DATSUN COMPETITION PREPARATION MANUAL

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In cooperation with
NISSAN MOTOR CORP.
IN U.S.A.
137 E. Alondra Blvd.
Gardena, California
CONVERTING FROM STREET TO TRACK
The Nissan Corporation of Japan is producing the finest production sports car, in its price range, available anywhere today.

Whether you want to buy any of their models for just everyday driving or full competition work you get the most car for your money — and, a tough, dependable machine.

The Bob Sharp Racing Organization selected Datsuns three years ago as the car that had the best chance of winning its class in sports car racing for the least grief and cash outlay. And these are very important considerations for anybody selecting a car for "just transportation" or serious racing.

During the period we have campaigned our Datsuns, a 1500 and 1600 cc model running in classes G and F, a great deal has been learned and definite improvements made in both engine and chassis. As with all racing cars, these changes and improvements came slowly through trial and error with many disappointing results along the way. But, things work out and we now have two race cars that can go against anything in their class.

The purpose of this manual is to pass along our experiences on developing and campaigning the two models of the Datsun sports car, and to eliminate, for you, some of the problems and errors we encountered.

You'll notice this booklet is in loose-leaf form. The purpose being that as time passes, and we find new and better ways of getting desired results, we will mail them along to you in the form of replacement or additional pages. This will keep your manual up to date and your car competitive no matter what the other guys come up with during the season.

Our goal is to see more Datsuns in competition on drag strips, at hill climbs, speed and time trials and on sports car tracks.

With a manual such as this, plus the optional equipment and parts that are now readily available to everyone, Datsuns will dominate.

Bob Sharp Racing
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CHAPTER I—GENERAL

This manual will deal with various stages of modifications that can be made to the 1500 (SPL 310) and 1600 (SPL 311) models of the Datsun sports car. In many of the discussions, the most extreme changes desired for full competition work will be given. In other cases, recommended changes will be discussed in stages that are best suited for various activities ranging from rallye and gymkhana to all-out racing. In all instances, the most economical approach will be considered and, for your convenience, a general price list has been incorporated at the end of the manual so that you might keep a running account of just how far you can go from your wallet’s point of view.

STRIPPING FOR WEIGHT REDUCTION

For full competition, or any part thereof, one of the quickest ways of going faster is to remove weight. Just to give you an idea of how important this is, on the 1500 model (Class G) every 19 pounds removed gives you one horse. So, a systematic removal of weight is a pretty cheap way of going faster. (You might even consider knocking off that extra drink or desert with dinner as part of the game also.) On the 1600 model (Class F), it’s 17 pounds per horsepower. These figures are based on a full competition engine sitting in a stock body. Under the present SCCA rules, the maximum allowable weight reduction is 5% of the manufacturer’s listed shipping poundage as it appears in the Club’s “Production Car Specifications” booklet.
INTERIOR MODIFICATIONS

For full competition, it is recommended that the center console be removed for safety and driver comfort — as well as the heater, tunnel and floor mats, door glass and window-winding mechanism. If you're really ambitious, you might wish to redesign the dash instruments' layout for better reading. A home-made dash board of aluminum also cuts about 10 pounds from the stock unit and is easily installed as the original piece drops out by loosening a few bolts. It's a good idea to solder all ignition wires to the terminals on the key/starter as they have a tendency to vibrate loose at the most embarrassing times.
INSTRUMENTS

A little care is in order here. When using the heavy duty oil pump (Part No. 15010-12210), replace the oil pressure gauge with a good, full-sweep instrument with a direct pressure line into the engine block. The stock unit is electrical and only reads to 90 PSI and is prone to give false readings. Purchase a gauge with a high reading of 150 PSI as the heavy duty oil pump puts out a little over a 100 pound reading when the engine is cold. Your new gauge will come with tubing and female fittings, but it will be necessary to order, from your Datsun dealer, a special male brass fitting (Part No. 22954-10400) to replace the electrical sending unit in the side of the block.

Purchase an oil temperature gauge if the optional aluminum sump and oil cooler are not installed. An operating temperature up to 230° is ok. If, because of climatic conditions in your area, your engine runs over 230°, invest in the oil cooler (Part No. 21300-12210) and larger aluminum sump. Order the 1600 model sump (Part No. 11110-14610) — it fits the 1500 block too.

The alternator and fuel gauges are ok as is, but a water temperature gauge, of the full-swing 240° type, should replace the stock unit.

It is also recommended that a mechanical tachometer, with a top reading of at least 8,000 be installed. The stock unit reads only to 7,000 and a well prepared Datsun 1500 engine will turn 7,300 RPM and the 1600 model 7,800 RPM — all day. The Jones Motrola tach has proven most reliable and by-passes any electrical problems sometimes incurred with battery-assisted set-ups. Also, on the Jones unit, the needle follows the engine very closely with no lag or over-run. And, it carries a resetable "tell tale" needle to keep you honest.
ROLL BAR

Installation of this handy item is quite easy in the Datsun. The frame is so positioned that direct contact can be made through the "shelf" behind the seats without a lot of fancy bends. You must use at least $1\frac{1}{2}''$ outside diameter x .120" wall thickness material with $\frac{3}{8}''$ diameter bolts of SAE quality. Check your SCCA "General Competition Rules" for additional details. Figure 1 shows the set-up on the Bob Sharp cars using 2'' OD material.

Figure 1
Typical roll bar dimensions for easy installation in the 1500 and 1600 models of the Datsun.
CHAPTER II—SUSPENSION & BRAKES

Whether your car is new or used, magnafluxing is a must. Check the front hubs, spindles, discs, wheels, spindle nuts, disc calipers, brackets, rear axles, brake drums, ball joint nuts, steering arm and its bolts, etc.

WHEELS & TIRES

American Racing Wheel and Minilite Magnesium Wheel Companies offer 13" and 14" wheels for both models of the Datsun. All mags, as of this writing, must be chamfered on the inside to seat correctly on the front hub flange. To fit the 14" American Racing Wheel to the 1600 model, it is necessary to file the disc calipers ⅛” to ¼” on the outer edge in order to clear the inside of the magnesium spokes. On the 1500, you’re allowed a 5½” rim width; and a 6” on the 1600.

