LC Engineering's Technical Department has provided some basic information as well as identification information to assist you in modifications to the 20R - 22R - 22RE Toyota 4 Cylinder engines. Along with our catalog, you should refer to the factory Toyota service manual for more in-depth information

We also provide our customers with a technical support phone line to assist in determining what product or products will deliver the best performance for your application and budget.

As you have seen in our catalog, we offer packages and products from mild modifications to wild modifications.

**1975 - 1980 20R Cylinder Head**
Round Intake Port
Round Exhaust Port
80/81 C.C. Chamber
Intake Valve Diameter 43mm
Exhaust Valve Diameter 35mm

**1981 - 1984 22R Cylinder Head**
Square Intake Port
Round Exhaust Port
82/83 C.C. Chamber
Intake Valve Diameter 44.5mm
Exhaust Valve Diameter 36.5mm

**1985 - 1995 22R-22RE Cylinder Head**
Square Intake Port
Pear Shape Exhaust Port
52/54 C.C. Combustion Chamber
82/83 C.C. Chamber (Turbo) Intake Valve Diameter 44.5mm
Exhaust Valve Diameter 36.5mm

**1975 - 1980 20R Block**
Deck Height 11.280"
Stock Bore 88.5mm - 3.484"
Maximum Over Bore 90.0mm - 3.544"

**1981 - 1984 22R Block**
Deck Height 11.280"
Stock Bore 92.0mm - 3.622"
Maximum Over Bore 93.0mm - 3.662"
Big Bore Forged Piston Kit 94.0mm - 3.701"

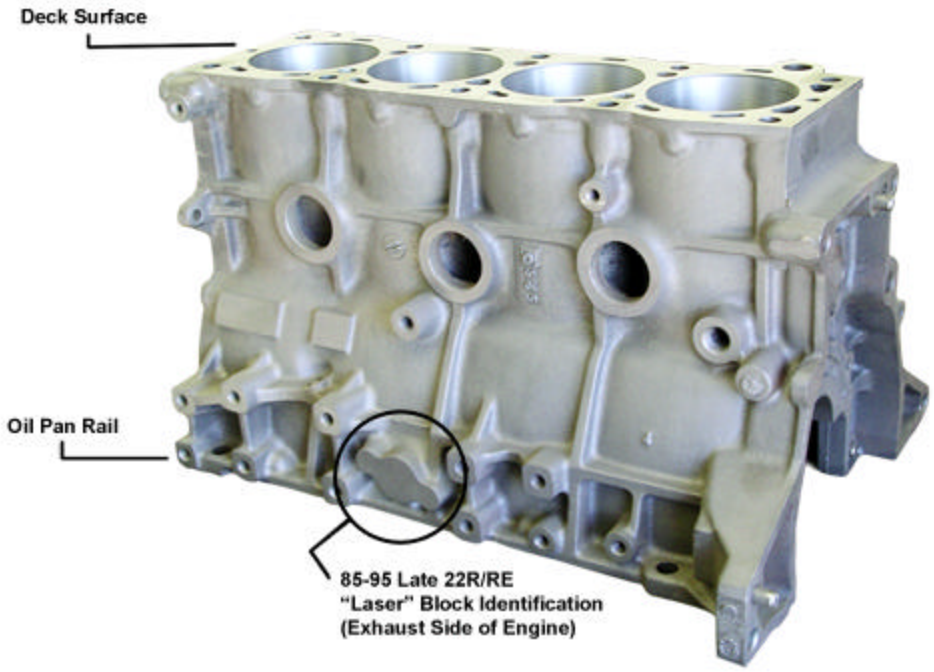
**1985 - 1995 22R-22RE "Laser Block"**

Deck Height 11.090"
Stock Bore 92.0mm - 3.622"
Maximum Over Bore 93.0mm - 3.6662"
Big Bore Forged Piston Kit 94.0mm - 3.701"

All Toyota 20R - 22R - 22RE engines use the same crankshaft and connecting rods. To accommodate the different deck heights, Toyota changed the compression height (piston pin location).

**Crankshaft (Forged)**
Stroke All 20R - 22R - 22RE 89mm - 3.5039"
Rod Journal 2.0861 to 2.086" (standard)
Main Journal 2.3614 to 2.13622" (standard)

**Connecting Rod (Forged)**
Center to center length 5.830"




## *Cylinder Head Identification*

**1975 1982 20R Cylinder Head**
Round Intake Port / Round Exhaust Port

80 / 81cc Chamber
In. Valve Dia. 43mm / Ex. Valve Dia. 35mm

**1981 / 84 22R / RE Cylinder Head**
Square Intake Port / Round Exhaust Port
82 /83 cc Chamber
In. Valve Dia. 44.5mm / Ex. Valve Dia. 36.5mm

**1985 / 95 22R / RE Cylinder Head**
Square Intake Port / Pear Shaped Exhaust Port
58 cc Chamber or 22RET (Turbo)
In. Valve Dia. 44.5mm / Ex Valve Dia. 36.5mm

## *Cylinder Head Intake Air Flow* (Aprox)

| | |
|---|---|
| **Stock** | **130 CFM** |
| **Stage 2** | **160 CFM** |
| **Stage 3** | **200 CFM** |
| **Stage 5** | **250 CFM** |

## *Engine Block Identification*

| 1975-1980 20R | 1981-1984 22R / RE | 1985 - 1995 22R / 22RE "Laser Block" |
|---|---|---|
| Deck Height 11.280" (Pan Rail to Top of Deck) | Deck Height 11.280" (Pan Rail to Top of Deck) | Deck Height 11.090" (Pan Rail to Top of Deck) |
| Deck Height 9.120" (Crankshaft Center to Top of Deck) | Deck Height 9.120" (Crankshaft Center to Top of Deck) | Deck Height 8.950" (Crankshaft Center to Top of Deck) |
| Stock Bore 88.5MM - 3.484" | Stock Bore 92MM - 3.622" | Stock Bore 92MM - 3.622" |
| Max Overbore 90MM - 3.544" | Max Overbore 94MM - 3.701" Turbo Max Overbore 93MM - 3.661" | Max Overbore 94MM - 3.701" Turbo Max Overbore 93MM - 3.661" |

***Note: Early 81-84 22R - 22RE and Late 85 -95 22R / 22RE Engine Blocks***

Cylinder Heads **DO NOT INTERCHANGE** without considerable modifications

For increased timing chain durability, ALL 1981 - 1984 should be converted to a double row timing chain, use oil pump drive and 20R - 1981 22R timing component set. For 1985 - 1995 engines, use timing chain conversion kit.

