

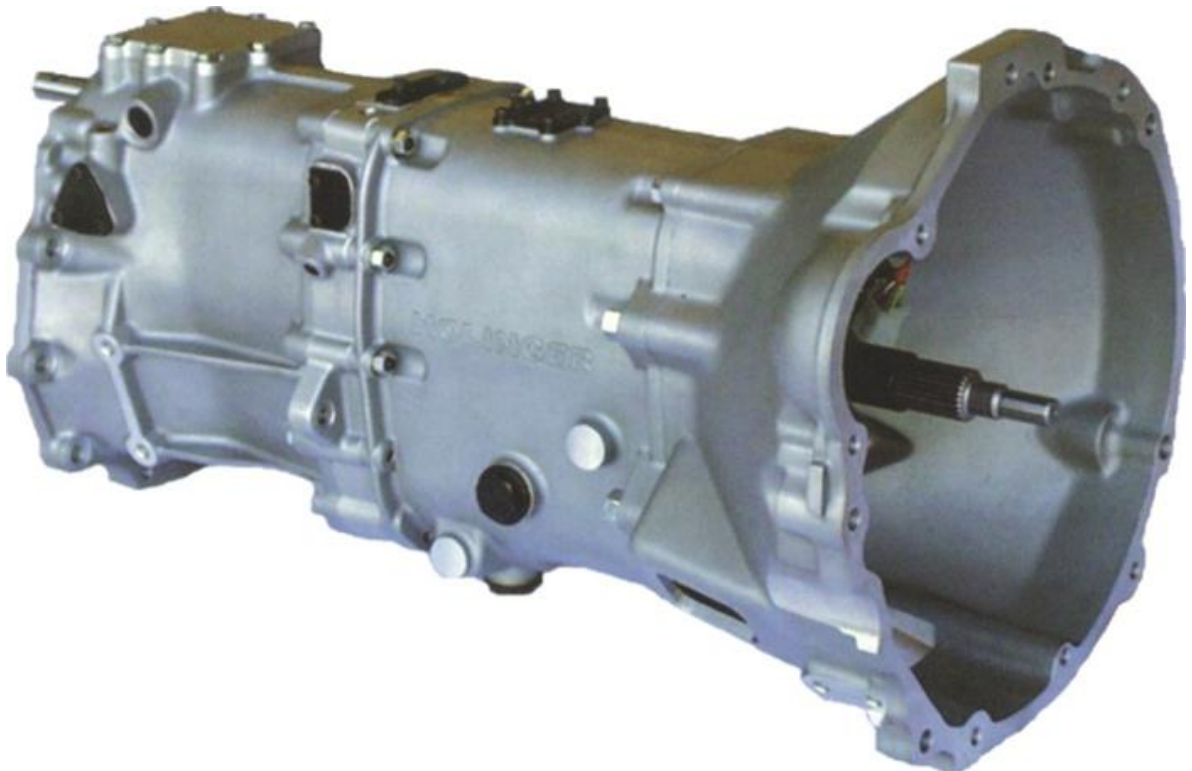
# **HOLINGER**

## **ENGINEERING**

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### ***GTR GEARBOX SERVICE MANUAL***

***2012***



# GTR

## **6-SPEED SEQUENTIAL GEARBOX**

### **Foreword:**

The Holinger GTR is a sequential-shift dog-change gearbox designed for use in the R32 and R33 Nissan Skyline GTR and is suitable for all types of racing. The gearbox is fitted with 6 forward gears and a reverse gear and shifting is performed via the original gear lever. These transmissions are used with great success in cars with more than 1000hp in drag racing applications.

### **Features:**

- The gearbox is designed to bolt directly to the Nissan RB Series engine at the front and standard Nissan R32/R33 transfer case at the rear.
- The gearbox is fitted with 6 forward gears and a reverse gear.
- It is available with a 1:1 6th gear or with an overdrive 6th gear.
- All gears are removable from shafts with an extensive range of ratios available.
- Gear engagement is performed by non-synchronised face dogs.
- Gear change is performed by using the standard Nissan gear lever and mechanism.
- The gear lever is pulled back for up changes and pushed forward for down changes.
- Neutral is selected from 1st gear position by moving the gear lever to the left and forward.
- Reverse is selected from the neutral position by pushing the gear lever forward. From reverse gear, neutral is selected by pulling the gear lever back and 1st is selected by pulling the gear lever back again.
- This system prevents neutral or reverse being accidentally selected when in the forward gear pattern.
- A gear position sensor is supplied for interfacing with an electronic dash display. Alternatively a stand-alone gear indicator display is available for cars not fitted with an electronic dash.
- Case hardened nickel chrome steel is used for all gears and shafts.
- The selector forks are aluminium bronze.
- Casings are sandcast Aluminium alloy, heat treated to T6 specifications.
- Clutch splines are normally 1 1/8" x 26, 24/48DP, 30 deg P.A., but can be ordered with standard Nissan splines.
- The gearbox weight is 46kgs (102lbs).

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# ***CHANGING GEARS***

Changing gears with a Holinger GTR is performed via the standard Nissan Gear Lever.

Shifting between gears is achieved by moving the gear lever forward and backward in a straight line. One movement in either direction corresponds to one gear change, in sequence from Reverse-Neutral-1st-2nd-3rd-4th-5th-6th and back.

To shift up a gear simply pull back firmly on the gear lever until it stops, then release it, allowing it to spring back to the “central” home position.

To shift down a gear simply push forward firmly on the gear lever until it stops, then release it, allowing it to spring back to the “central” home position.

***To avoid selecting Neutral or Reverse at an unwanted time, a Lock-Out system has been incorporated.***

To shift from 1st Gear into Neutral, push the gear lever all the way to the left and then push forward once. From this position the driver can select Reverse Gear with a single down-change or 1st gear with a single up-change as per normal.

## ***MAINSHAFT / LAYSHAFT BEARING END-FLOAT***

0.000" (0.00mm)

### ***TORQUE SETTINGS***

Mainshaft Nut	110lbs-ft (150 N-m)
Layshaft Nut	45 lbs-ft (60 N-m)
Layshaft Bolt	35 lbs-ft (48 N-m)
Drain and Filler plugs	60 lbs-ft (80 N-m)
Front Cover bolts/M8 Nuts	20 lbs-ft (27 N-m)
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.

The Oil Filler Plug located on the left hand side of the gearbox can also be used as an oil level check-hole. The oil level may change after running and should be re-checked to ensure it is correct.

The gear oil should be inspected regularly to quickly evaluate the gearbox condition. If oil condition looks overly metallic in appearance, further inspection of the gearbox should be conducted.

*If you do not have an assembly drawing of the GTR gearbox, please contact Holinger Engineering to obtain one.*

# ***DISASSEMBLY***

**NOTE:** The first thing to do before commencing any work on the Holinger GTR Gearbox, is to place it in the Neutral gear position.