A 5.50/8.10 x 13” tire will fit on the 1500 if the rear frame lip (portion over the rear axle) is bent over. Grind the side of the rear spring slightly (at the point where the tire’s sidewall would rub it), bang in the inner rear fender well, and roll-over the inside of the outer fender lip. It sounds like a lot of work, but the bigger tires make it all worthwhile. When modifying the frame, don’t grind the lip away — as you’ll break the weld on the box seam. Get a bigger hammer. Roll-over the front fender lip as well and check the lock-to-lock steering positions for tire rub.
On the 1600, a 5.75/9.50 x 14" tire can be used, but the clearances are very critical. In fact the clearances are so close, it is sometimes necessary to loosen the body bolts in order to insure perfect alignment of the body to the frame. The major problem is that the tires on the rear rub the inside of the fender. Even without lowering the car, the clearance of the tire to the fender is only ¼" — and will rub slightly under cornering loads. You can live with this, but to prevent prohibitive rubbing, a transverse, rear-end locating rod should be installed.

If you're not interested in all these modifications, or feel it's not worthwhile for the type of competition you'll be entering, run a 6.00 x 14" on your steel wheels and check the clearances all around.

On the 1500, with steel wheels, it's advisable to use the meatier 1600 hubs up front. It has been found that the 1500 hub doesn't offer enough contact area with the steel wheel lug flange and has a tendency to crack. Also, the steel wheel is less flexible than a magnesium wheel — which compounds the problem. Consider this change in hubs even if you are using mags.

We'll leave the tire pressures up to you, but as a starter: 40-48 lbs. on the front; 35-44 lbs. on the rear. These figures should be ambiguous enough not to offend anyone.
1500 FRONT SUSPENSION

For full, or serious, competition, lower the car 1". This can be accomplished by collapsing one coil of the front stock spring. Remove it from the car and put a torch to the top coil. When it’s hot enough, compress the coil until it touches the second coil. Let it cool naturally. This should give you the desired car height, but a little trial and error might be in order as springs and cars differ slightly.

Bob Sharp Racing has developed a shock absorber that is inexpensive and works very well. These, or Koni Shocks, are recommended as replacement units for any type of active driving.

The front rubber bumpers, located on the lower "A" arms, should be cut to give more travel to the suspension. How they are cut — the angle, and/or the height, determines greatly the handling of the car. Here again, it is highly recommended that work in this area be undertaken whether you intend to race seriously or just make a few autocrosses at the local shopping center. Generally, remove approximately ¾" of rubber from the peak of the bumper if the rest of the suspension is to be in stock form, or 1 ¼" if the front springs have been collapsed to lower the car one inch. Figure 2 illustrates the extreme modifications that can be made to induce over and understeer.

A stiffer front sway bar should be fitted. This may be purchased from Bob Sharp Racing or fabricated out of ½" chrome moly stock — utilizing the stock mounting points and brackets.

The front-end settings on the 1500 can be modified by shimming the upper "A" arms. Set the camber at 4° negative, leave the caster factory-set at 1 ½° positive, and toe-in the steering ½°.
Figure 2

Modifications to the rubber bumpers on all models of the Datsun can be easily made by bench grinding or cutting with a hacksaw.
1500 REAR SUSPENSION

The rear rubber bumpers should be modified as discussed above for the front bumpers with the following exception: on a tight, twisty course (as in gymkhana work or race tracks like Marlboro) the rear bumpers should be a little longer than the fronts. Suspension tuning comes into play here and will vary according to driver needs, road surface and tightness of corners. The general rule is: the longer the rear rubber bumper, the quicker the frame will make contact and cause oversteer. And, conversely, long rubber bumpers in the front will cause understeer and plowing. So if you want the rear end to come around a little more (induced oversteer), cut the fronts and leave the rears stock.

The above modifications to rubber bumpers are the easiest and least expensive way of tuning suspensions. But, the better and more accepted way of modifying is to work with rear spring rates. Bear in mind, a stiffer rear spring is ok if a limited slip is fitted. The reason being, a stiffer spring will lift the inside wheel quicker in a tight turn; a stock spring allows the inside wheel to hang down a little longer — giving more bite. In conjunction with this, a heavy duty sway bar in the front reduces body roll and helps keep the inside rear wheel on the ground. So, with a limited slip installed, you’ll have equal success in suspension tuning if you play with the rear spring rate. Any competent spring shop can work with you on these modifications. And, as mentioned above, if you don’t plan to install a limited slip, stick to tuning through the rubber bumpers, heavier sway bar and the special shocks. Remember, the different combinations of car height, spring rates, larger diameter sway bar and rubber bumper modifications will alter the handling of the car from one extreme of plowing to violent oversteer. Changing each of these items is tricky work and every modification effects the other components of the suspension. If you don’t wish to become involved in this type of experimentation, Bob Sharp Racing has developed the various suspension packages for every type of road condition. Or, you may communicate directly for assistance on your particular problem.
1600 FRONT SUSPENSION

Because of tire clearance problems on the full-race version of the 1600, it is not desirable to lower the car when using a 5.75/9.50 x 14" tire. In fact, it is even necessary to alter the front-end settings more radically than the 1500 in order to give desired tire clearance. The caster angle should be brought back to allow the tire to clear the front edge of the fender well. Increase the positive angle of the caster by shimming the back bolt on the upper "A" arm. Obtain 3 1/4" replacement bolts as a shim pack of one inch is sometimes necessary. Pick up four bolts as the front one on the upper "A" arm is shimmed approximately 1/2" to secure the desired negative camber of 4°. Set the toe-in to 1/8".

The shock absorbers (front and rear) and sway bar recommendations are the same on the 1600 as discussed for the 1500. The handling of the rubber bumpers on the 1600 suspension differs only in one respect from the 1500: Because of tire clearance, cut the bumper as shown in Figure 3.

Since the front spring is not collapsed on the 1600, it is desirable to install spring blocks in the front coils to stiffen the suspension. The number and placement will help determine the amount of over or understeer of the car. As a starter, use two per spring — located half-way up, opposite each other. Buy the type that is adjustable so that it can be secured to the coil of the spring and won't vibrate loose and slide to an undesirable position.
1600 REAR SUSPENSION

The 1600 has less suspension travel than the 1500 because of the larger rear-end housing. But, the same modifications to the rubber bumpers, as given for the 1500, are in order. De-arching the rear spring is not needed because of the tire clearance situation. It is a good idea, though, to have your spring re-bracketed to keep the leaves tight. This can be done on both the 1500 and 1600 models by any spring shop.
1500 BRAKES

This model has 9" drums on all four wheels. A good sintered metallic lining should be installed. Also, micro-polish the drum-to-lining surface for smooth contact. The brake linings can be purchased from a Velva-Touch franchisee located in most major cities. Be sure the linings are riveted as well as bonded. If you can't find a source for this type of lining material, Bob Sharp Racing has it available on a shoe exchange basis. The front and rear backing plates should be drilled with 3/8" holes as shown in Figure 4.

