Briggs & Stratton

World Formula

Tech Manual

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World Formula SUSPENSIONS

All suspensions must follow procedure listed in QMA rulebook. Except if otherwise noted in Tech Manuals.

Spark plugs, exhaust, gaskets and ignition timing infractions are race disqualification only.

NOTE:

- Refusal of tech shall be interpreted as an admission that the engine is illegal and a suspension from the Honda class will be immediate with all awards, qualifications being revoked.
- Confiscation of part or parts - only the illegal part and all related parts and not the whole motor will be confiscated. A full motor tear down is required if an illegal part is found.

Section 1
General Rules

1. Only stock Briggs & Stratton World Formula Model # 124335-8101will be used in this class except as provided in this Tech Manual. All parts will be stock unaltered Briggs & Stratton World Formula parts specifically made for this engine by Briggs & Stratton.
2. No modifications, alterations, additions, subtractions, deletions, or other changes are permitted to be done to these engines or their component parts unless specifically called out in the tech manual..
3. The use of air filter during Qualifying at asphalt events is illegal. The senior Tech official at that event reserves the right to allow filters if deemed necessary.
4. Direct Drive only: Clutches are not allowed.
5. Fuel: Gasoline only, no additives. Tech procedure is per QMA Rule Book.
6. ALL PERTINANT PENELTIES WILL APPLY.
7. NO welding, NO addition or removal of any material. NO painting or polishing of any part of engine or gearbox.

ALL PARTS ARE SUBJECT TO COMPARISON WITH A KNOWN STOCK PART.

Section 2
Required Modifications

1. Gearbox: Any gearbox is approved. The crankshaft may be altered only on external output shaft by adding a gear to drive the gearbox. All other modifications to the crankshaft are illegal.
2. Electric Starter: Electric starter must be removed and 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 must be cut down or replaced with a flat washer, Briggs Part number 691736 for flat washer. Briggs flywheel nut # 792723 or 699359 may be used.
4. Exhaust :Any exhaust gasket allowed (no silicone). Must use exhaust port extension in port. Minimum of a 0.475 length measured from the bottom of the exhaust flange to the end of the pipe using a depth mic. Any style pipe and max of four, (4) B & S style mufflers only. Any size bolt may be used on exhaust. Any size exhaust bolts may be used.
   i Exposed portions of the exhaust system that are located in front of the right rear tire cannot be higher than a straight line that extends from the top of the right rear nerf bar to the top of the right front tire. This inspection is to be performed with the car sitting on the ground with the driver in their driving position.
5. Muffler exhaust leakage- It is acceptable to have minor exhaust leakage at the muffler factory seam.
6. Oil Breather: Oil breather must vent to catch can under the tail cone within the engine compartment. Oil breather may be made from aftermarket parts. No check valves or PCV allowed.
7. The carburetor fuel overflow hose must not drain into the oil catch can container. This overflow hose must drain onto the ground, not into the oil catch can. Only the valve cover crankcase vent hose can exit into the catch can container.

8. Impulse Fitting on Intake Manifold: Impulse fitting on intake manifold must be filed if impulse type fuel pump is not used.
9. Scatter shield recommended.

