

## **CR2C NASCAR 4spd Gearbox Specification**

C&R contracted Xtrac to design and supply a kit of internal gears, gearchange parts and shifter system with the aim of improving the efficiency, gearchange performance and reliability while offering a significant inertia reduction. The CR2C meets the 2008 NASCAR weight rule of 80lbs. It also has provision for adjustable ballast to ensure that the transmission is at minimum weight, regardless of gear configuration.

### **Input Shaft / Mainshaft Support**

The front mainshaft support bearing is a cylindrical roller type concentric with the input shaft bearing, removing any tipping moments within the mainshaft. The input shaft is manufactured from S155 materials with a special heat treatment to minimise the clutch spline wear. Input shaft splines of 26 and 29 tooth (24/48 30 degree) are available

### **Central Shift Gearchange**

The gearchange system is a single rail type with a rod exit at the rear of the high strength cast magnesium alloy shifter housing in the centre of the gearbox. The selector forks are machined from high carbon steel material and are of the lightweight two pad design. All of the springs used are a high temperature stainless steel material. The reverse actuation is via a secondary rail and lever system inside the gearbox, actuated by the same single rod as the forward gears.

### **Sliders**

5 drive dog, 10 degree, pent-top slider, .180" dog height.

### **Gear Ratios**

The ground gear ratios are designed to an optimum face width and are shot peened with fully defined tip relief and crowning profiles to ensure durability. The gears have been designed using Xtrac's in house software and rated using the ISO6336 standard. The gears are integral 5 dog on 3.5" centres.

### **Input Gears**

The gear dogs are cut directly onto the input gear.

## **Mainshaft**

Gundrilled and honed design with an 1 $\frac{3}{4}$ " x 10 spline and internal oiling for cluster bearings and input gear bearing at the forward end. The shaft is nitted to give good life for the shaft and gears.

## **Quill Shaft (Tailshaft)**

A separate quill shaft that is driven by the mainshaft is used to minimise the drag that a single (over constrained) shaft running in cases deflected by external loads can cause. The quill shaft is gundrilled to reduce weight.

## **Layshaft**

Gundrilled and honed design with thin wall spacers to reduce weight and inertia and reduce stress raisers of circlip grooves. The spline is an Xtrac standard 35 tooth involute, flat root minor diameter fit to ensure suitable location of the gear ratios. The 1<sup>st</sup> gear is integral to the shaft for the lower ratios, for the higher ratios the 1<sup>st</sup> gear is slide on thus reducing inventory costs to the team. The shaft is nitted to give good life for the shaft and gears.

## **Drive Shaft Yoke Bearing**

A needle bearing arrangement is used to reduce drag.

## **Seals**

Low friction PDR seals are used for the input shaft and the output yoke. The front seal housing is available to suit Ford or GM, Dodge and Toyota motors.

## **Oil System**

The current oil system uses a driveshaft driven mechanical oil pump which draws oil from the lower oil fitting on the right hand side of the maincase. The oil returns to the gearbox via a fitting on the side of the cluster plate and directs the oil to the centre of the mainshaft to lubricate the gear and drop gear bearings to allow extended running in 3<sup>rd</sup> gear. Oil is also directed down a spray bar which allows dedicated oil feed to the gears as they come out of mesh. The tail housing rear bearing is lubricated by the natural swash of oil caused by the rotation of the reverse gear train and the motion of the vehicle. An internal oil pump option driven off the reverse gear is available.

## **Fasteners**

The cluster plate nuts are self locking K-Nuts. The shifter housing is retained by 'chemi-black' coated steel studs and K-Nuts.

## **Gear Linkage & Shifter**

The shifter mounts onto the centre of the tail casing and consists of a two piece housing mounted onto a bracket. The top half of the housing is high strength cast magnesium alloy. The bracket is car/driver specific. The handset is spring loaded (with stainless steel springs) into the 3<sup>rd</sup> / 4<sup>th</sup> gate, with a push down to engage reverse. Protruding from the top of the shifter assembly is a short gear lever with a 'two bolt' flange. A boot retained by a lip and ty-wrap is provided to encase the opening in the top of the shifter assembly.

## **Efficiency**

Throughout the design of the transmission parts, the overall gearbox efficiency was considered, particularly the lubrication system, the bearing type and clearances, the seal fits and minimising rotating inertias (27.8 lbs).

## **Casings**

The gearbox does not use a spectacle plate (Center Support), but instead minimises the distance between the mainshaft and layshaft bearings. The distance between the inner edges of these bearings is only 6.71". To achieve this, the high strength billet aluminum alloy casing cluster plate incorporates a forward offset into the standard CR1 gearbox casting.

The CR2C's maincase is a high quality cast aluminum case. This case has extra horizontal ribs for added stiffness. We have also added ports on both sides of the case of easy inspection, regardless of starter location.

## **Materials & Quality**

All internal components are manufactured from Xtrac's own grades of carburising steel. All of Xtrac's aerospace specification vacuum re-melted steel is supplied to the vigorous AAX quality standard for cleanliness. Most internal rotating components are shot peened. Heat treatment, and surface treatments such as shot peening and Xtrem polishing are defined and controlled in house to ensure optimum quality. (Xtrem is Xtrac's super polishing process based on the REM system.)

## **Assembly & Maintenance**

A set of assembly tools are available for nutting of the mainshaft and layshaft.

## **Xtrem**

The following components are Xtrem finished as standard, other components can be Xtrem finished on request.

- Gear hubs
- Mainshaft
- Layshaft
- Clutch shaft
- Gear ratios
- Sliders
- Input gears
- Various gearchange components

## **For more information**

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