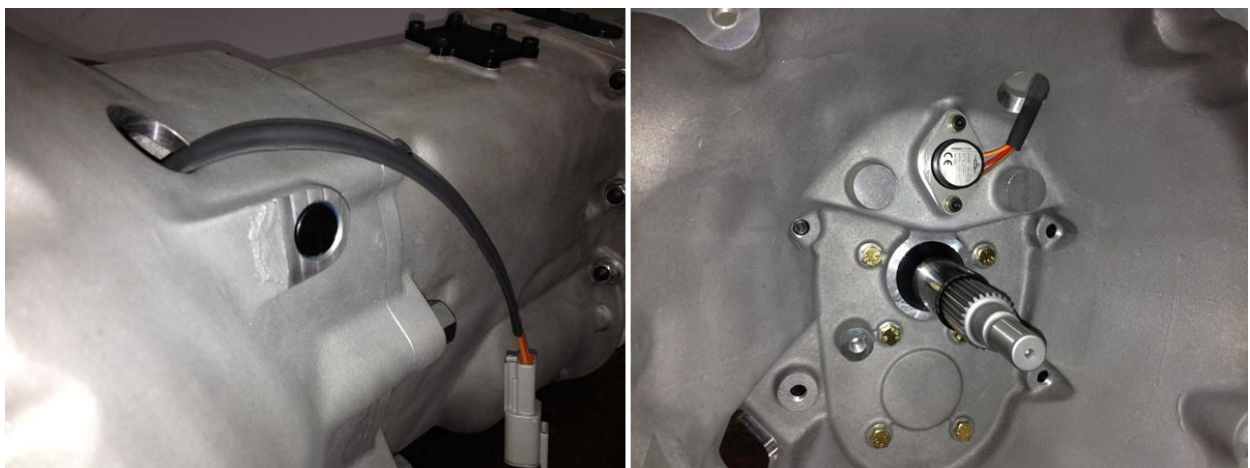
The Gearbox Bellhousing needs to be removed to expose the camshaft mechanism, before any other work can be carried out.



Begin by removing the 4 x M12 nuts/Washers. Then remove the Detent plunger and Spring which is located on the upper left side of the Bellhousing, under the black plug.

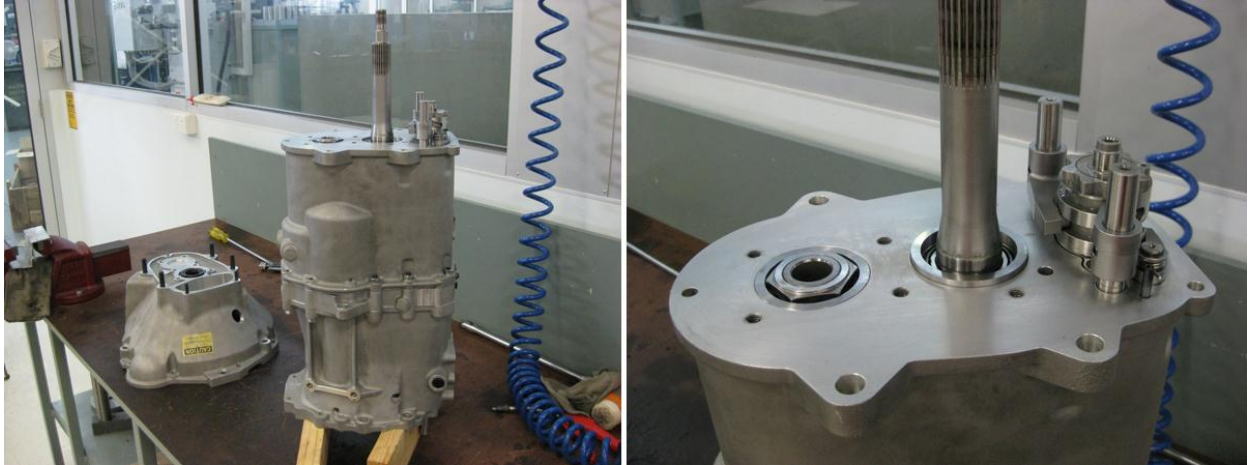
Then remove the Potentiometer, its Drive Adaptor and Spring.

Finally the 6 x M8 Bolts/Washers.

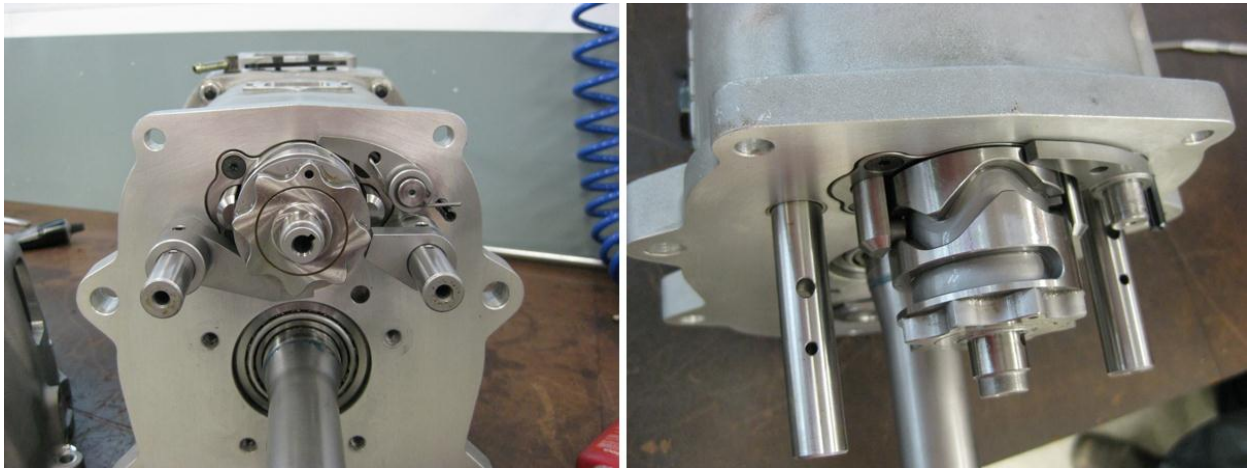




Lightly tap the Bellhousing away from the gearbox, and remove it to expose the Camshaft mechanism and front Bearings.

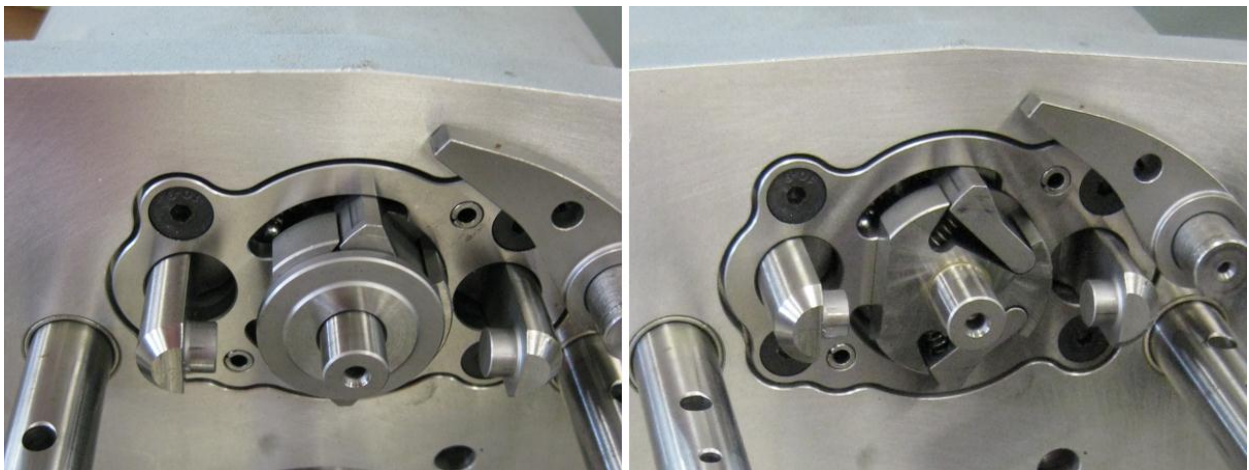


Knock the Rollpins out from the 3<sup>rd</sup>/4<sup>th</sup> and Reverse Cam Followers, and remove them from the selector rods. You can now also remove the Circlip/Washer/Spring from the Neutral Lockout Latch.