Section 3
Allowable Modifications

1. Crankshaft Seal: No tech on the crankshaft seal on gearbox side, seal can be removed.
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 808656 may be used. If used, fuel pump must be pulsed from the intake manifold pulse fitting only.
4. Black Plastic Control Cover: Black control cover B&S part number 555699 and bracket #557028 including ON/OFF switch may be removed. May be replaced with any other type of metal or aluminum cover. Blower housing openings must be covered with fabricated metal cover.
5. Rocker Cover: Rocker cover B&S part number 555679 may be modified for installation of oil breather line fitting. (it is allowable to have secondary drilling of holes in the breather valve area of the valve cover.) Installation of a check valve is legal at the location of the valve cover vent hole or in the location of the vent line hose.
6. The installation of the Briggs Breather By-pass system, part number 555688 or any aftermarket / home made By-pass system can be used but must function the same as the Briggs By-pass OEM design. Check valves and or PVC valves in this By-pass system are not legal. CPC-0716 Bypass system is also legal to use.
7. Plastic Flywheel Ring Gear: Plastic flywheel ring gear may be removed. No other alterations including the addition or subtraction of metal to the flywheel allowed.
8. Head heat disperser, Briggs part number 555690is legal.
9. Can use Briggs PVL system: Part Number 557127.
10. Manifold adaptor
11. Head Gasket Fire Ring: Part Number 555698.
12. An aftermarket gasket is allowed between the gearbox and engine side cover. One gasket only.
13. Cometic head gasket MLS H3590040S is legal for use.
14. The oil drain plugs are a non tech item. The use of billet and or extended drain plug nipples are legal.
15. The oil filler caps are a non tech item. The use of any style plastic or billet filler plugs are legal.
16. Loctite is allowed on all fasteners.
17. The bolt that holds the cylinder heat shield on can be replaced with a larger bolt
18. Any commercially available air filter may be attached to the outside of carburetor air inlet horn. Outerwear style or equivalent can be used over carburetor. Any air filter may be used as long as there are no device(s) used inside the air filter. Any device, manifold, tubing, etc connected between the carburetor and the air filter is not legal.

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. Any size exhaust bolts may be used.
   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.
   c.

2. Carburetor

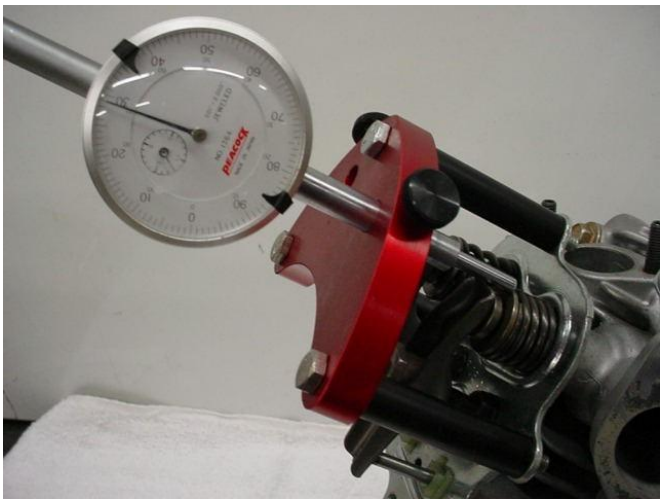
Remove Carburetor

a. Stock Walbro PZ26 carburetor ending in calibration number .A63 Carb only. No alterations allowed. Slide must remain unaltered. Stock needle marked "CDB" 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. Cap must be tight.
d. Choke: Unaltered, but may be fastened open with a spring, rubber band, or zip tie.
OR Remove choke and plug with silicone.
e. Idle Jets any size allowed.
f. Main Jets any size allowed.
g. Venturi Measurement:
Vertical: 25.00mm +/- 0.15mm (0.989"+ No-Go Gauge)
Horizontal: 18.50mm +/- 0.2mm (0.737"+ No Go Gauge)
h. Carburetor Adapter: Carb adapter B & S part number 557050 or updated B & S part number must be used in stock configuration.
i. Air Filter: Any commercially available air filter may be attached to the outside of carburetor air inlet horn. Outerwear style or equivalent can be used over carburetor. Any air filter may be used as long as there are no device(s) used inside the air filter. Any device, manifold, tubing, etc connected between the carburetor and the air filter is not legal.
j. Carburetor Overflow: .The carburetor fuel overflow hose must not drain into the oil catch can container.
k. O-Ring part number B & S part number 557007 is required and must be unaltered.
l. Carburetor float and needle. It is now legal to use aftermarket plastic (black or white color) floats and needles for the WF carburetors. However these aftermarket parts must have the same basic shape, size and function as OEM parts. This update is necessary because the current Walbro OEM supplier is no longer manufacturing these components for replacement.

