

# DART FORD 351W Small Block – Technical Notes

Deck Height	.....	9.500”	
Bore	.....	4.00” or 4.125” unfinished	
Main Bearing Size	.....	302 (2.249”) & 351C (2.749”)	
Weight	.....	9.500” – 195 lb	
Maximum bore	.....	4.185”	
Camshaft Journal diameter	.....	Standard 351	
Camshaft Position	.....	Standard 351	
Cylinder wall thickness, min.	.....	.250” @ 4.185” bore	
Minimum Deck thickness	.....	.675”	
Torque Specs – Main caps	1 - 5	1/2” bolts	100 ft lbs w/ CMD # 3 high pressure lube.
	2 - 4	7/16” bolts	65 ft lbs w/ CMD # 3 high pressure lube.
	1 & 5	3/8” bolts	35 ft lbs w. CMD # 3 high pressure lube.

**It is good engine building procedure to ALWAYS check the fit of the distributor before any machining or cleaning is done.**

**SPECIAL NOTE:** with a multitude of crankshaft, rod & piston combinations available it is very important to check clearance of all moving parts, especially crankshaft counterweight and connecting rod to block. Because the cylinder barrels have been extended for more piston skirt support with stroker kits you may have to clearance the bottom of the bores for rod clearance. Be careful if you need to add counterweight clearance at the oil pump area. Be sure to leave enough material to seal the oil pump-mounting flange. All parts must be checked before any type of machining or assembly is attempted.

**NOTE:** If you are using aftermarket cam profiles you must use the correct components for the application.

**NOTE:** Due to variations in lifter sizes and clearance preference, most of our engine builder customers prefer the lifter bores sized on the small size of the specification. Sometime these bores will need to be lightly honed. The lifter bore spec is .8747"-.8757". Most lifter manufacturers recommend .0015"-.002" clearance. **ALWAYS CHECK LIFTER TO BORE CLEARENCE!!**

**Use 351W 1/2" head bolt and stud kits**

Head stud holes are blind. They do not go into the water jacket.

A sealant/antiseize *must* be used on the head studs. Loctite #620 is recommended.

Studs should *never* be torqued into the block. They should only be lightly snugged.

**Note:** The tapered portion of the stud body should never contact the deck or bolt hole counter bore. If the stud body does thread to deep and makes contact with the deck surface then you should use a small ball bearing in the bottom of the bolt hole to space up the stud accordingly.

Standard 351W timing chain, timing cover, gear or belt drive can be used. Late model 351W timing chain required for clearance.

Actual deck height will be .001" - .005" taller for additional machining requirements.

Standard 351W oil pump fits correctly even with the 4 bolt front main cap.

When initially removing main caps, the caps and block should be deburred before reinstalling. This will insure that correct main size is maintained.

Press-in 1 1/2" freeze plugs, oil galley plugs, dowel pins and 2 3/8" cam plug are provided with the Dart block kit PN# 32000041

**CAM BEARINGS** O.D. should be deburred before installation.

Camshaft bearing bores are 2.2041"-2.2051" I.D. on all 5 cam bores.

The cam bearings have 5 different I.D.s to fit the stock ford cam journals but common O.D.s.

<u>Position</u>	<u>Brg#</u>	<u>Part#</u>	<u>Cam OD</u>
Front #1	B384	32210051	2.081"
#2	B385	32210061	2.066"
#3	B386	32210071	2.051"
#4	B387	32210081	2.036"
Rear #5	B388	32210091	2.021"

**Complete Cam Bearing Set P/N: 32210041**

Cam bearing sets for cams with common 2.081" size on all journals are available from Dart or Durabond # 351RHP.

Cam bearings sets for 2.051" common journals are available from Dart or Ford # M-6261-C351.

When using a front sump oil pan you can use Ford part# M-6059-D351 (std rotation water pump) or M-8501-B50 (reverse rotation) front cover with provision for a dipstick. The dipstick needs to be in the oil pan with a rear sump. The DART blocks do not have a provision for a dipstick.

