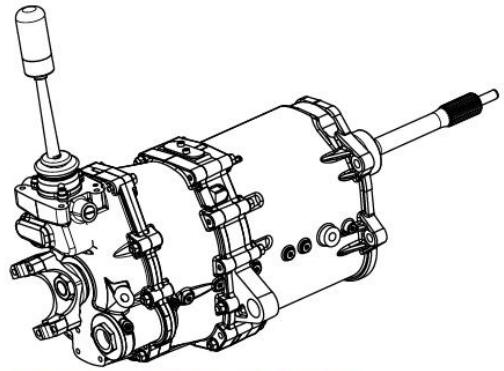


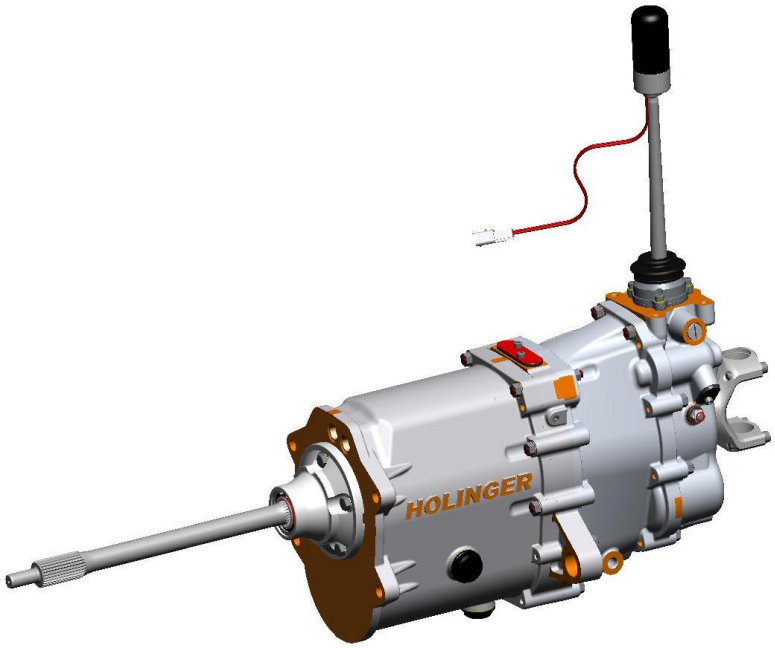
HOLINGER ENGINEERING

Racecar Gearbox Manufacturers

HOLINGER RD6-H

GEARBOX MANUAL

2010



Approved By: Leigh Nash **Date: 11/08/2010**

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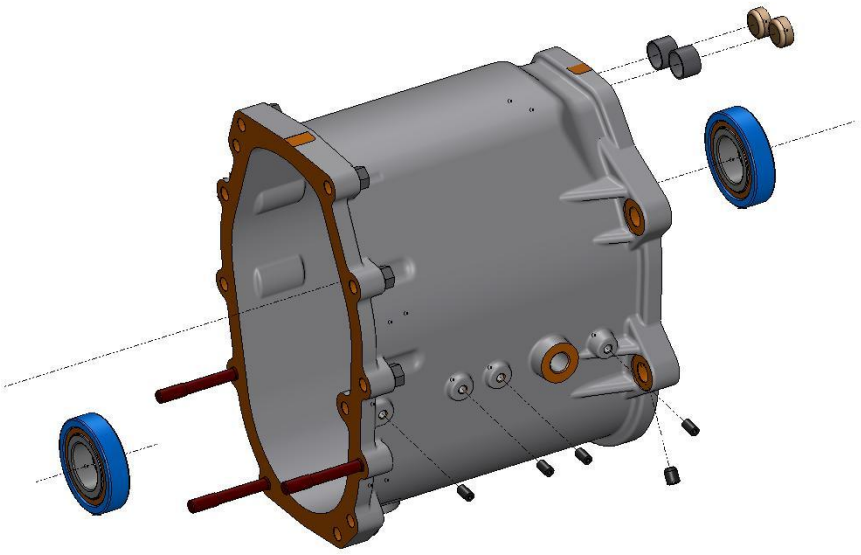
SUB ASSEMBLIES

NOTE: Ensure all parts are thoroughly cleaned before commencing any work. All threads that are to be secured with Loctite, should first be sprayed with 7471 Loctite Primer.

MAIN CASE



Insert two 120-1612DU bushes in through the front of the main case. Tap them into place until they seat against the shoulder.

NOTE: Take care not to distort the bushes when they seat. Check that a rod slides freely through the fitted bushes.

Blank the holes with 18mm welch plugs. Tap them into place until they are just below the front face.

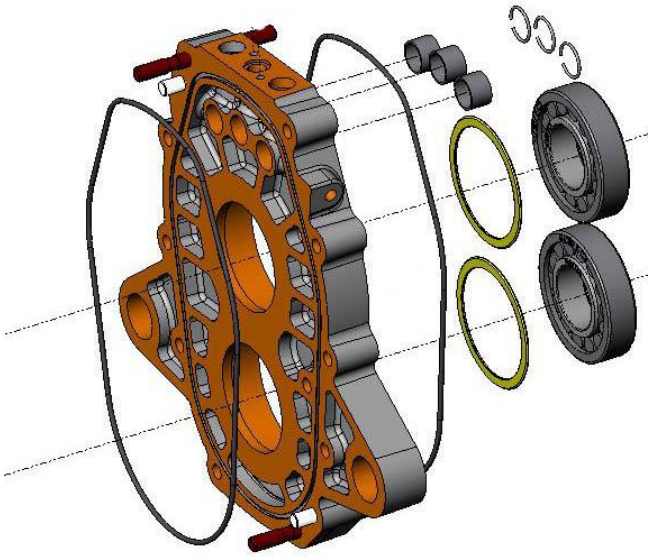
Insert three M8 x 70mm studs into the rear of the case with Loctite 262 (red). 54mm should be left protruding.

Warm the case until the two 104-357217NJ (NJ207 E C3) bearings will slide into place. The input shaft bearing (open hole) should be placed about 6.5mm from the front face. The layshaft bearing (blind hole) should be placed all the way home.

NOTE: Ensure the bearing inner races are kept with their respective outer races.