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.
b. Starter cup may be cut down.
c. Color of sheet metal is a non-tech item, any color is acceptable. This refers to blower housing, head shroud, top plate and valve cover.

Remove blower housing
Remove valve cover



Check valve lift and Ignition Timing

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: 0.315 inches max.
3. Install Degree wheel, using positive stop method. Recommend using a 9" to 11" Degree wheel to Check ignition timing.
4. Ignition timing is to be checked with a degree wheel and a fixed pointer mounted on the engine. Use a piston stop tool inserted in the spark plug hole to properly locate the piston top dead center (TDC) position. Using a hand held electric drill (The Dewalt drill number DWD520) is a good choice. or electric motor powered test bench. Rotate the engine in a clockwise direction and with a timing light to check the ignition timing.
5. Timing must be checked with the spark plug that was used in that race.
   31 degrees maximum at 2000 +/- 50 RPM
   Coil to flywheel gap is a non tech item.

4. Tech camshaft at lifters use approved fixture and dial indicator. It is recommended that you use 3/16 ball bearings between the lifter and dial indicator to perform this procedure.

4. Cylinder Head & Head Gasket
Remove cylinder head.

Head Gasket:

a. Stock, unaltered B&S part numbers 555698 or 555621or Cometic #MLS H3590040S are the only legal head gaskets. Cometic Spring Plate Gasket P/N EC1424060HTS is allowed. Maximum thickness .065

b. Minimum gasket thickness between head bold holes .038". Measurements are to be made with dial caliper from inside of fire ring for gasket part number 555698.

c. Measurements are to be made with dial caliper from inside of fire ring.

d. No bending of studs. Rocker arm stud plate #698214 or #797442 must be bolted to the head with one stock B&S gasket or Cometic gasket only- no alterations. Max thickness of gasket is .065 inches.

Head

e. Cylinder head, 557101 or 557133 (includes the heat dispenser installed). Cylinder head gasket surface may be machined. Depth from gasket surface to the head surface between valves must be a minimum of 0.319 . Hard carbon may be removed. Briggs Part number 555690 may be installed per included ms-3758.

f. Exhaust pipe attachment stud may be heli-coiled.

g. No alterations of any kind may be made to the intake or exhaust ports.

h. Combustion Chamber: 19.6 cc to 20.6 cc

i. Intake Port:

Maximum diagonal measurement = 1.101 inches

Maximum vertical measurement = 1.044 inches

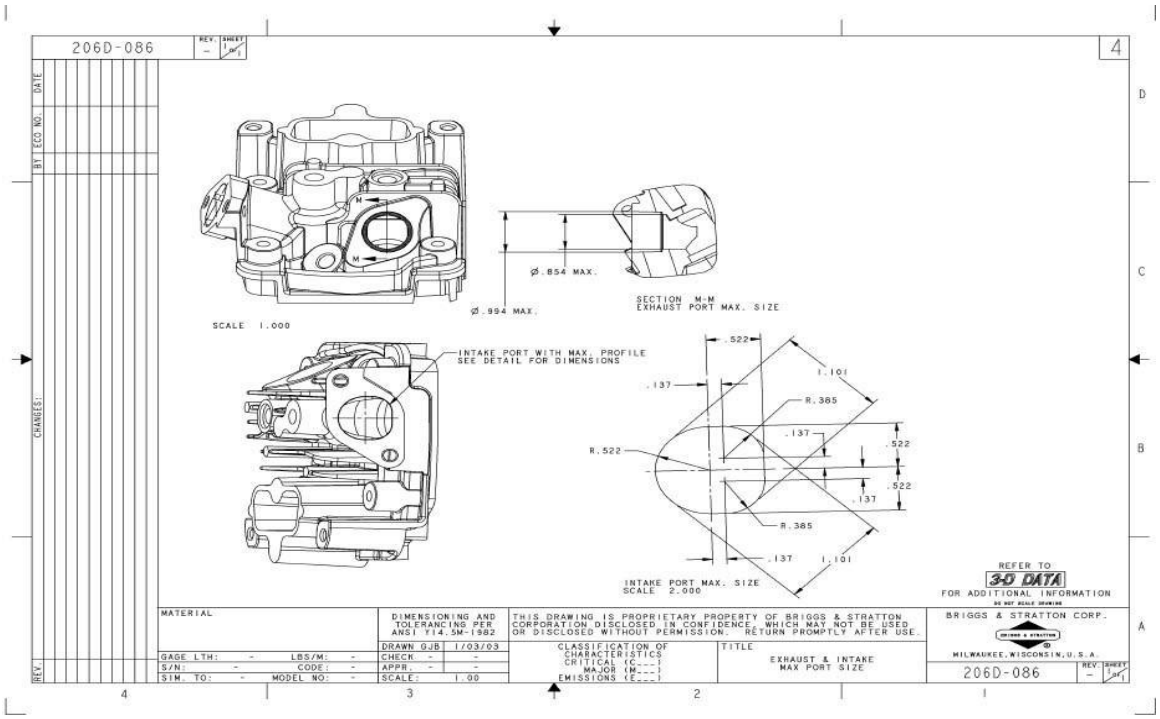
j. Exhaust Port AS CAST:

