



## **Briggs & Stratton**

### **Animal**

### **Tech Manual**



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## **ANIMAL CLAIM RULE - For M SERIES QMA Type Engines**

1. All engine claims must follow procedure listed in QMA rule book. Please see Article 6, Section 1

## **ANIMAL SUSPENSIONS**

1. All suspensions must follow procedure listed in QMA rule book. Please see Article 6, Section 2

### **Section 1**

#### **General Rules**

1. Only stock Briggs & Stratton Animal engine and gearbox M series Model #124432 820301 and M updated series model # 8202-01-lo 206 will be used in these classes. All parts will be stock unaltered Briggs & Stratton Animal specifically made for this engine.
2. No modifications, alterations, additions, subtractions, deletions, or other changes are permitted to be done to these engines or their component parts specifically allowed in these rules.
3. The use of air filter during Qualifying at asphalt and dirt events is illegal. The senior Tech official reserves the right to allow filters at any event that is deemed necessary.
4. Direct Drive only; Clutches are not allowed.

ALL PARTS ARE SUBJECT TO COMPARISON WITH A KNOWN STOCK PART. If it does not specifically say in this manual that you can then you cannot!

5. Modifications or machining of any parts in order to bring them to stated minimum/maximum specs, (or for any reason). "Blueprinting" is not legal.
6. Fuel: Gasoline only, no additives. Tech procedure is per QMA Rule Book Article 9.
7. ALL PERTINANT PENALTIES WILL APPLY.
8. NO welding NO addition or removal of any material. NO painting or polishing of any part of engine or gearbox.

### **Section 2**

#### **Required Modifications**

1. **Gearbox:** Only Briggs & Stratton gearbox part # 555721 is allowed. Ring gear may not be altered in any way with the exception of the keyed end of shaft that may be shortened, drilled or tapped or machined for snap ring groove. Keyway may be cut deeper. No other machining allowed.
2. **Electric Starter:** blower-housing openings must be covered with a fabricated metal cover. You should not be able to see **any** of the flywheel.
3. **Recoil Starter:** Recoil starter must be removed. Starter cup may be cut down or replaced with a flat washer, Briggs Part number 691736 for flat washer. The M series engine comes with a black plastic flywheel-opening screen. This **Must** be removed as airflow into the engine may not be impeded by this or any other means.
4. **Exhaust:** Any exhaust gasket will be allowed (NO SILICONE). Must use exhaust port extension in port. Minimum of a 0.520 length measured from the bottom of the exhaust flange to the end of the pipe using a depth mic. Any style of pipe and max of two (2) B & S mufflers only. Briggs style mufflers may be cut and welded to pipe baffle and center plug must remain unaltered. Optional candy cane style pipe may be used with RLV 4100 unmodified muffler. If this style is used muffler must be clamped to pipe so it may be removed. Welding washer on muffler for safety wire is permitted. All 4 baffle plates must be in proper location and unaltered. Holes measure .1285 max. All exhaust must pass thru muffler or mufflers. Spec on candy cane pipe 16.5 to 18.5 in length measured from port extension to end of pipe. 1 inch max OD straight walled no steps- tapers- butt welds or stages.
  - A) Exhaust oxygen sensor or temp sensor attached to any part of the Animal exhaust system is illegal.
5. **Oil Breather:** Oil breather must vent to catch can under the tail cone within the engine compartment.
6. **Carburetor Overflow:** Carburetor overflow may be vented to the ground. .
7. **Scatter Shield:** Scatter shield required. Scatter shield may be altered for installation of motor bolts. (see page 11)