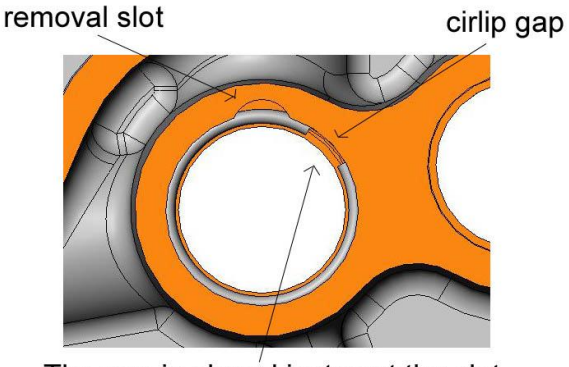
Insert four M6x10mm grubs screws into the spray bar pilot holes with Loctite 262 (red). And one M8x10 grub screw in the front gallery with Loctite 262.

SANDWICH PLATE



Insert three 120-1612DU Bushes in through the front of the sandwich plate. Tap them into place until they bottom out in their holes.

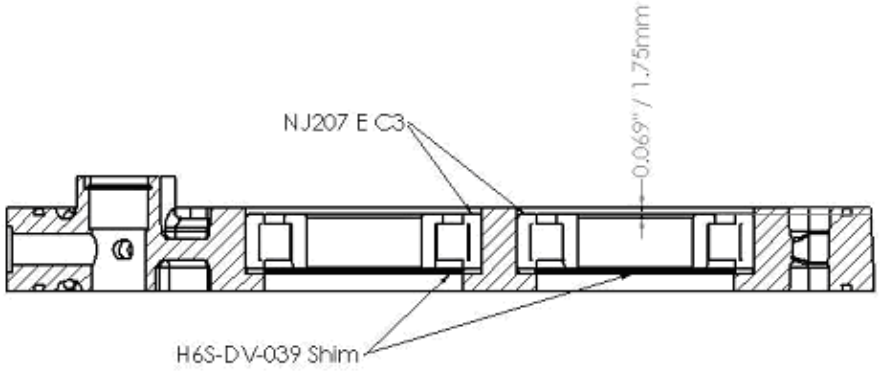
Retain the bushes with RD6-025 circlips. Place the circlips in a position that allows easy removal as the following diagram illustrates:



Insert two M8 x 83mm studs in opposing corners of the sandwich plate with Loctite 262 (red). Equal amounts should protrude either side.

Tap two 8 x 50mm dowels into place with a nylon faced mallet, in opposing corners of the sandwich plate. Equal amounts should protrude either side. Lubricate the dowels with some grease before inserting.

The two 104-357217NJ (NJ207 E C3) bearings installed in the sandwich plate must be set to a specified depth. H6S-DV-039 shims should be ground for both bearings to achieve the dimension in the following diagram:



cross section view of sandwich plate

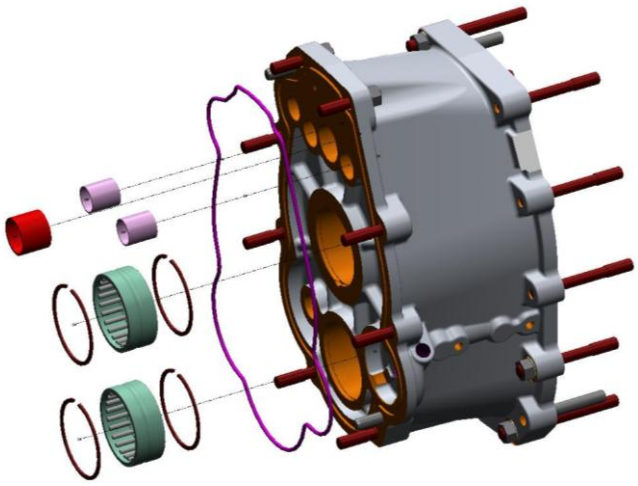
NOTE: Measure the distance between the sandwich plate and the INNER RACE of the bearing.

Warm the sandwich plate and place the bearings into the bores, with the correct shims installed underneath. When the plate has cooled ensure the bearings are seated properly using a press, on the outer race.

NOTE: Ensure the bearings inner races are kept with their respective outer race.

Place o-rings 132-BS171 in the grooves in both sides of the sandwich plate.

REAR CASE



Insert two 120-1620DU bushes in through the rear of the case. Tap them into place so the two outer bushes sit just below the rear surface. Then insert one 120-2220DU bush into the centre of the case, until it is flush with the surface.

Place two 140-52 (BR52) circlips into the inner side of the bearing bores.

NOTE: Place the circlips in a position to allow easy removal.

Warm the case until the two 108-425220 (NK 42/20) bearings can be placed easily into their bores. Retain the bearings with the second set of circlips.

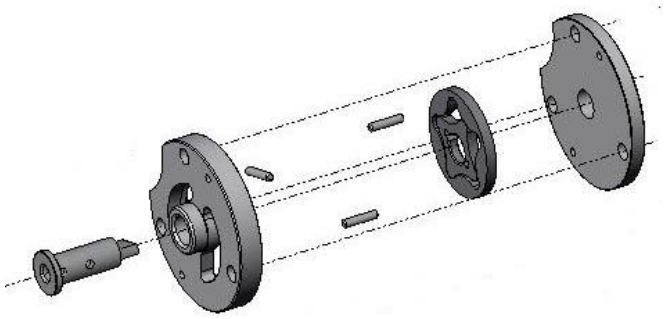
Insert five M8 x 70mm studs into the front of the case with Loctite 262 (red). 54mm should be left protruding. Then insert six M8 x 42.5mm studs into the rear of the case with Loctite 262 (red). 28mm should be left protruding.

Insert two 8mm x 25mm dowels into opposing corners of the rear case, roughly 10mm should be left protruding. Lubricate the dowels with grease before inserting.

Insert two M6x10mm grubs screws into the spray bar pilot holes, and a 7/16X 3/8 UNF plug into the oil gallery pilot hole. Seal these with Loctite 262 (red).

Place the RD6-019 O-ring into the groove on the back of the rear case.

OIL PUMP

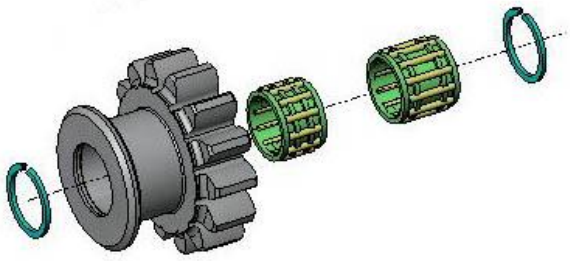


Insert the RD6-020 oil pump spindle into the RD6-022 pump housing, then place a 3x15.8mm roll through the exposed hole in the spindle.

Lower the J6S-077 oil pump into position. Place two 3x13.8mm rolls into the locating holes either side of the housing, and drop the RD6-021 top cover over the assembly.