Maximum ID of shoulder in bottom of exhaust port =0 .854 inches.

Valve Seats, Intake and exhaust: Must remain factory spec. and configuration with one 45 degree and a small 30 degree top angle only. Multi-angle valve seats are not permitted. Valve seats of additional angles and/or angles not comparable to the factory stock are not permitted. Valve maintenance permitted (valve job). Valve seats must remain with the factory specification of 45 and 30 degree angles only. Valve seats of additional angles and/or excessive material removed when compared to the factory stock is prohibited

k. Intake valve seat diameter inside = 0.965 to 0.972 inches.

l. Exhaust valve seat diameter inside = 0.838 to 0.850 inches.



Remove Valves

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

5. Valves

a. Check valves for dimensions and weight. Stock and unaltered B & S part #557018 (exhaust) and #557017 (intake). Valve surface must be unaltered factory ground and have one 45□ surface only. There will be no other angles ground on any part of the valve.

b. Valve Guides: Replacement of valve guides with B & S factory part # 555645 only is allowed.

INTAKE VALVE

c. Intake Valve:

Minimum Weight of Valve	27.90 grams min.
Diameter of Valve Stem	0.246 to 0.247
Diameter of Valve Head	1.055 to 1.065 inches
Diameter of Valve Seat	0.965 to 0.972 inches ID

Top of valve stem to top of retainer groove 0.200

EXHAUST VALVE

d. Exhaust Valve:

Minimum Weight of Valve	27.70 grams min.
Diameter of Valve Stem	0.246 to 0.247
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	0.200

6. Valve Springs

a. Valve Springs will be dual coil stock, unaltered B & S part # 557024.

b. Inner Spring

Inner Wire Diameter	0.066 to 0.068 inches.

c. Outer Spring

Outer Wire Diameter	0.112 to 0.114 inches

7. Rocker Arms and Rocker Arm Studs

a. Rocker arms will be stock B & S part # 557015 or 797443 and will not be altered in any way. Note # 797443 and 797441 are part of rocker arm adjuster kit #797440 old and new style parts may not be mixed. Rocker arm length 2.820" minimum.

b. Rocker studs will be stock, unaltered B & S part # 555549 OR # 797441 AND in stock location.

c. Ball must be stock.
Diameter 0.590 inch min. to 0.610 inch max.

d. No bending of studs. Rocker arm stud plate #698214 or #797442 must be bolted to the head with one stock B&S gasket or Cometic gasket only- no alterations. Max thickness of gasket is .065 inches.
B & S gasket only – no alterations.

