and should not fit loosely.

Crankshaft Removal (continued)



g334870

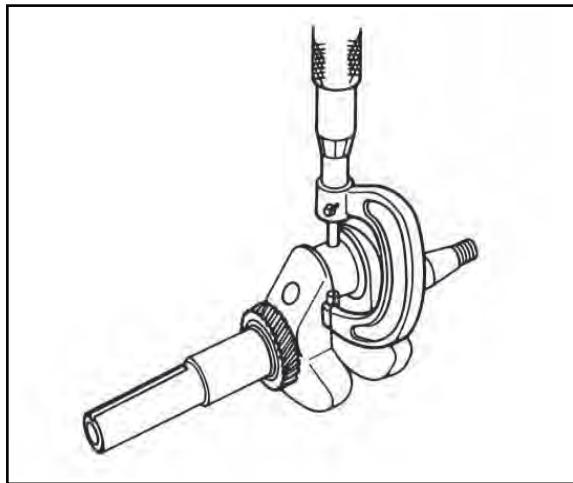
Figure 371

Crankshaft Inspection

1. Inspect the 3 crankshaft bearing surfaces for wear, pits, or other damage. Replace the crankshaft if damaged.
2. Measure and verify the crankshaft rod journal is to specification. Replace the crankshaft if not to specification.

Standard: 30.16 mm (1.18740 inch)

Service Limit: 30.1 mm (1.18503 inch)



g333033

Figure 372

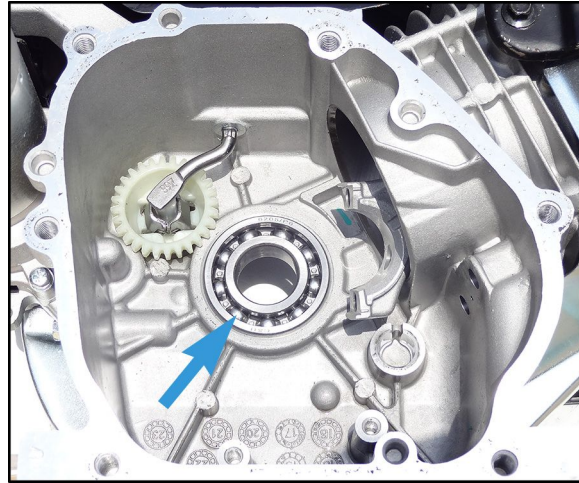
3. Inspect the timing gear teeth for damage. Replace the crankshaft if the timing gear teeth are damaged.
4. Inspect the keyways for damage. Replace the crankshaft if the keyways are damaged.
5. Inspect the threads at each end of the crankshaft for damage. Replace the crankshaft if the threads are damaged.

Crankshaft Installation

1. Verify the piston and connecting rod are at Top Center.

Crankshaft Installation (continued)

2. Apply a light coat of engine oil to the outside diameter of the ball bearing. Support the crankcase housing around the opening and press the ball bearing into the crankcase until bottomed out against the shoulder of the crankcase.

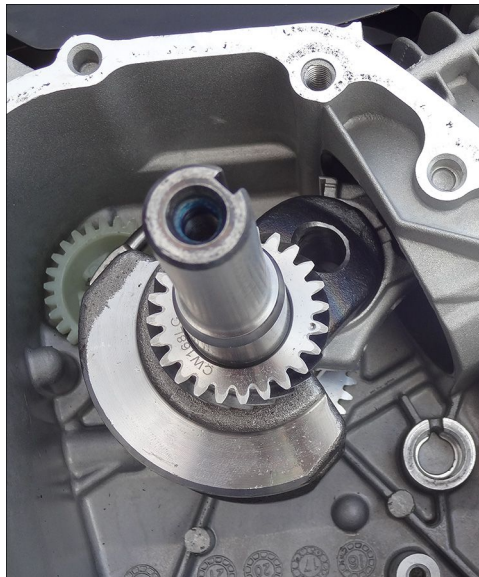


g334870

Figure 373

3. Clean the 3 crankshaft journals and lightly coat with engine oil.
4. Install the crankshaft by slowly sliding the crankshaft through the ball bearing on the flywheel side of the crankcase.
5. Install connecting rod onto the crankshaft journal by rotating crankshaft until connecting rod is seated squarely on the journal.

Note: The connecting rod and piston may need to be rotated in the cylinder to match the flat of the journal.

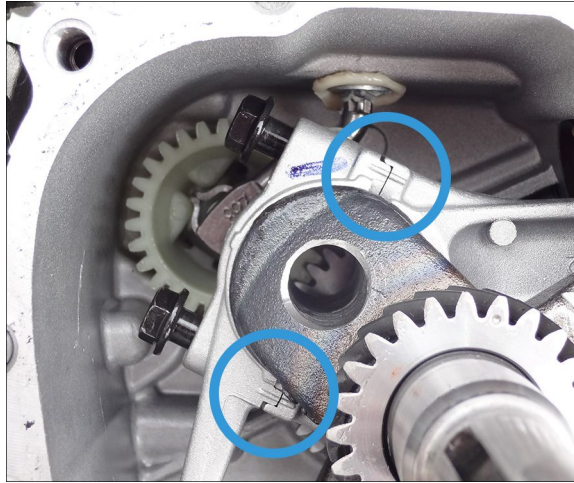


g333031

Figure 374

6. Install the rod cap so that dipper is oriented towards the bottom of the crankcase. Verify the connecting rod cap and mating connecting rod marks are aligned.