NOTE: Generously lubricate the pump with oil before installing it in the gearbox.

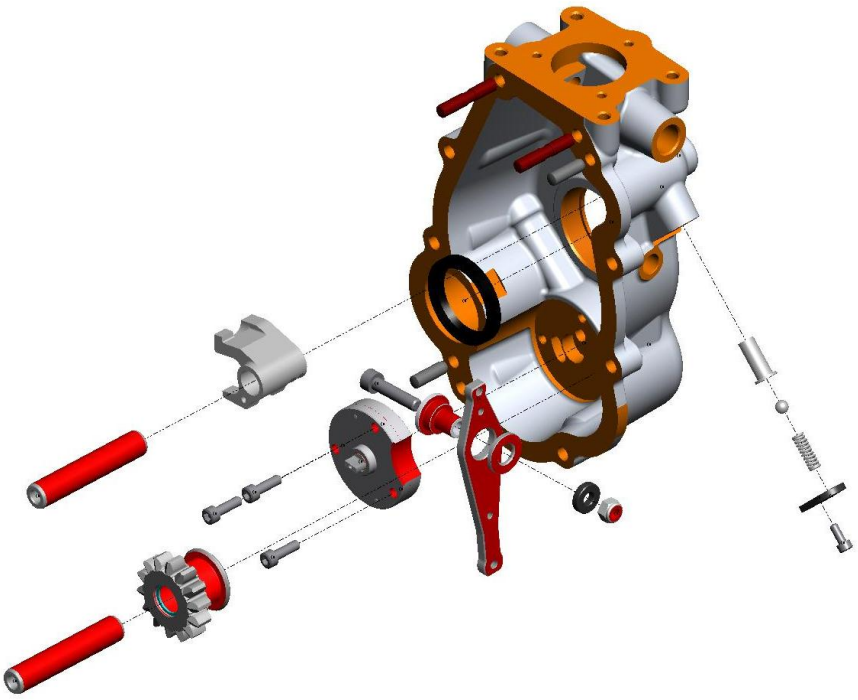
REVERSE IDLER



Insert a 140-20 (BR20) circlip into one side of the RD6-130 reverse idler. Place both bearings 106-162013, and 106-162017, into the bore of the gear and retain them with a second circlip.

NOTE: Place the 106-162017 bearing under the teeth of the gear.

SELECTOR HOUSING



Lubricate and place the oil pump assembly into the base of the casting and secure with M6x20mm cap screws. Retain the screws with lock wire.

Lubricate the 130-425507 lip seal with grease and push it home into the rear of the case.

Fit two M8x39mm studs into the top of the casting with Loctite 262 (red). 23mm should be left protruding.

Seal the oil gallery pilot hole with a 7/16 UNF X 3/8 plug, retained with Loctite 262 (red).

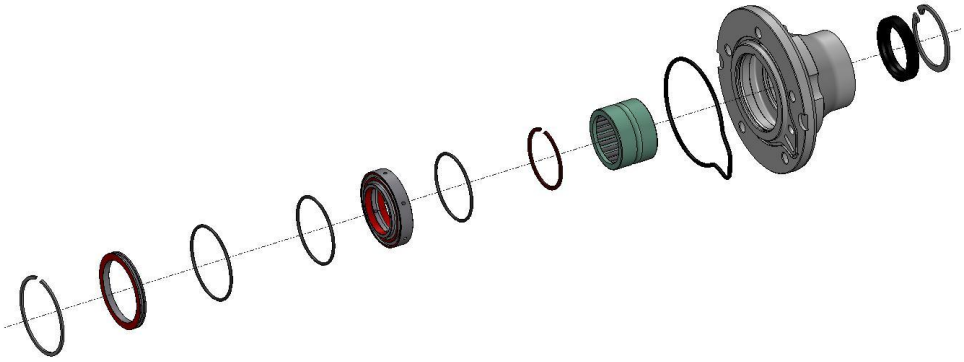
Insert the assembled reverse idler together with the RD6-016 reverse idler spindle into the selector housing using a small quantity of oil on the bearings.

Using an M8X35mm SHCS, assemble the GRA-6N-027 reverse lever pivot along with the H6S-003 Reverse lever and GRA-6N-028 thrust washer. Insert the pivot into the selector housing making sure one end of the pivot is properly located into the ground slot of the reverse idler. On the outside of the case place the GRA-6N-029 reverse washer with a small quantity of sealant along with the M8 Nyloc.

Note: Gearboxes fitted with wide reverse gears have an asymmetric reverse lever. This lever has a dot on one side which must face towards the centre of the gearbox.

Insert the RD6-012 reverse actuator into the housing, so that it slots over the reverse lever. Then insert the RD6-016 reverse actuator spindle home into the selector housing. Quickly check that pushing the reverse actuator into the housing moves the reverse idler outwards in a smooth motion.
Finally insert the GRA-6N-036 detent sleeve along with the 5/16” ball and GRA-6N-080 Detent Spring into the selector housing. Smear the mounting face of the H6S-029 with sealant and screw in an M5x12mm SHCS.

FRONT COVER

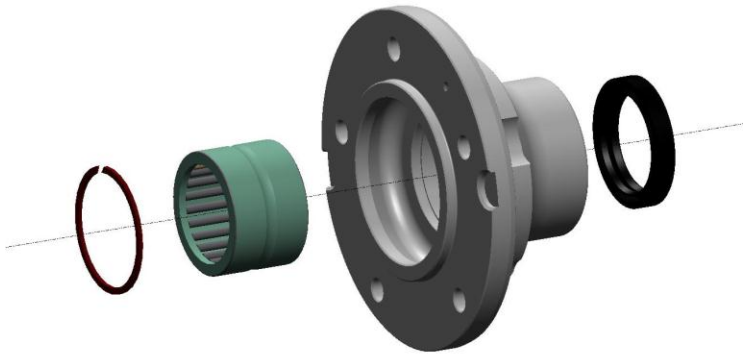


Warm the RD6-150 cover until the 108-354530 (NK35/50) bearing slides into position. Then retain the bearing with a 140-45 (BR45) circlip. Ensure the position of the circlip allows for easy removal.

Lubricate two 132-482.0 o-rings with grease and fit with the oil transfer sleeve into the cover.
Lubricate the 132-532.0 o-ring with grease and fit to the RD6-155 spacer, then insert it to the cover.
Using a press, with an appropriate bung against the RD6-155, compress the o-rings and fit the 140-58 circlip.

