

TECH FILE: #3

STARION 4 SPOT BRAKE CONVERSION

By Merlin and Cookie.

This article describes the front brake 4 piston calliper conversion, using either Wilwood Dynalite callipers or Tornado F3 callipers. Both callipers use the same 133.4mm mounting centre and brake pads are compatible. The conversion can be used with 282mm rotors, which fit under 15 inch JB Starion rims, or, 298mm rotors for 17 inch rims.

PIX FROM COOKIES STARION



FIG 1: DYNALITE 120-4998 & 282mm ROTOR

FIG 2: MOUNTED WITH 15" JB RIM

PIX FROM MERLINS STARION



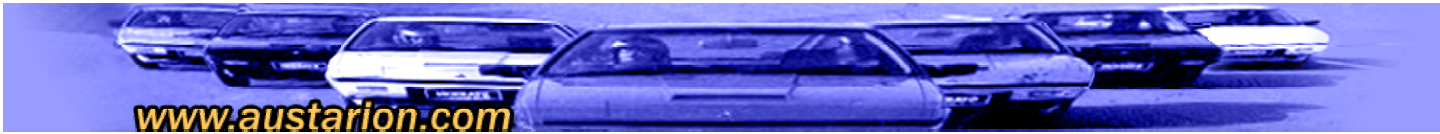
FIG 3: DYNALITE 120-6814 & 298mm ROTOR

FIG 4: MOUNTED WITH 17" BSA 205 RIM

BRAKE ROTOR OPTIONS

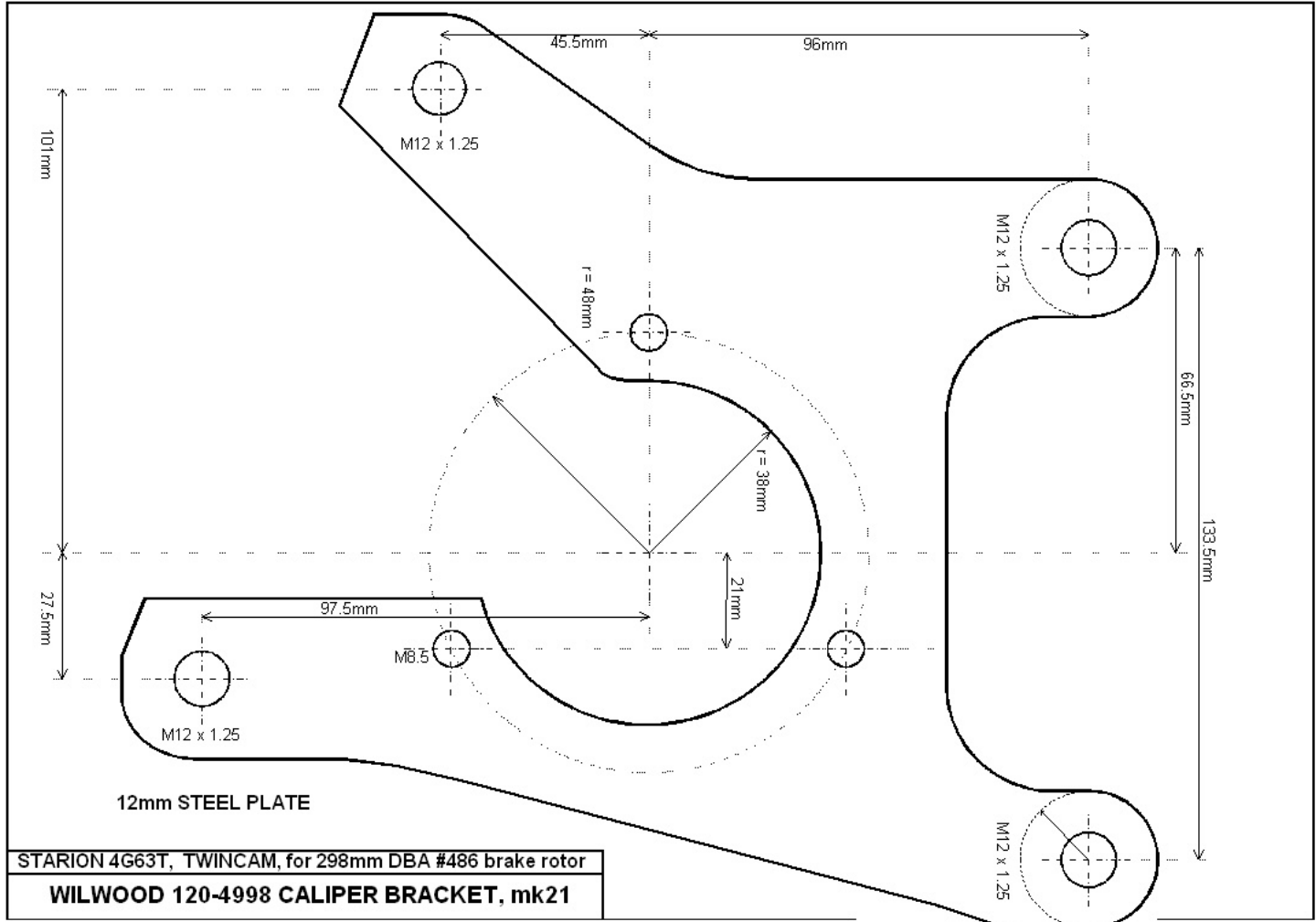
282 mm ROTOR DISK - DBA # 484 Available in SLOTTED	298mm ROTOR DISK - DBA # 486 Available in SLOTTED and SLOTTED/DRILLED
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FIG 5:



CALLIPER MOUNTING BRACKET

FIG 6: MK21 CALIPER BRACKET FOR DBA #486 ROTOR



NOTE: The calliper to wheel centre dimension, 96mm, is for the 298mm diameter rotor. This should be set to 86mm for the 282mm rotor.

DETAIL OF THE FINISHED MK21 CALIPER BRACKET, & ASSEMBLED WITH 298mm ROTOR



FIG 7:



FIG 8:

MASTER CYLINDER

The standard Starion master cylinder could be used, but would result in more peddle movement than before the conversion. This is because more fluid is required to be displaced with the four spots, as there are now eight pistons to be moved.

There are three ways to improve this situation.

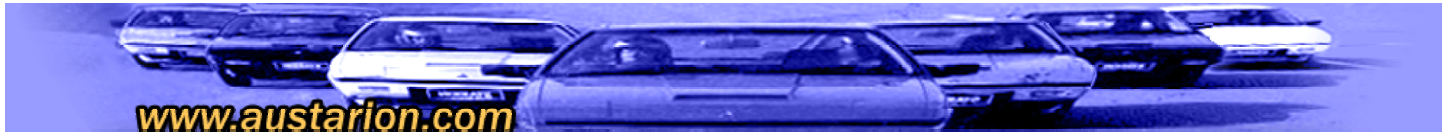
1. Re-bore and re-kit the original Starion master cylinder.
2. Replace with a larger bore master cylinder. Merlins choice as his is a street car.
3. Replace with a specialty race peddle box setup. Cookies choice, as his is a race car.

The master cylinder chosen is a 17/16 inch bore unit specified on some Nissan Patrol's. The unit itself is an aftermarket type, PBR part number J1715, which comes in a Lucas box, and contains a Tokico master cylinder!

It has the same 80mm mounting centre holes as the Starion unit, and will bolt straight onto the Starion brake booster. A gasket should be used between the booster and the new master cylinder. The booster has a pushrod length adjustment, which will need to be reset when fitting the new master cylinder. As can be seen in the pix, the hard lines can be connected to the new master cylinder with a bit of bending. The master cylinder should be bled before connecting the brake lines though.



FIG 9: TOKICO 17/16 INCH MASTER CYLINDER ON JA STARION BRAKE BOOSTER



HIGH PERFORMANCE BRAKE FLUIDS

BRAKE FLUID DESCRIPTION Polyalkalene Glycol Ether based	DRY BOILING POINT		WET BOILING POINT		DOT STANDATD
	°F	°C	°F	°C	
GENERIC DOT 3 SPECIFICATION	401	205	284	140	3
GENERIC DOT 4 SPECIFICATION	446	230	311	155	4
GENERIC DOT 5.1 SPECIFICATION	500	260	356	180	5.1
MOTUL: ULTRA 5.1	509	265	365	185	5.1
AP RACING: AP ULTRA 5.1	518	270	375	191	5.1
AP RACING: AP551	527	275	302	150	3
CASTROL: RESPONSE DOT 4	528	270	323	162	4
BP: HEAVY DUTY DOT 4	532	278	365	185	4
CASTROL: RESPONSE SUPER DOT 4	547	286	363	184	4
FORD: HEAVY DUTY	550	287	284	140	3
NEO: SUPER DOT	585	307	421	216	4
AP RACING: AP600	590	310	410	210	N/A
MOTUL: RBF 600	593	312	420	216	N/A
NEO: SUPER DOT 610	610	321	421	216	N/A

