First off, we want to congratulate you on owning a Toyota Celica. This is a very quick and agile car with a lot of torque and plenty of potential. New list members always ask a series of questions, so in an effort to reduce the traffic a little, we have compiled this FAQ. Hopefully you will find your answer here, but if you don't, just ask the list. We're all friendly, and usually willing to help. We were all new at one time or another:

This FAQ is currently a work in progress. Please send suggestions or corrections to celicas@celicas.org.

Basic Information Section:

Section 10: Bodywork

Section 11: Questions

Section 1: Block

Part 1.1 Block/Model specs

Model year	country	model code or trim	engine codes
1971	US	ST	8R-C
1972-1974	US	ST	18R-C
1974	US	GT	18R-C
1972-1974	FI	LT, ST	2T*
1975	US	ST, GT	20R
1974-1976	FI	LT, ST	2T*
1976	FI	RA23	18R
1976-1977	US	ST, GT	20R
1977	AU	RA28	18R-G
1976-1977	FI	ALL	18R
1978	CA	GT	20R
1978-1981	US	GT Coupe & Liftback	22R
1978-1981	JP	TA41 (ET/LT/ST/XT)	12T-U [ET coupe only]
		TA42 (LT/ST/XT/SE)	3T-U
		RA40 (ST/XT/SE)	18R-U
		TA40 (GT/GTV)	2T-GEU
		RA40 (GT/GTV)	18R-GU
1978-1981	UK/EU	TA40 (ST)	2T-B [coupe]
		RA40 (ST/XT)	18R [liftback]
		RA40 (GT)	18R-G [liftback]
1978-1980	US	RA42 (ST)	20R [coupe]
		RA42 (GT)	20R
1981	US	RA43 (ST)	22R [coupe]
		RA44 (GT)	22R
1981.7-1983.8	JP	RA63 (GT)	18R-G
1981.7-1983.8	JP	TA61 (GT, GT Rally)	2T-GEU
1981.7-1983.8	JP	TA63 (ST-EFI, SX)	3T-EU
1981.7-1984.12	JP	SA60 (SV, ST, SX)	1S-U (SX 83.8-85.7)
1981.7-1985.7	JP	AA6*	3A-U
1982.10-1985.7	JP	TA64* (GT-T, GT-TR)	3T-GTEU
1983.8-1984.12	JP	AA63* (GT, GT-R)	4A-GEU
1985.1-1985.7	JP	SA6* (GT, GT-R)	3S-GELU
1985.1-1985.7	JP	AA63* (GT)	4A-GELU
1985.1-1985.7	JP	SA6* (SX, SV, ST)	1S-iLU
1982-1985	EU	TA60 (ST)	2T-B
	EU	RA61 (XT)	21R
	EU	AA63* (GT)	4A-GE [liftback]
1982-1985	EU	RA63	18R-G*
1982	US	RA63 (ST)	22R [coupe] [automatic: 22R-EC]
		RA64 (GT, GT-S)	22R-EC [GT-S liftback]
1982.8-1983.8	US	ALL	22R-EC, except manual ST 22R
1983.8-1085	US	ALL	22R-EC

1982.2-1985	UK	RA61 (ST, XT)	21R
1984.8-	US	RA65K	22R-EC (GT-S convertible)

Section 2: Head

Part 2.1 Head specs

Part 2.2 Replacing the head gasket

Date: Fri, 18 Sep 1998 09:38:21 -0500
From: Eric D. Johnson <databit1@pdq.net>
To: old-celica-club@celicas.org
Subject: Re: 20r head gasket

Head gasket is a breeze I think. These are the steps I go through for changing a head gasket:

1. Remove hood. (You will more room to work)
2. Remove distributor cap. Use a wrench to set the engine to TDC. If distributor rotor is not pointing to cylinder one (upper left) then rotate engine 360degrees and check it again.
3. If you have power steering, remove the bolts holding the mounting bracket to the engine.
4. Remove header pipe. (Leave exhaust manifold attached to head)
5. Disconnect anything connected to the Intake manifold from anywhere else on the car. ie. fuel lines, water lines, vacuum lines going to body, ground wires, etc.
6. Remove valve cover.
7. Remove distributor and plug wires.
8. Remove bolt from timing chain gear on cam shaft.
9. Slide gear off the cam and let it set on the timing chain guides. Be careful through the rest of the process not to disturb the gear.
10. Remove the head bolts in the proper pattern.
11. Where the tip of the distributor was, buried in a little pool of oil is a 12mm bolt. Remove this also.
12. Take an old fan belt and loop it between the two hooks on the head located at the drivers side rear and opposite front. Lift head from engine straight out with manifolds and all. You may have to use a small pry bar to break the head gasket loose before doing this. Be careful not to apply too much pressure at any one point to avoid warping the head (if it is not warped already)
13. If the head is warped (and they usually are) (or you want to be sure you have a nice flat surface) remove the manifolds and take it to be milled. Heck it would be a great time for porting too! Maybe even a valve job.
14. Clean the block top and head bottom (if you did not have it milled) being careful not to scratch the surface.
15. Put new head gasket on the block.
16. With the head and manifolds still assembled (or re-assembled) set the head back on the block. It is best to have someone spot you on this to guard the timing chain gear against being bumped. It is very important not to let any of the weight of the head rest on the gear as you lower it. It will bend the chain guides.
17. With the head in place and lined up, hand tighten all the head bolts. Do not put any torque into them at all. Just till they reach the bottom or are too tight to comfortably turn by hand.
18. Get out a torque wrench and use the proper pattern and torque intervals to tighten down the head. If this is not done in the right order or it is torqued without the proper intervals then you WILL warp the head and be back to square 1.
19. Replace the 12mm bolt from the front of the head and tighten it down.
20. As long as no-one has gone mucking with the cam or the crank, the timing should still be set. If the cam does not line up with the timing gear though just turn it till it does. The important thing is that until this point the timing gear sat undisturbed and the chain was not moved on it. Put the

timing gear back onto the cam, put the distributor drive gear back onto the cam and tighten it all back down (sometimes tricky to get it all to line up).
21. With the distributor cap off, line up the rotor to approximately cylinder one. Insert the distributor and visually line up the spine inside the distributor with the electronic pick up directly across from it (you will need to pull the rotor to see good enough to do this). You may have to try re-inserting the distributor a couple of times to get the correct alignment. Once you have it lined up, bolt down the distributor.
22. Reattach the exhaust and all the intake connections. Bolt Power steering back on. (all grunt work)
23. Verify all your vacuum connections against a diagram.
24. Set the gaps on all the valve clearances. Check it twice.
25. Replace valve cover.
26. Top off the oil. Engine should start without any problem and you can make adjustments to the distributor timing accordingly.

Doing it this way will take alot of the work out of having to fight the intake manifold and also will prevent the timing problems as you have it already set still. Just DON'T remove the gear from the chain! And DON'T bump the gear when lowering the head back into place.

I have made all the mistakes doing this and following these steps and just being careful I have learned to avoid them. Let me know if you have any questions.

Eric "warped more heads than Captain Kirk has gone to warp" Johnson

Section 3: Fuel System

Part 3.1 Carb / EFI specs

Part 3.2 Where to find replacement carbs

Part 3.3 What can be done to improve the EFI

Section 4: Exhaust

Part 4.1 Exhaust system improvements

Section 5: Transmission

Part 5.1 Transmission specs

Part 5.2 Removing / Replacing transmission

Part 5.3 Replacing the automatic with a manual

Section 6: Differential / axle

Part 6.1 Axle specs / codes

Part 6.2 Upgrading your axle / Differential

Section 7: Cooling System

Part 7.1 How change out your manual fan for an electric one

Section 8: Electrical System

Section 9: Suspension

Part 9.1 Suppliers for springs

Date: Tue, 15 Sep 1998 08:54:19 +0000
From: hfeith@pop3.sprint.ca
To: old-celica-club@celicas.org
Subject: Re: Need a new source of springs!

I have come across a shop for custom made springs.
The address is:

Coil Springs
632 W Bertrand
St. Mary's, Kansas 66536
Tel:- 1 785 437 2025
Fax:- 1 785 437 2266

Henry Feith

Section 10: Bodywork

Section 11: Questions

Question 1: How do I get more horsepower out of my engine?

Answer 1: Read this FAQ. If you don't get an idea of how to increase your horsepower, ask the list.

Question 2: What should I buy for my car to make it go faster?

Answer 2: General opinion is that you should always start at the ends of the engine, and work your way to the middle.

Here is the order that we suggest to maximize performance/dollar ratio.

1. Start with a good header and exhaust system.
2. Install a new air intake system. (Air filter/ cold air induction/etc.)
3. Get the head re-worked. (port match, mild polish, oversized valves, new valve springs, etc)
4a. Get better/higher flowing injectors.
4b. Get a better flowing carb.
5. Get a high performance cam.
6. Rebuild the engine to take the abuse that you are going to give it. (crank, pistons, rods, balance, etc)
7. Add Aftermarket ECU (injection computer)
8. Add forced induction (Turbo/supercharger)

Question 3: Who make parts for our cars (20R/22R)?