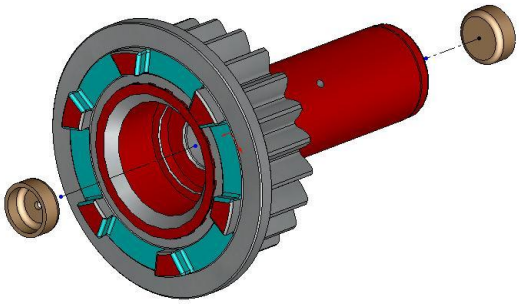
Lubricate the 130-354707 lip seal with grease and push it into place, in the front of the cover, retain it with circlip – 143-47. Finally, fit the 132-BS152 O-ring into the groove.

Note: RD6-H gearboxes manufactured before 2010 where supplied without a pressure fed mainshaft oiling system.



Assemble the front cover as mentioned above, however it will require sealant on its mating surface once assembled onto the front case as is does not have an O-Ring to seal.

INPUT SHAFT

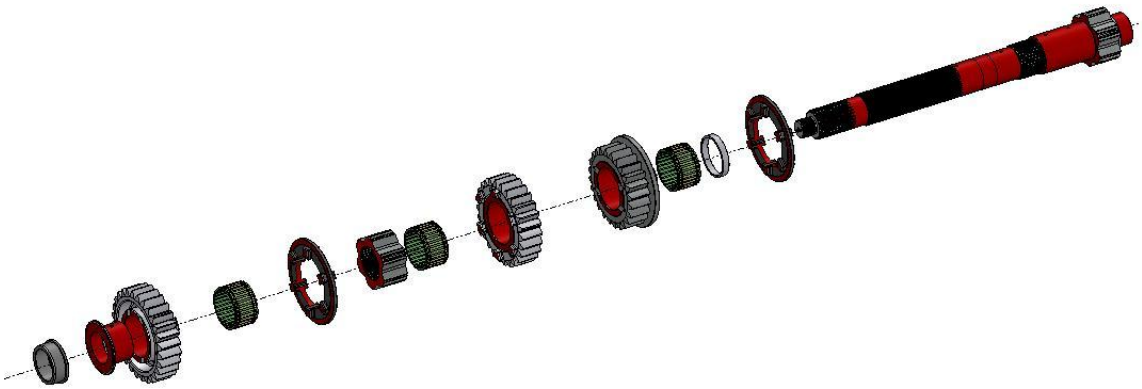


Two Welch plugs are fitted to the input shaft. The front plug is unmodified. The rear (dog end) plug requires a 3mm hole in its centre, to form the oil jet.

NOTE: New RD6-157 supplied from Holinger has Welch plugs fitted.

The inner race of the 104-357217NJ (NJ207 E C3) input shaft bearing is a neat sliding fit on the input shaft.

MAINSHAFT



Start by sliding the bearing spacer and needle rollers up against the integral hub. Generously lubricate them with gear oil. The spacer must be beneath the integral dog on 5th (6th if overdrive).

Place 5th gear (6th gear if an overdrive gearbox) onto the shaft, with the dogs facing the selector hub. Then place 4th gear (3rd if O.D.) onto the shaft, with the dogs facing towards the rear of the shaft.

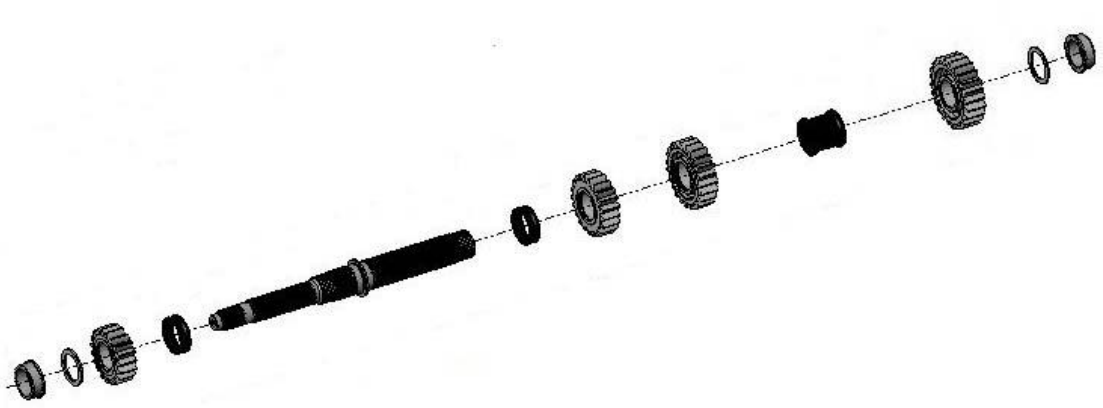
Slide an HTA-022 selector hub onto the shaft, and then slide an RD6-069 selector ring over the hub.

Place a needle roller bearing onto an RD6-159 bearing sleeve and 3rd (4th if O.D.) gear, with the dogs facing away from the sleeves shoulder. Fit to the mainshaft.

Finish by pressing the inner race (NJ207 E C3), matched pair from the sandwich plate onto the shaft up against the RD6-159 sleeve.

NOTE: When the bearing is pressed home, check all gears have between 0.007”-0.010” (0.18mm-0.25mm) end float.

LAYSHAFT



Begin by sliding an HTA-057 spacer, the 3rd spline gear (4th if O.D.), and the HTA-075 spacer onto the rear of the layshaft as shown in the left side of the diagram.

Then press the inner race from the sandwich plate layshaft bearing (NJ207 E C3), onto the shaft. Check the shoulder side of the bearing race is adjacent to the spacer (HTA-075).

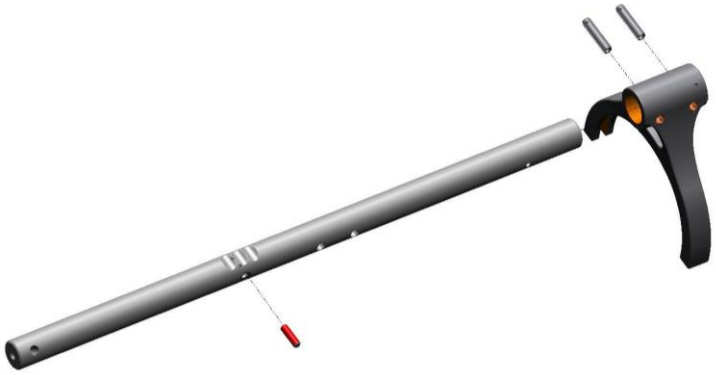
Now assemble the forward part of the shaft by sliding another HTA-057 spacer on, followed by the 4th and 5th (3rd and 6th if O.D.) spline gears respectively. Fit the HTA-018 spacer, followed by the drop gear.

