



# **HONDA TECH MANUAL GX160 UT2 (ONLY)**



## **HONDA ENGINE RULES GENERAL RACING RULES SPECIFICALLY FOR 160 HONDA CLASS ONLY**

*Grant Bennett, QMA Technical Director*

Updated: January 2022

## **HONDA SUSPENSIONS**

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

**NOTE: All shipping is to Express Mail at the shipper's Expense**

- For the purposes of this rule only, if a handler has multiple cars competing in the Honda class (GX120 or GX160) at one race event and more than one engine is found to be illegal at that event, it will be considered to be one offense.
- 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.

## **GENERAL RULES**

Only stock Honda GX160 UT-2 serial # beginning with GCBPT engine and gearbox will be used in this class. All parts will be stock Honda specifically made for the Honda GX 160 UT-2. No aftermarket blocks

- A. All stock Honda parts must be used and properly installed with the following exceptions:
- B. Governor system may be fully removed including the steel drive gear on the crankshaft. If shaft is removed, the resulting hole must be taped for threaded plug of sorts. No silicone or epoxy. No welding.
- C. Stock Honda fuel tank must be removed.
- D. Recoil starter must be removed. Pull cup may be cut down for washer. Must use original cup.
- E. **Exhaust:** All of the exhaust gasses that the engine produces must pass thru the muffler. The Honda muffler shall be removed and discarded. The factory supplied flange may be cut off and used an adapter flange for the new exhaust pipe. An aftermarket flange may be utilized, 0.27" maximum thickness. The transition from the "D" shape and the round ID of the pipe may be blended. There shall not be any steps or tapers in the pipe from the flange to the pipe coupling that the muffler screws into. However, the same diameter tubing may be butt welded together to obtain the desired path and length of the exhaust pipe. The pipe shall be between 20.0 to 26.0  $\pm$  0.06" inches long including the ¾ pipe coupling to attach the Briggs & Stratton 294599 or aftermarket equivalent. The length of the pipe shall include flange and the coupler. If the flange is attached to the pipe at an angle the midpoint shall be the point of measuring. This dimension shall be checked with a small piece of flexible hose about ½ inches in diameter averaging the long measurement and the short measurement.

Choke butterfly & shaft may be removed. Hole may be filled with silicone the choke shaft may be cut down and reinstalled. Factory Sealing washer between carburetor and air filter adaptor may be used.

- Oil level switch may be removed and the resulting hole in the block plugged.
- Gearbox may be rotated to any desired position.
- Off-On ignition switch may be removed, and hole covered. (any material; no welding)
- All pin measuring gauges are plus tolerance.
- Oil drain back hole between lifters may be enlarged.
- Aftermarket drain plug and fill plug may be used

Exhaust oxygen sensor or temp. sensor attached to any part of Honda exhaust system is illegal.

Valve seals are legal.

Cryogenics of any Honda part is illegal.

***Note: Taking parts out of service reference to "Wear Limits" in Engine Block Internal section. DQ Only – Not suspension for: Exhaust, Air Filter Adapter, Spark Plug, silicone or any type of sealer or epoxy in unapproved areas (approved areas are choke shaft hole and governor shaft hole) or more than one exhaust gasket.***

Shrouds can be repainted to either the stock Honda Red or Black no other colors allowed

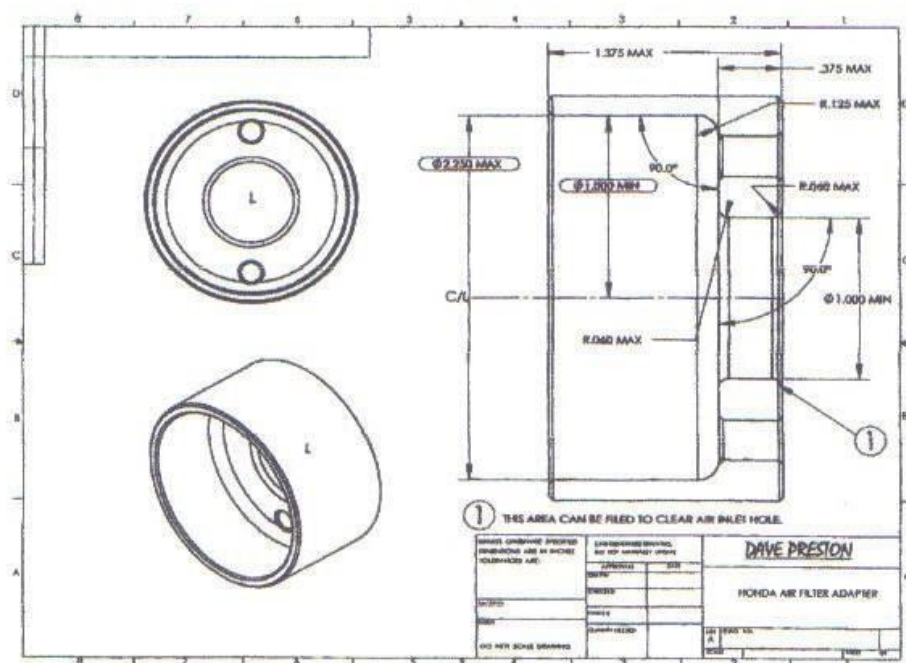
## **TECH PROCEDURE**

External visual check of engine for required components: muffler, shrouds and sheet metal, oil level sensor (this can be partially observed from outside).