#### **WET / DRY SUMP with EXTERNAL OIL PUMP**

When using a dry sump system or a wet sump with external oil pump you must block off the oil pump outlet hole in the block next to the front main cap. We recommend drilling and tapping for a 3/8" NPT plug. The oil filter inlet hole can be blocked using a -12AN plug utilizing an o-ring style washer to seal it.

The recommended inlet is at the rear of the block on top of the bell housing area. This will provide **TRUE PRIORITY MAIN OILING** as it delivers oil directly into the main oil galley and feeds the main bearings before it feeds the lifter galleys. This increases the oil flow to the mains and drastically reduces the oil pressure requirements. It is 1/2" NPT thread and is at a 2° angle to help the fitting clear the cylinder head but some clearancing of the cylinder head may have to be done. If this method is used the -10AN feed hole at the front of the block also must be plugged (see below).

If the front external oil feed is used you must plug the 1/2"NPT feed at the rear of the block.

#### **-10AN FITTING**

The oil feed hole at the left front corner is a -10AN thread, NOT a tapered pipe thread. If you are not using this hole use an O-ring Boss Plug. You can drill this plug for your oil pressure tap if desired.

The following are part numbers for this -10AN plug:

Aeroquip # 4024

Earls # 981410

Goodridge # 4024

Russell # 660290

#### **LIFTER GALLEY RESTRICTORS**

The Oil Restrictor provisions are in-between the main oil feed and the Passenger side Lifter galley located in the center and rear crossovers in the valley. This restricts both right & left lifter galleys. Because it restricts both sides the orifice size in the 1/8" NPT plug should be large enough to feed both sides. This gives you priority main oiling before feeding the lifters.

### **HYDRAULIC ROLLER LIFTERS**

Having dual lifter galley feeds at each end of the lifter valley as described above is a very useful feature but it does interfere with the OEM Ford sheet metal hydraulic roller lifter retainer that Ford and some aftermarket cam companies furnish in their kits. You *cannot* use an OEM style retainer or hydraulic roller lifter in these blocks. *You must use a tie-bar style hydraulic roller lifter.* Crane Cams manufactures tie-bar hydraulic roller lifters that fit this application. These are also available from Ford Motorsports. Most other cam companies are in the process of producing them. All other standard flat tappet hydraulic, solid and roller lifters are suitable for this application.

**PIPE PLUGS** All front and rear oil galleys are tapped for 1/2" AN O-ring fittings. The Dart kit PN# 32000041 includes all necessary pipe plugs needed for assembly.

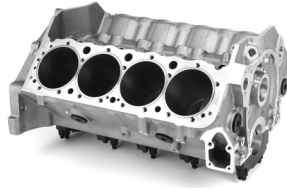
### **OIL PANS**

Some oil pans, including stock pans will not clear the 4-bolt front & rear main caps. You need to use a pan that is specifically made for 4-bolt end caps. Most manufacturers should stock pans for this block. Moroso & Canton have these. At the rear of the pan rail where the pan gasket and the rubber end seal meets there is an 1/8" deep machined section in the block. Most engine builders fill this void with silicone. This void can be filled with a piece of metal 1/2"x 3/4"x 1/8" if you prefer. It can be siliconed in or a #8 hole can be drilled & tapped, installing a countersunk screw.