## HP and Torque Ratings

| | | | |
|---|---|---|---|
| 22R | **99 HP @ 4800 RPM** | TORQUE | **129 @ 2900 RPM** |
| 22R CALIF. | **95 HP @ 4800 RPM** | TORQUE | **129 @ 2900 RPM** |
| 22RE | **116 HP @ 4800 RPM** | TORQUE | **140 @ 2900 RPM** |
| 22RET | **135 HP @ 4800 RPM** | TORQUE | **173 @ 2900 RPM** |
| 22R & 22RE | **103 HP @ 4800 RPM** | TORQUE | **133 @ 2900 RPM** |

**Same as 1989 - 1990**

***No 22R After 1990***

## Torque Specifications

| Part | FT. LBS |
|---|---|
| Mains | 76 |
| Stock Rod Bolts | 46 |
| ARP Rod Bolts | 50 |
| Intake Manifold | 33 |
| Exhaust Manifold | 33 |
| Oil Pan Bolts | 9 |
| Cylinder Head Bolts | 62 |
| Cam Timing Gear | 58 |
| Cam Bearing Bolt | 14 |
| Crankshaft Pulley | 116 |

| | |
|---|---|
| Timing Cover 8mm Bolts | 9 |
| Timing Cover 10mm Bolts | 29 |
| Flywheel | 80 |
| Cylinder Head Studs | 70 |

Another contributing factor to a "Blown Head Gasket" is dowel pin clearance - or lack of clearance, which can occur when a cylinder head is milled too much.

This is an often-overlooked area and can cause major problems. The dowel pin, which is used to align the block with the cylinder head, can cause the head to not meet flush with the head gasket and the block. Basically the dowel pins are bottoming out.

The best way to check this is to measure the depth of the dowel pin-receiving hole in the head and the height of the dowel pin. It is recommended you have an extra .050" depth in the head-receiving hole. Drilling deeper into the receiving holes can do this, but be careful not to drill too much.

# Thrust washer clearances / Crankshaft end play

Street .002 to .003
Race .005 to .006 Max. .008

**Bearing Clearances**

**Race Street**

Rods .0025 to .0030 Rod .0015 to .0020
Mains .0025 to .0030 Main .0015 to .0020

**Crank Journal sizes @ .010 under**

**Toyota Journal**

Mains 2.3504 to 2.3508
Rods 2.0748 to 2.0752

**Pro Journal**

Mains 2.3520 to 2.3522
Rods 2.0800 to 2.0802

**Stroker Journal**

Mains 2.3520 to 2.3522
Rods 2.0997 to 2.1000

## Cast vs Forged Pistons

One of the most common questions is about which piston to buy. The marquee is one factor, but sometimes we have to choose between a cast and forged piston. This article cannot give you the definitive answer to which piston to use, but some facts must be shared based upon experience.

A cast shaped component means that the material has been melted and then poured into a mold that basically shapes the piston. The advantages are many, for example: a possibility to add other components like silicone, carbon, zinc and so on in order to gain certain properties. The aluminum itself doesn't build up inner tension as much. It is cheap. The density of the material doesn't increase which means it could be kept light.

There are disadvantages also, of course. The piston will be weaker in structure. It is often heavier since the manufacturer has to increase wall thickness in order to achieve sufficient strength. The heat expansion cannot be controlled and is therefore often not completely round since the piston pin requires some material on the inside. They are also produced in bulk with most manufacturers only producing sizes that are close to factory specifications. This also makes them more affordable.

Forged pistons are mechanically shaped into a piston shape. They are hammered into a mold forming the piston and by utilizing state-of-the-art CNC machines, most manufacturers can maintain exact specifications and tolerances. This makes them structurally more durable. Forged pistons are well known in the racing and performance industry because of their ability to withstand more heat, higher rpm?s, higher boost and higher temperatures. Another advantage to a forged piston is that they can be individually made to any custom size or specification without the high cost of casting.

Here at LCE, the philosophy is quit simple. The choice between using a cast piston or a forged piston is dictated by the application. If you plan on running normal octane gas and it falls into our ?street? application, we recommend using the cast aluminum pistons. If you plan on using high octane, high compression or high boost for your application, then we recommend using a forged aluminum piston.

## Head Bolts

Believe it or not, there is a huge difference between using a cylinder head "stud" and a cylinder head "bolt." Factory head "bolts" will eventually stretch and pull out of the cylinder head, leaving a not-so-wonderful opportunity for a blown head gasket, warped cylinder head or costly damage to the engine block. It is highly recommended that you DO NOT install used head "bolts."

You have two choices when re-installing a cylinder head. 1) Use brand new cylinder head "bolts" (Part# 13-106OEM) or 2) install a new set of cylinder head "studs" (Part# 13-106). Cylinder head "studs" CAN be reused and allow the head to be evenly torqued down. In performance and high compression applications, it is recommended that you go to a cylinder head "stud" set up