It is recommended that a good lithium-based moly EP grease be used on wheel bearings in both models of the Datsun as brake heat has a tendency to melt material of lesser quality.

A neat little mod is to install the 1600 model hydraulic brake and clutch reservoirs on the 1500 model. They're bigger and increase the capacity of the fluid in the system.

1600 BRAKES

On the rear, use the same lining material as on the 1500, polish the drums and drill the backing plates. On the front discs, bend the dust shield inward to a 45° angle to scoop more air into the disc and caliper. For full competition, use either Ferodo brake pads with the green/blue color coding or Raybestos pads available through franchised dealers. For any driving less than all out racing, the stock front brakes are more than adequate.

On both models, it is recommended that a good grade of brake fluid be used in the system.
CHAPTER III—DRIVE TRAIN

1500 & 1600 CLUTCHES

The stock 1500 and 1600 clutch discs will not hold up too well under full competition use. It is advisable to replace the stock material with a brass impregnated fabric lining such as the Rusco Company produces, and have the disc balanced. Or, either model, already modified, can be purchased through Bob Sharp Racing.

The 1500 clutch has to be beefed-up for competition use. Replace the clutch springs with stronger units available from any brake and clutch repair shop. You're looking for a total increase in spring pressure of 120 lbs. An alternate route is to use a stock 1600 clutch. This unit is fine, as is, for any type of competition. And, it fits the 1500 flywheel with only one modification: The clutch attachment bolt pattern on the 1500 flywheel is larger, in diameter, than the 1600. So, if you use a 1600 clutch, with a 1500 flywheel, have new bolt holes drilled and tapped, and new locating pins pressed into the flywheel. Figure 6 indicates, for comparison, both bolt hole patterns.
1500 & 1600 FLYWHEELS

For serious competition, have the flywheel lightened to 13 lbs. Following the contour on the back of the flywheel, remove the rough casting to a depth of .200". Remove additional metal on the back, at the outer edge, next to the ring gear, to a depth of .225". On the face side, from ¾" outside the center line of the clutch attachment bolt holes, a great deal of metal can be removed safely. The shaded area in Figure 5 indicates where to cut. The dotted shaded area is discussed next.

Figure 6, showing the face side of the flywheel, indicates the area to be scalloped between the clutch attachment bolt holes. This is a milling operation that can be performed by any machine shop. When this work is done, however, it is necessary to have new locating pins pressed into the flywheel to assist in centering the clutch when it is attached.

Bear in mind, Figure 6 is a scale drawing of the 1600 model flywheel. If you are working with the 1500 model, notice that the clutch attachment bolt hole pattern has a ¾" larger bolt circle diameter. Therefore, you will not be able to scallop, or mill, as far in from the outer edge. The main thing to consider is leaving a big enough "platform" for the clutch attaching flanges to rest on. As long as there is approximately a square inch of "platform" around the bolt hole, you're home free.

Radius the edges of the angles in the cut areas as it will enhance the strength of the section and insure that it doesn't end up in your lap.
1500 TRANSMISSION

Working from the transmission to the rear, the first modification to consider is close ratio gears to alleviate the "stump puller" 1st gear and long spacing between 2nd and 3rd. This condition is especially prevalent when higher numerical rear end gears are installed. The gears needed are: main drive gear, counter drive gear, main shaft second gear, main shaft third gear and the normal assortment of transmission gaskets. Use the stock 1st and reverse idler gear. If the unit you’re working with is not new, it is wise to replace all the synchronizer rings. Also, pay close attention to the 2nd and 3rd gear brass bushings as they have a tendency to crack after prolonged or hard usage.

When the optical close ratio gear set is installed, it is necessary to turn down, or trim, the main shaft drive (pilot bushing end) to the same length as the stock shaft you are replacing. The close ratio main shaft is actually manufactured for a different transmission housing and this machining modification is needed to make it seat properly into the crankshaft pilot bushing.

The shifting mechanism can be made smoother by cutting one coil off the three shaft poppet springs. These are the springs that hold the check balls on each of the gear selector shafts. When this modification is performed, it has been found that the shift lever will pop out of gear after prolonged use — that is, half a full racing season. If you should experience the same problem, merely replace the poppet springs.

Safety wire the internal nuts and bolts as shown in the Datsun Shop Manual and fill the transmission with a good grade of 90 wt. gear oil to the ¾ mark on the dip stick.

On the 1500 and 1600 models, no modifications to the drive shaft are necessary unless you feel balancing the unit is the ultimate for a few extra revs.
1500 REAR END

The stock rear end ratio is 3.89 on hypoid gears. The optional gears available through your Datsun dealer are 4.11, 4.38, 4.62 and 5.13. For everyday driving and weekend autocross-type work, a 4.11 is recommended. If you don’t mind sacrificing your top-end (illegal turnpike cruising speeds), you can go as low as 4.38. Keep in mind your speedometer will read low with a numerical increase in the rear end ratio. The change will be proportional—that is, a 10% change in the numerical figure in the gear ratio gives you a 10% error in the reading on the speedometer.

For racing, a 4.62 ratio works out well on most of the tracks in the country with the exception of tight, twisty courses like Marlboro and Bryar in New Hampshire. On these tracks, or other road conditions that have short straights with slow entrances, a 5.13 is recommended.

Limited slips for the 1500 are being developed by the Nissan Corporation and should be available sometime in 1967. Even though this is a good item to have, the 1500 has done very well, to date, without it.

The only other modifications to the rear end would be extending the oil breather tube by some 6” to cut down on oil loss sometimes encountered with lower rear end gear ratios. If the loss is excessive, extend the tube up into the trunk—dumping into a plastic catch bottle.

1600 TRANSMISSION

The standard transmission, as delivered on the 1600, is completely adequate for racing. There are close ratio gears available, but the added expense and subsequent modifications needed to mate it to the rest of the drive train do not warrant the change or work involved. As suggested on the 1500 transmission, you may wish to re-work the shifting mechanism and check over the various bearings and bushings for wear. Use a good grade of 90 wt. gear oil and fill to one pint less (for full competition use) than the Manual recommends.

1600 REAR END

The rear end ratios available are the same as listed for the 1500 model: 4.11, 4.38, 4.62 and 5.13. But, because of the larger tires and wheel diameter on the 1600, the best all around gear for racing is a 5.13. This should even suffice on the longer tracks if you don’t mind turning your engine to 7500-7800 RPM. If not, or you have a track with exceptionally long straights, go to a 4.62. The 5.13 is recommended when using the big 5.75/9.50x14” tires. If smaller tires are used, like the 6.00 x 14” or low profile series, the 4.62 would be the all around gear. For everyday street driving and weekend speed trial use, go with the 4.38.