## Dart FORD 351W SB Iron Block Technical Notes

<b>Part#</b>	<b>31395135 - 31395235</b>
<b>Material:</b>	<b>Special RMR alloy</b>
<b>Bore:</b>	<b>4.00" or 4.125" unfinished</b>
<b>Bore &amp; stroke:</b>	<b>4.185" x 4.250" max recommended</b>
<b>Cam bearing bore ID:</b>	<b>SVO 2.203"- 2.205"</b>
<b>Cam bearings:</b>	<b>Special coated, grooved, w/3 oil holes</b>
<b>Cam Bearing O.S.</b>	<b>+ .010", +.020", +.030"</b>
<b>Cam bearing press:</b>	<b>.002" - .003"</b>
<b>Cam journal OD:</b>	<b>Standard Ford SB</b>
<b>Cam Plug:</b>	<b>2.375" dia. Cup plug</b>
<b>Cylinder Wall Thickness:</b>	<b>.250" min @ 4.185" bore</b>
<b>Cubic inch:</b>	<b>468" max recommended</b>
<b>Deck Height:</b>	<b>9.500"</b>
<b>Deck Thickness:</b>	<b>.675" min.</b>
<b>Fuel Pump:</b>	<b>Mechanical pump provision</b>
<b>Freeze Plugs:</b>	<b>STD Ford press in cup plugs 1.500" OD</b>
<b>Head bolts:</b>	<b>1/2" Blind holes</b>
<b>Lifter Bores:</b>	<b>STD Ford .8747" - .8757" Honed to size</b>
<b>Lifters:</b>	<b>STD Ford - Hydraulic rollers need tie-bar style lifters.</b>
<b>Main journal size:</b>	<b>302 (2.249") or 351C (2.749")</b>
<b>Main bearing bore:</b>	<b>2.9415" - 2.9425" Honed to size</b>
<b>Main thrust width:</b>	<b>.913" - .915"</b>
<b>Main Cap Bolts:</b>	<b>#1 1/2" (2) 3/8" (2)</b>
	<b>#2, #3, #4 1/2" (2) 7/16" splayed (2)</b>
	<b>#5 1/2" (2) 3/8" (2)</b>
<b>Main cap press:</b>	<b>.003" - .004"</b>
<b>Main caps:</b>	<b>Steel - 4 bolt, all 5</b>
<b>Main cap register:</b>	<b>Deep stepped register on each side (no need for dowels)</b>
<b>Oil system:</b>	<b>STD Wet Sump or SVO dry sump</b>
	<b>Priority Main oiling with external pump (wet or dry)</b>
<b>Oil Filter:</b>	<b>Standard filter w/ adapter Dart PN# 32940000 (Sold separately)</b>
<b>Oil Pan:</b>	<b>Standard 351W oil pan (May require some modification for fitment)</b>
<b>Rear Main Seal</b>	<b>STD 1 piece seal - FelPro# 2921 or 2942 4.500"x 3.750" SVO</b>
<b>Serial No.</b>	<b>Right front &amp; main caps</b>
<b>Starter:</b>	<b>Standard</b>
<b>Stud &amp; bolt holes, Head:</b>	<b>1/2" STD SVO with blind holes</b>
	<b>ARP 154-4303 for 6 bolt per cylinder heads</b>
<b>Timing chain/gears</b>	<b>Standard components Note: (Late model 351W chain required)</b>
<b>Timing Cover:</b>	<b>Uses stock 351W timing cover</b>
<b>Torque Specs:</b>	<b>1-5 1/2" bolts - 100 ft lbs</b>
	<b>2-4 7/16" bolts - 65 ft lbs</b>
	<b>1 &amp; 5 3/8" bolts - 35 ft lbs</b>
<b>Weight, approx:</b>	<b>195 lbs - 9.500"</b>

# IMPORTANT



*This Block should be assembled only by experienced, professional engine builders.*

## INSPECTION

Upon receiving this block it should be thoroughly inspected for shipping damage.

Prior to machining and assembly please inspect the following items:  
Cylinder bores - Oil passages - Deck surfaces - All threads