### Section 3 Allowable Modifications

1. **Crankshaft Seal:** Crankshaft seal must be removed on gearbox side of engine for addition of gearbox.
2. **Flywheel Cup:** Flywheel cup may be cut or replaced with a washer, Briggs Part number 691736.
3. **Fuel Pump:** Fuel pump, B & S part number 557033 may be used. If used, fuel pump must be pulsed from a pulse fitting installed in the engine crankcase cover top oil fill hole.
4. **ENGINE TOP COVER:** May use Briggs metal cover or fabricate one from metal. Blower housing openings must be covered with fabricated metal cover.
5. **Rocker Cover:** Rocker cover B & S part number 555528 may be modified for installation of the Briggs breather bypass system, part number 555688 per included ms-3742 sheet. Must be attached to catch can. (It is allowable to have secondary drilling of holes in the breather valve area of the valve cover.) Valve cover may be altered for any style breather.
6. Heat Dispenser, Briggs part number 555690, may be installed per included ms-3758
7. Head Gasket Fire Ring: Part Number 555698. Non fire ring Part number 555723.
8. Flywheel may be lapped stock key must be used. Key must have B&S logo.
9. Head may be re-cut to QMA spec.
10. All pin-measuring gauges are plus tolerance.
11. Cryogenics of any Briggs & Stratton parts is illegal.
12. Any air filter allowed. Air filter must attach directly to carburetor. No filter cups, velocity stacks, Springs etc.

### Section 4 Tech Procedure

#### 1. General

- a. Heli-coiled threads for shrouds, (all), valve cover, oil drain, oil fill holes, blower housing, and exhaust pipe attach studs on the head and lower brackets. Exhaust studs may be replaced with any size or style exhaust bolts.
- b. Blocking airflow: No device may be used that will, or appears that it may impede airflow into the engine cooling system. This may require that the engine be run at a speed above idle by the tech personnel at the scale, after the car has qualified or raced. Black plastic flywheel cover supplied with engine must be removed.

#### 2. Carburetor & Intake Manifold

##### Remove Carburetor

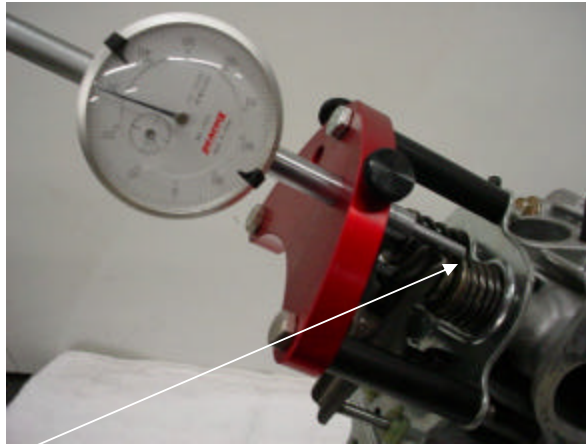
**NOTE; LINE ITEMS A AND C PERTAIN TO JUNIOR ANIMAL ONLY. ANY FUTURE CHANGES TO THE JUNIOR ANIMAL WILL BE ON THE QMA WEB SITE.**

- a. Stock Walbro PZ22 carburetor ending in calibration number .15 Carb only. No alterations allowed. Slide must remain unaltered 555590 to measure 1.218 INCH with QMA slide restrictor installed on top of slide. Slide stop restrictor bushing to measure 0.515 INCH MINIMUM. Stock needle marked "BGB" is required.
- b. Needle Jet C-clip must be properly installed. But may be installed at any of the 5 factory settings on the needle jet.
- c. Throttle cable cap on the top of the carburetor must be used and properly installed. SEALING GASKET MUST BE REMOVED. Cap must be tight. Carburetor locking Cap 555726 to be used.
- d. Choke: Unaltered, but may be fastened open with a spring, rubber band, or zip tie.
- e. Idle Jets any size allowed.
- f. Main Jets any size allowed.  
Note: Pilot and main jets must be factory type- Installed and function as intended by Briggs. Only orifice hole is non-tech.
- g. Venturi Measurement:
- h. Vertical: 0.792 inches Max
- i. Horizontal: 0.615 inches max at widest part 0.602 inches Max at narrowest part
- j. Carburetor Overflow: May be vented to the ground.
- k. O-Ring part number B & S part number 555601 is required and must be unaltered.
- l. Slide opening to be set at 0.325 inches Max at front of slide for JR. Animal.
- m. Main nozzle-OEM stock unaltered-hole size=0.101 inches Min to 0.103 inches Max
- n. No drilling, slotting or oblonging of hole.
- o. Emulsion tube – OEM stock unaltered. 4 small holes 0.018 to 0.020 inches max. 4 big holes 0.026 to 0.028 inches max.
- p. Air pick off hole 0.057 min to 0.061 inches max.
- q. Intake manifold intake manifold – max length=1.740 inches min to 1.760 inches max  
intake manifold – bore diameter= 0.885 inches min. to 0.905 inches max