The 1600 does have an optional limited slip available from the factory, but it is shipped set-up on a 4.38 ring and pinion in the carrier. Because of this, the following Parts List will be helpful in selecting the gears you desire.

Use the following part numbers when ordering a complete rear end carrier with the ring and pinion already set-up. The first five digits is the carrier number, and the second five digits is the ring and pinion number.
To order just the ring and pinion, use the following part numbers:

**MODEL SPL 310 (1500)**

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<td>38300-10400</td>
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<tr>
<td>4.11</td>
<td>38300-09600</td>
</tr>
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<td>4.38</td>
<td>38300-08300</td>
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<td>38300-04104</td>
</tr>
<tr>
<td>5.13</td>
<td>38300-04103</td>
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**MODEL SPL 311 (1600)**

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.89</td>
<td>38300-14600</td>
</tr>
<tr>
<td>4.11*</td>
<td>---</td>
</tr>
<tr>
<td>4.38**</td>
<td>38300-13210</td>
</tr>
<tr>
<td>4.62**</td>
<td>38300-36800</td>
</tr>
<tr>
<td>5.13***</td>
<td>38100-04100</td>
</tr>
</tbody>
</table>

*The 4.11 is not available as a complete unit. Order the 4.38 assembly with the limited slip (Part No. 38300-13210) and the 4.11 ring and pinion (Part No. 38100-61001).

**This unit includes the limited slip already set-up.

***The 5.13 is not available as a complete unit. Order the 4.38 assembly with the limited slip (Part No. 38300-13210) and the 5.13 ring and pinion (Part No. 38100-37000).

**IMPORTANT:** On the 1500 model, you must purchase the sedan carrier when installing a 4.38, 4.62 or 5.13 ring and pinion because of the pinion offset. Order carrier Part No. 38100-09600. If you are using a 4.11 ratio, just order the ring and pinion — as they will fit into your present carrier.

If you order new axles for your 1500, note whether your axles are threaded or tapered two inches behind the hub flange. The grease retaining seal for the outer axle bearing is secured, on some axles, by a nut and locking plate, and on others by just a press fit of the grease seal onto the axle. Specify which type you have when ordering.

Again, as on the 1500 rear end, extend the breather tube to minimize loss of gear lube.
CHAPTER IV—ENGINE

GENERAL

The stock Datsun engine is very well engineered and does not show the percentage increases in horsepower, when hopped-up, that have been experienced with other small-bore imports. However, you will be impressed with the performance if you decide to go all out. Just don't think that your efforts will make it a Cobra eater, or that you'll be able to run it forever without maintenance or care. Any big changes are going to effect the reliability. Because much of the work to be performed pertains to both the 1500 and 1600 models, the following instructions will apply to both engines unless otherwise specified.

As a general rule, most people think of milling the cylinder head as a starting point in gaining horsepower. This is true on most engines, but not the Datsun. With everything else stock, you could mill the head only .015" before the piston/valve/combustion chamber clearances would become critical. And, if you should ever warp the head a little, and needed to have it milled a few thousandths, things would be tight. Also, milling .015" isn't going to raise the compression that much, so skip it.

The best starting point is a re-ground camshaft. A mild cam, suitable for street use, can give you a 15% increase in horsepower @ 6500 RPM. Up to 3500 RPM, you'll experience a slight loss in horsepower, but over that the performance is very good. With a mild cam, the stock carburetor needles work well.

The next step would be to let the engine breath more efficiently. Polish up the intake manifold, clean-out the rough castings in the exhaust manifold, install .100" carburetor jets (stock is .090") and rework the ports in the cylinder head. Also, at this point carburetor needle experimentation is in order. These changes will give you horsepower at the top end.

In order to make the above changes work for you throughout the range, it is necessary to raise the compression ratio by modifying the pistons and reworking the combustion chambers. Now you're into a lot of work and your engine almost completely torn-down. If this is the case, you might as well pull the engine and lighten the fly-wheel and install a heavy-duty clutch disc. Next in order would be to work over the bottom end of the engine, install a heavy-duty oil pump and balance the entire assembly.
Here's how the above modifications break-down in stages and the approximate costs involved.

**STAGE I**

<table>
<thead>
<tr>
<th>Modifications</th>
<th>Parts Cost</th>
<th>Labor Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild cam</td>
<td>65.00</td>
<td>65.00</td>
</tr>
<tr>
<td>New lifters</td>
<td>7.20</td>
<td></td>
</tr>
<tr>
<td>Valve springs</td>
<td>26.00</td>
<td></td>
</tr>
<tr>
<td>Gasket set</td>
<td>10.75</td>
<td></td>
</tr>
</tbody>
</table>

Stock valve lifters should be polished as discussed in the text.

**STAGE II**

<table>
<thead>
<tr>
<th>Modifications</th>
<th>Parts Cost</th>
<th>Labor Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>.100&quot; carb. jets</td>
<td>10.00</td>
<td>18.00</td>
</tr>
<tr>
<td>Carb. needles</td>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td>Polishing (light)</td>
<td>25.00</td>
<td></td>
</tr>
</tbody>
</table>

In addition to polishing the cylinder head ports and matching the intake and exhaust manifolds, the carburetor throttle shafts and butterflys should be thinned-down.

**STAGE III**

<table>
<thead>
<tr>
<th>Modifications</th>
<th>Parts Cost</th>
<th>Labor Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head milling .125&quot;</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>Piston machining</td>
<td>30.00</td>
<td></td>
</tr>
<tr>
<td>Push rods</td>
<td>24.00</td>
<td></td>
</tr>
</tbody>
</table>

The above three stages of work can be performed without removing the engine from the car. If all the work is done at once, your outside labor costs will only be a one-time expense.