An H6S-DV-044 **set-up shim** roughly 0.080”-0.085” (2mm-2.15mm) wide should be placed in between the drop gear and the bearing inner race. The original shim will suffice if the gearbox is used. The NJ207 E C3 bearing inner race is a neat sliding fit.

NOTE: The HTA-075 spacer and the H6S-DV-044 shim have identical dimensions, except for their thickness. The HTA spacer is fixed at 0.110” (2.794mm), whereas the H6S-DV shims thickness is varied to adjust shaft end-float.

SELECTOR RODS/FORKS

Place the 5th/6th fork (HTA-025) on the RD6-008 selector rod as shown.



Place the 3rd/4th fork (HTA-025) on the RD6-007 selector rod as shown, then slide the RD6-024 interlock pin into the small hole with grease.

Place 1st/2nd fork (HTA-025) on RD6-006 selector rod as shown.
Secure the forks onto the selector rods with 5mm x 22mm roll pins.

NOTE: Roll pins are a single use item. Use only Holinger supplied Roll Pins.

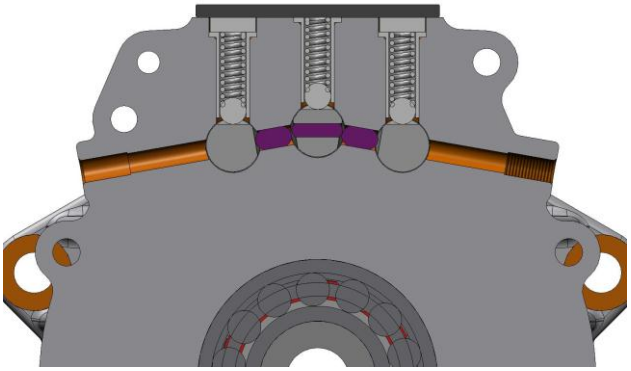
GEARBOX ASSEMBLY

NOTE: Ensure all parts are thoroughly cleaned before commencing any work. All threads that are to be secured with Loctite, should first be sprayed with 7471 Loctite Primer.

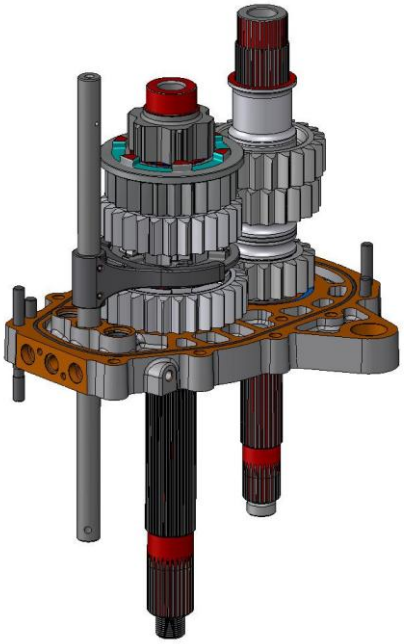
ASSEMBLE 4TH – 6TH GEAR TRAIN AND SET SHAFT END FLOAT

Place the sandwich plate onto an assembly fixture.

Slide the two RD6-023 interlock plungers into the small holes in the sandwich plate, refer to the cross section below.

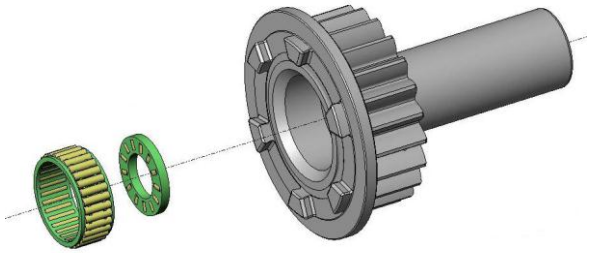


Check the interlock pin RD6-024 is fitted in the 3rd / 4th selector rod. Then install the mainshaft, together with the 3rd/4th selector fork/rod and the layshaft as per diagram. Move the 3rd/4th fork and rod into its neutral position so that the interlock plungers allow 5th/6th to be fitted in the next step.

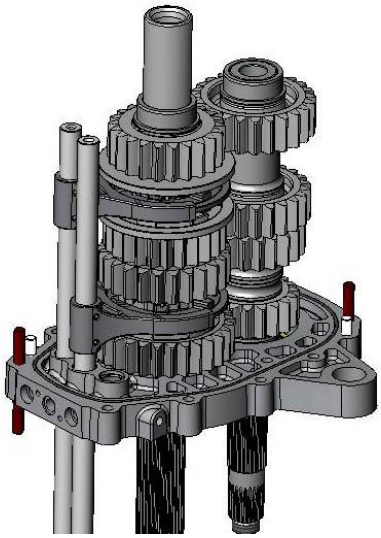


Then fit the 5th/6th selector ring and selector fork/rod.

Place a 112-2035 thrust bearing, and 106-354216 needle roller into the input shaft as shown, and lubricate generously with gear oil:



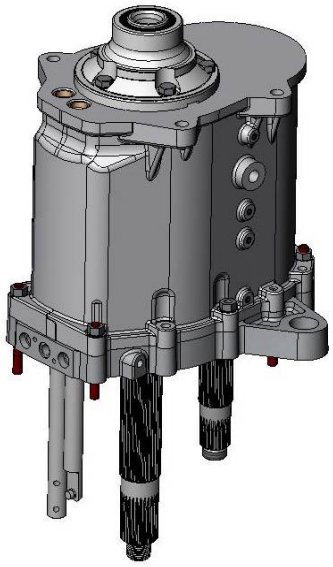
Place the input shaft on top of mainshaft assembly. Then fit the drop gear to the layshaft, followed by the H6S-DV-044 shim and the layshaft front bearing inner race. According to the following diagram:



Grease the dowels, and place the maincase over this assembly. Make sure the selector rods can travel freely and the shafts turn freely.

Secure the main case with M8 nuts and washers. Clamp the case home in at least six evenly spaced positions.

Install a set-up H6S-DV-040 shim, 0.105”-0.110” (2.7mm-2.8mm) thick, on top of the input shaft bearing and then bolt the front cover in place.



Use a dial indicator check the end float on the shafts.
The set-up shim thickness is intended to always give end float and should be considerably thinner than the final shim

Grind and fit new shims to set the end float between 0.003”-0.005” (0.075mm-0.13mm) for both the main and layshafts.