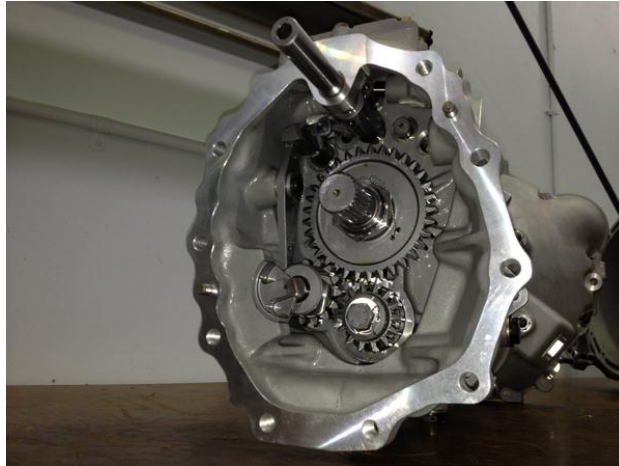


Remove the Camshaft by pulling it away from the rest of the gearbox.

**NOTE: Be careful not to lose the Pawls/Springs when doing this.**



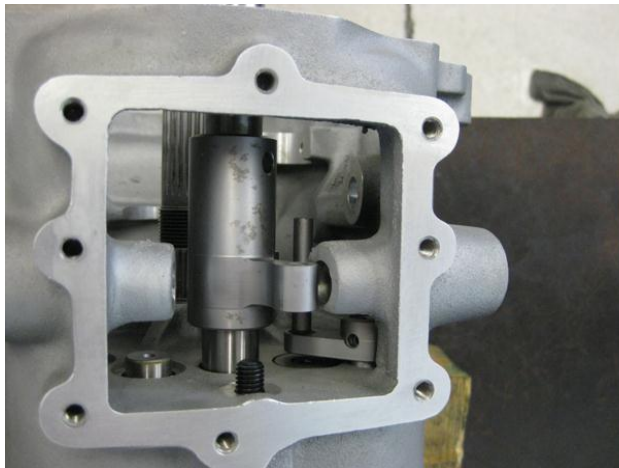
After removing the Camshaft Shim, Pawls/Springs, turn your attention to the Rear of the gearbox.



Select either 3<sup>rd</sup> or 4<sup>th</sup> gear by moving the selector rod protruding from the front of the gearbox, and simultaneously select Reverse gear by moving the other protruding rod (This locks the gearboxes shafts together allowing the rear nut/bolt to be removed).

Cut the lock-wire on both the Mainshaft Nut and Layshaft Bolt, then remove them.

Remove the Cast Aluminium Cover from the top of the Rear case, then knock out the Roll Pins from Gear Change Rod, Neutral Latch Striker and Reverse Rod End. Now Remove the Reverse Lever, Reverse Idler Gear and Spindle.





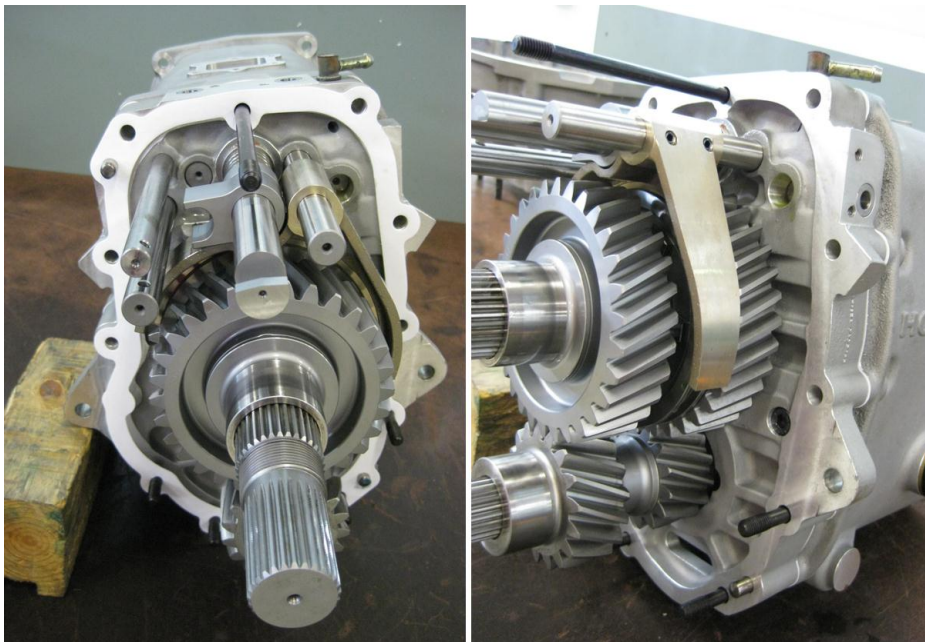
The rest of the components in the Rear Case can now be removed, along with the M8 Nuts/Washers between the Main and Rear Cases. Now also remove the Blackened Plates from the top and side of the gearbox:



**NOTE: The plates located on the sandwich plate will release Detent Springs/Balls. Be Careful not to lose them!**

Lightly tap the Rear Case backwards with a soft hammer, separating it from the Sandwich Plate.

**NOTE: If possible try to prevent the Gasket from tearing.**



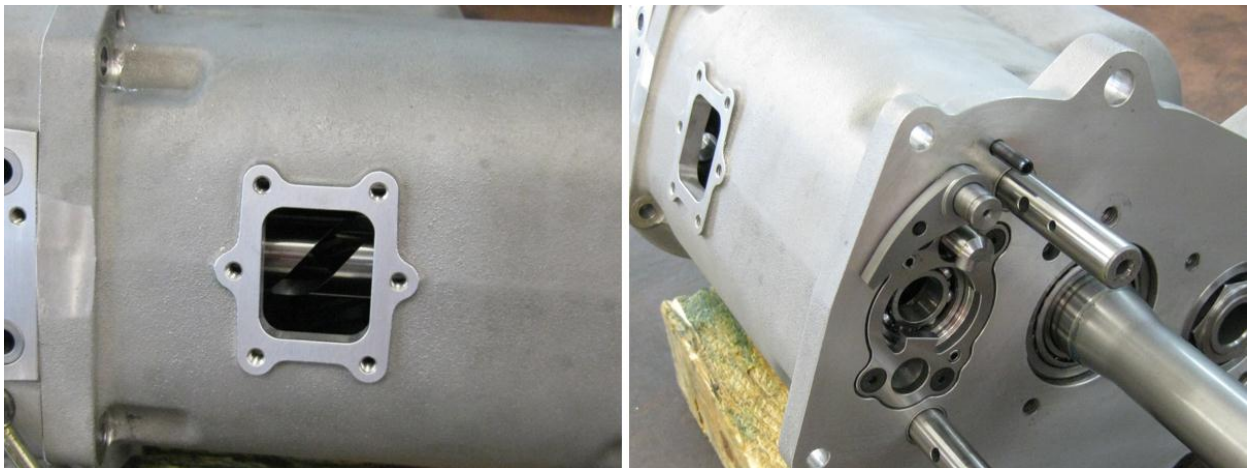
Remove 1<sup>st</sup> and 2<sup>nd</sup> Gears/Spacers/Sleeves, along with the Selector Ring/Hub and Rod/Fork.

You will now need to remove the Spiral Actuator Pin and Rollers:



**NOTE:** It may be helpful to try and support the pin on the under-side to remove the Circlip/Washer/Rollers from the top. If the gearbox is being completely disassembled do not worry if the parts fall into the gear train, so long as they are retrieved after the Maincase is removed.