Crankshaft Installation (continued)

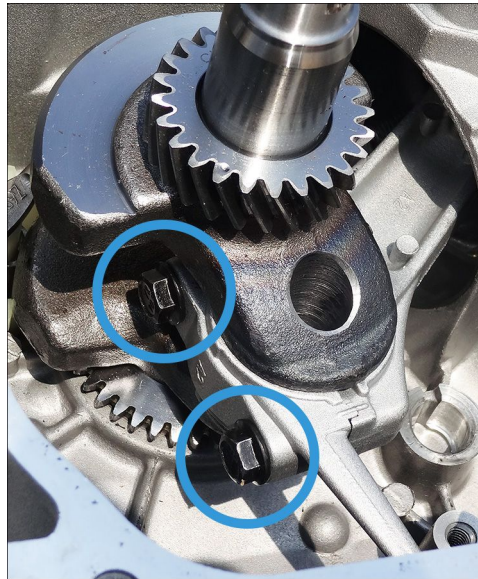


g333030

Figure 375



7. Loosely install the 2 connecting rod bolts securing the connecting rod cap to the journal. Torque the bolts alternating pattern in the specification order below.
 - 5 N • m (44 in-lb)
 - 10 N • m (88 in-lb)
 - 14 N • m (124 in-lb).



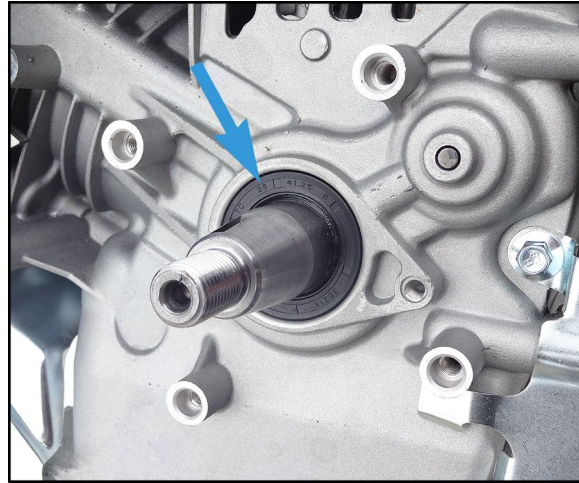
g338328

Figure 376

8. Install the camshaft onto the engine block. [Camshaft Installation \(page 9–14\)](#)
9. Apply a light coat of engine oil to the inner diameter of the oil seal. Press the oil seal into the crankcase until just below flush.

Note: Install the oil seal with the lipped side facing inward.

Crankshaft Installation (continued)



g334871

Figure 377

10. G210–1 engine models only, install the G210–1 flywheel. [G210–1 Flywheel Installation \(page 8–16\)](#)
11. G210–2 & G210–4 engine models only, install the G210–2 & G210–4 flywheel. [G210–2 & G210–4 Flywheel Installation \(page 8–29\)](#)
12. Refill the oil.

Crankshaft Test

1. Test run the engine and verify no oil leaks exist.

Oil Drain Replacement (G210–1, G210–2, & G210–4)

G210–1 & G210–2 Oil Drain Removal

1. Remove the (M10 x 1.25) screw and washer from the oil drain tube. Drain the oil into a suitable container.



g336013

Figure 378

G210-1 & G210-2 Oil Drain Removal (continued)

2. Remove the (M10 x 1.25) screw and washer from the engine block.



g336027

Figure 379

-
3. Remove the oil drain tube and washer from engine block.



g336016

Figure 380

G210-1 & G210-2 Oil Drain Inspection

1. Clean and inspect the cylinder block threads and surrounding cylinder casting for damage. Replace the engine if damaged.
2. Clean and inspect the oil drain tube and the threads on both ends. Replace the oil drain tube if damaged.
3. Clean and inspect drain plug. Replace the drain plug if damaged.
4. If removed, clean and inspect the sealing washers. Replace if damaged.

G210-1 & G210-2 Oil Drain Installation

1. Apply pipe thread sealant suitable for high temperatures to the oil drain tube threads.



2. Install the washer onto the oil drain tube. Install the oil drain tube into the engine block. Torque the oil drain tube to 22 N • m (195 in-lb).



g336016

Figure 381



3. Install the (M10 x 1.25) screw and washer onto the oil drain tube. Torque the screw to 22 N • m (195 in-lb).



g336013

Figure 382

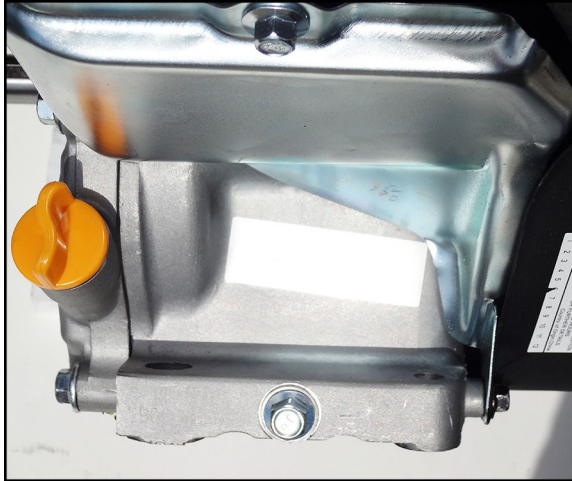
4. Install the (M10 x 1.25) screw and washer onto the engine block.
5. Refill the engine oil.

G210-1 & G210-2 Oil Drain Test

1. Test run the engine and verify no oil leaks exist.

G210-4 Oil Drain Removal

1. Remove the (M10 x 1.25) screw and washer from each side of the engine block.



g336014

Figure 383

-
2. Drain the oil into a suitable container.

G210-4 Oil Drain Inspection

1. Clean and inspect the screws for damage. Replace if damaged.
2. Clean and inspect the washers for damage. Replace if damaged.