Holinger Engineering can provide shims to your required thickness.
Mainshaft shim: H6S-DV-040
Layshaft Shim: H6s-DV-044

Upon reassembly, apply some sealant to the threads of the M8 bolts for the front cover.

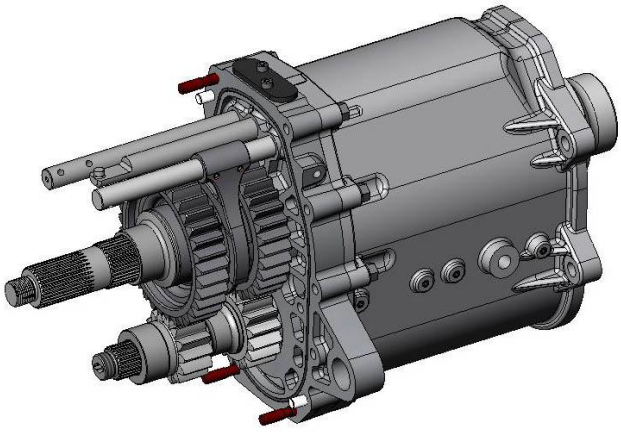
ASSEMBLE 1ST – 2ND GEAR TRAIN

Place 106-424727 needle rollers onto the two remaining bearing sleeves, RD6-160, and RD6-161. Lubricate them with gear oil and place the 1st dog (2nd if O.D.) gear onto the RD6-161 sleeve, and the 2nd dog gear (1st if O.D.) onto RD6-160 sleeve.

Slide the RD6-160 sleeve/gear onto the mainshaft, to seat against the roller bearing inner race. Then slide the corresponding spline gear onto the layshaft, so they are in mesh.

Next slide the HTA-023 selector hub onto the mainshaft, with the 1st/2nd selector ring, and fork/rod. Slide the HTA-017 spacer onto the layshaft.

Fit the RD6-161 sleeve/gear onto the mainshaft and the corresponding spline gear into mesh with the dog gear, with the GRA-6N-010 inner race onto the layshaft.



TIP: Visually check the gear tooth backlash to be 0.008” (0.2mm), Also check the gear end float to be 0.009”-0.012”

Now install the rear case, lubricating the dowels with some grease.
Secure the case with M8 nuts and wave washers. And check the selector rods can travel freely and the shafts turn easily.

ASSEMBLE SELECTOR MECHANISM

Firstly fit the 3rd/4th rod end - engage third gear to expose the roll pin hole in the selector rod. Attach the rod end with the 5mm x 22mm roll pin.

The 1st/2nd and 5th/6th rod ends can now be attached to the selector rods with 5mm x 22mm roll pins.

With all rod ends attached the RD6-013 interlock shuttle and RD6-014 interlock guide can now be installed with M6 X 16mm SHCS. Lock wire into position once tight.

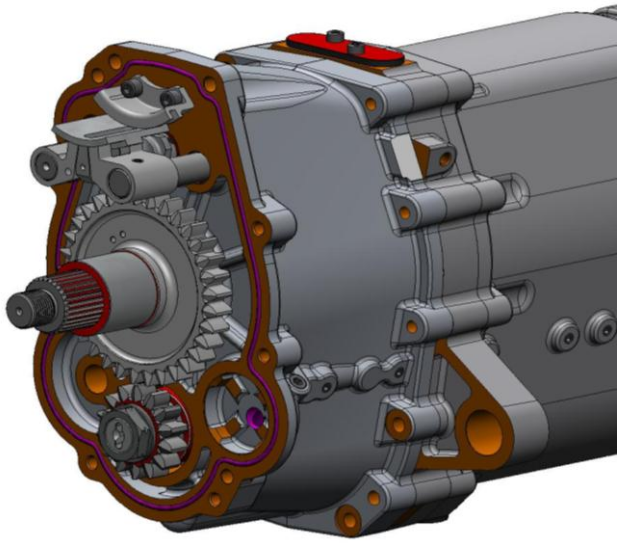
Slide the mainshaft reverse gear RD6-131 up against the RD6-161 bearing sleeve, with the leads on the gear teeth are facing towards the back of the gearbox.

Slide the RD6-037 spacer up against the reverse gear.

Slide the layshaft reverse gear RD6-132 onto the layshaft, again with the leads facing toward the rear of the gearbox. Secure this gear with the HTA-038 nut.

NOTE: The HTA-038 Layshaft nut is left hand thread.
The tightening torque is 80Ftlb (110 Nm). Retain with Loctite 262 (red).

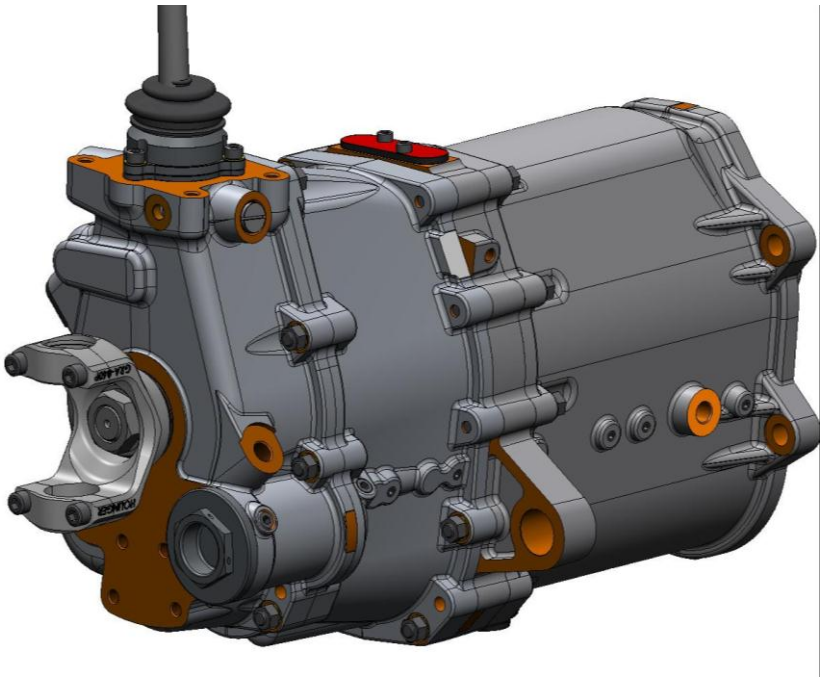
TIP: Select two gears at once to stop the shafts from turning. Fit RD6-016 and the reverse idler RD6-130 temporarily and also select 4th gear.



The Selector housing can now be installed.