Now remove the Spiral Actuator:



Remove the Maincase from the Sandwich plate. To do this you must first remove 2 x M8 Capscrews from the rear of Sandwich Plate:



It is desirable to now hold/support the gearbox in a vertical position, with the Sandwich Plate bolted to a solid fixture. This allows the Maincase to be easily removed.

Tap the Maincase gently away from the Sandwich Plate to expose the forward Gear Train.



You can now remove all the parts, starting with the Input Shaft, then the Layshaft, the Mainshaft and Selector Forks/Rods.

Whilst not totally necessary the Spiral Actuator can be removed by knocking out the Roll Pin in the sleeve on the rear side of the Sandwich Plate.

**NOTE: It is best to support the Rod in a Vice close to the pin you are removing. Do not strike the rod if only supported by the Sandwich Plate, as this may damage the bore the Rod Slides in.**

**THOROUGHLY INSPECT AND CLEAN ALL PARTS.**



# ***RE-ASSEMBLY***

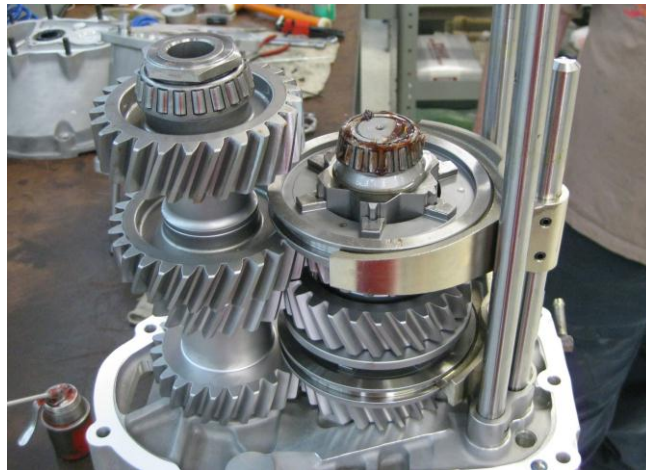
**NOTE:** Before commencing ensure all parts are clean and that all worn parts have been replaced with new ones.

It is best to begin by bolting the sandwich plate onto a fixture supported vertically in a vice or similar.

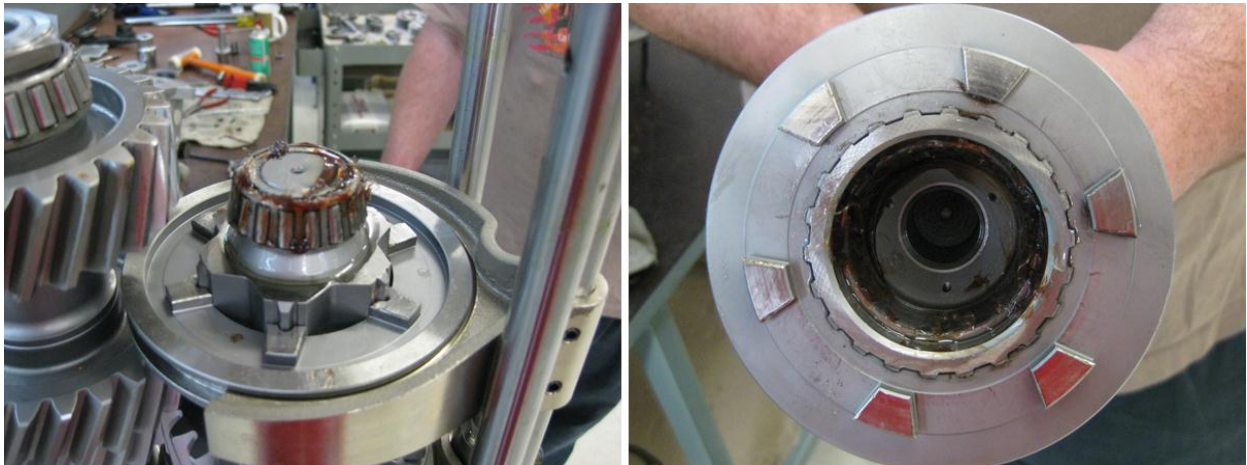
Insert the Mainshaft assembly into the Sandwich Plate along with the 3<sup>rd</sup>/4<sup>th</sup> Rod/Fork.

Insert the Reverse Selector Rod into the Sandwich Plate and align the Reverse Selector Rod Guide with the 5<sup>th</sup>/6<sup>th</sup> rod hole. Now Place the 5<sup>th</sup>/6<sup>th</sup> Selector Ring/Rod into the assembly.

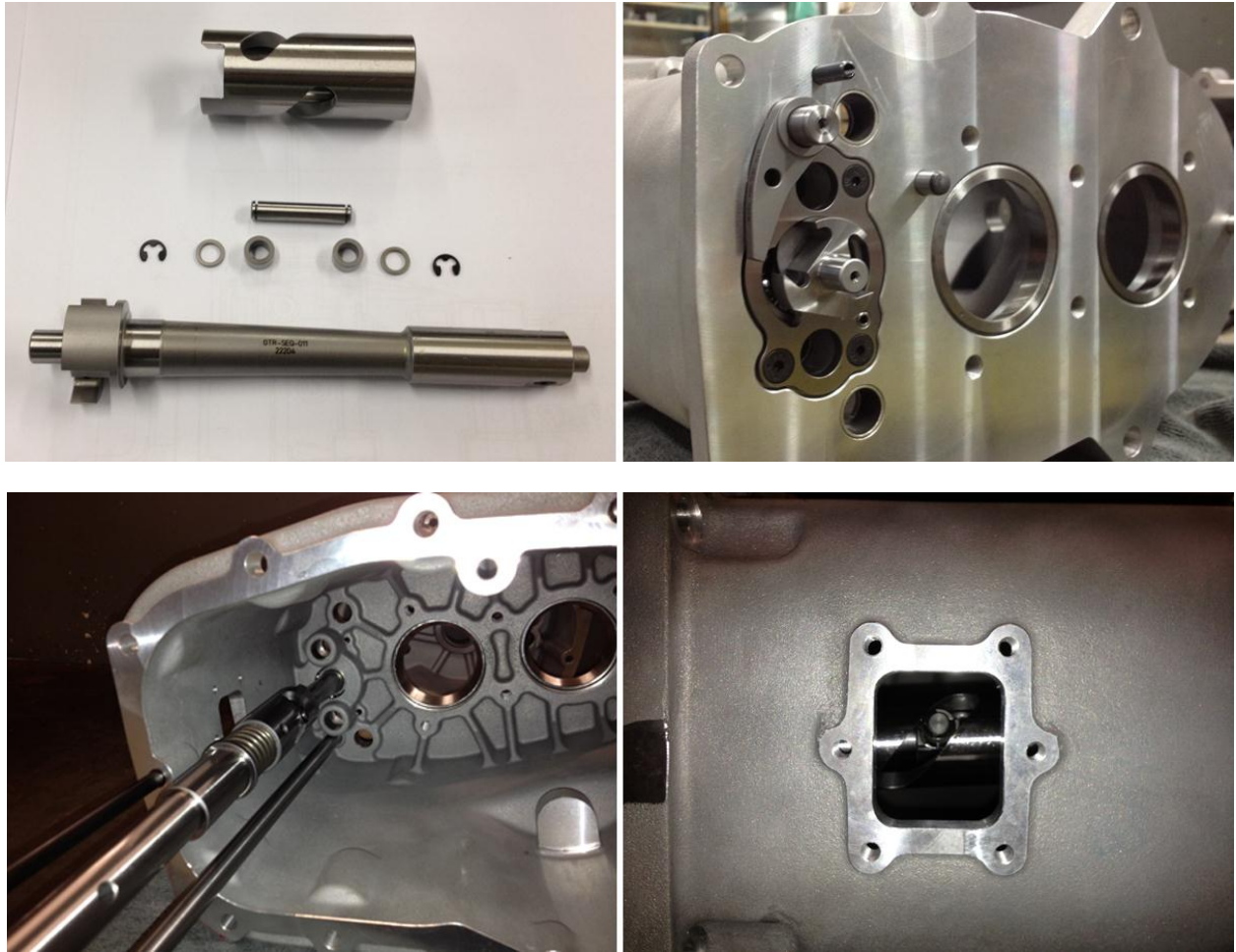
Install the Layshaft.