8. Push Rods

a. Push rods will be stock, unaltered B & S part # 555531 or #693517
Push rod length: 5.658 max to5.638"min
Push rod diameter 0.183" min to 0.190" max

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. There will be no polishing, sand blasting, or glass beading to any interior surface. The only exceptions are the deck surface and the oil return hole between the lifters may be enlarged.

b. Deck surface is a non-teachable item.

c. Cylinder bore may not be oversize. Sleeving is not allowed.

d. Cylinder bore position will not be moved or tipped in any manner.

e. Cylinder Bore Dimension: (2.693)max
2.688 inches +/- 0.005 max. Taken at top or bottom of bore.

f. Check Stroke: 2.206 max. Push piston down to take up rod play.

g. Piston pop up 0.038 above deck max. Machining of deck surface is permitted. Hard carbon may be scraped from the piston. Piston pop up cannot exceed 0.038 above block surface in the center of the piston. When measuring piston pop up. It should be accomplished with bar stock on a parallel with the piston wrist pin. recommended to use a ¼ by ¼ key stock

Cam Shaft Profile Limits

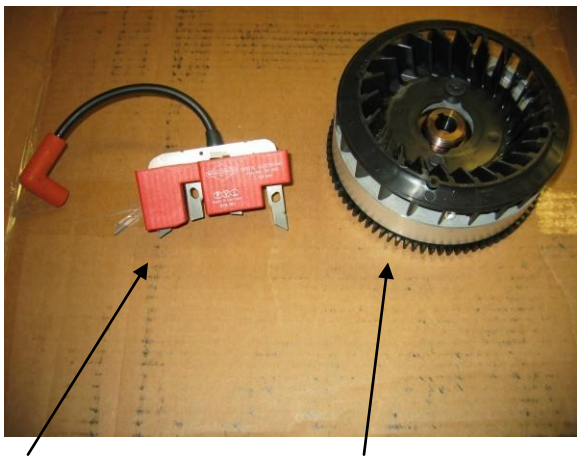
a. First camshaft check will be taken at the valve spring retainers. With the lash set at zero, (0), the movement of the valve spring retainer may not exceed 0.3097 inches. Camshaft must be supplied with compression relief.
b. Tech camshaft at pushrods. Push gently down on dial indicator stem to ensure that there is no lash when push rods are going down.
c. It is legal to have one number out of spec on the intake and one on the exhaust, with the exception of the maximum lift.

9" to 11" Degree Wheel Recommended

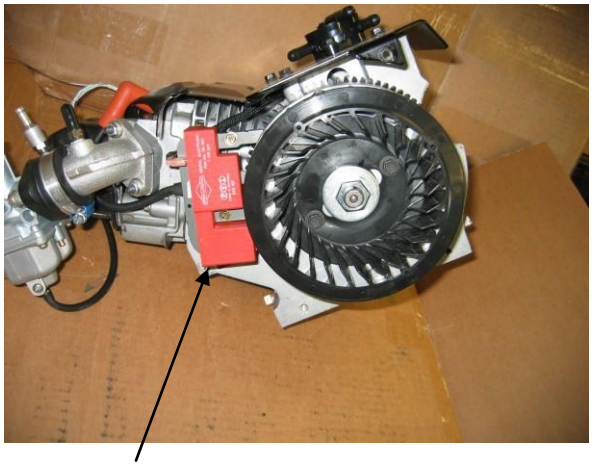
Intake Degrees	**Exhaust Degrees**
0.050" 13 - 17 BTDC	0.050" 232 – 237 BTDC
0.100" 1 ATDC- 5 BTDC	0.100" 215 – 220 BTDC
0.150" 13 – 17 ATDC	0.150" 201 - 205 BTDC
0.200" 29 – 34 ATDC	0.200" 185 – 189 BTDC
0.250" 48 - 54 ATDC	0.250" 165 – 169 BTDC
0.275" 62.5 – 67 ATDC (**split)**	0.275" 150 – 156 BTDC (**split)**
.315 MAX LIFT (107-111 CL)	.315 MAX LIFT (108-111 CL)
0.275" 148 – 152 ATDC (**split)**	0.275" 64 – 72 BTDC (**split)**