### ***NOTES:***

Factory air cleaner must be removed. Any approved air filter may be attached to the outside of air filter adapter. Outerwear style or equivalent can be used over carburetor only with no adapter. The approved air filter adapter may be run with or without an air filter.

Air filters must attach to filter cup NO ADDITIONAL adaptors are allowed. We are using “outerwear” to define a style not a brand name.



- A. Any type throttle linkage may be utilized. Carburetor will be unaltered with the exception of the black plastic piece on upper end of throttle shaft, this is the only part in the carburetor that can be altered. Material may not be added to throttle stop area of black plastic piece or carb body.
- B. Rear mounting brackets for Honda fuel tank may be removed.
- C. The starter cup that is behind the flywheel-retaining nut can be cut away to leave only the flat washer back piece that retains cooling fan.
- D. The keyed end of the ring gear shaft may be shortened, drilled and tapped or machined for snap ring
- E. All threaded holes in the engine may be repaired by using Heli-Coils, except the threaded hole that secures the magnet to the flywheel. However, these same hole centers may not be moved.
- F. Honing and deglazing of the bore is allowed.
- G. Lapping the valves is allowed.
- H. **Blocking Air Flow:** No device may be used that will/or appear that it may impede Air flow 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

## **CARBURETOR**

Remove Carburetor:

- A.** Check for any alterations or worn parts that would allow additional air into engine: holes, slots, perforations, spacers, loose bolts, warped flanges.



- a. Gasket thickness: 0.025" maximum.
- b. Insulator gasket thickness: 0.025" maximum
- c. Either stock Honda UT-1 or UT-2 insulator can be used

**B.** Carburetor identification number: BE 65 B Thailand BE65Q & BE54D

**C.** Check carburetor for alterations. Upper choke shaft hole may be sealed with silicone type sealer.

**D.** Carburetor Bore: Intake end: maximum diameter 0.952" ref. Throttle end: maximum diameter 0.710.

**E.** Carburetor venturi bore: 0.523- no/go. This measurement is best made with a no go gauge but may be made using a telescoping gauge as a no go.

**F.** Junior 160 will use a BE65B, BE65Q or BE54D carburetor and a blue (Junior Honda) restrictor plate with gaskets on both side of the plate

*Main nozzle will be checked with a No/Go Gauge (0.424") If gauge goes over dump tube carb is illegal. This is best measured using a 0.452" rod type gauge with a 0.424" flat area to be used as a go gauge. Main Nozzle may be changed when purchasing a new UT-2 160 to the following # 16166-ZH8-W50 in the BE54D UT-2 carb.*



- 1. Air vent holes on the side of the main nozzle must not be plugged.
- 2. Main nozzle must not be held into place in the carburetor body by anything other than the main jet
  - Decimal equivalents of numbered size drills chart on

## **GX 200 CARBURETORS ON HEAVY 160 ONLY**

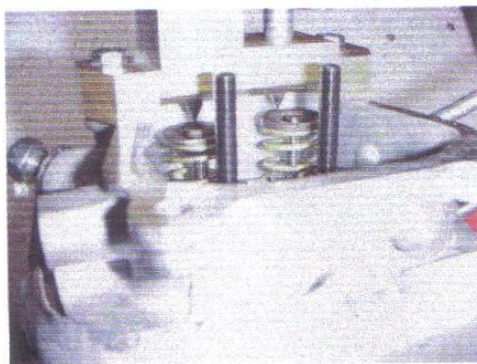
- A. Check for any alterations or worn parts that would allow additional air into engine: holes, slots, perforations, spacers, loose bolts, warped flanges etc.
- Carb insulator (see above for standard 160 carb)
- B. Carburetor identification number: BE 64 Y Only
- C. Check carburetor for alterations. Upper choke shaft hole may be sealed with silicone type sealer.
- D. Carburetor Bore: Intake end: maximum diameter 0.952" ref. Throttle end: maximum diameter 0.748
- E. Carburetor venturi bore: 0.5715- go 0.5745 no/go. This measurement is best made with a no go gauge but may be made using a telescoping gauge as a no go.
- F. Main nozzle will be checked with a No/Go Gauge (0.449") If gauge goes over dump tube –
- carb is illegal. This is best measured using a 0.570" rod type gauge with a 0.449" flat area to be used as a go gauge.
- G. The butterfly screw, the butterfly, and the throttle shaft must not be removed from the carburetor. Any evidence of tampering will be a disqualification and suspension.

## **ENGINE COOLING SHROUDS**

- A. All pieces of the stock engine-cooling shroud must be properly installed.
- B. There must be no addition or subtraction of any material from the shrouding except for the covering of the switch hole. (Any material). Starter cup may be altered to be used as washer retainer for the cooling fan.
- C. Fan Shroud may be any color. All other shrouds must remain as produced by Honda.