**NOTE:** Before installing the Input Shaft, ensure that the Pocket Bearing is well lubricated with Oil/Grease!



If the Spiral Actuator was removed previously, it is easiest to install that and the pawl carrier now:



Place a new Gasket onto the Sandwich Plate then lower the Maincase over the assembly. Lightly tap it home with a soft hammer ensuring it goes on square and even onto the locating Dowels.

**NOTE: The Bearing Inner Races for both the Input Shaft and Layshaft should be tapped forward slightly from their original location after disassembly. This allows you to reset the Bearing Endfloat correctly during re-assembly.**

Clamp the Sandwich Plate and Maincase together in at least 6 evenly spaced places, and install the Endfloat Shims above the Input and Layshaft bearings.

Now you will need to install the Bellhousing, purely as a Bearing Setting aid, so this should be done without the use of sealant, and without all the final parts.

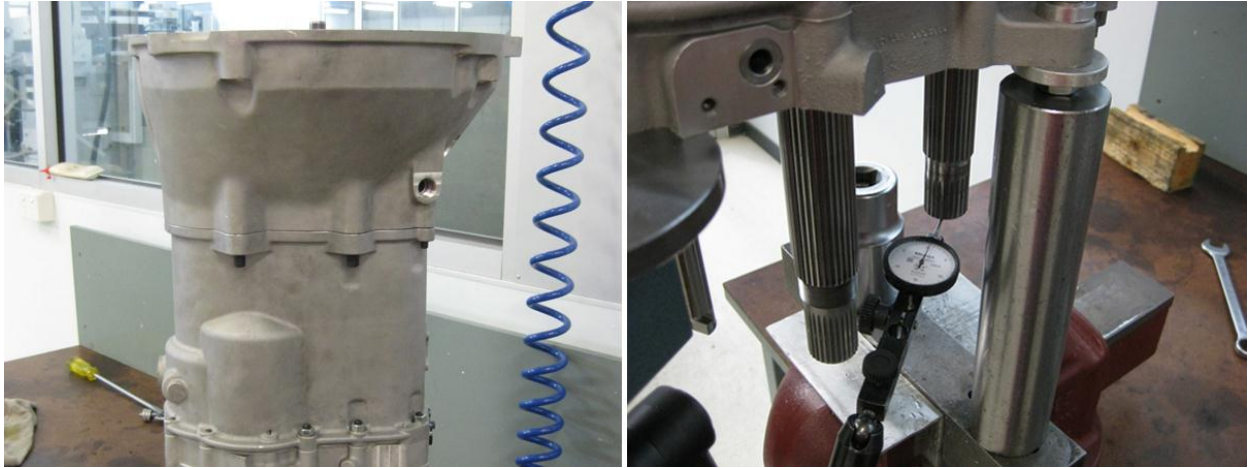
Tighten the 6 inner M8 bolts on the Bellhousing, so that it is flush with the Maincase.

**NOTE: Make sure you tighten the bolts gradually to ensure the bearings are clamped evenly.**

Now you can check the Bearing "End-Float".



By using a Dial Indicator under the Main and Layshafts, then applying an appropriate amount of force to move them up and down, you can check the End-Float:



The correct End Float setting for the GTR gearbox is:

**Mainshaft: 0.000"**

**Layshaft: 0.000"**

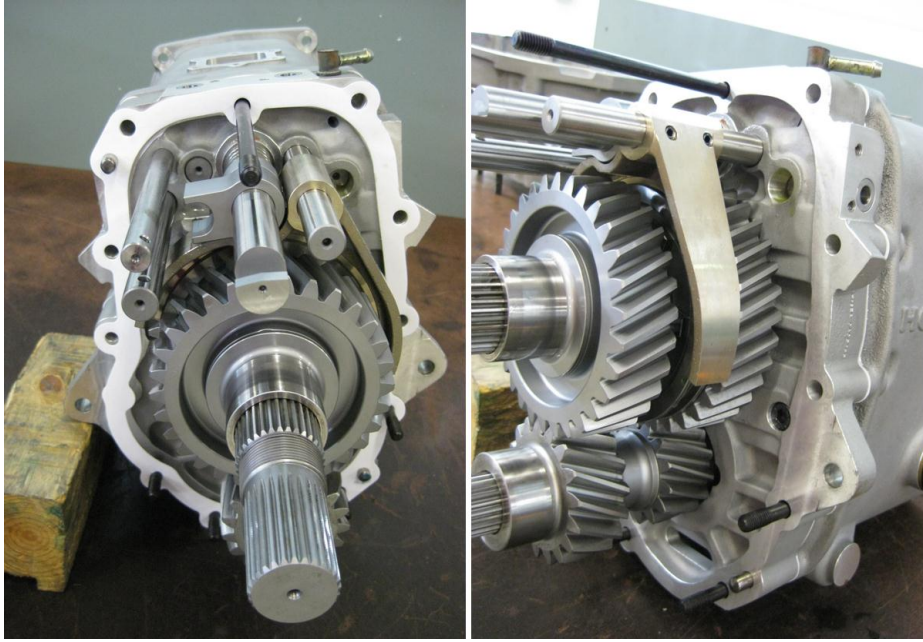
You may need to install wider shims to achieve this in a used Gearbox.

Once the correct End Float has been achieved, you can remove the Bellhousing.