G210-4 Oil Drain Installation



1. Install the (M10 x 1.25) screw and washer onto each side of the engine block. Torque the screw to 22 N • m (195 in-lb).



g336014

Figure 384

-
2. Refill the engine oil

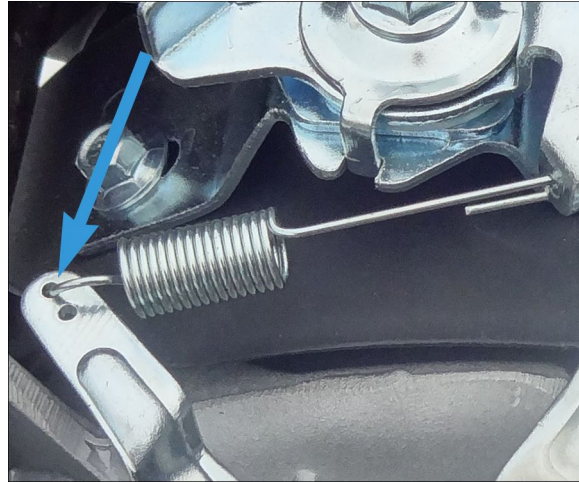
G210-4 Oil Drain Test

1. Test run the engine and verify no oil leaks exist.

Governor Gear Assembly Replacement (G210-1, G210-2, & G210-4)

G210-1 Governor Gear Assembly Removal

1. Drain the fuel and oil into a suitable container.
2. Remove the G210-1 flywheel. [G210-1 Flywheel Removal \(page 8-7\)](#)
3. Unhook the governor spring from the governor arm and speed control assembly.



g325633

Figure 385

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4. Loosen the (M6) flange nut secured to the governor arm bolt. Remove the governor arm off of the governor shaft.

Note: A small flat bladed screwdriver can be used to pry the clamp open to allow the governor arm to lift up more easily.



g325632

Figure 386

-
5. Slide the hair pin upward and out of the slot on the governor shaft.

G210–1 Governor Gear Assembly Removal (continued)

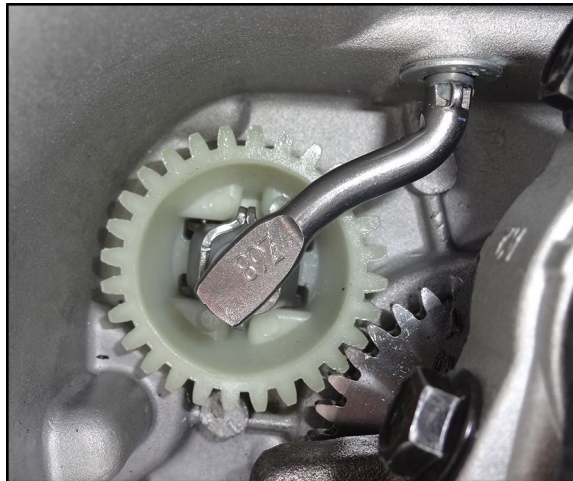


g337344

Figure 387

-
6. Remove the crankcase cover from the engine block. [Crankcase Cover Removal \(page 9–6\)](#)
 7. Rotate the crankshaft to access the governor gear assembly.
 8. Rotate the governor shaft away from the governor spool.

Note: Do not rotate the crankshaft. Damage to the governor shaft may occur.

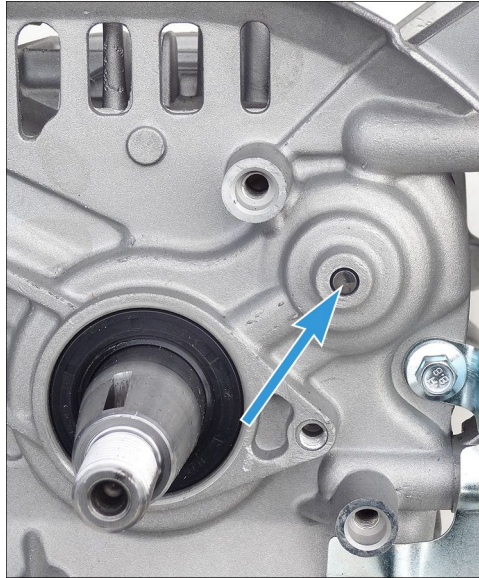


g337343

Figure 388

-
9. Place a shop towel inside the crankcase to catch the governor gear assembly.
 10. Position the engine with the PTO side of the crankcase downwards. Support the engine so the crankshaft is not carrying weight.
 11. Use a 3/16 inch pin punch to drive out the governor gear assembly from the crankcase.

G210-1 Governor Gear Assembly Removal (continued)

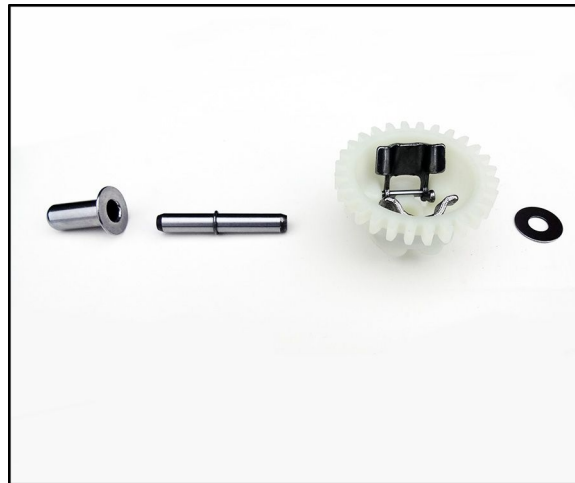


g337341

Figure 389

12. Remove the shop towel and governor gear assembly.

Note: There are 2 types of governor gear assemblies. One with a plastic spool and one with a metal spool.



g337339

Figure 390

G210–1 Governor Gear Assembly Removal (continued)



g337340

Figure 391

G210–1 Governor Gear Assembly Inspection

1. Clean and inspect the hole in the crankcase where the governor gear assembly was installed. If damage exists, replace the engine.
2. If installing a used governor gear assembly, inspect the components below. If any components are damaged, obtain a new governor gear assembly.
 - Inspect the gear teeth for wear or damage.
 - Inspect the center bore if worn or loose on shaft.
 - Inspect the flyweights for cracks, worn, or bent.
 - Inspect the spool if cracked or worn. Verify the spool slides freely on shaft.
 - Inspect the shaft if galled or rough where the spool and gear assembly rotate.
 - Inspect the washer(s) if worn, bent, or damaged.
3. Verify the governor shaft and arm are free to rotate in the crankcase.

G210–1 Governor Gear Assembly Installation

1. Position the crankcase so that the flywheel side of the engine is downward. Support the crankcase where the governor gear assembly will be installed.