**STAGE IV**

<table>
<thead>
<tr>
<th>Modifications</th>
<th>Parts Cost</th>
<th>Labor Costs</th>
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</thead>
<tbody>
<tr>
<td>Racing pistons</td>
<td>100.00</td>
<td></td>
</tr>
<tr>
<td>Connecting rods</td>
<td>127.00</td>
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<tr>
<td>Race cam</td>
<td>75.00</td>
<td></td>
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<tr>
<td>Rod bearings</td>
<td>16.90</td>
<td></td>
</tr>
<tr>
<td>Rocker arms</td>
<td>80.00</td>
<td></td>
</tr>
<tr>
<td>Rocker shaft</td>
<td>4.80</td>
<td></td>
</tr>
<tr>
<td>Valve spring spacers</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Aluminum sump</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>HD oil pump</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>Clutch disc</td>
<td>25.00</td>
<td></td>
</tr>
<tr>
<td>Lightened flywheel</td>
<td>35.00</td>
<td></td>
</tr>
<tr>
<td>Block machining</td>
<td>95.00</td>
<td></td>
</tr>
<tr>
<td>Head machining</td>
<td>55.00</td>
<td></td>
</tr>
<tr>
<td>Balancing</td>
<td>40.00</td>
<td></td>
</tr>
<tr>
<td>Exhaust manifold</td>
<td>75.00</td>
<td></td>
</tr>
<tr>
<td>Coil</td>
<td>20.00</td>
<td></td>
</tr>
<tr>
<td>Electric fuel pump</td>
<td>18.00</td>
<td></td>
</tr>
<tr>
<td>Spark plugs</td>
<td>6.00</td>
<td></td>
</tr>
<tr>
<td>Gaskets, bearings, etc.</td>
<td>25.00</td>
<td></td>
</tr>
</tbody>
</table>

To the above figures add the costs listed for Stages I, II and III with the exception of the camshaft, piston machining (Stage III) and gasket set (Stage I).

Now that you have an idea of what's involved in the way of work, time and money, each step will be discussed in detail.
INDUCTION SYSTEM

As with most engines, the thing is to make them breath. Get more air/fuel in and exhaust gases out faster. To accomplish this, open-up the ports and reduce foreign restrictions. Match the intake and exhaust manifolds to the cylinder head ports. Place the manifold gasket to the head and scribe the outline of the ports. Next, place it against the intake and exhaust manifolds and check for alignment. Any necessary grinding can be done with a high-speed hand grinder. Remove the locating rings from the intake manifold and discard. Open the intake ports in the cylinder head to 1 1/4” on the 1500 and 1 7/8” on the 1600 model. One-third into the port, taper-down gradually 1/8” on both the 1500 and 1600 to ensure that you don’t grind through the wall into the bolt hole.

On the exhaust ports in the cylinder head (both 1500 and 1600), merely grind away the rough castings and polish—without opening or increasing the basic stock dimensions. Figure 7 illustrates the finished product.

The design of the intake manifold leaves little to be desired and a light polishing job is all that is necessary to ensure good air/fuel flow.

On the carburetors, dis-assemble and cut-down the throttle shafts and butterflies. Figure 8 is a before and after shot to show you just how far you can safely cut. Replace the butterfly attachment screws with solder as there will not be enough metal left for adequate threads.

If you intend to go with the .100” carburetor jets, install RH needles on the 1600 and SL needles on the 1500. For full competition, remove the oil from the carburetor piston and, as a starting point, turn-down the jet adjuster one-half turn. This would be equivalent to three “flats” on an SU carburetor.

Figure 9 shows the type of 4” velocity stacks employed on the Bob Sharp cars to straighten the air before entering the carburetor.
EXHAUST SYSTEM

In 1967, a "free" exhaust system is allowed in SCCA racing. As of this writing, many designs are being developed and tested. If you intend to stay with the stock exhaust header, you won't be too far off if a few modifications are made. As mentioned above, clean-up the flanges and match them to the cylinder head ports. Split the number 2 and 3 exhaust ports on the manifold by welding in a steel separator 2 1/2" long, tapered. On the collector chamber end, cut off the flange and weld on a 1 3/4" ID diameter 3" extension. This will cut down any restrictions of the stock flange — as it protrudes into the collector chamber. Also, it makes a neater installation of your straight-through exhaust pipe, (1 3/4" ID material) and will take a slip fit and clamp. Figure 10 shows the length and exiting position of the pipe. Notice the installation of a megaphone with dimensions of 18" long with a 2 9/16" opening.

VALVES

The stock valves give good gas flow and require only polishing as a modification. Even the valve seat angle of 45° is ok, as anything less, like 30°, has a tendency to thin-out the lip too much and invite chipping. The valve seat contact area should be 1/16" wide to insure proper sealing and under the head should not be tuliped as it weakens the head and it might come adrift.

Check your valve guides for excessive wear. If a clearance of more than .002-.003" is experienced, have the guides knurled. This can be checked by placing the valve in the guide, without the valve springs, and try to wobble the valve in the guide, from side-to-side.
VALVE SPRINGS

Heavy duty valve springs are a must. You are looking for a total of 230 lbs. pressure with the valves fully open. The seated pressure of the spring (valve closed) should be at least 110 lbs. It is important to check this latter pressure because of the critical initial valve opening inherent with radical profiles on racing cam lobes. The opening ramp of the lobe has a tendency to cause the valve to float initially if the spring pressure is not sufficient. The above pressure figures are based on the cams used in the Bob Sharp cars which carry a lift of .480" at the valve. If you select a cam of another manufacturer, check with him on recommended spring pressures for his grind.

Alloy retainers, or collars, are lighter than the stock 1500 units and should be used. The stock 1600 retainers are pretty light, as is, and can be used in a full competition engine. Figure 11 shows a typical aluminum collar secured at a local speed shop that matched to the valve springs perfectly.

ROCKER ARMS & SHAFTS

Using high RPM's and stiffer valve springs cause scoring of the rocker arm/rocker shaft contact area. They are both steel surfaces and don't mate well under racing conditions. Figure 12 illustrates the three stages of modifying the rocker to alleviate the problem. Ream out the shaft hole and press in a brass bushing to insure longer life. Polish the rocker shaft lightly to remove rough edges and gain a shaft/rocker arm clearance of .0015". Grind and polish the rocker arms. As much as 32 grams can be removed safely. Lightened rocker arms, with brass bushings, and matched rocker shaft are available through Bob Sharp Racing.
PUSH RODS

On a Stage III engine, where the head has been milled .125", it is necessary to shorten the push rods ¼". The least expensive operation is to cut the end off with a hacksaw, grind a radius (to match the socket in the cam follower) and polish. Figure 13 illustrates how to hand lap the push rod to the follower with grinding compound. Once each set has been matched, don’t mix them with other sets.

A better method, but more expensive, would be to install alloy-stemmed push rods. These lighter units can be purchased from camshaft suppliers or made-up from your stock push rod by a local machine shop. Cut the stock ends off 3/8" and have a ¼" shoulder lathe-turned so it can be pressed into a hollow alloy stem. Figure 14 is a sketch of this operation.