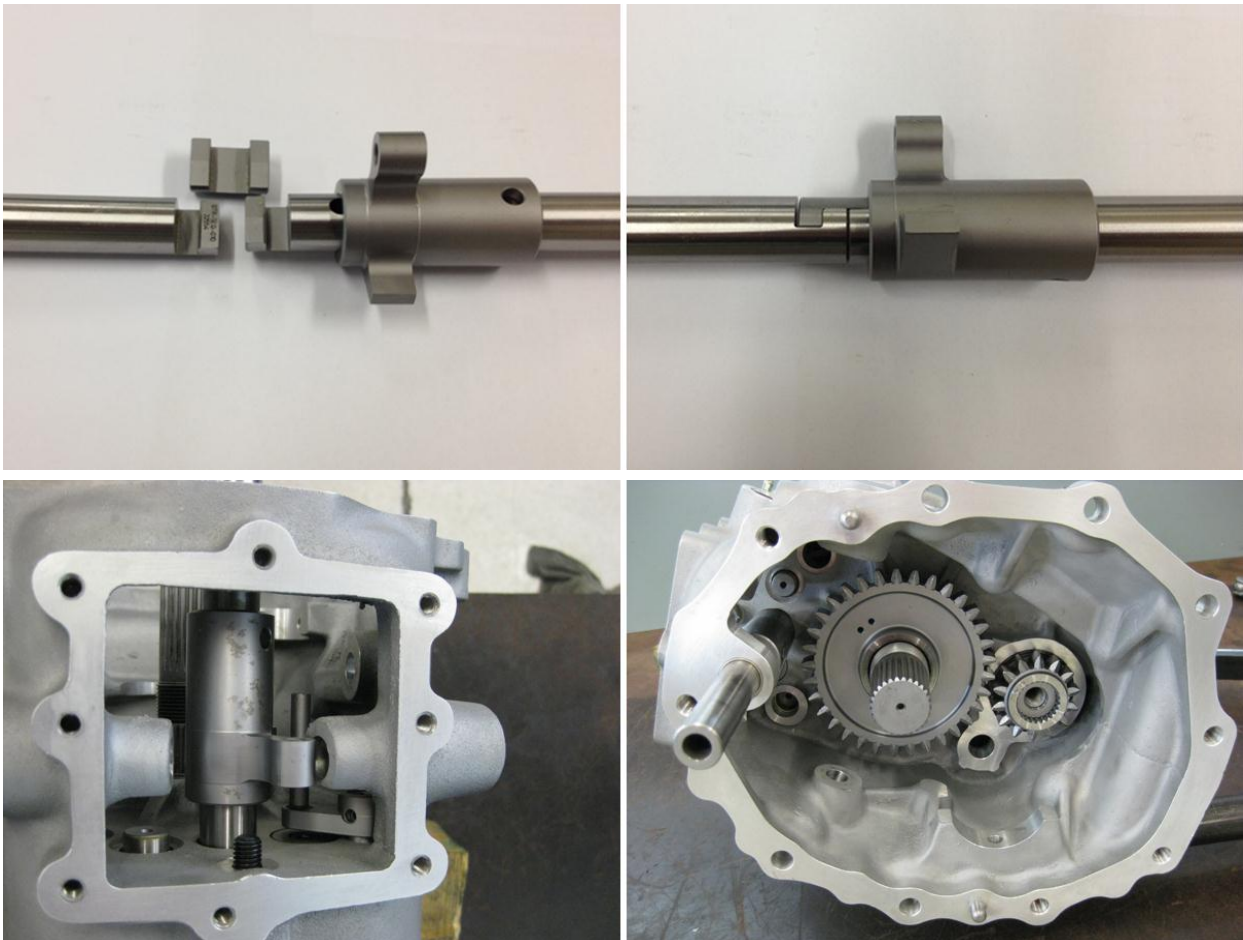
**NOTE: If you haven't already, install the M8 Cap Screws that secure the Maincase and Sandwich Plate together.**



Install the Gasket, then the 1<sup>st</sup> and 2<sup>nd</sup> Gears/Spacers/Sleeves, along with the Selector Ring/Hub and Rod/Fork. Also install the spring/spacers and rod guide if necessary.



Now install the Rear Case. Whilst installing the Rear Case the Gear Lever Rod must be connected to the Intermediate Rod by the use of the Rod Connector, then the Neutral Actuator must slide over the connector. The Striker must also be placed onto the Neutral Latch Rod, whilst sliding the Rear Case Forward.



Secure the case with M8 Nuts and Washers.

The Reverse Gears can now be fitted to the Main and Layshafts, and the nut/bolt tightened.

The Mainshaft Nut can be secured with Loctite 263 (red). Tighten to 110 lbs.ft (150 N.m). Lock-wire the nut to the reverse gear.

The Layshaft Bolt can be secured only with Lock Wire. Tighten to 35 lbs.ft (50 N.m).

**NOTE: Ensure that the Gear and Washer are placed in a way that allows the Lock Wire to be installed so that it is in TENSION if the Nut/Bolt try to loosen.**



Insert Roll Pins into the components requiring them.

Install the Reverse Idler Gear, Lever and Rod End. Ensure sealant is placed under Blackened Washer retaining the Reverse Lever. Ensure Loctite 243 (Blue) is used on the bolt securing the Reverse Idler Spindle.

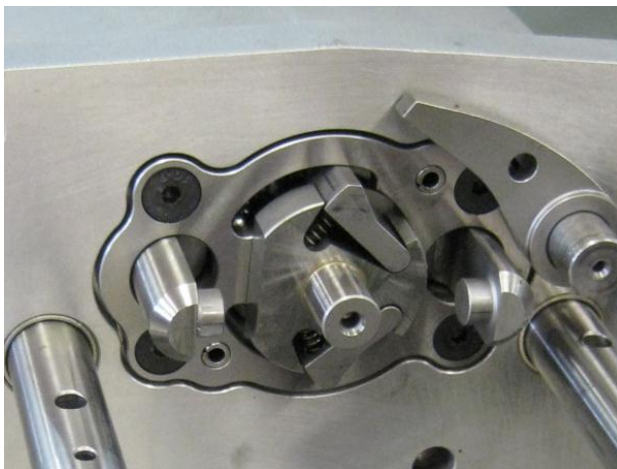




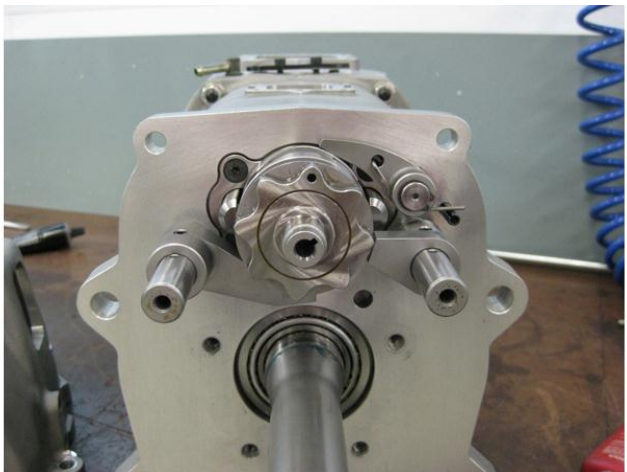
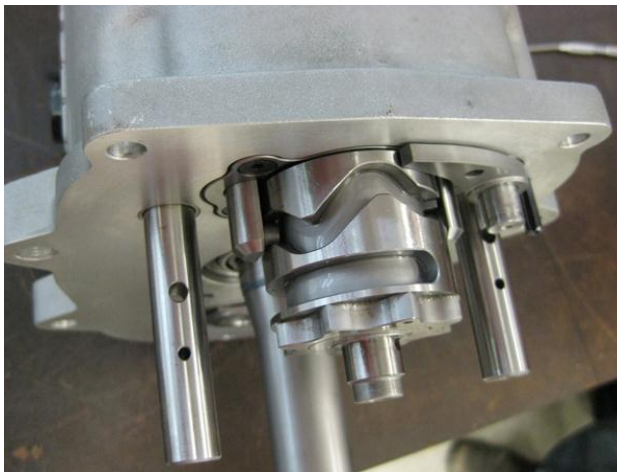
Fit the detent balls and springs, then the Blackened Plates. Seal with an appropriate sealant.



Fit the Pawls, Springs and Camshaft Shim.