0.250” 162 – 165 ATDC	0.250” 51 – 57 BTDC
0.200” 182 - 186 ATDC	0.200” 32 – 37 BTDC
0.150” 198 - 203 ATDC	0.150” 16 – 21 BTDC
0.100” 213 - 217 ATDC	0.100” 1 – 6 BTDC
0.050” 228 – 232 ATDC	0.050” 11 - 16 ATDC

10. Flywheel
    a. No modifications allowed to flywheel.
    b. Stock B&S part #555683 only. No machining, glass beading, sand blasting, painting or coating of flywheel is allowed.
    c. The plastic flywheel fan part number 692592 and 555778 are both legal. Flywheels with broken fins must be replaced
    d. Plastic starter ring gear between flywheel and engine may be removed.
    e. Flywheel timing key - The flywheel timing key is a non tech configuration. Aluminum or steel key, can be machined or filed and offset designs are all legal. However a key must be present.
    f. Can use a Briggs part number 691736 flat washer under flywheel nut. You can use the factory cup cut down for washer. Briggs flywheel nut # 792723 or 699359 may be used
    g. It is legal to lap the flywheel to the crankshaft.
    h. The 2 flywheel fan bolt holes can be heli coiled and or the stock fan bolts can be replaced with any size and style of fastener.



Coil Part #557125 Flywheel Part #557126



Red Coil Only - No Other Allowed

11. Ignition System

B & S PVL Ignition with Red Coil

a) Unaltered B&S stock ignition part #5557125 is mandatory, max RPM is 7150. Only "RED" 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 bolt holes may not be altered.
b) Spark plug: Any automotive type with 10mm thread only, unaltered with stock washer allowed. Indexing washers is not allowed. Standard spark plug is Champion RG519HC.
c) Spark plug connector: Only the OEM Briggs part number 555714 is permitted.
d) Magneto air gap is non-tech.

12. Gear Box

a. Gearbox is not considered part of the engine and in non-tech; therefore any gear reduction box may be used.
b. Thread locking compound is permitted on the 4 gear box to crank case cover bolts.

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. Aftermarket gaskets are approved, however they must be of the same size and material as stock gaskets. Only one gasket is allowed.
c. Thread locking compound is permitted on the 6 crank case cover to engine block bolts.

14. Piston

Remove rod and piston.

a. Stock and unaltered B & S " kidney bean" piston - part # 557001 only.
b. Minimum from top of piston to top of wrist pin on circlip side is 0.680 to 0.686 in.
c. Minimum piston length is 1.768 in.
d. Oversized pistons are not allowed.
e. Weight: Complete combination includes piston, rings, rod, clip, cap, and bolts: 300 grams – min. OR 10.6 oz min
NOTE: Torque head assembly- average 357 grams
Hex head assembly- average 360 grams

15. Rings

a. Must be stock; unaltered B & S rings part # 555664 only.

This set contains file to fit top ring.

the following:

b. No decreasing of ring tension by heating, machining or any other means.

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 .095 inches.

e. Thickness of top two rings is .059 to .064 inches. (each ring)

f. Minimum width of oil ring is .065 inches. Ring groove must be present.

g. Thickness of oil ring is .098 to .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 # 557005 or 555117 (hex head bolts).

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 # 555620 or 557135 crankshaft must remain unaltered except Crankshaft may be altered only on external output shaft and only by adding a gear to drive the gearbox. All other modifications to the crankshaft are illegal.
   Briggs Key Part # 798972 for updated 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.

h. Crankshaft keyway for cam drive gear, maybe staked & or lock tight.

Splined Crankshaft

Part #555722

19. Camshaft

a. Stock, unaltered B & S part # 557041 camshaft.
b. There will be no additions or subtractions from any part of the camshaft.
c. Compression release counter weight tabs may be trimmed to ease starting
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 # 557038 tappets only.
b. Tappet diameter = 0.964 to 0.984 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

Modified World Formula (Only)

-The Briggs scatter shield is required for Modified WF-

-Modified World Formula allowed required modifications-

Fuel: Methanol only, no additives.