### 3. Engine Cooling Shrouds/Blower Housing

- a. All pieces of the stock engine cooling shroud/blower housing must be stock and properly installed.  
Blower housing thickness 0.115 (reference only) color non tech. No plating.
- b. Starter cup may be cut down.

Remove blower housing  
Remove valve cover



#### Check:

1. Max. Valve lift will be checked from the top of the valve spring retainer. Valves must be adjusted to zero clearance.
2. Valve Lift: First camshaft check will be taken at the valve spring retainers. With the lash set at zero, the movement of the valve spring retainers may not exceed the following:  
Intake and Exhaust: 0.252 inches max.
3. Install Degree wheel, using positive stop method.  
Check ignition timing. With the right edge of the magnet, (not the magnet holder), aligned with the right edge of the notch of the right leg of the coil, the engine must be from 23° BTDC to 27° BTDC You must use stock key way and unaltered flywheel stock Briggs and Stratton only allowed. Key must have Briggs logo.

### 4. Cylinder Head & Head Gasket

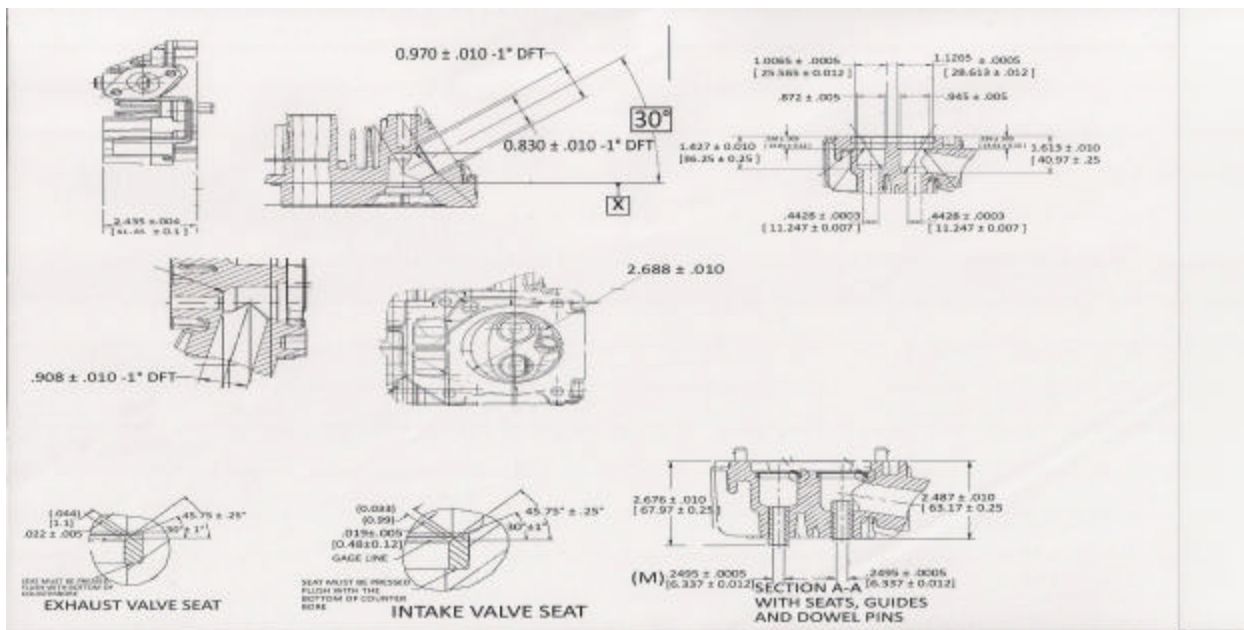
Remove cylinder head.