### **Check Valve Lift at Valve**

1. Install indicator as shown.
  2. Zero dial indicator after exhaust bump. (0.050) ref.
  3. Maximum valve lift will be checked from the top of valve spring retainer. Valves may be adjusted to zero clearance or shims may be installed to create zero clearance. This may dictate making special shims, as it is difficult to insert feeler gauge blades so as not to interfere with indicator contracts on retainer.
- Valve lift:
    - Intake: 0.245 Maximum
    - Exhaust: 0.255 Maximum





## **CYLINDER HEAD, HEAD GASKET, VALVES, SPRINGS**

Remove cylinder head.

Head gasket thickness: 0.008" minimum thickness of inner rim.

Measure from head surface to top of valve head:

Intake:	maximum 0.264"	Minimum 0.242"
Exhaust:	maximum 0.250"	Minimum 0.225"

This is best done with a depth micrometer or a bridge type dial indicator. Bridge type does not require removing carbon from head surface. See photo on next page.

Combustion chamber cc: 17.2 cc. Ref. with stock spark plug



## **VALVE SPRINGS**

Valve springs will be stock Honda springs and will not be altered in any way.

### 160 Spring

- A. Wire diameter: 0.071" Maximum
- B. Outside diameter of spring: 0.790" Maximum
- C. Number of total coils: 5.3
- D. Spring pressure: 11 LBS max. at 0.812"
- E. Stacked length will be: 0.394" Maximum

### 140 Spring

- A. Wire diameter: 0.079" Maximum
- B. Outside diameter of spring: 0.808" Maximum
- C. Number of total coils: 7
- D. Spring pressure: 16 LBS max. at 0.812"
- E. Stacked length will be: 0.524" Maximum

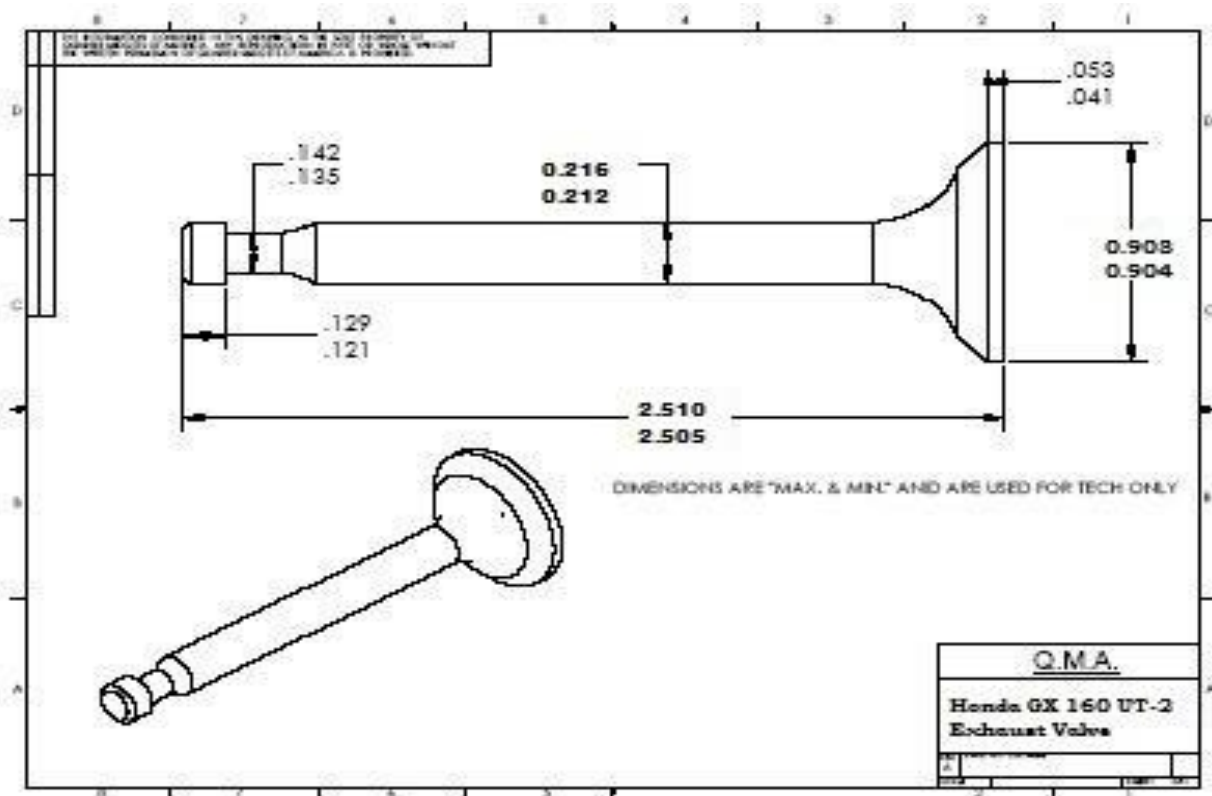
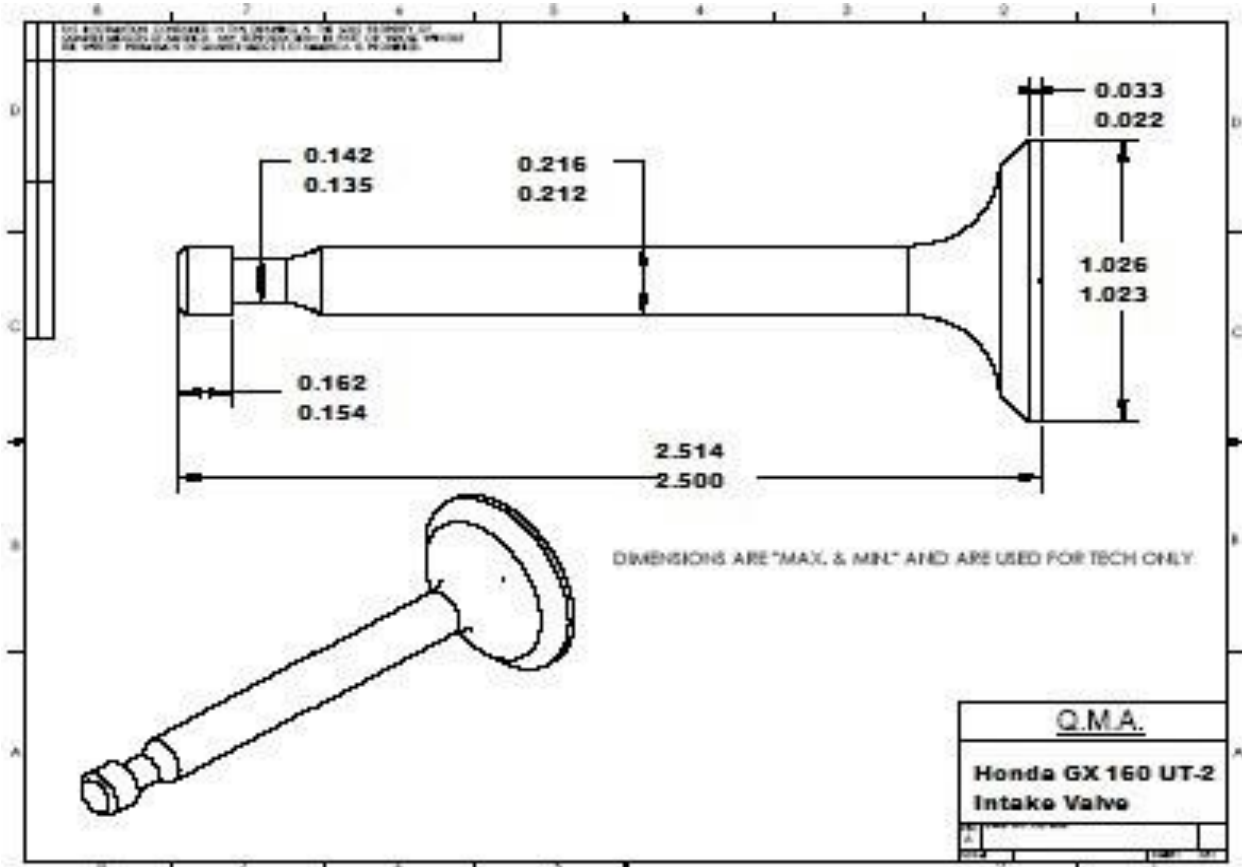