CAM FOLLOWERS

The stock cam followers are used in the full-race versions of the 1500 and 1600 engines. It is suggested that the face of the lifter be polished to increase the life of the cam. Figures 15 and 16 illustrate the easiest way of getting a mirror-finish, using a light abrasive cloth and buffing on a wheel with rouge.
ROCKER SHAFT PEDESTALS

Cutting the pedestals, when the head has been milled and the push rods shortened, will bring your rocker arm geometry back to a more realistic perspective. Proper geometry will increase the life of the various parts involved, but your horsepower will suffer by a reading of 3 or more. If you’re looking for longer life in your valve train, cut the bottom of the pedestals .190” to bring the contact of the rocker and valve to a better relation. This will increase the life of the valve guide, valve stem and rocker. If you’re looking for maximum horsepower, and are willing to sacrifice wear, leave the pedestals at stock height. This will give you a higher valve lift, allowing your engine to take in and push out more air/fuel and gases. Horsepower increases of 3 to 5 have been gained by running a “cockeyed” geometry. These figures are based on using a head milled .150”, push rods shortened ¼” and a valve lift of .480” at the valve. Cutting the pedestals .075” is a good compromise. Bear in mind, if you’re working with a used head and have had to re-seat the valves in the head, you will have caused the same effect as cutting the pedestals. The exaggerated sketches in Figure 17 show what effect the height of the pedestal has on the valve-to-rocker contact. This contact is what effects your valve lift because of the relationship of the radius of the rocker pad to the top of the valve. The Datsun valve is not perfectly perpendicular to the rocker arm. It is angled 9°. This has the added effect of valve guide wear because the rocker is pushing the valve to one side. Notice in the sketch, with the stock pedestal, the valve rides on the outer edge of the rocker pad where there is a greater radius.

Figure 17 — Examples of changing rocker arm geometry by cutting pedestals.
CYLINDER HEAD

The first operation, after cleaning up the intake and exhaust ports, is to have the head milled .125". This is the operation for a Stage III engine where you will be using your stock pistons with machining modifications. On a Stage IV engine, where the block will be removed from the car, it is better to mill the head .075" and flycut into the combustion chamber .075", for a total of .150", to get the desired compression increase. This second route is recommended for the full-race engine because milling the head surface .150" weakens the metal to a point where it could warp or cave-in. The above recommendations are suggested for both the 1500 and 1600 models.

There is not a great deal of grinding work needed in the combustion chamber. On the 1600, merely clean-up the rough castings and polish. On the 1500, open-up the walls around the intake valves ¼" to relieve the "shrouding" effect. Be careful not to open it up to a point where it is extended past the edge of the head gasket. Lay the gasket on the head as a template and scribe your grinding lines. There is no grinding needed to "unshroud" the exhaust valve. Make a note of the spark plug threads protruding into the combustion chamber and the sharp edges around the valve seats. Radius these edges as shown in Figures 18 and 19. It might be a good idea to take a trip down to your local Datsun dealer and ask to examine a 1600 head in his parts department. You'll notice the design of the combustion chamber and contours in the intake ports are greatly improved over the earlier 1500 model. This will be helpful in determining where to grind your 1500 head to make it more efficient.
Figure 20 — Dimensions taken from center lines of head bolt holes to locate bore centers for flycutting combustion chambers.

Figure 21 — Flycutting marks to accommodate "pop-up" pistons.

If you ever buy a new 1500 or 1600 head, be sure to also order two brass oil hole plugs (Part No. 11065-30000), as the old ones cannot be removed without damaging them.

As mentioned above, the Stage IV head should be flycut .075" in the combustion chamber area to gain the desired compression ratio increase. Use the bore center and diameter dimensions as shown in Figure 20. The shaded area in Figure 21 indicates the cut to be taken. This work, plus the milling of .075" from the head surface of the block, will give you a compression ratio of 13-to-1 on the 1500 and 14-to-1 on the 1600.
PISTONS

After milling the head .125" (Stage III), have your stock pistons machined as illustrated in Figure 22. The stock replacement piston rings are sufficient for this compression increase. There are no other modifications needed.

If you decide to bore-out your block and go with .040" oversized pistons (Stage IV), the machining operation, as illustrated in Figure 22, still holds true. On the 1500 piston, the stock replacement rings are used. On the 1600, you might wish to replace the top stock ring with a cast iron unit for quicker seating to the cylinder wall. These are available from the Perfect Circle Piston Ring Co. Order 37/16" plus .040" x %4", part number KTF 200.

Figure 22 — Machining tops of stock 1500 and 1600 pistons to increase compression ratio.
**BLOCK**

As discussed, for the full-race, Stage IV engine, you should bore the cylinders to accommodate the .040” oversized pistons, and mill the block surface .075” to raise the compression ratio. For a perfect “bottom-end”, it is also advisable to have the crank and camshaft bearing surfaces line bored for true alignment. After all the machining work has been performed to the block, be sure it is cleaned thoroughly before re-assembly. Pay close attention to the pockets in the valve lifter area and rear cam bearing, as metal filings have a tendency to hide well. Also, run a tap into the head stud holes to insure that all foreign particles are removed.

On the 1500 block, because of the smaller bore diameter, it is necessary to chamfer the edges of cylinders as indicated in Figures 23 and 24. This is done to allow valve clearance when the head has been milled and a higher lift cam installed. This high-speed grinding can be done even with the engine in the car and the pistons in place. Carefully tape the tops of the pistons and cover all bolt holes.
CRANKSHAFT

Have your crankshaft magnafluxed before beginning any of the recommended modifications. Because of production tolerances and foundry flaws in castings, it is a good idea to make sure the 1500 crankshaft is equal to factory specifications for hardness. For full competition, you'll want a Rockwell hardness of 75 on the Superficial Scale or 40 on the "C" Scale. Before any hardening is done, however, the following work is advised: Cross-drill the rod and main journals, through the existing oil passages, to increase lubrication to the bearing surface. Next, micro-polish the rod and main journals, .0005" to increase the bearing clearance to .0015"-.0025". If it is necessary to nitrate harden your crankshaft to meet factory specifications, do it at this point and have the journals micro-polished again to remove the coating left by the hardening process.

The 1600 crankshaft usually doesn't need to be hardened as factory tolerances have greatly improved. Micro-polish the journals, as above, to increase clearances and balance in conjunction with the crankshaft pulley, flywheel and clutch.