#### Head Gasket:

- a. Stock, unaltered B & S part numbers 555698 or 555621 are the only head gaskets allowed.
- b. Minimum gasket thickness between head bolt holes 0.041 inches. Measurements are to be made with dial caliper from inside of fire ring.



- A. Cylinder head, 555635 must be stock, unaltered and be in "as cast" and in factory machined condition except head gasket deck surface may be machined to the following specs. Depth of head at shallow part of head 0.011 inches MIN ref. (This measurement to be taken with a depth gage on both the combustion and spark plug sides of the cylinder head). Depth at floor of head between valves is 0.319 inches MIN. Depth to top of valve seat is 0.320 inches min to 0.360 inches max. Head thickness from head gasket surface to head plate gasket surface is 2.405 inches MIN. No additions to or subtractions from any part of head with the exception of Heat Disperser, Briggs Part number 555690 may be installed per included ms-3758.
- B. Exhaust pipe attachment studs may be Heli-coiled. Or removed and replaced with any size or style exhaust bolts.
- C. No alterations of any kind may be made to the intake or exhaust ports.
- D. Intake Port: 0.918 inches MAX
- E. Exhaust Port AS CAST:  
Maximum ID of shoulder in bottom of exhaust port = 0.855 inches.
- F. Valve Seats, Intake and Exhaust: Must remain factory spec. with one 45° angle only. Multi angle valve seats are not permitted.
- G. Intake valve seat diameter inside = 0.965 to 0.972 inches.
- H. Exhaust valve seat diameter inside = 0.844 to 0.850 inches.
- I. Head surface to intake valve guide 1.255 inches max
- J. Head surface to roof of combustion chamber between valves 0.319 inches Minimum.
- K. Head surface to top of valve seat 0.320 to 0.360 inches.
- L. Head thickness from head gasket surface to top plate gasket surface 2.405 inches MIN.



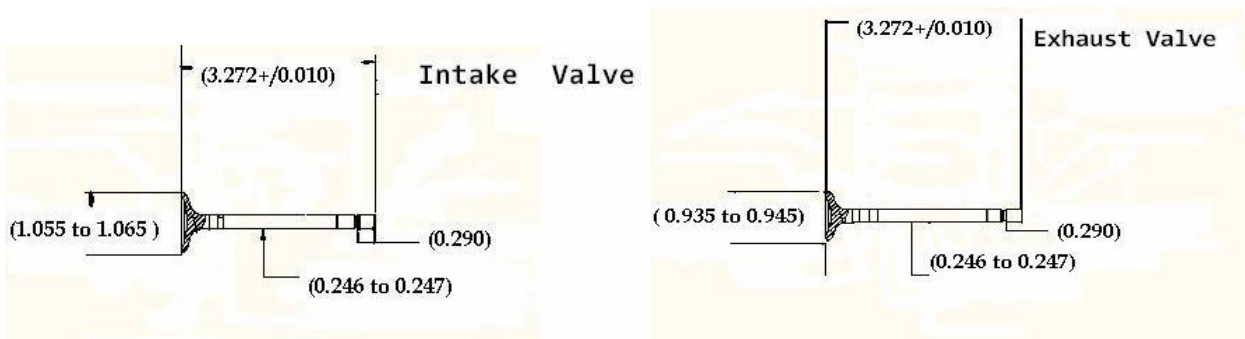
Inspect retainers for alterations that would increase valve spring pressure. Both intake and exhaust must have stock B & S valve keepers.

## 5. Valves

- a. Retainer Dia .0785 inches Max.
  - b. Top thickness. 0.055 inches min to 0.075 inches max.
- a. Check valves for dimensions and weight. Stock and unaltered B & S part #555552 (exhaust) and #555551 (intake). Valve surface must be unaltered factory ground and have one 45° ANGLE only. There will be no other angles ground on any part of the valve.
  - b. Intake Valve:

Minimum Weight of Valve	28.26 grams min.
Valve Length	3.272+/-0.010 inches
Diameter of Valve Stem	0.246 to 0.247 inches
Diameter of Valve Head	1.055 to 1.065 inches
Diameter of Valve Seat	0.964 to 0.972 inches ID
Top of valve stem to top of retainer groove	0.290 reference.
  - c. Exhaust Valve:

Minimum Weight of Valve	28.00 grams min.
Valve Length	3.272+/-0.010 inches
Diameter of Valve Stem	0.246 to 0.247 inches
Diameter of Valve Head	0.935 to 0.945 inches
Diameter of Valve Seat	0.844 to 0.850 inches ID
Top of valve stem to top of retainer groove	0.290 reference.