### **ROCKER ARMS – PUSH RODS – STUDS**

Rocker arms will be stock Honda and will not be altered in any way. Rocker arm studs will be stock Honda. They or their mounting position may not be altered in any manner. No heli-coiling of mounting holes. No bending of studs. Push rods will be stock Honda and will not be altered in any way. Push rod length will be 5.279” max.

### **VALVES**

- A. Check valves for dimensions and weight. Valve seating surface must be factory ground to a single angle only, 45 degrees. There will be no other angles ground on any part of valve. Valves must not be polished, lightened or altered in any way.
- B. Valve weight:
  - Intake 22 grams minimum
  - Exhaust 20.5 grams minimum
- C. Drawing of valve dimensions (Intake Valve followed by Exhaust Valve)

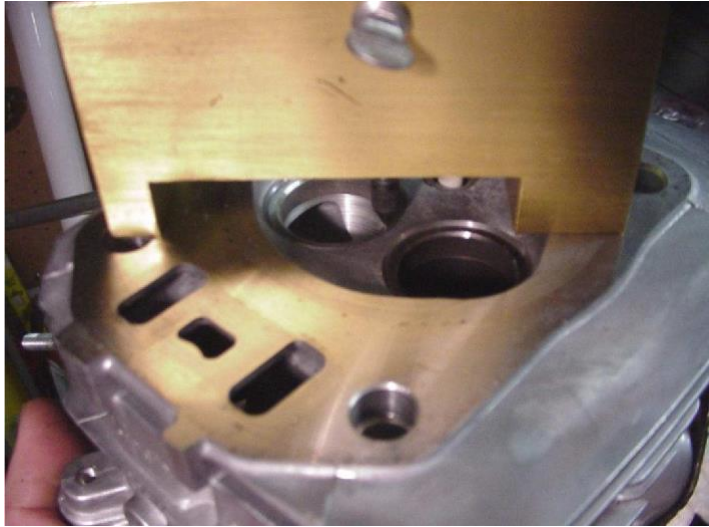




## **HEAD**

Cylinder head will be in “as cast” condition and there must be no addition of metal or any other substance to the inside or outside of the cylinder head. This includes any type of machining or grinding to increase airflow. Casting # beginning with TK1-1. Head gasket surface is a non-tech item.