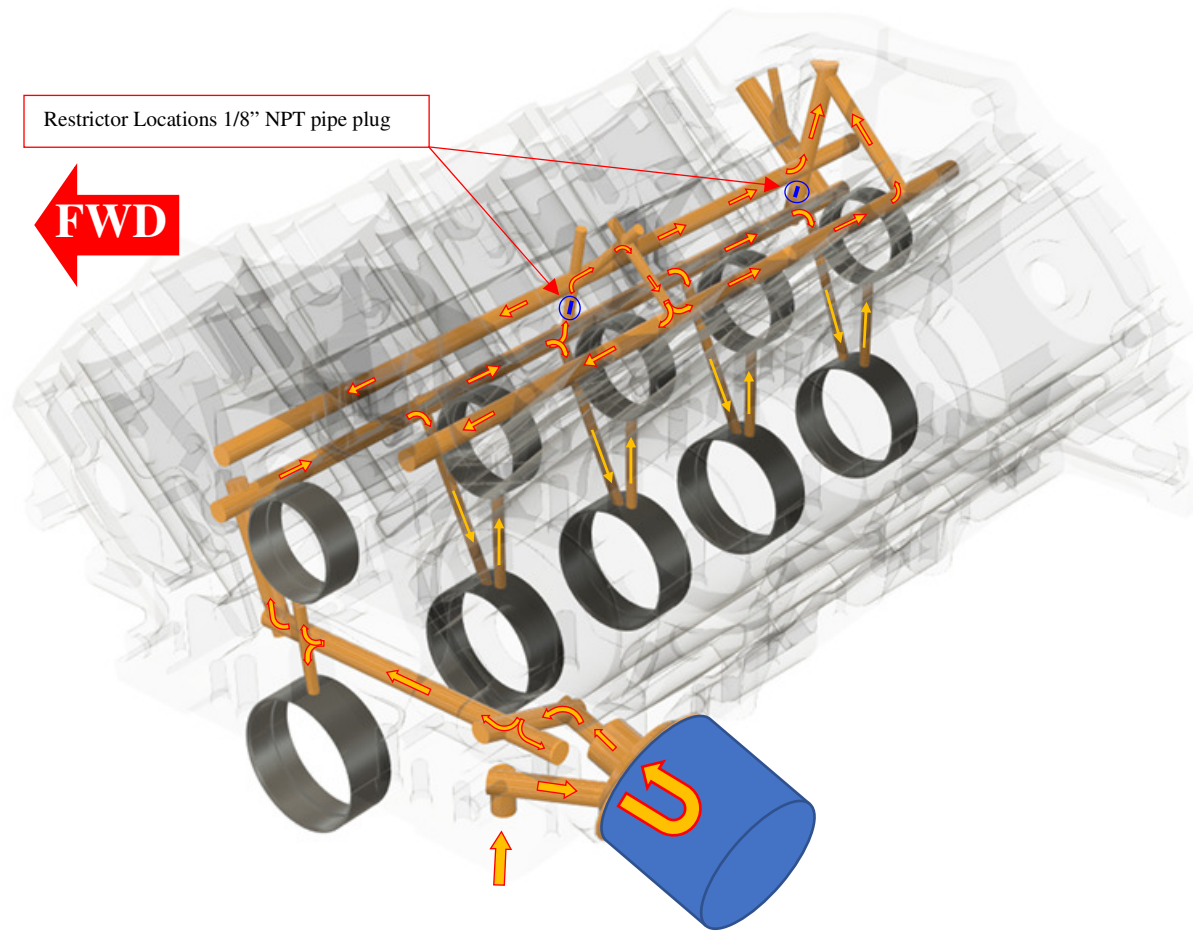
## MEASURING & MACHINING

- ❑ All initial measuring should be done before any machining has begun.
- ❑ Decks are CNC machined to standard deck heights. If you need a particular deck height always measure before machining.
- ❑ Main journals are finish line honed to the low to middle of the specification. They should be measured for your preference. If you have need for a different diameter you must realign hone this yourself.
- ❑ Crankshaft & rod clearance should always be checked before any machining is started. You need .060" clearance for rotating counterweights and rods.
- ❑ Due to variations in OD dimensions of the numerous lifter manufacturers, lifter bores are finish honed on the tight side of the tolerance to leave room for lifters that are larger than the standard.