FIG 10: BRAKE FLUID COMPARISON TABLE

BRAKE FLUID CHOICE

The glycol based fluids tabled above are all available in Australia, and are reasonably priced. The two stand out low cost fluids for street cars are the Castrol Response Super Dot 4 and the BP Heavy Duty Dot 4. I have used both on track days, and both have excellent wet ERBP, meaning they will give good long term results in a daily driven street car. If your car only gets a fluid change every two years, go for the fluid with the best wet boiling point.

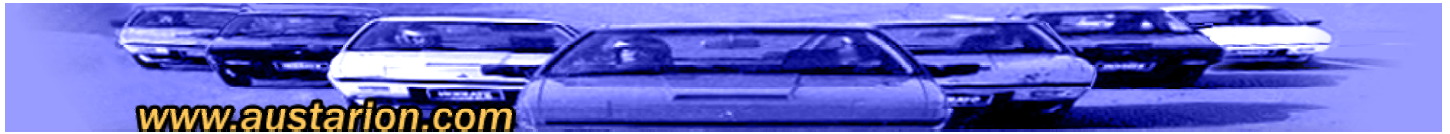
Only glycol based brake fluids have been shown. DOT 5 silicon fluids, while having excellent wet and dry ERBP specifications, are not generally recommended for street cars, or for track use. Castrol SRF has been recognised as the best endurance racing brake fluid, but is expensive, and has some silicon content. Top race teams use it, but they can afford to rebuild a brake system for every event.

The last three fluids shown in the table are specialty glycol based racing brake fluids, and all three are recommended for track use. There are some other glycol race brake fluids around, such as CALTEX GP600, WILWOOD 570, FERODO 5.1, GS 610, BRAKEMAN Extreme6, if you can find them.

TEMPERATURE CONVERSIONS

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 1.8) + 23$$

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 0.555$$



HIGH PERFORMANCE BRAKE PADS

MANUFACTURER	PART NUMBER	DESCRIPTION
WILWOOD	15B-3991K	Polymatrix "B" Type
WILWOOD	15C-4415K	Polymatrix "C" Type
WILWOOD	15D-4331K	Polymatrix "D" Type
WILWOOD	150-368K	Cold Stoppers (TAN)
WILWOOD	150-2391K	Gator Pads (GREEN)
WILWOOD	150-2561K	PFC (83 BLACK)
WILWOOD	15A-5734K	7112 A Polymatrix
WILWOOD	15B-3991K	7112 B Polymatrix
WILWOOD	15C-4415K	7112 C Polymatrix
WILWOOD	15D-4331K	7112 D Polymatrix
WILWOOD	15E-6096K	7112 E Polymatrix
WILWOOD	15J-7222K	7112 J Polymatrix
WILWOOD	15Q-6824K	7112 Q Polymatrix
WILWOOD	15T-5911K	7112 T Polymatrix
EBC	DP2001	Green Stuff
EBC	DP2002	Red Stuff
BRAKE MAN		#1 compound, COF=0.65, under 500°F
BRAKE MAN		#2 compound, COF=0.54, up to 900°F
BRAKE MAN		#3 compound, COF=0.48, up to 1200°F

FIG 11: HIGH PERFORMANCE BRAKE PADS

BRAKE PAD CHOICE

Brake pads to suite these callipers, Wilwood Dynalite and Tornado F3, are interchangeable and available from several sources. They are also available in several grades, from street use to endurance racing. Brake pad details are shown below.