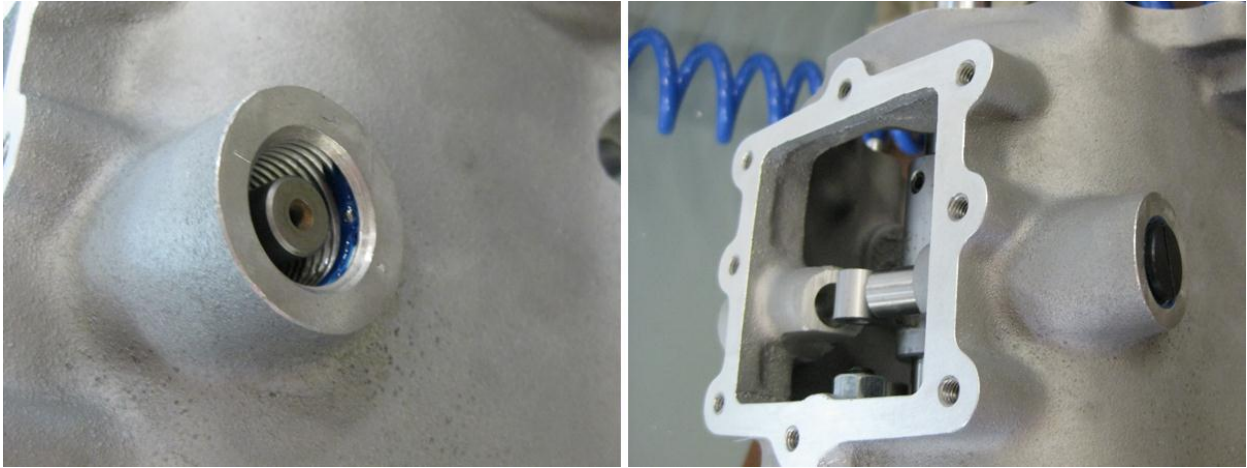
Now fit the Camshaft, 3<sup>rd</sup>/4<sup>th</sup> Cam Follower, Reverse Cam Follower, Neutral Lockout Spring and Washer:



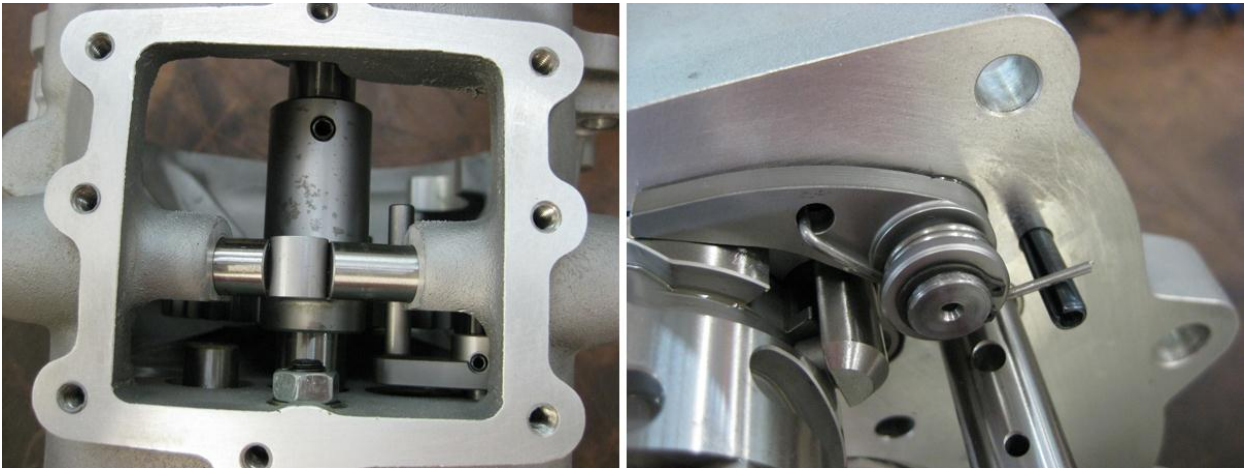
**NOTE: If installing a new Camshaft or Bearing the Shim underneath it may need to be adjusted. Please contact Holinger directly to receive proper instruction on how to calculate the required thickness.**

Insert the plungers into the rear of the Gearbox, and seal the Black Plugs with Loctite 243 (blue).

**NOTE: The Plunger on the Left Hand Side of the picture is sprung loaded.**



Before the Loctite sets, adjust the Sprung loaded Plug on the LHS of the pictures so that the neutral Latch just clears the Camshaft when the gear Change Rod is turned Clockwise to it's extremity. Use feeler gauges if necessary and set the clearance to about 0.020" (0.5mm).



Now the cast Rear Cover can be placed over the plungers. Make sure it is sealed with an appropriate sealer.

Now return to the front of the Gearbox.

Make sure the correct Endfloat Shims are placed in front of the appropriate shaft bearings, then install the Bellhousing. Ensure the Cam Bearing has not fallen out, and that the detent plunger is removed:





The Bellhousing must be sealed with an appropriate sealant all the way around the edges, along with the internal M8 bolts. Finally secure the housing with the external Studs, Nuts and Washers.

**NOTE: If installing a new Camshaft or Bearing the Shim underneath the bearing may need to be adjusted. Please contact Holinger directly to receive proper instruction on how to calculate the required thickness.**

Finally install the Detent Plunger, Spring, Cap and Gear Position Potentiometer:

Detent Plunger: Ensure the plunger is inserted with the guiding slot aligned with the roll pin in the bore. The blackened cap that retains the plunger and spring must also be set to the appropriate depth, and sealed with Loctite 243 (Blue).

Do this by first inserting the plunger and spring, and then wind the plug into a depth that still exposes several threads.

Push the Gear Change Rod forwards twice to engage 2nd gear, and then backwards once to engage 1st again (you may need to turn the input shaft to do this).

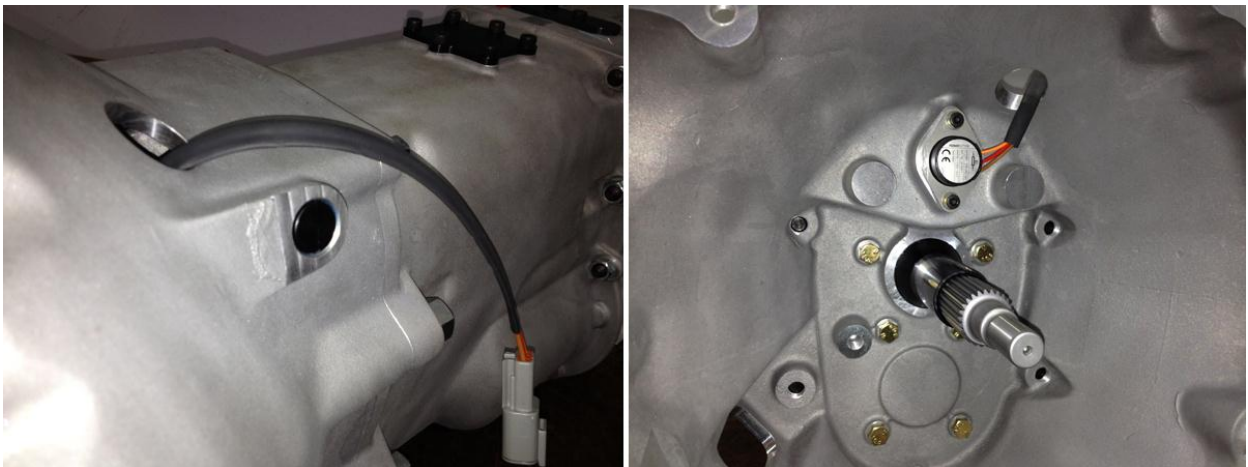
You need to be able to change between 1st and 2nd gear, by pulling back once and then forward once, repeatedly. You may need to turn the input shaft a small amount initially, but should be able to simply go back and forward when the dogs are aligned.

Wind the Plug deeper into the Bellhousing until you cannot change gears smoothly. Find the point where shifting is still smooth and wind the plug back one full turn. The plunger depth is now set.