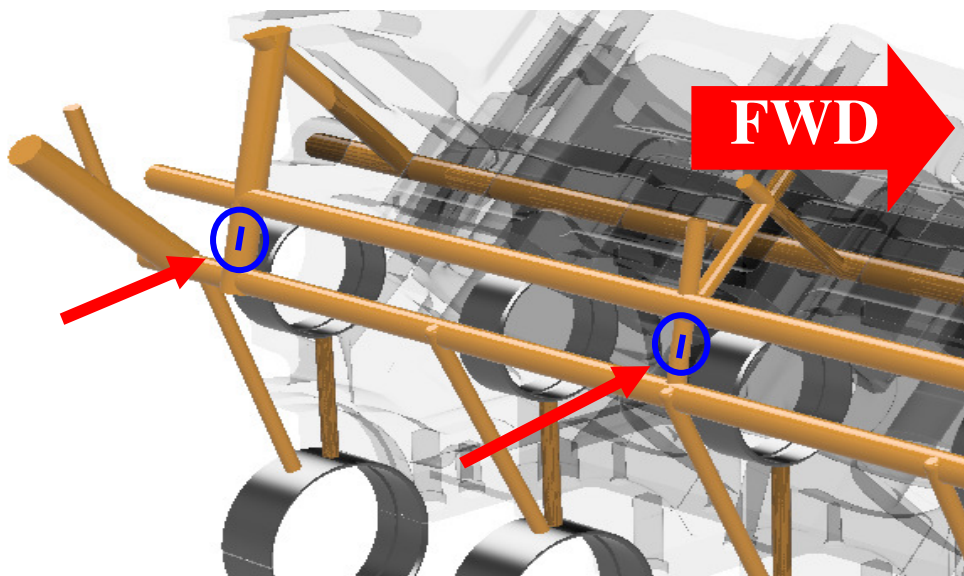
## WASHING

- ❑ Final washing should be very thorough, paying particular attention to all oil galleys. Use hot soapy water and rinse with hot water first, followed by cold water which helps reduces rust.