Answer 3: Here are a few vendors that make parts for the 20R/22R:

LC engineering makes drop in crate racing engines and hop up accessories. They aren't cheap.

LC Engineering
1880-b Commander Drive
Lake havasa City, AZ 86403

http://www.lcengineering.com
(502)505-2501

Paeco import parts, basically an expensive machine shop for race engines. If you want to drop BUCKS for a 200+ hp 22R, they'll build it right.

Paeco Import Parts
2400 Mountain Drive
Birmingham AL 35226
http://www.quicklink.net/Bahn/paeco
(800)326-641

Thorley headers seem to be the preferred header of this list. Exhaust upgrade is a simple, common bolt-on that won't wear your internals.

Thorley Headers
1561 Commerce St.
Corona, CA 9172
www.thorleyheaders.com
info@thorleyheaders.com
(909)735-7208

Downey off road manufacturing makes suspension, etc, etc, for 4x4's but also has upgrades such as large volume efi air intakes, throttles, and air horns as well as webber/holley carb kits, cams, headers. They can probably supply super/turbo kits.

Downey Off Road Manufacturing
10001 S. Pioneer Boulevard
Sante Fe Springs, CA 90670-3221
(562)949-9494 no internet that I know of

Northwest Off Road Same offerings as downey.

Northwest Off Road
0.9. box 1617
Bellingham, WA 98227-1617
Warehouse
199 Iowa St.
Bellingham, WA 98226-7488
www.northwestoffroad.com
(360)676-1200

These four engine sites ask $6 for catalog.

Question 4: What kind of Header/Exhaust should I install?

Answer 4: There are a lot of manufacturers out there that will try to sell you their performance header. Do not believe them all. We have found the best results using the Doug Thorley Header and a 2.25 inch exhaust. Muffler is a personal choice, with quite a few people recommending the Dynomax Turbo Muffler. Just remember, the fewer bends the pipe makes, the less HP the engine looses.

Question 5: What kind of Air Filter should I get?

Answer 5: Along with the header, the next best bet is the air filter. The stock filter is a huge restriction.

Option 1: Drop-in replacement filter. K&N makes a filter that will drop in to the stock airbox. This is an wash, oil and reuse type of filter. This type of filter will be a large improvement over the stock paper filter.

Option 2: Open element filter. K&N, Powerstack and others make open element filters. These are generally a universal fit type of filter, and they leave the details of how to integrate it into your intake system up to you. There are, however some adapters to be found that make this a little easier. This type of filter will give you a substantial improvement to even the drop-in replacement filter, but needs to be washed and re-oiled more frequently.

Option 3: Cold air intake. This uses one of the above two options, but routes air from outside the engine compartment to the filter. In theory, the colder air will be heavier, and allow more efficient combustion. These setups are all custom, and there have been several designs. The one constant seems to be the material used in making these systems, cheap dryer ducting.

Any of these three options will allow you to get better performance.

Question 6: What do I need to do to the head?

Question 7: What kind of Carb/Injectors should I get?

Question 8: What kind of CAM is right for me?

Answer 8: Taken from a message on the list:

I will have to use a little speculation here, but I run the CompCams 268S in my Celica, and it has good vacuum, and strong top end. I don't see why the stock ECU would have a problem with it. You may need to trim the 2 adjustments on the air flow meter, but the tuning range should be more then enough to make it work. The stock injectors will be close to their limit, but just a little more fuel pressure should do the job. At a 900 rpm idle, it pulls about 16 inches of vacuum, and the power brakes are fine. It even runs cruise control with a 60 mph cruise running at about 10 inches of vacuum. If it wasn't for the turbo restricting the exhaust, I would have gone with the Comp 280S. I am using the MAP based TEC II EFI, but the AFM stock setup should be pretty good with these. The power increase over stock should be about 30% for around 150 hp with strong pull to 5500. This would require about 20 lb/hr at the injectors. Raise the fuel pressure about 8 to 12 psi, and tune the air meter. It should be fine. The 268S uses only a 110 degree center line, but the ramps are fast and the overlap is not too big.

Be sure to check the rocker rubbing pattern. I had to cut .020 off of the rocker stands to make it right. I am also using the LC Eng. rocker shafts. They are much stiffer then stock, and the oiling is better.