## 6. Valve Springs

- a. Valve Springs will be single coil stock, unaltered B & S part # 555553.
- b. 4.25 to 4.75 coils.
- c. Spring wire diameter 0.103 to 0.107 inches
- d. 0.930 inches max length
- e. 11 lbs at 0.812 inches

## 7. Rocker Arms and Rocker Arm Studs

- a. Rocker arms will be stock B & S part # 555546 and will not be altered in any way. Rocker arm length 2.865 inches Minimum.
- b. Rocker studs will be stock, unaltered B & S part # 555549 AND in stock location.
- c. Rocker Ball must be stock.  
Diameter 0.590 inch min. to 0.610 inch max.
- d. Rocker arm mounting positions may not be altered in any manner. No Heli-coiling of mounting holes. No bending of studs. Rocker arm stud plate must be bolted to the head with one stock  
B & S gasket only – no alterations.

## 8. Push Rods

- a. Push rods will be stock, unaltered B & S part # 555531 or 693517.
- b. Push rod length 5.638 minimum to 5.656 inches maximum.
- c. Push rod diameter 0.185 minimum to 0.190 inches maximum.

## 9. Engine Block

- a. Engine block must be in "as cast - stock factory machined condition with no alterations. There must be no addition or subtractions of metal or any substance to the inside or outside of the cylinder block.
- b. No machining of deck surface is permitted.
- c. Cylinder block deck will not be resurfaced by any means. There will be no polishing, sand blasting, or glass beading to any interior surface.
- d. Cylinder bore will not be bored oversize.
- e. Cylinder bore will not be re-sleeved.
- f. Cylinder bore position will not be moved or tipped in any manner.
- g. Cylinder Bore Dimension: 2.688 inches +/- 0.005 max. (Taken at top or bottom of bore.)
- h. Check Stroke: 2.204 inch MAX. Push piston down to take up rod play.
- i. Piston pop up 0.005 inch max (this measurement does not include spru on piston top. spru may be removed).

### Cam Shaft Profile Limits

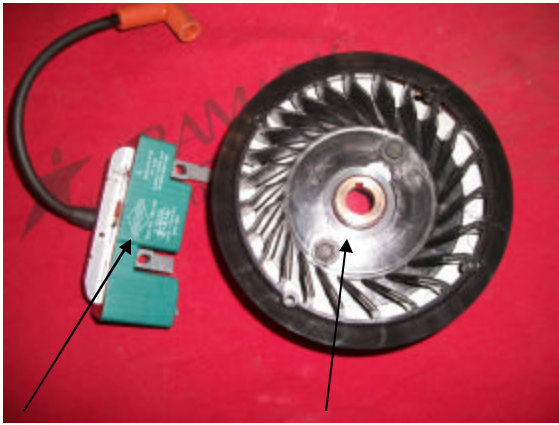
- a. First camshaft check will be taken at the valve spring retainers. With the lash set at zero, (0), the movement of the valve spring retainer may not exceed 2.52 inches. Camshaft must be supplied with compression relief.
- b. Install fixture on cylinder block. Cam profile to be ran from lifters.