# SBF Iron Eagle Oiling Diagram

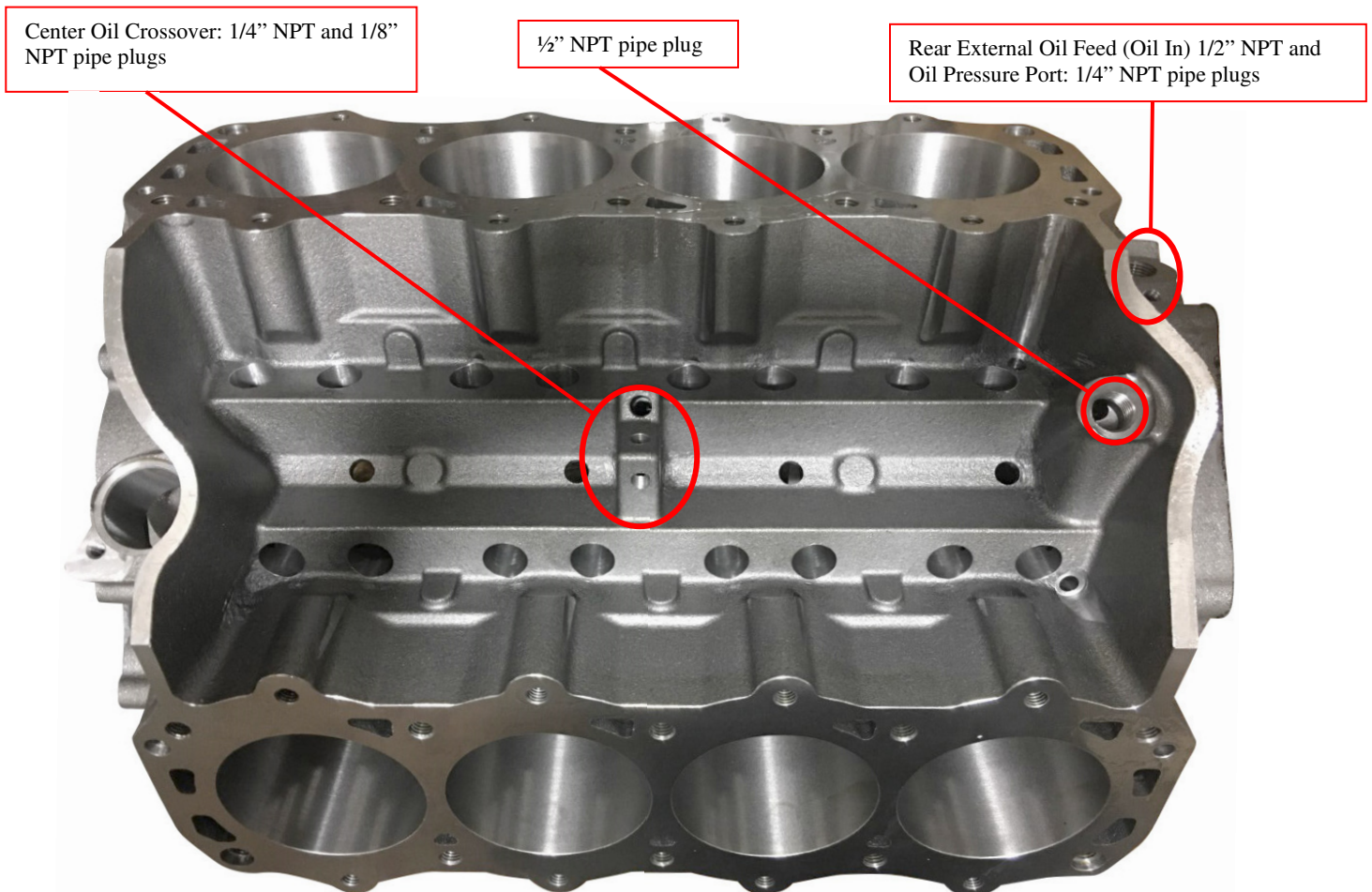
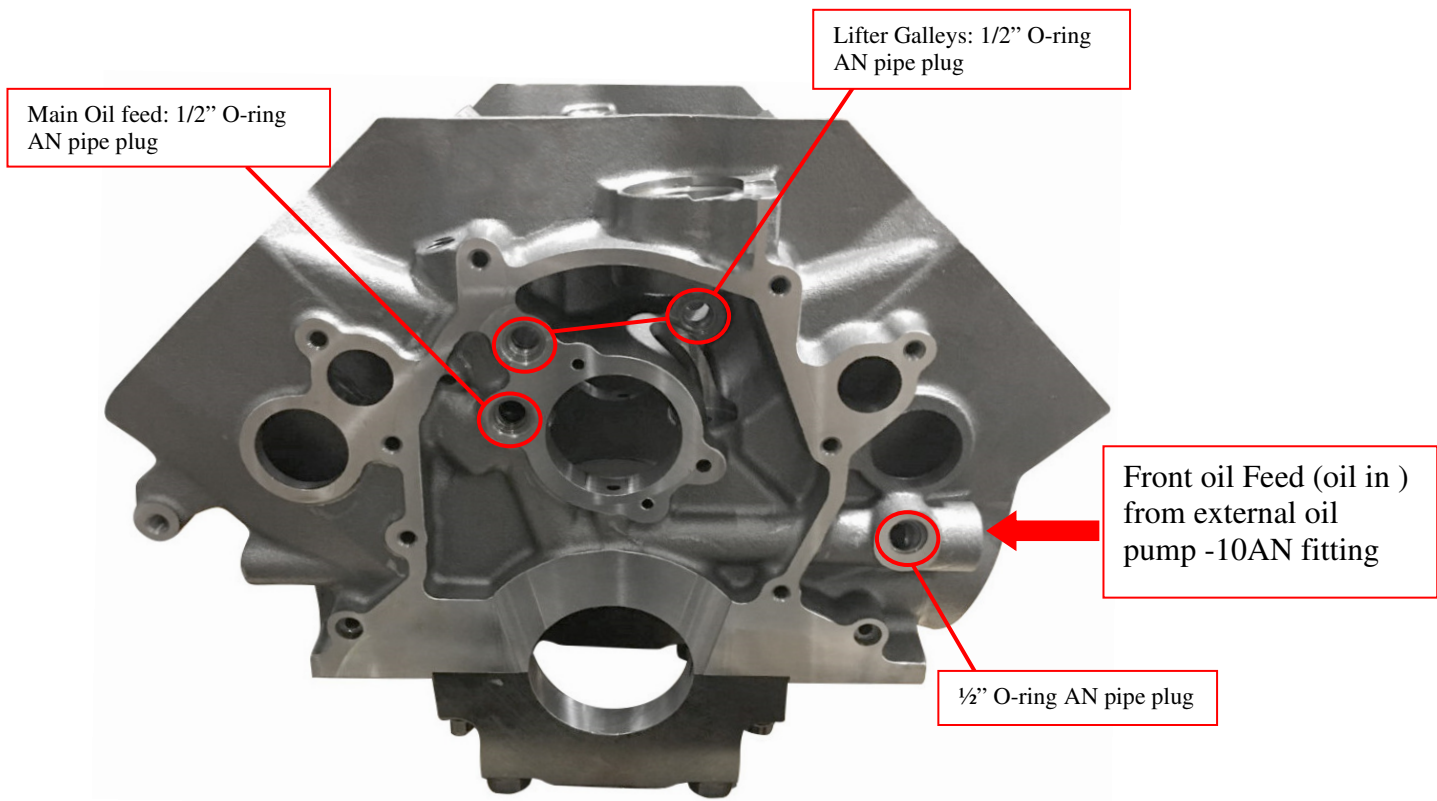