- A. Measure from flat of head surface down to valve seat. This dimension will be:
- maximum 0.305”
  - minimum 0.287”
- B. Measure from surface of head to top of valve guide. This dimension will be: 1.010” Maximum



- C. Thickness of head. This will be measured from valve cover surface to head gasket surface at the side at a position in line with upper intake & exhaust flange bolt.
- Maximum 2.917”
  - Minimum 2.909”

## **INTAKE AND EXHAUST PORTS**

- A. Ports will be “as cast” and in factory machined condition. The addition or subtraction of any other substance to the inside or outside of the cylinder head is illegal.
- B. No alterations of any kind to be made to the intake or exhaust port.
- C. This includes any grinding, polishing, etching, sand blasting or glass beading to interior surface.
- D. Valve seats must be a stock single 45-degree angle. Multi angle valve seats are not permitted. Valve seats may not be replaced.
- E. Intake and Exhaust ports at valve:
- Intake: maximum 0.946”
  - Exhaust: maximum 0.830”
- F. Use of 5/16 studs are allowed to repair the factory exhaust studs. No altering of hole location

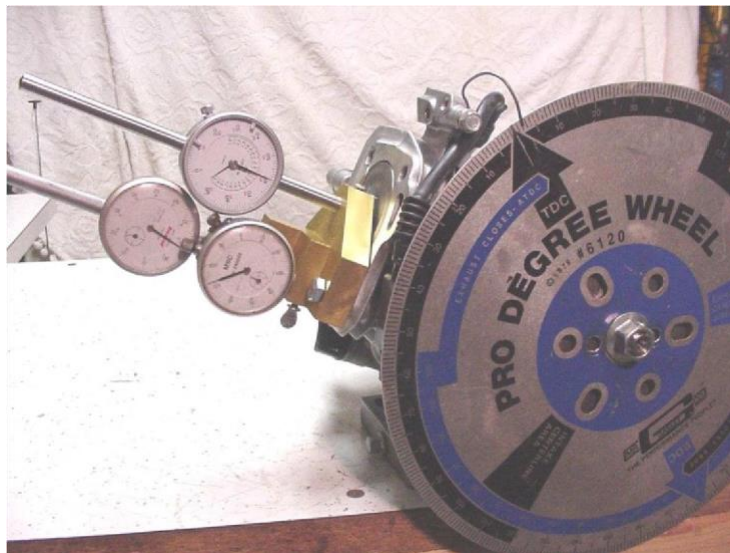
## ENGINE BLOCK

This engine block must be “as cast”. There must be no addition of metal or any other substance to the inside or outside of the cylinder block, crankcase over, crankshaft, rod, piston, pin, rings, flywheel or coil with the following exceptions below. Still needs to meet other requirements listed.

- Addition of brackets, fittings etc. to accommodate throttle linkage, tachometer, temperature gauge is allowed.
- Bore size: 2.682 maximum.
- **“Wear Limits/Parts Out of Service”** QMA reserves the right to confiscate 160 Honda engine parts deemed illegal or at QMA maximum wear limits. **EXAMPLE:** Cylinder Bore will be 2.682 Max. All measurements taken at top of bore or very bottom of bore parallel to crank, 90 degrees from crank. Any cylinder block that has one measurement over QMA maximum wear limits will be taken out of service. If no measurements exceed QMA maximum wear limits the part of block will not be confiscated. Handler has the right to have confiscated parts returned to them but will be rendered unusable
  - Check stroke: 1.778 maximum to 1.758” minimum
- Measure amount that piston is up or down from block surface at T.D.C. This will be measured at edge or highest part of piston, not in center or relieved area.
- This dimension will be: 0.000” Maximum.
- Install degree wheel on flywheel. Install pointer in order to read degrees. Locate accurate T.D.C. This should be done with a positive stop type fixture and not established with indicator alone.

## CAMSHAFT

- A. Cam will be checked with indicator reading off the top end of tappets, which will provide zero clearance. The inverted radius of the top of the tappet presents some problem to get accurate readings and to prevent binding of indicator stem. Indicator holder and positions are very critical in this operation
- B. Zero indicator on base circle of cam. Be sure that compression release does not affect zeroing exhaust indicator. Zero dial indicator after exhaust bump (0.050) ref.
- C. Turning engine in normal rotation, clockwise facing flywheel, take reading at specified opening. Readings must fall between specified degrees on the following chart.
- D. One profile check point on intake and one profile check point on exhaust out of spec is legal, with the exception of the maximum camshaft lift. Maximum camshaft lift must not exceed max spec.



## CAMSHAFT PROFILE LIMITS

<u>Intake Degrees</u>	<u>Exhaust Degrees</u>
0.050" 4 - 8      ATDC	0.050" 208 – 212 BTDC
0.100" 22 - 27    ATDC	0.100" 191 - 195   BTDC
0.150" 42 – 46 ½ ATDC	0.150" 172 – 176   BTDC
0.200" 71 - 75      ATDC	0.200" 145 - 149   BTDC
<u>MAX LIFT</u>	<u>MAX LIFT</u>
<b>0.227"</b>	<b>0.229"</b>
0.200" 143 1/2 – 147 ATDC	0.200" 70 – 74    BTDC
0.150" 172 - 175 ½ ATDC	0.150" 41 ½ - 45 BTDC
0.100" 192 ½ - 195½ ATDC	0.100" 22 - 25 BTDC
0.050" 210.5 ½ - 214 ATDC	0.050" 4 ½ – 8 ½ BTDC

- Check max lift at intake and exhaust.