Note: Do not let the assembly rest on the end of the crankshaft of the choke lever.
2. Rotate the crankshaft to allow access to the governor gear area.
3. Swing the governor shaft towards the crankshaft.
4. Install the washer into the crankcase.
5. Assemble the governor assembly by inserting the long end of shaft into the plastic gear assembly.

G210–1 Governor Gear Assembly Installation (continued)



g337342

Figure 392

6. Place the governor gear assembly into the crankcase and verify the teeth of the governor gear assembly mesh with the crankshaft gear.
7. Press the governor gear assembly into the crankcase. Verify the clearance between the washer and the crankcase is 0.05–0.35 mm (0.002–0.013 inch).
8. If installing the plastic spool, install the washer and plastic spool on the governor gear shaft.
9. If installing the metal spool, install the metal spool onto the governor gear shaft.
10. Rotate the governor shaft so the lever end contacts the governor spool.



g337343

Figure 393

11. Install the hair pin on the governor shaft with the open end of the hair pin pointing towards the flywheel. Verify the governor shaft only rotates a few degrees and lever does not contact the crankshaft.

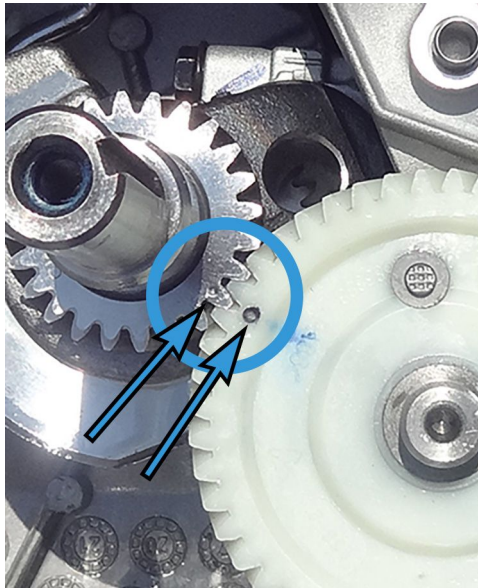
G210–1 Governor Gear Assembly Installation (continued)



g337344

Figure 394

12. Remove the spark plug from cylinder head and rotate the crankshaft 360° to verify the governor gear assembly rotates freely.
13. Verify the camshaft timing mark is matched up to the crankshaft timing mark.



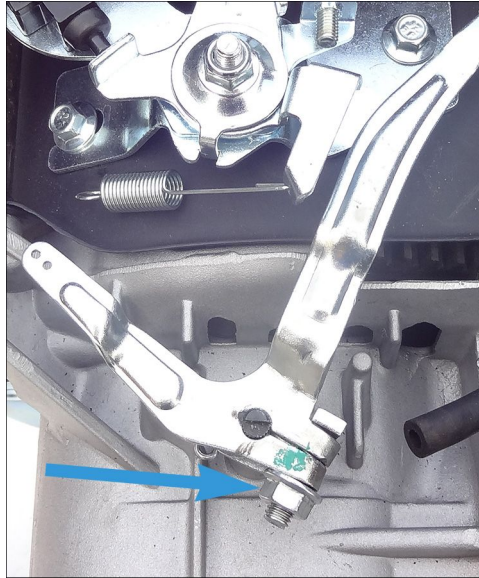
g331668

Figure 395



14. Install the spark plug into cylinder head. Torque the spark plug to 29 N • m (21 ft-lb).
15. Install the crankcase cover. [Crankcase Cover Installation \(page 9–7\)](#)
16. Align the governor bolt and (M6) flange nut so that bolt head is captured by the governor arm. Slide the governor arm over the governor shaft protruding from top of engine block. Loosely install the flange nut.

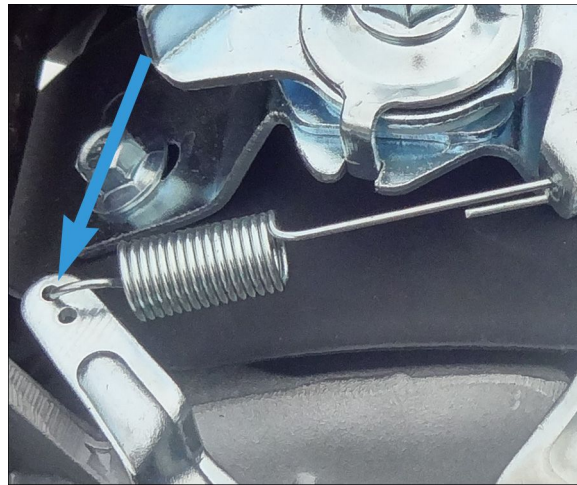
G210–1 Governor Gear Assembly Installation (continued)



g325632

Figure 396

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17. Connect the governor spring to the governor arm and speed control assembly.



g325633

Figure 397

-
18. Zero the governor. [Zeroing the Governor \(page 6–16\)](#)
 19. Install the G210–1 flywheel. [G210–1 Flywheel Installation \(page 8–16\)](#)
 20. Refill the fuel and oil.
 21. Set Top No Load RPM. [Top No Load RPM \(page 6–18\)](#)

G210–1 Governor Gear Assembly Test

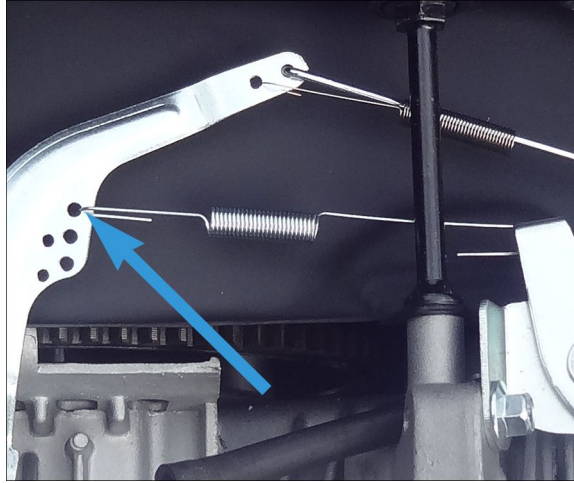
1. Start and run the engine to verify Top No Load RPM. [Specifications \(page 2–2\)](#)
2. Verify no oil leaks exist.