Important: Make sure the oil pump drive slot in the layshaft is lined up with the pump spindle and that the interlock shuttle is rotated towards 1st/2nd rod end to allow clearance for the reverse actuator.

The rear flange can now be installed and the nut tightened to 150 lbs-ft (200 N-m) with Loctite 262 (red). Use a brace bolted to the flange by the four 5/16UNF bolts to restrain the shaft.

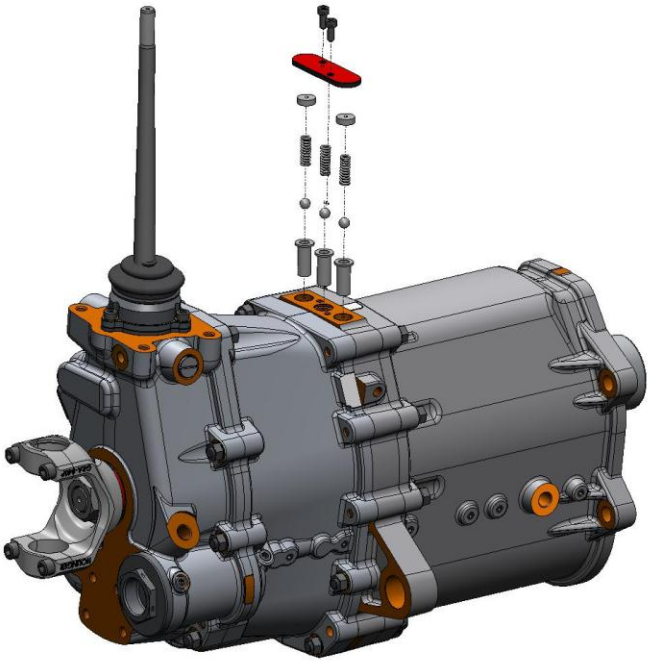


Now you can install the Selector housing cup, Gear lever, spring, washer, cap and rubber boot using 3, M6x16mm SHCS.

Insert the detent plungers into the side of the selector housing. The H6S-035 (long) is inserted in the left side, and the H6S-036 (short) in the right side. Following these are springs GRA-6N-084 (long) in the left and GRA-099 (short) in the right. These are retained by GRA-061 selector plugs using loctite 243 (blue).

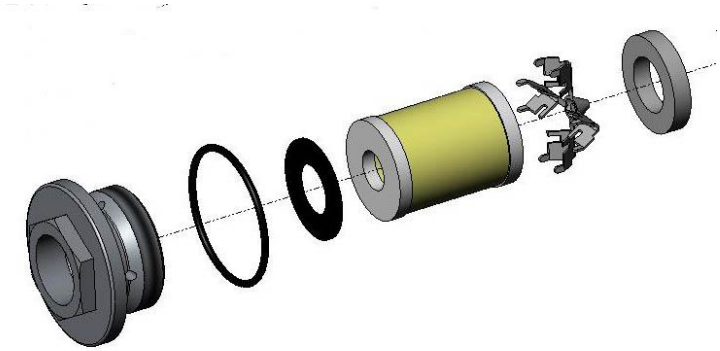
Note:
To allow some adjustment of the spring pressure, the plugs don't tighten against a seat.

Typicaly the spring pressure would be set to maximum by holding the gear lever against the side of the 'gate' and screwing the corresponding plug in. When the spring coil-binds the gear lever will move off its stop. The spring and plug should be able to coil bind, as it will cause selection problems.



Insert three lubricated GRA-6N-036 detent sleeves into the sandwich plate followed be 5/16” balls, GRA-6N-080 Detent springs and HTA-046 Detents spacers in the outer two detent bores. Attach using two M5x12mm SHCS, using sealant on the GRA-6N-060 spring plate.

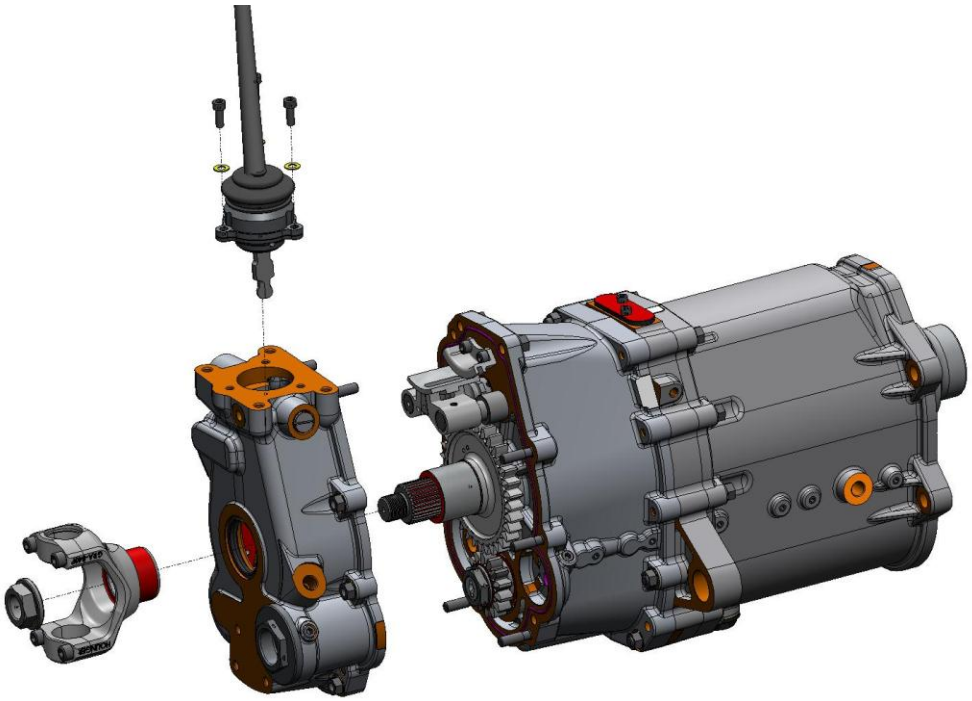
The oil filter assembly can be inserted in the rear of the selector housing. Tighten the cap to 45 lbs-ft (60 N-m).



GEARBOX DISASSEMBLY

The RD6-H can be dismantled as a reversal of the assembly process.

For rapid disassembly, the selector mechanism can be removed as a unit and later disassembled independently. See below.



NOTE: Select neutral before starting any of the below procedures.

Start by removing the mainshaft nut and flange. Remove the gear lever assembly by removing the three M6x16mm SHCS.