<i>INTAKE LOBE</i>	<i>LIFT</i>	<i>EXHAUST LOBE</i>
0.005 55 TO 65 BTDC		0.005 278 TO 284 BTDC
0.020 12 TO 16 BTDC		0.020 237 TO 241 BTDC
0.050 1 TO 5 ATDC		0.050 219 TO 224 BTDC
0.100 17 TO 21 ATDC		0.100 202 TO 206 BTDC
0.150 32 TO 37 ATDC		0.150 186 TO 190 BTDC
0.200 53 TO 57 ATDC		0.200 166 TO 171 BTDC
0.225 split ATDC		0.225 split BTDC
0.250 88 TO 92 ATDC		0.250 130 TO 134 BTDC
<b>0.257 MAX (104 TO 107 CL.)</b>		<b>0.257 MAX. (113 TO 116 CL.)</b>
0.250 119 TO 122 ATDC		0.250 92 TO 96 BTDC
0.225 split ATDC		0.225 split BTDC
0.200 154 TO 159 ATDC		0.200 58 TO 62 BTDC
0.150 174 TO 179 ATDC		0.150 38 TO 42 BTDC
0.100 191 TO 194 ATDC		0.100 22 TO 26 BTDC
0.050 208 TO 212 ATDC		0.050 5 TO 9 ATDC
0.020 225 TO 230 BTDC		0.020 8 TO 13 ATDC
0.005 269 TO 274 BTDC		0.005 52 TO 58 ATDC

## 10. Flywheel

No modifications allowed to flywheel.

- a. Stock B & S part # 557126 only. No machining, glass beading, sand blasting, painting or coating of flywheel is allowed.
- b. Flywheels with broken fins must be replaced.
- c. Stock, unaltered flywheel key is required. No offset keyways allowed.
- d. Can use Briggs part number 691736 flat washer under flywheel nut. You **can** use factory cup cut down for washer.



Coil Part #555718

Flywheel Part #557126



Green Coil Only - No Other Allowed

## 11. Ignition System

- a. Unaltered B & S stock Ignition part # 555718 is mandatory. Only "Green" Coil allowed. Ignition Coil or its position, other than air gap may not be altered in any way. Coil mounting bolts must be stock and cannot be altered in any way to advance or retard timing. Attachment bolts and/or boltholes may **not** be altered.
- b. Spark plug: Any automotive type 14mm <sup>3</sup>/<sub>4</sub> inch reach with 14mm thread only, unaltered with stock washer allowed. Indexing washers is not allowed. No taper seat plugs allowed.
- c. Magneto air gap is non-tech.
- d. Timing:
  - Normal = 29° BTDC,
  - Min. = 27° BTDC
  - Max. = 31° BTDC
- e. Install Degree wheel, using positive stop method. Check ignition timing. With the right edge of the magnet, (not the magnet holder), aligned with the right edge of the notch of the right leg of the coil, the engine must be from 23° BTDC to 27° BTDC You must use stock key way and unaltered flywheel stock Briggs and Stratton only allowed. Key must have Briggs logo.

## 12. Gear Box

- a. Gearbox must be Briggs gear box part number 555721.



Part # 555721 complete gear box

### 13. Crankcase Cover

Remove crankcase cover

- a. Cover must be in stock, unaltered, "as cast in factory" condition. No alterations or subtractions of metal or any other substance to crankcase cover.
- b. Crankcase cover gasket must be stock B & S part # 555525. One gasket max, may be installed.

### 14. Piston

Remove rod and piston.

- a. Stock and unaltered B & S Animal piston Part number 555660 piston must be used. Briggs logo inside of piston near pin boss.
- b. Minimum from top of piston to top of wrist pin is 0.660 to 0.662 in.
- c. Minimum piston length is 1.762 in.
- d. Oversized pistons are not allowed.
- e. Weight: Complete combination includes piston, rings, rod, clip, cap, and bolts: 349 grams – min.

**NOTE:**

**Complete assembly-** average 352 grams

### 15. Rings

- a. Must be stock; unaltered B & S rings part # 555664 only.  
This set contains file to fit top ring.
- b. No decreasing of ring tension by heating, machining or any other means. ( this includes oil ring expander).
- c. Three rings mandatory
  1. Top compression ring must have chamfer or O toward top of piston.
  2. Second scraper ring must be installed with inside chamfer down and O toward the top of piston.
  3. Oil ring must be installed as from factory.
- d. Minimum width of top two rings is 0.095 inches.
- e. Thickness of top two rings is 0.059 to 0.064 inches. (each ring)
- f. Minimum width of oil ring is 0.065 inches. Ring groove must be present.
- g. Thickness of oil ring is 0.098 to 0.102 inches.