Shift back and forward between all the gears (to shift from 1st to neutral, rotate the gear change rod all the way clockwise and pull back), including reverse. Shifting should be positive, smooth and consistent throughout all the gears.

Finally place the gearbox in 3rd gear and install the Gear Position Potentiometer into the end of the Camshaft. Roughly align the dot on the potentiometers spindle with the red wire in its body.

Plug in the dash mounted gear indicator, and make sure it has power. Shift through all the gears and check that the display is correct.



# GEAR RATIOS

## RD6, HTA, SG, GTR, GRA-5& H6S

INPUT SHAFT GEAR		20	21	21	21	22	22	22	23	23	23	
LAY SHAFT GEAR		26	27	26	25	26	25	24	25	24	23	
L/S	M/S											
1st, 2nd	14	34	3.157	3.122	3.007	2.891	2.870	2.760	2.649	2.640	2.534	2.429
	14	33	3.064	3.031	2.918	2.806	2.786	2.679	2.571	2.562	2.460	2.357
	14	32	2.971	2.939	2.830	2.721	2.701	2.597	2.494	2.484	2.385	2.286
	15	33	2.860	2.829	2.724	2.619	2.600	2.500	2.400	2.391	2.296	2.200
	15	32	2.773	2.743	2.641	2.540	2.521	2.424	2.327	2.319	2.226	2.133
	15	31	2.687	2.657	2.559	2.460	2.442	2.348	2.255	2.246	2.157	2.067
	16	32	2.600	2.571	2.476	2.381	2.364	2.273	2.182	2.174	2.087	2.000
	16	31	2.519	2.491	2.399	2.307	2.290	2.202	2.114	2.106	2.022	1.938
	16	30	2.438	2.411	2.321	2.232	2.216	2.131	2.045	2.038	1.957	1.875
	17	31	2.371	2.345	2.258	2.171	2.155	2.072	1.989	1.982	1.903	1.824
	17	30	2.294	2.269	2.185	2.101	2.086	2.005	1.925	1.918	1.841	1.765
	17	29	2.218	2.193	2.112	2.031	2.016	1.939	1.861	1.854	1.780	1.706
	18	30	2.167	2.143	2.063	1.984	1.970	1.894	1.818	1.812	1.739	1.667
	18	29	2.094	2.071	1.995	1.918	1.904	1.831	1.758	1.751	1.681	1.611
	18	28	2.022	2.000	1.926	1.852	1.838	1.768	1.697	1.691	1.623	1.556
	19	29	1.984	1.962	1.890	1.817	1.804	1.734	1.665	1.659	1.593	1.526
	19	28	1.916	1.895	1.825	1.754	1.742	1.675	1.608	1.602	1.538	1.474
3rd, 4th	19	27	1.847	1.827	1.759	1.692	1.679	1.615	1.550	1.545	1.483	1.421
	20	28	1.820	1.800	1.733	1.667	1.655	1.591	1.527	1.522	1.461	1.400
	20	27	1.755	1.736	1.671	1.607	1.595	1.534	1.473	1.467	1.409	1.350
	20	26	1.690	1.671	1.610	1.548	1.536	1.477	1.418	1.413	1.357	1.300
	21	27	1.671	1.653	1.592	1.531	1.519	1.461	1.403	1.398	1.342	1.286
	21	26	1.610	1.592	1.533	1.474	1.463	1.407	1.351	1.346	1.292	1.238
	21	25	1.548	1.531	1.474	1.417	1.407	1.353	1.299	1.294	1.242	1.190
	22	26	1.536	1.519	1.463	1.407	1.397	1.343	1.289	1.285	1.233	1.182
	22	25	1.477	1.461	1.407	1.353	1.343	1.291	1.240	1.235	1.186	1.136
	22	24	1.418	1.403	1.351	1.299	1.289	1.240	1.190	1.186	1.138	1.091
23	25	1.413	1.398	1.346	1.294	1.285	1.235	1.186	1.181	1.134	1.087	
23	24	1.357	1.342	1.292	1.242	1.233	1.186	1.138	1.134	1.089	1.043	
24	24	1.300	1.286	1.238	1.190	1.182	1.136	1.091	1.087	1.043	1.000	
24	23	1.246	1.232	1.187	1.141	1.133	1.089	1.045	1.042	1.000	0.958	
25	23	1.196	1.183	1.139	1.095	1.087	1.045	1.004	1.000	0.960	0.920	
24	22	1.192	1.179	1.135	1.091	1.083	1.042	1.000	0.996	0.957	0.917	
25	22	1.144	1.131	1.090	1.048	1.040	1.000	0.960	0.957	0.918	0.880	
26	22	1.100	1.088	1.048	1.007	1.000	0.962	0.923	0.920	0.883	0.846	
25	21	1.092	1.080	1.040	1.000	0.993	0.955	0.916	0.913	0.877	0.840	
26	21	1.050	1.038	1.000	0.962	0.955	0.918	0.881	0.878	0.843	0.808	
27	21	1.011	1.000	0.963	0.926	0.919	0.884	0.848	0.845	0.812	0.778	
26	20	1.000	0.989	0.952	0.916	0.909	0.874	0.839	0.836	0.803	0.769	
27	20	0.963	0.952	0.917	0.882	0.875	0.842	0.808	0.805	0.773	0.741	
28	20	0.929	0.918	0.884	0.850	0.844	0.812	0.779	0.776	0.745	0.714	
27	19	0.915	0.905	0.871	0.838	0.832	0.800	0.768	0.765	0.734	0.704	
28	19	0.882	0.872	0.840	0.808	0.802	0.771	0.740	0.738	0.708	0.679	
5th, 6th												

# HOLINGER ENGINEERING

Holinger Engineering has been designing and manufacturing high precision components for motor racing for decades.

Specialising in transmissions, we manufacture a range of gearboxes and associated products, from stand-alone bespoke designs right through to gear sets for existing production cars.

Our gearboxes can be found in a wide range of international classes, from GT racing right through to cross-country rallying. We supply several categories with "control" gearboxes, as well as featuring heavily in open classes.

Some of our customers include Porsche, Ford, GM, Ralliart, Lamborghini, Aston Martin and BMW, plus many other private teams and racers. Our products have survived some of the toughest endurance events in the world, including the Le Mans, Spa and Nurburgring 24 hour races, the Bathurst 1000 and the Dakar Rally.

## WHY CHOOSE HOLINGER?:

**"Product Longevity"**- Holinger Racing Transmissions are truly world-class, ultra reliable, and user friendly. We have many customers that have enjoyed years of reliable service from their Holinger gearboxes, many of which have done so after enduring prolonged frustration and on-going cost from inferior brands.

**"Ease of maintenance"**- All of our gearboxes are designed to be easily worked on, with regular workshop tools. So servicing can be easily performed wherever and whenever the need arises.

**"Parts backup"**-Holinger prides itself in producing gearboxes with a very long service life, and we will always continue to support our classic gearboxes and kits. This means that our customers have the peace of mind that they can always source genuine Holinger parts.

We have supplied reliable winning transmissions to many categories and classes around the world.

## Some of our most recent projects include:

V8 Supercars Australia: 2008-Current Control Transmission

Porsche Cup: 2005-Current Global Control Transmission

International FIA GT Championships with victories in 2011

The Dakar Rally, including the T1 class victory in 2009

The Australasian Safari: 1st Outright in 2008, 2009, 2010 and 2011

Australian Rally Championship: 1st Outright 2011

Australian Tarmac Rally Championship: 1st Outright 2010

ALMS (American Le Mans Series)

plus many others.....