CONNECTING RODS

Although the stock connecting rods on the 1500 and 1600 engines are fully adequate, there are a few basic modifications you might wish to perform in order to get the most from your engine and give you a little peace of mind at high RPM's. The order of work is:

1. magnaflux
2. check alignment
3. lighten
4. hone bushing
5. rough balance
6. glass-peen
7. final balance

Whether new or used, have your rods magnafluxed for flaws. Check the alignment and straighten if necessary.

Although the Bob Sharp engines use stock weight rods, it is possible to remove as much as 100 grams safely. Radius around the top of the wrist pin end, tapering down to the sides. Smooth off the casting marks on the outside of the shank and grind off the casting numbers in the recessed area of the shank. Radius both sides of the "big end" of the rod and grind the bottom of the cap to one-half its original height on the 1500. On the 1600, the square casting on the cap can be ground to the same height as the bridge on either side.

Check the condition of the wrist pin bushing and replace if scored. Hone the bushing to allow a "slip fit" of the wrist pin at room temperature. The wrist pin-to-piston should also have a "slip fit".

Rough balance the rod at this point and have it glass-peened. And finally, go back for the finished balance.

Make sure the oil hole in the rod is open all the way through and thoroughly clean after all machining and grinding operations are performed.

OIL PUMP

You may either purchase the factory heavy-duty oil pump (Part No. 15010-12210 through your Datsun dealer or modify your stock unit by shimming the relief valve spring ¼". Also make sure the valve has a free fit in its guide. Lightly polish if necessary.
ASSEMBLY PROCEDURE

After all your parts have been magna-fluxed, machined and balanced, a thorough cleaning is needed. Be careful about having your block “boiled” at a machine shop as the cleaning agent used by most will ruin your cam bearings. A good detergent, hot water and a high-pressure air hose will generally do the job.

It is recommended that you perform a “rough” assembly first—checking clearances as you proceed.

Check the piston-to-cylinder wall clearances as shown in Figure 25. If necessary, hone the cylinder bore to obtain a clearance of .004” on a Stage IV engine.

Using “Plastigage”, check the main bearing clearances as shown in Figure 26. The micro-polishing performed on the crankshaft should give you a clearance of .0015”-.0025”. Follow the same procedure on the connecting rods.

Assemble the piston to the connecting rod, install the rings and, with a depth micrometer, check the piston “pop-up” as shown in Figure 27. As mentioned earlier, milling the top of the 1500 and 1600 blocks .075” will give you a “pop-up” on the piston of .075”.

Install the camshaft and timing gear and place the cylinder head on the block, without a head gasket. Using clay on the tops of the pistons, and turning the engine over by hand, it will be possible to check the clearances of the valves to the pistons. A safe margin is .040”. If your clearances are less, either—cut the face of the valve, reseat the valve deeper into the valve seat or notch the tops of the pistons.
At this point, you might wish to measure the actual cubic centimeters of your combustion chamber in order to determine the exact compression ratio of the engine. After finding top dead center of number one piston (Figure 28), seal the edges of the piston and valves with grease and install the head with a gasket. These surfaces should also be greased and the head torqued to 45 ft. lbs.

Placing the engine so that the spark plug hole is vertical orthogonally (with the aid of a plumb bob), it is possible to "cc" the engine as shown in Figure 29.

The final assembly is next, after re-cleaning the block, pistons and head.

Installation of the rear main oil seal is quite critical. Figure 30 shows the excess material being cut — leaving \( \frac{3}{16} \)" standing above the cap-to-block surface.

Torque the main caps down and then remove the rear cap. Again trim the material that has "mushroomed" onto the cap-to-block surface. If this is not done, the cap might seat at an angle and cause uneven or excess wear of the bearing.

The remainder of the final assembly should be performed as outlined in the Datsun Shop Manual, using a good grade of assembly fluid such as lithium grease or heavy oil.

For maximum performance, degree the camshaft and install a new timing chain. At the end of the last chapter, a Specifications Table and Torque Chart have been included for your convenience.
CHAPTER V—THE FINAL TOUCHES

COOLING SYSTEM

The early units of the 1500 model were fitted with 8.4 qt. capacity radiators (Part No. 21400-10400). Later models came through with a 13.6 qt. capacity. For full competition, it is advisable to use the later model. Order radiator Part No. 21400-12200.

The stock hoses are adequate, but should be wrapped with plastic electrical tape for safety. Many race cars are run without fans. It is recommended that two of the four blades be retained on both models of the Datsun. It does not effect the horsepower and keeps your engine cooler when idling through the pits or waiting on the grid for the start of the race. Keep an eye on the blades, from time-to-time, for fatigue can cause cracks at their bases.

ELECTRICAL

The stock distributor and points are used on the Bob Sharp cars—along with the factory ignition wires. However, a Mallory high-performance coil, with accompanying condenser, is recommended for a Stage III or IV set-up. The vacuum advance line from the distributor to the rear carburetor should be removed and the resulting holes plugged.

Champion N60Y spark plugs, gapped to .028"-.032", have proven very successful on the full-race engines. For a street engine, with .100" carburetor jets, go with the N65Y projected nose plugs gapped to .028"-.032". On the Stage I engine, use the N-5 Champion gapped to .025".

ELECTRIC FUEL PUMP

Mount an electric fuel pump in the trunk of the car for racing engines. Place the pump on the inner fire wall, as close to the trunk floor as possible. The stock gasoline lines are retained throughout the car with a short length of ¼" ID neoprene tubing spliced into the line for routing to the electric pump.

Re-arrange the gas line in the engine compartment, along the top of the fire wall, to avoid engine heat as much as possible. Block-off the stock manual fuel pump hole in the side of the block as shown in Figure 31.

FOOT PEDALS

For driver comfort and easier "heel and toe" action, install 1949 Ford brake and clutch pedal pads. Drill a hole in the Datsun pedals and bolt on the Ford pads — leaving as much room as possible between the brake and clutch. You may also wish to install a universal hinged gas pedal for more positive feel. Bolt a thin plate to the back of it so it will ride smoothly on the stock gas pedal.

DRIVER SEAT

A good, light-weight bucket seat incorporating adequate side support can make a big difference in lap times and reduce driver fatigue. An angle iron bracket can be bolted to the existing slide tracks in the car to maintain full seat adjustments.
SCATTER SHIELDS

Scatter shields are mandatory in all cars competing in SCCA races. A ¼" or ⅜" steel plate should be fitted around the bell housing of the transmission. Or, a reinforced rubberized collar which wraps around the bell housing can be purchased for less than $40 through some of the national auto supply houses or local speed shops.