### 16. Wrist Pin

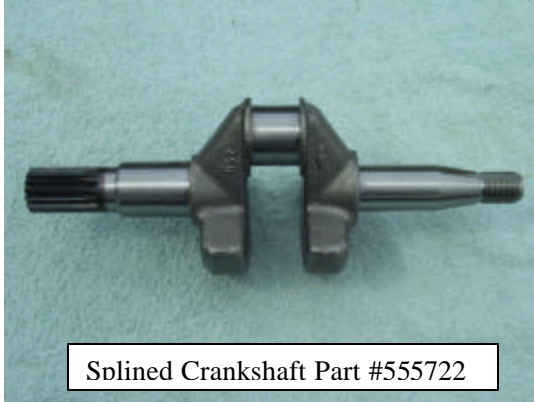
- a. Must be stock, unaltered B & S part # 555520 wrist pin and lock part # 555521
- b. Wrist Pin:  
Maximum I.D. = 0.414"  
Max. O.D. = 0.626"  
Minimum length – 1.901"

### 17. Connecting Rod

- a. Must be stock, unaltered B & S part # 555626 Briggs logo on rod beam.
- b. Rod length, measurement from bottom of wrist pin hole of top of crank journal hole is 2.419 inches minimum to 2.429 inches maximum.
- c. Diameter of big end = 27.9476 mm - 1.003" ref
- d. Diameter of small end – 15.89405 mm - 0.625" ref

## 18. Crankshaft

- a. Stock B & S part # 555722 crankshaft must remain unaltered. Briggs logo cast in crankshaft.
- b. Crankshaft journal diameter = 1.094 inches to 1.100 inches.
- c. Stock, unaltered B & S part # 555573 bearings required.
- d. B & S part 555054 key-flywheel.
- e. Shim, (s), Briggs Part number 55619, if used must be installed as from factory.
- f. Stock, unaltered part # 555574 timing gear installed in stock location on crankshaft only.
- g. No offset keyways allowed on cam gear for crankshaft.



## 19. Camshaft

- a. Stock, unaltered B & S part # 555532 OEM # 696813 camshaft.
- b. There will be no additions or subtractions from any part of the camshaft.
- c. Compression release will remain intact.
- d. Lobe center angle will not be altered by any means.
- e. Lobe profile will not be altered in any way.

## 20. Tappets

- a. Stock, unaltered B & S part # 555307 tappets only.
- b. Tappet diameter = 0.820 to 0.860 min. max.