G210–2 & G210–4 Governor Gear Assembly Removal

1. Drain the fuel and oil into a suitable container.

G210–2 & G210–4 Governor Gear Assembly Removal (continued)

2. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
3. Unhook the governor spring from the governor arm.

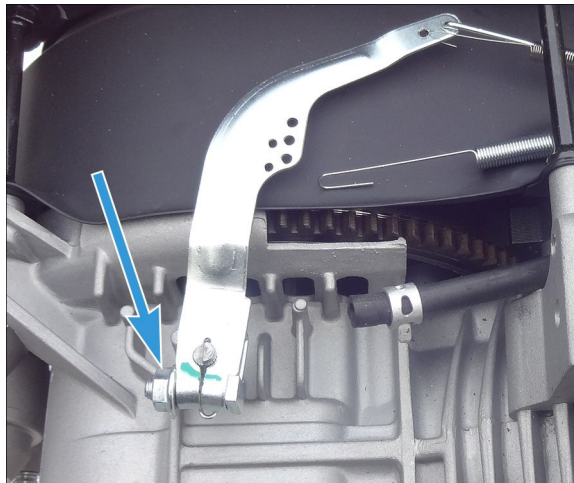


g325636

Figure 398

-
4. Loosen the (M6) flange nut secured to the governor arm bolt. Slide the governor arm off of the governor shaft.

Note: A small flat bladed screwdriver can be used to pry the clamp open to allow arm to lift up more easily



g325635

Figure 399

-
5. Slide the hair pin upward and out of the slot on the governor shaft.

G210-2 & G210-4 Governor Gear Assembly Removal (continued)

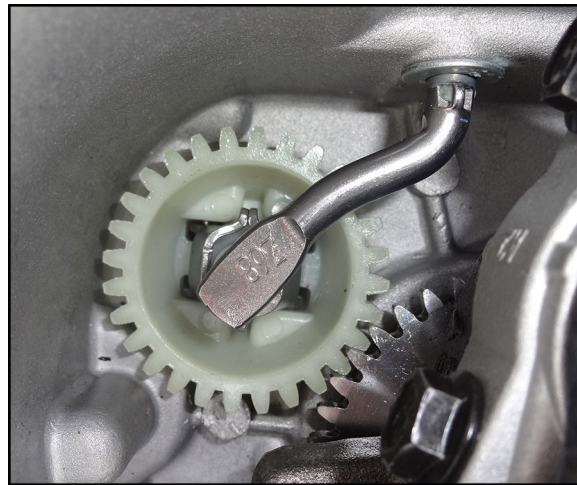


g337344

Figure 400

6. Remove the G210-2 & G210-4 flywheel. [G210-2 & G210-4 Flywheel Removal \(page 8-25\)](#)
7. Remove the crankcase cover from the engine block. [Crankcase Cover Removal \(page 9-6\)](#)
8. Rotate the crankshaft to access the governor gear assembly.
9. Rotate the governor shaft away from the governor spool.

Note: Do not rotate the crankshaft. Damage to the governor shaft may occur.

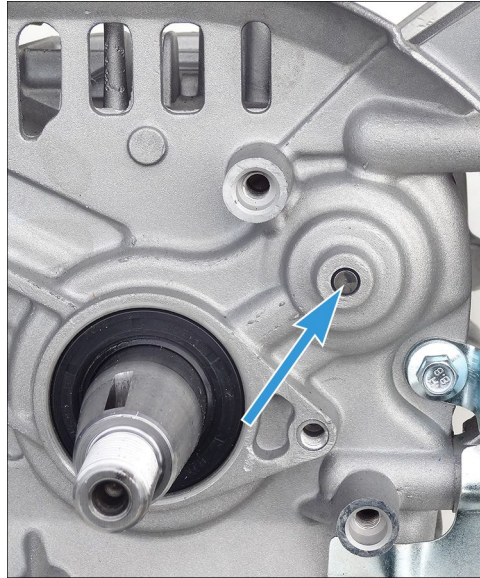


g337343

Figure 401

10. Place a shop towel inside the crankcase to catch the governor gear assembly.
11. Position the engine with the PTO side of the crankcase downwards. Support the engine so the crankshaft is not carrying weight.
12. Use a 3/16 inch pin punch to drive out the governor gear assembly from the crankcase.

G210-2 & G210-4 Governor Gear Assembly Removal (continued)

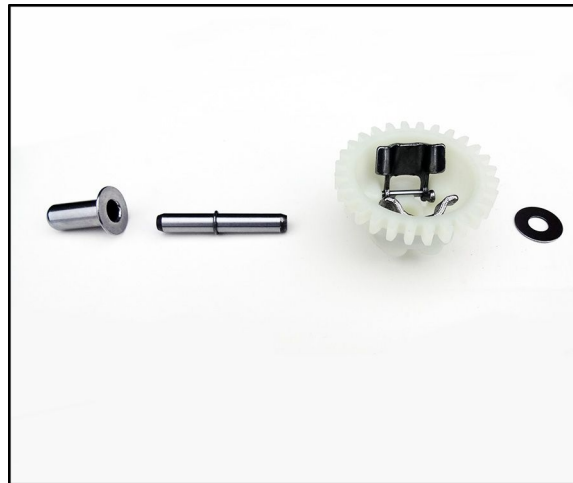


g337341

Figure 402

-
13. Remove the shop towel and governor gear assembly.