### FLYWHEEL, FAN AND IGNITION SYSTEM

*Caution should be used when removing flywheel. Do not hit with hammer or other heavy objects. Service manual show flywheel to be removed with commercially available 6" puller. Another method is inertia type knocker that threads onto crankshaft end.*

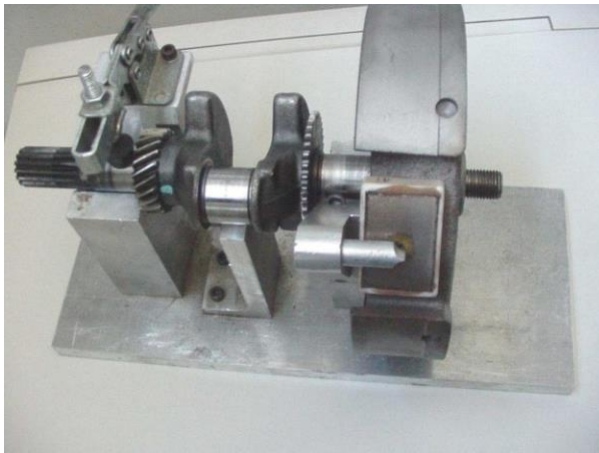
The transistorized magneto ignition is fixed at 20 degrees BTDC and may not be altered in any way. Firing must not exceed 0.104 "or 20 degrees BTDC. Offset flywheel key is allowed in the UT-2 160 engine only. Either Honda or offset key must be used (no-key not allowed) flywheel may also be lapped on UT-2 160 only with use of key. Acceptable magnet insulator colors are: White, Green and Yellow.

## PROCEDURE FOR CHECKING TIMING

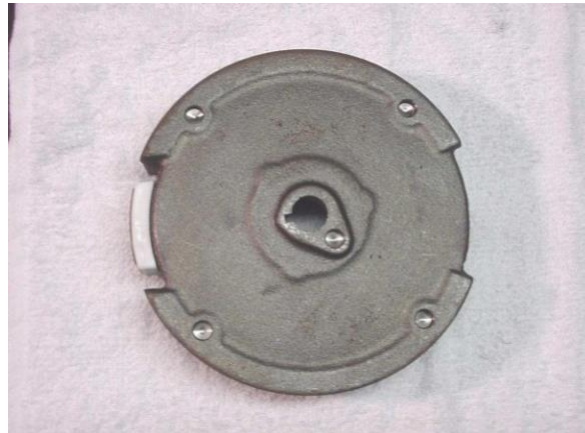
- A. With degree wheel and pointer installed use the positive stop method to find exact TDC
- B. Use a suitable timing light connected to the spark plug wire, with a standard spark plug gapped to 0.025" to 0.035". Using a drill, with the appropriate drive connection to the flywheel nut and rotate engine in clockwise direction to a rotational speed of 800 RPM or more.
- C. Energize the timing light and observe on the degree wheel to see what the timing is. It must be 20.5 degrees BTDC or less for the ignition timing to be legal.



- A. Flywheel keyway or its position must not be altered.
- B. Key must be in place.
- C. Magnet and its position may not be altered in any way.
- D. Magnet retaining screw may not be altered in any way. Screw may not be replaced with larger or smaller screw. No heli-coiling of mounting hole.



- E. Ignition coil may not be altered in any way. Max coil gap is 0.035 checked at 3 locations around the flywheel with a 0.035" feeler gauge. Gauge must not go completely under coil but can start under the edge of coil leg
- F. All nylon blades on the cooling fan must be intact. If missing fins due to normal breakage and hasn't been modified, Take out of service.



- G. No metal may be added or removed from the flywheel.
  - Flywheel weight will be: 2300 grams minimum
- H. A stock Honda spark plug cap, (wire end and resistor), must be used.
- I. Any automotive type spark plugs with  $\frac{3}{4}$ " reach maximum is allowed. Tapered seat plugs are not allowed. Race DQ only.
- J. No plug-indexing washers allowed.
- K. If temperature sensor is used under spark plug, factory washer must be removed.

### **GEAR BOX AND RING GEAR**

- A. Gear box may not be altered in any way. May be rotated to desired position.
- B. Ring gear may not be altered in any way with the exception of the keyed end of shaft that may be shortened, drilled and taped or machined for snap ring groove. No other machining, drilling, grinding etc. to ring gear. Keyway may be cut deeper.
- C. Ring gear may not be altered in any way including polishing or use of any compound or abrasive on gear shaft where bearings ride.
- D. Two gaskets maximum between gear box halves.





## **CRANKCASE COVER**

Remove crankcase cover.