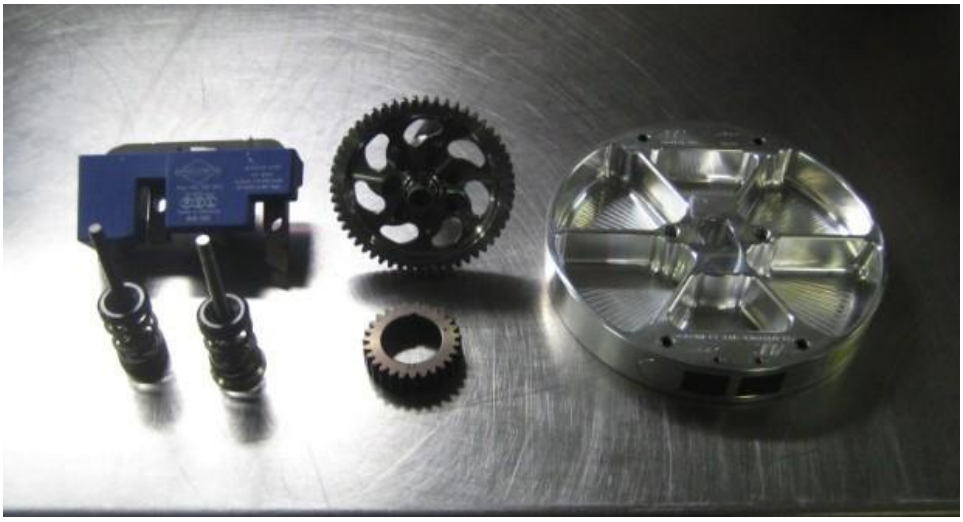
-Modified World Formula allowed optional modifications-

1.) **Briggs Blue PLV coil --- 12,000 rpm – Part # 555681**
2.) **ARC 1lb. 9 oz. aluminum billet Flywheel (31 degrees of timing max allowed) – Part # 6600- A**
3.) **Dyno cams billet camshaft – Part # Animal P-Open TSB**
4.) **Any double coil valve spring is allowed**
5.) **Any steel or aluminum retainers are allowed. No titanium retainers**
6.) **DynoCams rocker arm stud T-bar girdle is legal**
7.) **Dyno cams billet crank gear –Part # DC -1346**
8.) **Briggs Animal intake valve Part # 555551**
9.) **Briggs Animal Exhaust valve Part # 555552**
10) **Burris # BSA-304-40 /Cosmetic MLS SS # H3590040S head gasket (.040 thick)**
11) **B&S connecting rods #557005 or 555117, ARC or Burris billet connecting rods**

Engine is Methanol burning and below is the jetting that has been used for current studies and is using the Briggs Fuel Pump . There are no jet size requirements, these are just recommended jetting.

Main Jet = .060 inch

Pilot Jet = .030 inch



Camshaft Profile Limits

1. The first camshaft check will be taken at the valve spring retainer with the lash set to zero,(0) the movement of the valve spring retainer may not exceed .375 inches.

2. Tech camshaft at the pushrods. Push gently down on dial indicator stem to ensure that there no lash when push rods are going down.

Camshaft Duration: Maximum camshaft lobe duration specifications. Specs shall be measured at push rods. (Intake and exhaust lobe separation = 107 to 109 degrees).

Note: There is no specification for camshaft opening and closing specs in relation to camshaft angle position.

Intake Lobe Duration	Exhaust Lobe Duration
288 Degree @ .020	291 Degree @ .020
265 Degree @ .050	271 Degree @ .050
239 Degree @ .100	244 Degree @ .100
186 Degree @ .200	190 Degree @ .200 114 115
Degree @ .300	120 Degree @ .300

Connecting rod specs:

1) measurement from bottom of wrist pin bore to top of rod journal bore: 2.419 min– 2.490 max

3.