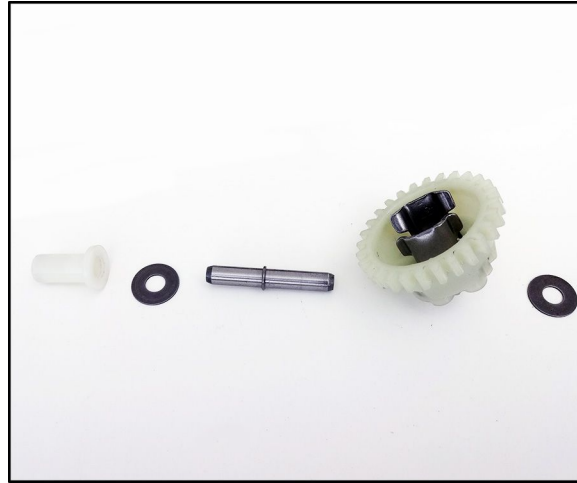
Note: There are 2 types of governor gear assemblies. One with a plastic spool and one with a metal spool.



g337339

Figure 403

G210–2 & G210–4 Governor Gear Assembly Removal (continued)



g337340

Figure 404

G210–2 & G210–4 Governor Gear Assembly Inspection

1. Clean and inspect the hole in the crankcase where the governor gear assembly was installed. If damage exists, replace the engine.
2. If installing a used governor gear assembly, inspect the components below. If any components are damaged, obtain a new governor gear assembly.
 - Inspect the gear teeth for wear or damage.
 - Inspect the center bore if worn or loose on shaft.
 - Inspect the flyweights for cracks, worn, or bent.
 - Inspect the spool if cracked or worn. Verify the spool slides freely on shaft.
 - Inspect the shaft if galled or rough where the spool and gear assembly rotate.
 - Inspect the washer(s) if worn, bent, or damaged.
3. Verify the governor shaft and arm are free to rotate in the crankcase.

G210–2 & G210–4 Governor Gear Assembly Installation

1. Position the crankcase so that the flywheel side of the engine is downward. Support the crankcase where the governor gear assembly will be installed.

Note: Do not let the assembly rest on the end of the crankshaft on the choke lever.
2. Rotate the crankshaft to allow access to the governor gear area.
3. Swing the governor shaft toward the crankshaft.
4. Install the washer into crankcase.
5. Assemble the governor gear assembly.

G210–2 & G210–4 Governor Gear Assembly Installation (continued)



g337342

Figure 405

6. Place the governor gear assembly into the crankcase and verify the teeth of the governor gear assembly are mesh with the crankshaft gear.
7. Press the governor gear assembly into the crankcase. Verify the clearance between the washer and the crankcase is 0.05–0.35 mm (0.002–0.013 inch).
8. If installing the plastic spool, install the washer and plastic spool on the governor gear shaft.
9. If installing the metal spool, install the metal spool onto the governor gear shaft.
10. Rotate the governor shaft so the lever end contacts the governor spool.



g337343

Figure 406

11. Install the hair pin on the governor shaft with the open end of the hair pin pointing towards the flywheel. Verify the governor shaft only rotates a few degrees and lever does not contact the crankshaft.

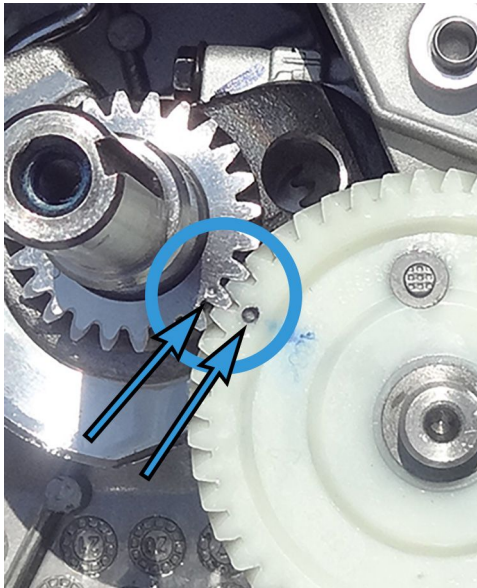
G210-2 & G210-4 Governor Gear Assembly Installation (continued)



g337344

Figure 407

12. Remove the spark plug from cylinder head and rotate the crankshaft 360° to verify the governor gear assembly rotates freely.
13. Verify the camshaft timing mark is matched up to the crankshaft timing mark.



g331668

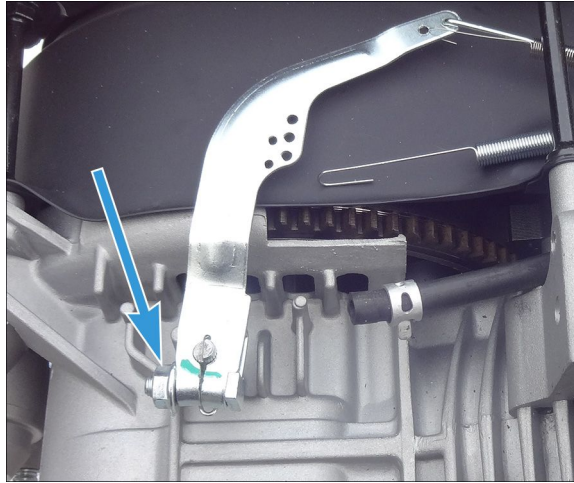
Figure 408

14. Install the crankcase cover. [Crankcase Cover Installation \(page 9-7\)](#)



15. Install the spark plug into cylinder head. Torque the spark plug to 29 N • m (21 ft-lb).
16. Align the governor bolt and (M6) flange nut so that bolt head is captured by the governor arm. Slide the governor arm over the governor shaft protruding from top of the engine block. Loosely install the flange nut.