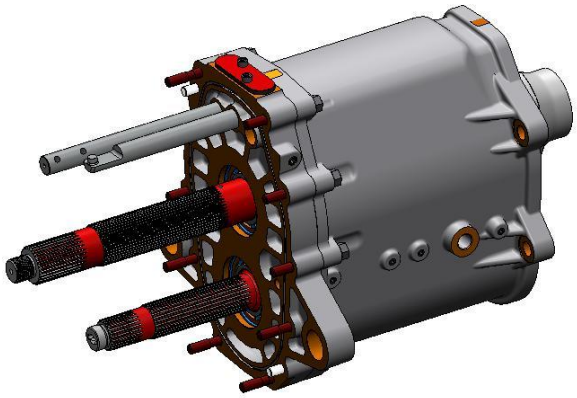
Remove the M8 nuts/washers and slide the housing off separating it from the rear case. Ensure the interlock shuttle is pushed towards 1st/2nd rod end to allow the reverse actuator clearance to move.

NOTE: The black layshaft nut HTA-038 is left hand thread.
Remove the layshaft nut (HTA-038).
TIP: To prevent the shafts from turning, use the reverse idler and spindle from the selector housing subassembly. Engage reverse and a forward gear together.

Slide the reverse gears and spacer (H6S-DV-011, HTA-036, RD6-037-*fixed flange only*) off their respective shafts, remove shuttle interlock and remove the rod ends (RD6-011, 010 and 009) from the selector rods.

Then separate the rear case from the sandwich plate by removing the M8 nuts/washers, which will expose 1st and 2nd gear train.

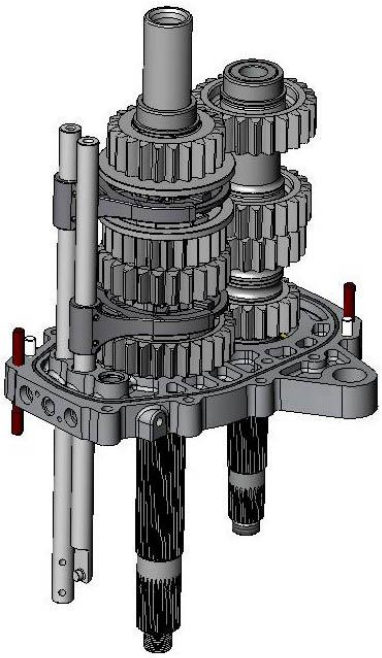
First and second gear along with their respective sleeves, spacer, hub, fork and selector ring will slide off the shafts by hand.



Next remove the front cover, which is held on by five M8 bolts.
Locate the end float shim (H6S-DV-040) from in front of the input bearing.

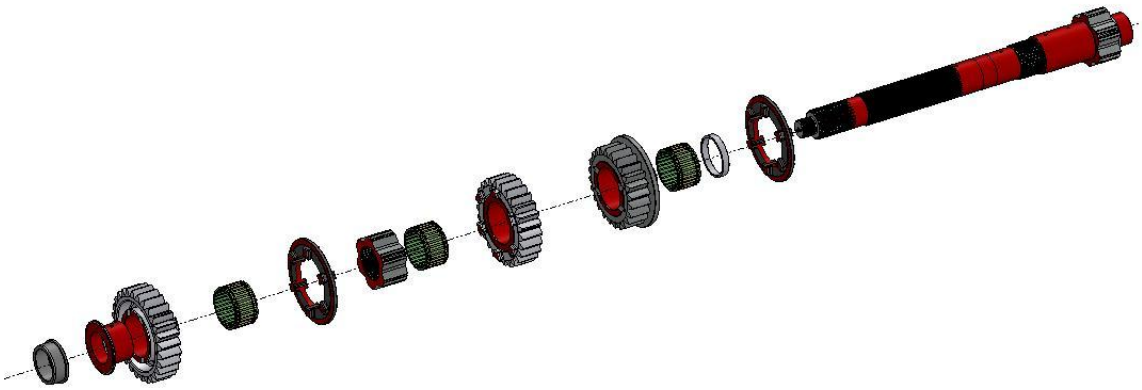
Remove the remaining M8 nuts at the sandwich plate and remove the main case.
Once the 4th -6th gear train is exposed it can be removed from the sandwich plate.

NOTE: The roller bearing inner races are not interchangeable with one another.



Layshaft subassembly:
The forward section of the layshaft can be disassembled, by sliding the bearing race, gears and spacers off by hand (NJ207EC3, HTA-012, HTA-013, HTA-018, HTA-057).
The bearing inner race mid shaft should be removed with press. Allowing removal of 3rd gear (4th if O.D.), and two spacers (HTA-013, HTA-075, HTA-057).

Mainshaft subassembly:
To dismantle the mainshaft, the NJ207 E C3 inner race must be removed. It is safe to use a press, resting against third gear (4th if overdrive) to press the shaft through the bearing. You can then remove the gears, sleeve, hub, and selector ring (H6S-DV-008's, HTA-019, 022, RD6-069).



Thoroughly clean and inspect all parts.

4th – 6th PARTIAL DISASSEMBLY:

If you wish to only inspect the front gear train or change the drop gears, you can remove the maincase before any other part of the gearbox. The M8 nuts and washers holding the rear case/sandwich plate/maincase together need to be removed, then the main case can be tapped off to expose the forward gear train.

Note: The two studs located next to the locating dowels are threaded into the sandwich plate. Here you should remove the nuts/washers on the main case side only.

MAINSHAFT / LAYSHAFT BEARING END-FLOAT

0.003”-0.005” (0.08mm-0.12mm)

TORQUE SETTINGS

Mainshaft Nut (Fixed Flange)	150 lbs-ft (205 N-m)
Mainshaft Nut (Slip Yoke)	80 lbs-ft (110 N-m)
Layshaft Nut (LH Thread)	80 lbs-ft (110 N-m)
Drain and filler plugs	60 lbs-ft (80 N-m)
Filter Cap	45 lbs-ft (60 N-m)
Front cover bolts/M8 Nuts	20 lbs-ft (27 N-m)
RD6-122 Detent Plunger cap	15 lbs-ft (20Nm)
M6 capscrews	12 lbs-ft (16 N-m)
M5 capscrews	7 lbs-ft (9.5 N-m)

LUBRICATION

The extreme pressure additives in Limited Slip Differential oil have proven to aid gear life.

We recommend, fully synthetic LSD oil, with an API GL 5 or higher rating and heavier viscosity range, typically 85w-140. 75w-90 is also acceptable.

Note: Some Shockproof oils are not suitable for use in gearboxes with an oil pump, paper element filter, galleries, and spray bar etc. such as the RD6-H.