Question 9: How do I rebuild this engine for performance?

Question 10: What's an ECU, and what does it do for me? (Adding forced induction)

Question 11: How do I add even more power to my engine?

Question 12: What's this AFM thing I keep hearing about?

Answer 12: From a message on the list?

To help everyone understand this better, I will try to explain a little about how the AFM (air flow meter) fuel injection systems work. So you can see why you are doing what.

If this was a perfect world, and the air was always the same density (temperature) then the position of the flapper door would be exactly proportional to the amount of air coming in. The problem is that the accuracy at low flows would not be good enough to get a good idle, so they make it logarithmic. By this I mean that it takes about double the air flow to open the door about each 10 degrees. I don't know the exact relationship for each meter, but this is just theory, some meters may have a different scaling. The important thing is, to understand that as the engine draws in more air, the computer will look at the position of the door, and produce a pulse to open the injector to spray a "PRE-PROGRAMMED amount of TIME". This is important to understand. The other thing to remember is that as rpm doubles, the pulse width is divided in half for any given door position. So if the motor makes the same torque at 2500 rpm, and 5000 rpm, then the air meter would show double the air flow, but at twice the rpm, it would spray half as long, after reading a doubling of air flow, so it is the same pulse width.

If the air meter and injectors are set up to work together, then from a light load idle, all the way to Full throttle red line, the ECU will inject the right amount of fuel. Now if you do anything to the engine that will make it draw in more air, the air meter will open further and more fuel will be injected, up until the injectors can't flow enough. This is usually about 75 to 80% duty cycle for a stock ECU. To get more "room" for more power you raise fuel pressure for small gains, or add bigger injectors for bigger gains. Now each millisecond of injector on time is more fuel. BUT the air flow meter is still telling the ECU what pulse width to inject, based on the original program that we can't alter. What we have to do is fake out the air meter to give the signal we want.

The first thing to tune is the high flow area. This is done by adjusting the spring holding the flap closed. If you loosen the spring, it will open further, and inject longer pulses (more fuel) and if you tighten the spring it will open less and inject shorter pulses (less fuel). This should be fairly straight forward, what you are doing is making it think less air is flowing, so it injects less fuel out of your new bigger injectors. Now at very light loads, the fuel quantity must be very precise to get a solid idle and good economy. The second adjustment is the bypass channel. This is a very low flow fine tunning trick. They make the flap too sensitive at very light flow, and then let some air leak around it. By opening this bypass, less air is trying to push the flap open. This results in a shorter pulse (less fuel) for a given amount of air flow so it will be leaner. Closing the bypass will make more air push on the flap and open it further, so it will inject more fuel and run richer.

Using an air/fuel meter, run the car at high load, and rpm. Have a friend watch the air fuel meter as you do this. It should go near full rich under max power. If it does notm then loosen the spring until it does. Always start too rich, it is safe for the engine. Then just lean it one click at a time until it comes off of full rich at full load. If it is a non boosted motor, you can go even a little further, but always keep the air/fuel meter about half, 60% is probably a little better for a performance engine. Once you are confident about the top end adjustment, then it is time to dial in the idle. If the stock ECU is working right, it will adjust to keep the air fuel ratio as close to 50% as it can during idle and light load. If it is set right, it will cause the air/fuel meter to bounce about once per second between rich and lean. This is normal closed loop fuel control, and it is a good thing for emissions and economy. If it is staying either rich or lean, you are way off. If it is rich, then open the bypass channel, this should be counter clockwise. Once it starts to bounce, remember where it is, then continue to open until it stays lean, then return it to half way between these points. If it dies before you get too lean, then split this point with where it started to bounce. If it was lean at idle, then close the bypass until it bounces, and find the point halfway between staying lean and staying rich.

If it was bouncing at idle, it is still a good idea to run it through it's range slowly to find the end points of where it goes rich and lean. This will put the closed loop control in the center of its range.

Now remember what I said about pre programmed, and log response. For these reasons, there are limits to how far you can go. The air meter can only respond to about 8 doublings of air flow. If you move this range too high, it won't be able to lean down at idle. And the curve may not fit

the air demand perfectly, because it is not linear, it could fall lean in the midrange, even if it is rich at both ends. If this is seen on the air meter, then you must richen the top end to fil in the hole. If it is right at both end, but goes rich in the middle, then you have to live with it. These are the limits of faking the stock system, don't ever let it go lean under power.

I hope this helps,

Gary M.