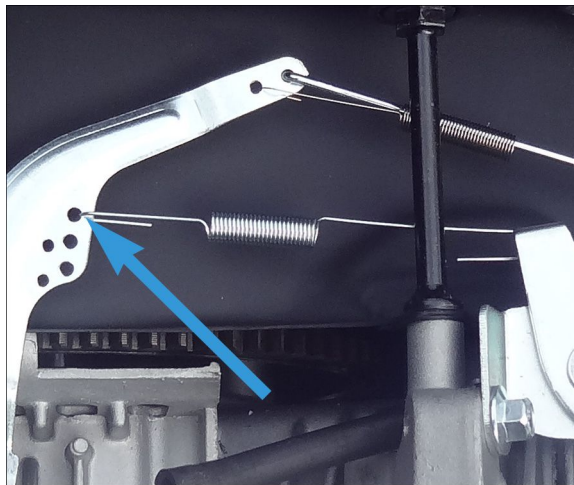
G210–2 & G210–4 Governor Gear Assembly Installation (continued)



g325635

Figure 409

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17. Connect the governor spring to the governor arm and speed control assembly.



g325636

Figure 410

-
18. Zero the governor. [Zeroing the Governor \(page 6–16\)](#)
 19. Install the G210–2 & G210–4 flywheel. [G210–2 & G210–4 Flywheel Installation \(page 8–29\)](#)
 20. Install the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
 21. Refill the fuel and oil.
 22. Set Top No Load RPM. [Top No Load RPM \(page 6–18\)](#)

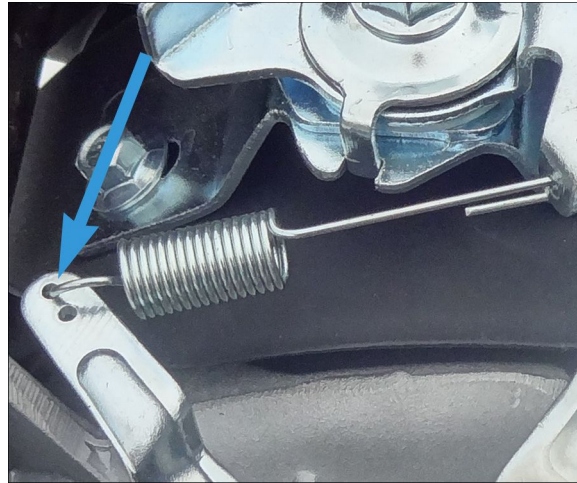
G210–2 & G210–4 Governor Gear Assembly Test

1. Start and run the engine to verify Top No Load RPM. [Specifications \(page 2–2\)](#)
2. Verify no oil leaks exist.

Governor Shaft Replacement (G210-1, G210-2, & G210-4)

G210-1 Governor Shaft Removal

1. Drain the fuel and oil into a suitable container.
2. Remove the crankshaft from the engine block. [Crankshaft Removal \(page 9-19\)](#)
3. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
4. Unhook the governor spring from the governor arm.



g325633

Figure 411

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5. Loosen the (M6) flange nut secured to the governor arm bolt. Remove the governor arm off of the governor shaft.

Note: A small flat bladed screwdriver can be used to pry the clamp open to allow governor arm to lift up more easily.



g325632

Figure 412

-
6. While holding spline of the governor shaft, remove hairpin from the governor shaft.

G210–1 Governor Shaft Removal (continued)



g337344

Figure 413

-
7. Remove the governor shaft and washer from the inside of the crankcase.



g340491

Figure 414

G210–1 Governor Shaft Inspection

1. Clean and inspect the hole in the crankcase where the governor shaft is installed. If damaged, replace the engine.
2. Clean and inspect the governor shaft for damage. If damaged or worn, replace the governor shaft.
3. Clean and inspect the washer. If damaged or worn, replace the washer.
4. Inspect the hair clip. If the hair pin is damaged or will not stay attached to the governor shaft, replace the hair pin.

G210–1 Governor Shaft Installation

1. Install the washer on the splined end of the governor shaft.

G210–1 Governor Shaft Installation (continued)

2. Install the splined end of the governor shaft through the hole in the crankcase. Position the governor shaft so the lever makes contact with the governor spool.
3. Install the hair pin on the governor shaft with the open end of the hair pin pointing towards the flywheel.



g337344

Figure 415

-
4. Install the crankshaft onto the engine block. [Crankshaft Installation \(page 9–22\)](#)
 5. Align the governor bolt and (M6) flange nut so that the bolt head is captured by the governor arm. Slide the governor arm over the governor shaft protruding from top of the engine block. Loosely install the flange nut.

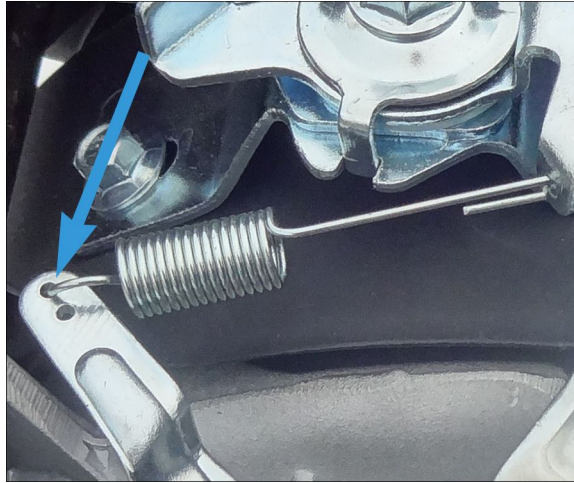


g325632

Figure 416

-
6. Connect the governor spring to the governor arm and speed control assembly.

G210–1 Governor Shaft Installation (continued)



g325633

Figure 417

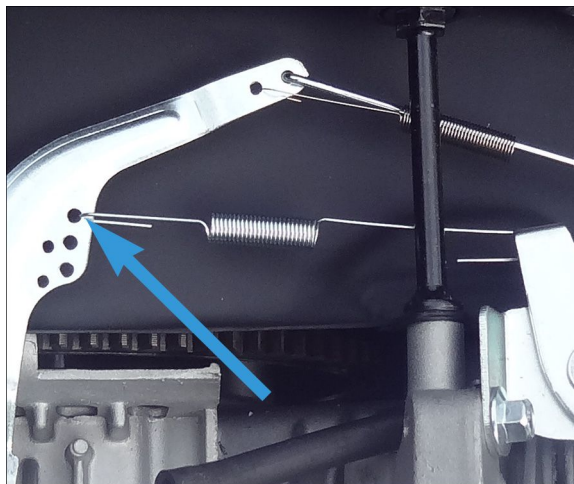
7. Zero the governor. [Zeroing the Governor \(page 6–16\)](#)
8. Refill the fuel and oil.
9. Set Top No Load RPM. [Top No Load RPM \(page 6–18\)](#)

G210–1 Governor Shaft Test

1. Start and run the engine to verify Top No Load RPM. [Specifications \(page 2–2\)](#)
2. Verify no oil leaks exist.

G210–2 & G210–4 Governor Shaft Removal

1. Drain the fuel and oil into a suitable container.
2. Remove the crankshaft from the engine block. [Crankshaft Removal \(page 9–19\)](#)
3. Remove the fuel tank from the engine block. Refer to the product Service Manual for the fuel tank removal procedures.
4. Unhook the governor spring from the governor arm.