- A. Cover must be “as cast” and in factory machined condition and there must be no addition or subtraction of metal or any other substance to crankcase cover.
- B. Crankcase cover gasket must be stock Honda. Only one gasket may be installed with a maximum thickness of 0.025”

Critical dimensions are - thrust face of camshaft holder and position of crank bearing. Place a straight edge over crank bearing and cam boss thrust face. These surfaces should be level. Maximum tolerance will be + 0.005”. There will be no alterations to crankcase cover. This includes any alteration to crank bearing and camshaft holder position and height in an attempt to alter valve timing.

## **PISTON – WRIST PIN AND PISTON RINGS**

Remove rod and piston – dot on top of piston must point toward push rods - piston, wrist pin and rings must be absolutely stock and not altered in any manner.



## **PISTON NOTES**

Piston will be stock Honda standard size and will not be altered in any way.

- Oversized pistons must not be used.

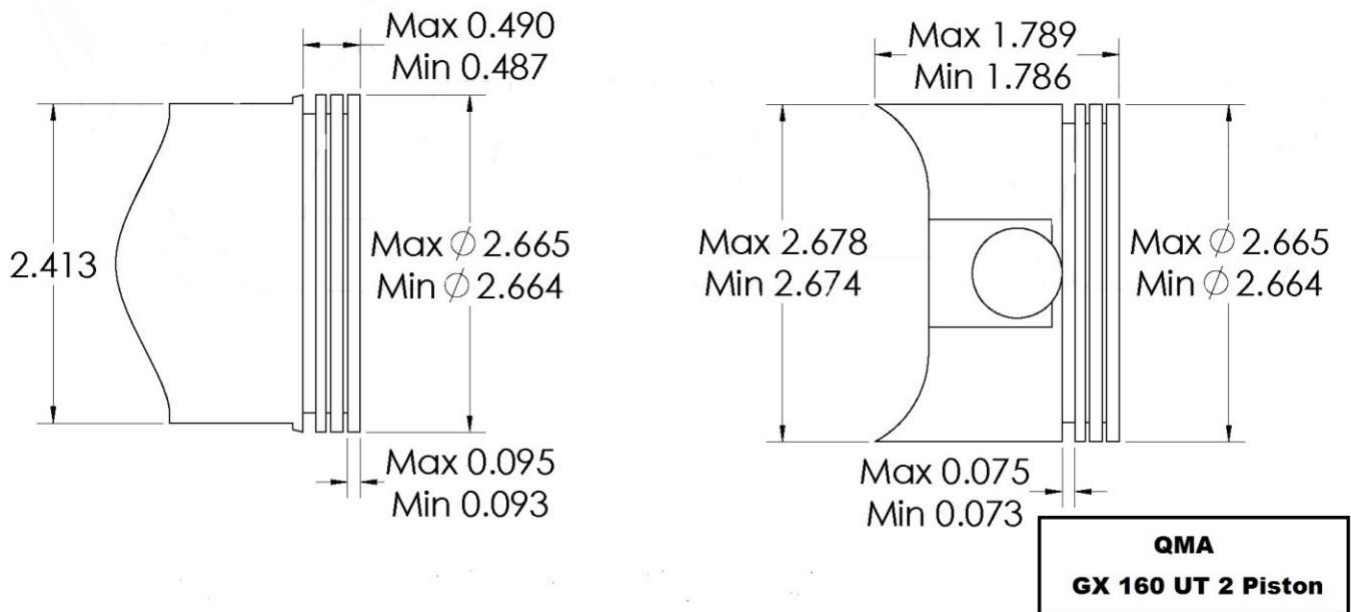
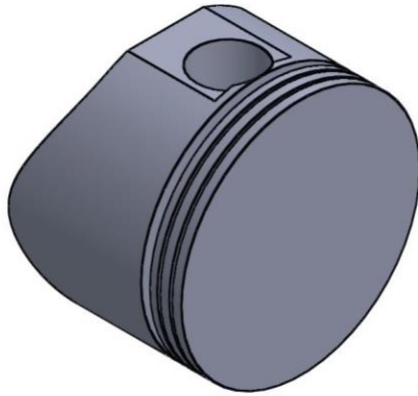
All three piston rings must be used and installed properly.

- *Top ring:* Chrome compression ring installed with 1 R on rail up. No expander under ring
- *Middle ring:* Oil scraper ring installed with R on rail up. No expander under ring.
- *Bottom ring:* Check oil ring expander for alterations that will alter ring tension (cutting ends of expander ect.)

Piston may not be knurled, grooved or coated

- A. Total Piston weight: With rings, pin, and clips 195 grams minimum
- B. Minimum total combined weight: 337 Grams = (Piston, rings, complete rod w/ bolts wrist pins & retainers.)
- C. See drawing for dimensions





## RINGS

- A. Must be stock Honda rings with stock size and configuration.
- B. No decreasing of ring tension by heating, machining or any other means.
- C. Ring thickness: UT-2
  - Compression: 0.036" min.
  - Scraper: 0.036" min.
  - Oil Ring: 3-piece oil ring = 0.076 min.

## **WRIST PIN**

Stock Honda wrist pin and retainer



- OD: 0.708" Minimum 0.709" Maximum
- Length: 2.120" Minimum 2.128" Maximum
- ID: 0.556" ref. +/-
- Weight: 40 grams minimum

## **CONNECTING ROD**

Stock Honda rod with no alterations.