## Torque Specifications:

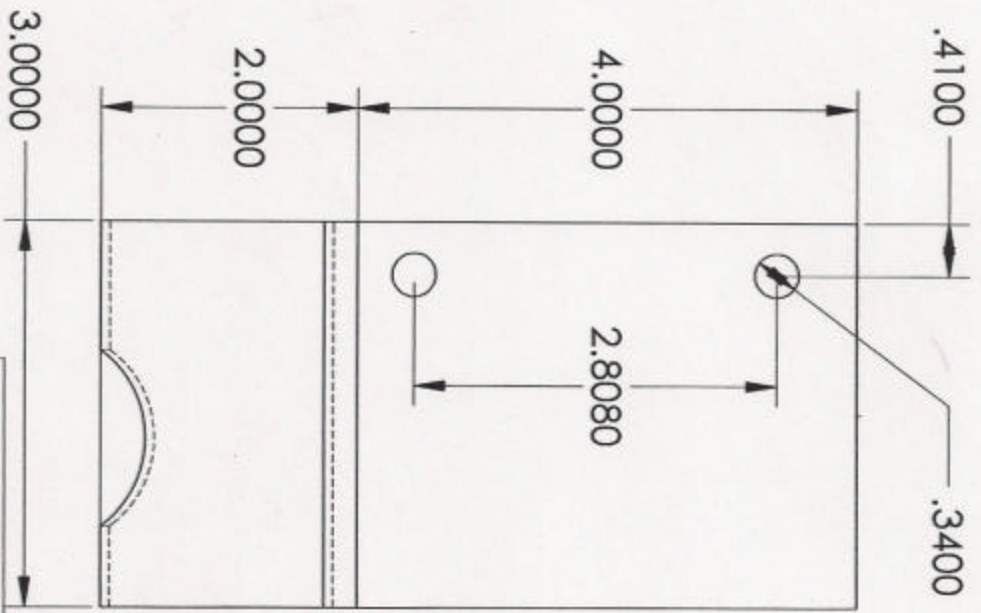
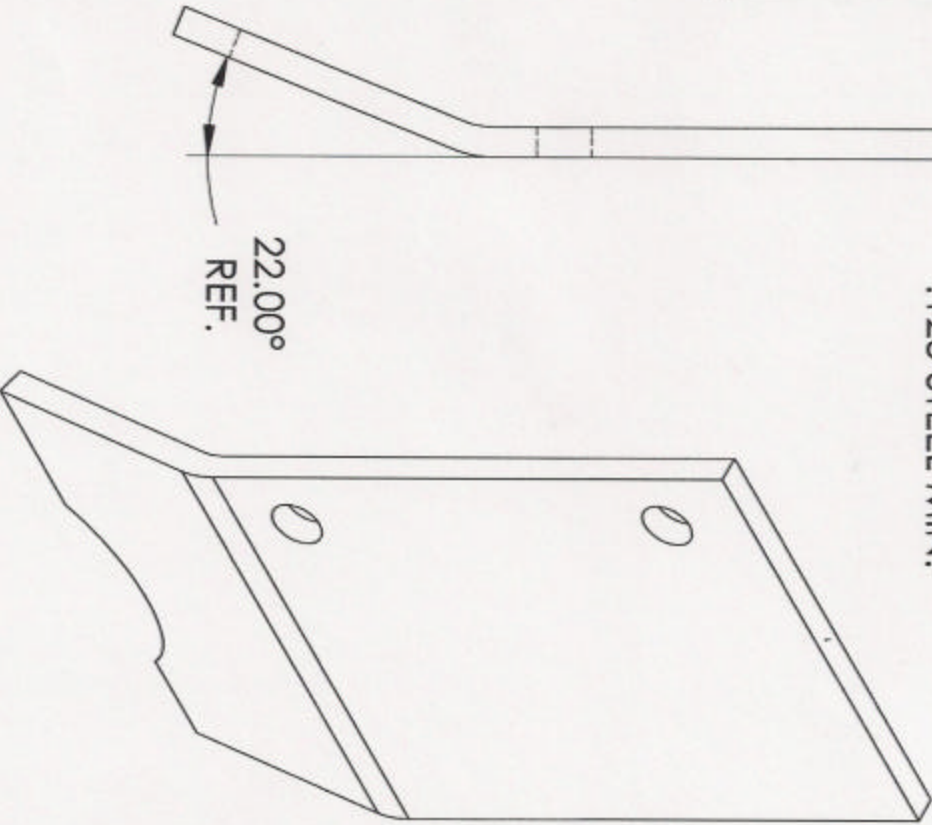
Non-Tech, recommended by B & S

Flywheel Nut	55-75 ft. lbs. (74.5–101 Nm)
Cylinder Head	180-22- in. lbs. (20-25 Nm)
Connecting Rod	120-140 in. lbs. (13.5-15.8 Nm)
Crankcase Cover	120-140 in. lbs. (13.5-15.8 Nm)
Cylinder Head Plate	70-90 in. lbs. (8-10 Nm)
Rocker Arm Stud	70-11- in. lbs. (8-12.5 Nm)
Valve Cover	30-60 in. lbs. (3.5 -7 Nm)
Spark Plug	95 – 145 in. lbs. (11-16 Nm)
Intake and Exhaust	Measured at TDC .005 -.007 in. (.127 - .178mm)
Flywheel Holder Tool	Part # 19372
Valve Lash	Cold

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.1875 ALUM. MIN.  
.125 STEEL MIN.

22.00°  
REF.



<b>Q.M.A.</b>	
SCATTER PLATE	
SIZE	DWG. NO. 31010001
A	
SCALE	SHEET 1 OF 1