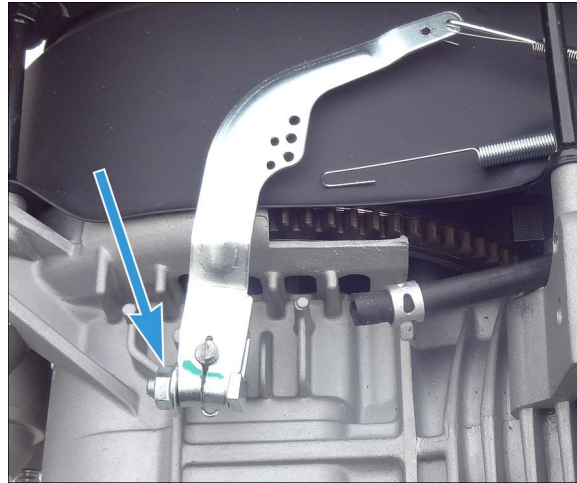
g325636

Figure 418

G210-2 & G210-4 Governor Shaft Removal (continued)

5. Loosen the (M6) flange nut secured to the governor arm bolt. Remove the governor arm from the governor shaft.

Note: A small flat bladed screwdriver can be used to pry the clamp open to allow arm to lift up more easily.



g325635

Figure 419

6. While holding the spline of the governor shaft, remove the hairpin from the governor shaft.



g337344

Figure 420

7. Remove the governor shaft and washer from the inside of the crankcase.

G210–2 & G210–4 Governor Shaft Removal (continued)



g340491

Figure 421

G210–2 & G210–4 Governor Shaft Inspection

1. Clean and inspect the hole in the crankcase where the governor shaft is installed. If damaged, replace the engine.
2. Clean and inspect the governor shaft for damage. If damaged or worn, replace the governor shaft.
3. Clean and inspect the washer. If damaged or worn, replace the washer.
4. Inspect the hair clip. If the hair pin is damaged or will not stay attached to the governor shaft, replace the hair pin.

G210–2 & G210–4 Governor Shaft Installation

1. Install the washer on the splined end of the governor shaft.
2. Install the splined end of the governor shaft through the hole in the crankcase. Position the governor shaft so the lever makes contact with the governor spool.
3. Install the hair pin on the governor shaft with the open end of the hair pin pointing towards the flywheel. Verify the governor shaft only rotates a few degrees.

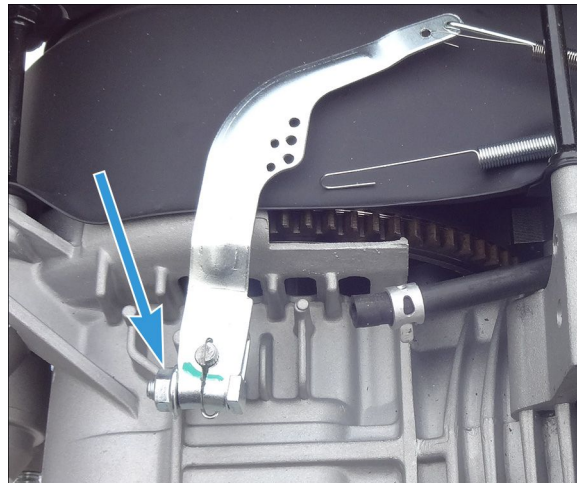
G210-2 & G210-4 Governor Shaft Installation (continued)



g337344

Figure 422

4. Install the crankshaft onto the engine block. [Crankshaft Installation \(page 9-22\)](#)
5. Align the governor bolt and (M6) flange nut so that the bolt head is captured by the governor arm. Slide the governor arm over the governor shaft protruding from top of engine block. Loosely install the flange nut.

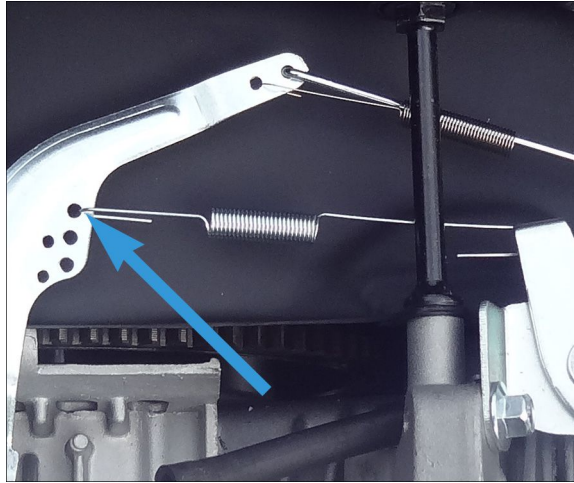


g325635

Figure 423

6. Connect the governor spring to the governor arm and speed control assembly.

G210–2 & G210–4 Governor Shaft Installation (continued)



g325636

Figure 424

7. Zero the governor. [Zeroing the Governor \(page 6–16\)](#)
8. Install the fuel tank onto the engine block. Refer to the product Service Manual for the fuel tank installation procedures.
9. Refill the fuel and oil.
10. Set Top No Load RPM. [Top No Load RPM \(page 6–18\)](#)

G210–2 & G210–4 Governor Shaft Test

1. Start and run the engine to verify Top No Load RPM. [Specifications \(page 2–2\)](#)
2. Verify no oil leaks exist.