- A. Connecting rod big end size: 1.176 "minimum 1.184" maximum
- B. Pin end bore is: .710" ref.
- C. Length from bottom of pin bore to top of big end bore will be:  
2.441" maximum 2.441" minimum
- D. Rod weight with bolts: 140 grams
- E. No oil grooves on bearing surface of either end.

## **CRANKSHAFT**

Stock Honda crankshaft with no alterations.

### **Notes:**

- A. No removal or addition of any metal from or to the crankshaft is allowed.
- B. No balancing of the crank is allowed.
- C. No oil grooving is allowed on the crank journal.
- D. Keyway location must not be altered.
- E. Measure thrust to crank gear side = 3.340 Min.
- F. Thailand crankshafts have no heat treat marks.

NOTE: Refer to photo of crank color.

UT 2



### **CAMSHAFT**

Camshaft must be stock Honda with no alteration of any kind.

- A. There will be no additions to or subtractions from any part of the camshaft.
- B. Compression release will remain intact and unaltered.
- C. Lobe center angle will not be altered by any means.
- D. Lobe profile will not be altered in any way.



### **CAMSHAFT SPECIFICATIONS**

#### **INTAKE EXHAUST**

- Heel to Heel                      0.865" - 0.869"                      Heel to Heel                      0.866" - 0.870"
- Heel to Peak                      1.079" - 1.093"                      Heel to Peak                      1.081" - 1.095"
- Length - thrust flange to thrust flange:
  - 3.135" minimum                      3.142" maximum
  -
- Cam bearings are 0.547" - 0.551" and unaltered (UNDER .547 MINIMUM TO BE TAKEN OUT OF SERVICE NO DQ)

## TAPPETS

Tappets must be stock Honda with no alterations.

- |                    |                  |                      |
|--------------------|------------------|----------------------|
| A. Base diameter:  | 0.910" minimum   | no maximum specified |
| B. Stem diameter:  | 0.312" minimum   |                      |
| C. Base thickness: | 0.073" minimum   | 0.090" maximum       |
| D. Length:         |                  | 1.220" maximum       |
| E. Weight:         | 16 grams minimum |                      |

## ENGINE BLOCK INTERNAL

The engine block must be in an “as cast” and there must be no addition or subtraction of metal or any other substance to the inside or outside of the block.

- A. Cylinder bore will be 2.682" maximum.
- **“Wear Limits/Parts Out Of Service”** QMA reserves the right to confiscate 160 Honda engine parts deemed illegal or at QMA maximum wear limits. EXAMPLE: Cylinder Bore will be 2.682 Max. All measurements taken at top of bore or very bottom of bore parallel to crank, 90 degrees from crank. Any cylinder block that has one measurement over QMA maximum wear limits will be taken out of service. If no measurements exceed QMA maximum wear limits the part of block will not be confiscated. Handler has the right to have confiscated parts returned to them but will be rendered unusable. Handler has the right to have confiscated parts returned to them but will be rendered unusable.
- B. Cylinder bore will not be bored oversize.
- C. Cylinder bore will not be re-sleeved.
- D. Cylinder bore position will not be moved or tipped in any manner.
- E. Cylinder block deck will not be resurfaced by any means. There will be no polishing, sandblasting or glass beading to any interior surface.
- F. Machined surface of block down to thrust face of cam boss:  
3.220" minimum 3.235" maximum
- G. Machined surface of block down to bearing face:  
3.416" minimum 3.435" maximum



***Tech officials have the right to tech any or all cars in any class at their discretion. Tech Officials follow the same chain of command as all officers of QMA – as follows: Local – Regional – National I.E. Regional tech officials can tech at any event at their region and National Tech Officials can tech at any event in QMA. National Tech Director is final authority on all tech issues.***

# DECIMAL EQUIVALENTS OF NUMBER SIZE DRILLS

Size in		Size in		Size in		Size in	
No.	Decimals	No.	Decimals	No.	Decimals	No.	Decimals
1	.2280	21	.1590	41	.0960	61	.0390
2	.2210	22	.1570	42	.0935	62	.0380
3	.2130	23	.1540	43	.0890	63	.0370
4	.2090	24	.1520	44	.0860	64	.0360
5	.2055	25	.1495	45	.0820	65	.0350
6	.2040	26	.1470	46	.0810	66	.0330
7	.2010	27	.1440	47	.0785	67	.0320
8	.1990	28	.1405	48	.0760	68	.0310
9	.1960	29	.1360	49	.0730	69	.0292
10	.1935	30	.1285	50	.0700	70	.0280
11	.1910	31	.1200	51	.0670	71	.0260
12	.1890	32	.1160	52	.0635	72	.0250
13	.1850	33	.1130	53	.0595	73	.0240
14	.1820	34	.1110	54	.0550	74	.0225
15	.1800	35	.1100	55	.0520	75	.0210
16	.1770	36	.1065	56	.0465	76	.0200
17	.1730	37	.1040	57	.0430	77	.0180
18	.1695	38	.1015	58	.0420	78	.0160
19	.1660	39	.0995	59	.0410	79	.0145
20	.1610	40	.0980	60	.0400	80	.0135