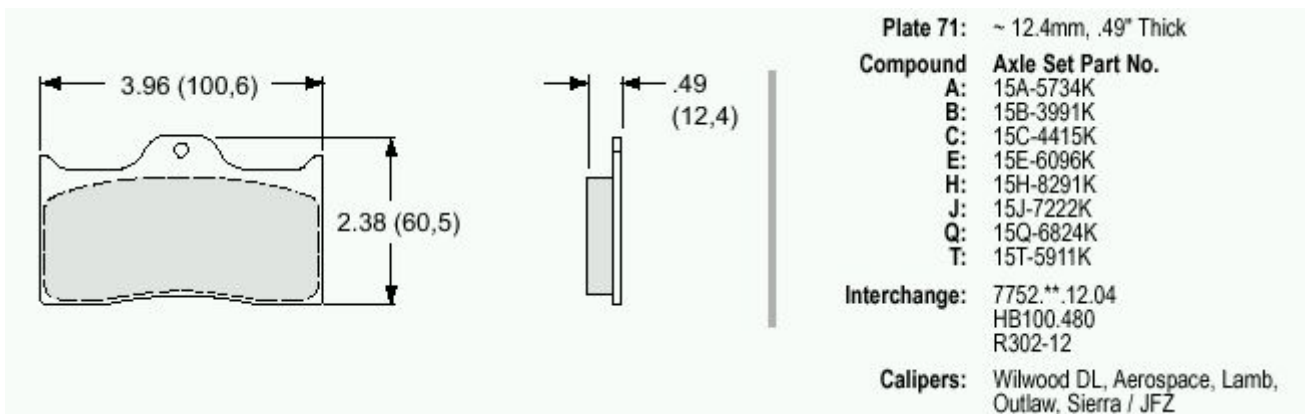
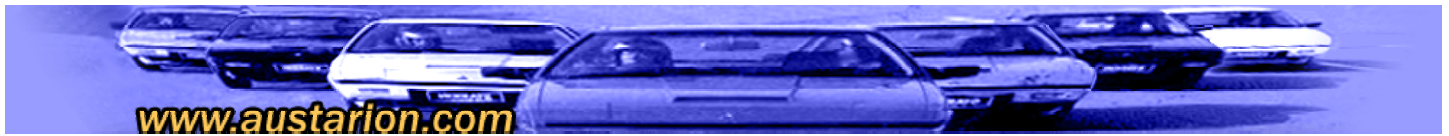


FIG 12: DETAILS OF WILWOOD BRAKE PADS AND DIMENSIONS

The cotter pin hole centre is 55mm from the lower edge of the backing plate, and 4.5mm dia. The top of the pad friction material is 46mm from the lower edge of the backing plate.



PARTS LIST for MERLINS STARION

CALIPER

WILWOOD DYNALITE, part number 120-6814

CALIPER BRACKET

MK21

BRAKE DISK ROTOR

DBA part number 486, from a late model Honda NSX. These need to be re-drilled to mount on the Starion hubs. An ally centring mandrel was turned-up for this purpose.

BRAKE PADS

EBC - GREENSTUF, part number DP2001 for street use.

EBC - REDSTUF, part number DP2002 for track days.

BRAKE FLUID

I used Castrol Super Response DOT 4 to flush and bleed the new system initially, then bleed the system through with Motul RBF600 racing brake fluid.

BRAKE LINES & FITTINGS

Need to be 620mm long overall, with 320mm from the inner guard to the strut mount. These can be normal rubber hose types, made to order, or braided stainless and Teflon types, using -3 size hose. The Dynalite callipers have 1/8 inch NPT inlet port, so an adapter was used to convert to -3AN. This is a Speedflow type 383-03, 90 degree elbow type. A product called Dripstop was used to seal the NPT fitting. Alluminium brake line mounting clamps previously made were re-used.

CALLIPER MOUNTING HARDWARE

Two bolts, M12x1.25mm, 39mm long, #10 stamped head. With spring and flat washer. They secure the calliper to the adaptor bracket.

A 2.5mm spacer is required between the calliper mount and the adaptor bracket. This should be welded to the adaptor bracket.

ADAPTOR BRACKET MOUNTING HARDWARE:

Three bolts, M8x1.25mm, 28mm long, #7 or #10 stamped head. With spring washer.

These three M8 bolts secure the adaptor to the fixtures originally used for the dust cover.

They are NOT strong enough to secure the adaptor on their own.

Two bolts, M12x1.25mm, 30mm long, #10 stamped head. With spring and flat washers.

These two bolts need to be high tensile bolts. They secure the adaptor to the strut on the original brake mounting points.

A 5mm spacer is required between the original mount and the adaptor bracket. This should be welded to the adaptor bracket. The spacers can be seen in the pix of the finished calliper bracket. The spacers were 12mm steel flat washers, 2.5mm thick, Champion BH704.

WHEEL STUDS

Longer wheel studs are used as 25mm thick spacers have been machined to provide the correct offset for the FWD type rims. The wheel studs used are Nice Products type NS3400.

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