STARTING AND TUNE-UP

The Bob Sharp cars use Kendall GT-1 30 wt. oil in the engines and 90 wt. heavy-duty EP lubricant in the transmissions and rears.

With the spark plugs removed, crank the engine, by the starter, to ensure full oil pressure when you first fire it up.

Set the timing, static, at 10°-15°BTDC, adjust the valves, cold, to .020" and the points to .018". Staying below 3,000 RPM's, warm the engine to 170°-180°. Re-torque the cylinder head before putting any additional stresses on the engine.

Adjust the valves, hot, to the cam manufacturer's specifications, re-check the timing to ensure a total advance of 35°-37° at 3,500 RPM's, and break-in the engine for one-half hour at a 1,200 RPM idle.

At this point, check things over — including removing the pan and inspecting the bearings. Change the oil and the filter and make sure all metal filings, etc. are removed from the pan.

Once at the track, run a few slow laps — increasing the rev range progressively until you are using full throttle and RPM by the end of one-half hour.

The rest is up to you, but you are welcome to contact Bob Sharp Racing for any further technical assistance or help on a particular problem you might encounter.

TORQUE SPECIFICATIONS

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<thead>
<tr>
<th></th>
<th>Road</th>
<th>Race</th>
</tr>
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<tbody>
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<td>Cylinder head</td>
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<td>60 ft. lbs. — steel</td>
</tr>
<tr>
<td>Main bearing caps</td>
<td>71-81 ft. lbs.</td>
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<tr>
<td>Connecting rod bolts</td>
<td>35-45 ft. lbs.</td>
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<td>Flywheel-to-crankshaft</td>
<td>35 ft. lbs.</td>
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<td>Clutch-to-flywheel</td>
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## ENGINE SPECIFICATIONS

<table>
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<th>SPL 311 (1600)</th>
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<tr>
<td>Bore</td>
<td>80 mm — 3.150”</td>
<td>87.2 mm — 3.433”</td>
<td>1500, 3.191”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1600, 3.475”</td>
</tr>
<tr>
<td>Stroke</td>
<td>74 mm — 2.91”</td>
<td>66.8 mm — 2.640”</td>
<td></td>
</tr>
<tr>
<td>Displacement</td>
<td>1488 cc</td>
<td>1595 cc</td>
<td>1500, 1590 cc</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1600, 1637 cc</td>
</tr>
<tr>
<td><strong>PISTONS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>LO-EX aluminum alloy</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>Piston clearance</td>
<td>0.0014” — .33 mm</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>Diameter (measured at right angles to piston pin)</td>
<td>3.1492”</td>
<td>3.4316”</td>
<td>1500, 3.187”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1600, 3.471”</td>
</tr>
<tr>
<td><strong>PISTON RINGS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piston ring gap at ring opening</td>
<td>0.010 - 0.017”</td>
<td>same</td>
<td>.015-.020”</td>
</tr>
<tr>
<td><strong>COMPRESSION RINGS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of compression rings</td>
<td>2</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Ring clearance in groove</td>
<td>0.002-0.003”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td><strong>OIL CONTROL RINGS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of oil rings</td>
<td>1</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Ring clearance in groove</td>
<td>0.0010-0.0024”</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td><strong>PISTON PINS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fit</td>
<td>0.0004-0.0007”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>In connecting rod</td>
<td>slide fit</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>In piston</td>
<td>slide fit</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Standard diameter</td>
<td>0.8657-0.8661”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td><strong>CYLINDER HEAD</strong></td>
<td></td>
<td>aluminum 3.245”</td>
<td></td>
</tr>
<tr>
<td>Thickness (measured from bolt surface to gasket surface)</td>
<td>3.230”</td>
<td>cast iron 3.250”</td>
<td></td>
</tr>
<tr>
<td><strong>CRANKSHAFT</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crank axial clearance</td>
<td>0.002-0.006”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Main bearing radial clearance</td>
<td>0.001-0.0027”</td>
<td>same</td>
<td>0.0015-0.003”</td>
</tr>
<tr>
<td>Con rod bearing radial clearance</td>
<td>0.001-0.002”</td>
<td>same</td>
<td>0.0015-0.0025”</td>
</tr>
<tr>
<td><strong>MAIN BEARINGS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main bearing journal diameter</td>
<td>2.3598-2.3602”</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td><strong>MAIN BEARING SHELLS</strong></td>
<td></td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Thickness, standard</td>
<td>0.0719-0.0725”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td><strong>CON ROD BEARING JOURNALS</strong></td>
<td></td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Bearing seat width</td>
<td>1.1319-1.1339”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Diameter, standard</td>
<td>2.0457-2.0463”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td><strong>CON ROD BEARING SHELLS</strong></td>
<td></td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Thickness, standard</td>
<td>0.0591-0.0594”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Width, standard</td>
<td>0.0988-0.9409”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td><strong>CONNECTING ROD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter of big-end housing</td>
<td>2.1653-2.1658”</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>Big-end width</td>
<td>1.1319-1.1339”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Axial clearance @ crankshaft</td>
<td>0.001-0.002”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Length, center-to-center</td>
<td>5.669”</td>
<td>6.002”</td>
<td>same</td>
</tr>
<tr>
<td><strong>CAM SHAFTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of bearings</td>
<td>3</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Front bearing journal diameter</td>
<td>1.779”</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>Center bearing journal diameter</td>
<td>1.728”</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>Rear bearing journal diameter</td>
<td>1.623”</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>Radial clearance</td>
<td>0.001-0.002”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td><strong>VALVES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inlet head diameter</td>
<td>1.67”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Exhaust head diameter</td>
<td>1.26”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Stem diameter (oversizes avail.)</td>
<td>0.34”</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>Valve seat angle</td>
<td>44° 30’</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Cylinder head seat angle</td>
<td>45°</td>
<td>same</td>
<td>(45° 0.060” wide)</td>
</tr>
<tr>
<td><strong>CLEARANCES</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance warm</td>
<td>0.017”</td>
<td>same</td>
<td></td>
</tr>
<tr>
<td>Clearance cold</td>
<td>0.020”</td>
<td>same</td>
<td></td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENTS

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The various photographs used throughout the Manual were produced by Joe Corbett, Ken Fagan, W. R. Haessner & Associates and David Nadig.

Bob Sharp
Bob Sharp Racing
117 Danbury Road
Wilton, Connecticut
HORSEPOWER CURVES FOR DATSUN 1600 ENGINE

- FULL RACE 1600 WITH RRZ CAM
- STOCK 1600 WITH RS 1 CAM
- STOCK 1600

HORSEPOWER (HP)

RPM x 10^2