Oil flow comes in from the oil pump pickup, passes through the oil filter, up to the main oil galley feeding the #1 main and cam bearing on the way, it is then diverted to the Main line (Crankshaft) bearings first (Priority main oiling) flows to the Cam bearings and then to the Lifter galleys secondary.



Oil Restrictor provisions are in-between the main oil feed and the Drivers side Lifter galley located in the center and rear crossovers in the valley. These are drilled and tapped for 1/8" NPT.







CHAMPIONSHIP ENGINE COMPONENTS

Here at Dart we are constantly improving upon our products to ensure that you are receiving the latest and most technologically advanced products in the industry. Through our extensive R&D we have found that valvetrain oil is crucial in a high performance engine. The following modification will correct oil volume to the valvetrain that may occur when using solid roller lifters in any block.

**Figure 1:**  
Stock un-modified  
solid roller lifters

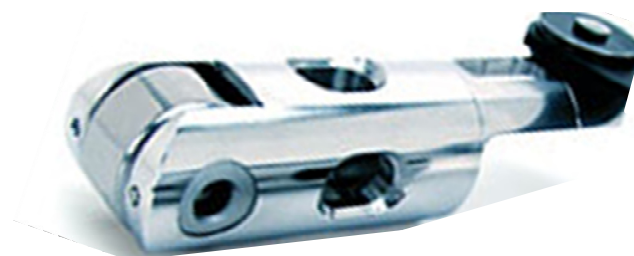


**Figure 2:**  
Dart oil galley modification  
from band to pushrod oil hole



We recommend a .020" deep x .080" radius wide groove from the pushrod feed hole to the oil band / machined feed hole in your solid lifters (**Front hole only** as shown in Figure 2 above) depending on your tooling & method. You can also do this with a cutoff wheel or a dremel. This allows you to use the restrictor provisions provided in your Dart block to tune oil volume to the lifter oil galley. This allows you to control the oil going to the pushrods, rocker arms and valve springs.

**CAUTION!**



The use of lifters that are heavily lightened should not be used in Dart Blocks. The lightening holes will cause lifter oil to leak into the valley instead of oiling the pushrod, rocker arm and valvespring.

*Please call our technical staff with any questions Mon-Fri 9am-6pm E/T (248)-362-1188*