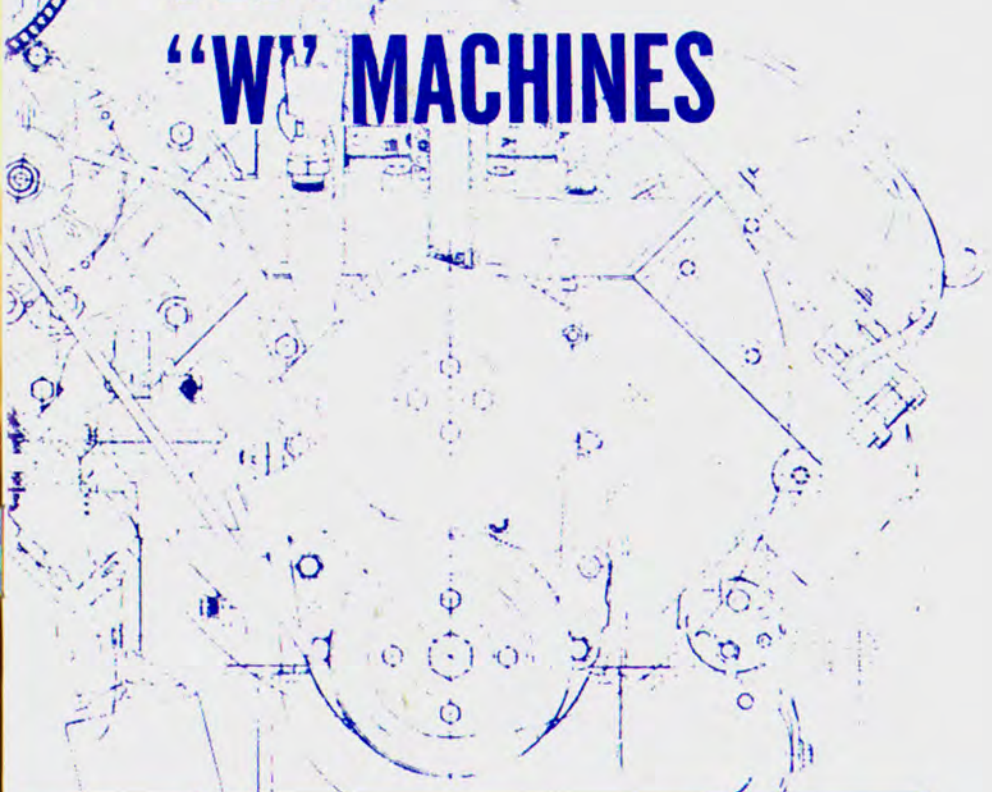


# **SUPER TUNING and BLUEPRINTING OLDS “W” MACHINES**



**W-30**

**W-31**

**W-32**

# SUPER TUNING AND BLUEPRINTING OLDS W MACHINES

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## BRINGING YOUR W-MACHINE TO MAXIMUM TUNE

Every W-Machine built without exception is given special consideration during assembly.

Critical parts in these precision machines are individually selected, matched, and fitted, to close production tolerances.

If, however, you wish to bring your W-Machine to a still higher state of tune, you will find the following information helpful.

### SUPER-TUNING THE W-30, W-31, AND W-32

#### IGNITION

Stock distributors on each of the W-Machines have mechanical advance curves which parallel best spark. Changes in the basic setting, of course, will have a corresponding effect on top end and spark timing above 4000 rpm.

When using a high spark setting be careful to:

1. Disconnect vacuum advance and plug source. This will generally preclude road load detonation which must be avoided for long engine life.
2. Use super premium fuels to further avoid detonation.

Our high-speed test-run results with stock mechanical distributors have been most successful. Some gain is claimed for using double sets of distributor point springs to insure against point bounce.

If this is done the distributor cam should be lubricated frequently to reduce wear. For those who prefer it, Oldsmobile offers a capacitor-discharge ignition system package. (See parts list)

For off-the-road use, distributors should be set to give 35° advance BTC above 4000 rpm. Advance beyond 35° should be done against a timer and in conjunction with changes in carburetor jetting, until the ultimate potential is realized.

To set timing correctly above 4000 rpm, the balancer must be scribed. Standing in front of the balancer, scribe lines are made clockwise from the top center mark on the balancer as indicated:

<u>Degrees BTC</u>	<u>W-31</u>	<u>W-30, W-32</u>
30°	1 7/8 in.	1 11/15 in.
35°	2 3/16 in.	1 31/32 in.
40°	2 1/2 in.	2 9/32 in.

The timing indicator is marked for 0, 2, 4, 6, 8, and 10° etc. The edge of the pointer stamping is 14-15 BTC.

W-30: Basic stock setting of 14° BTC at 1250 provides 27° BTC timing above 4000 rpm.

W-31: Basic stock setting of 12° BTC at 1000 provides 29 1/2° BTC timing above 4000 rpm.

W-32: Basic stock setting of 14° BTC at 850 provides 36° BTC timing above 2900 rpm.

## CARBURETION

In general, carburetion will be found satisfactory as received. 4MV specifications for "W" cars are:

<u>"W"</u>	<u>Production Cars, No. (on casting)</u>	<u>Main Jet Diameter</u>	<u>Secondary Metering Rod Diameter</u>
W-30	7029254	.075 in.	.053 in.
W-31	7029255	.074 in.	.053 in.
W-32	7029251	.070 in.	.053 in.

If enrichment is desired, the following areas may be explored. (See 1969 Oldsmobile Shop Manual, section 6M):

### Air Valve Wrap

1. Loosen lock screw.
2. Turn adjusting screw counter-clockwise until air valve starts to open.
3. Turn adjusting screw clockwise while tapping on casting until valve just barely closes.
4. Turn adjusting screw an additional 1/2-turn clockwise.
5. Tighten lock screw.

If a "hole" is evidenced during wide open throttle starts, turn adjusting screw clockwise in 1/8-turn increments, until this condition is eliminated.

**IMPORTANT: OVERTIGHTENING OF ADJUSTING SCREW WILL REDUCE FULL-THROTTLE HIGH-SPEED PERFORMANCE.**

## Main Metering Jets

A list of jets available from your Oldsmobile or United Delco Dealer is contained in the attached parts list.

Enrichment of about 1 1/2% is achieved for each .001 inch diameter change in jet size.

## Secondary Metering Rod Lever

This lever may be very carefully bent up to pass more fuel. It should not be raised more than 1/16" from the stock setting.

## Secondary Metering Rods

A list of available rods is contained in the attached parts list.

<u>Rod.</u>	<u>Dia.</u>	<u>Description</u>
AT 2033658	.067 in.	4 1/2% leaner above 3000 rpm than stock.
AU 2033655	.053 in.	Stock W-30, W-31, W-32.
AX 2033549	.042 in.	3% richer above 3500 rpm and 5% richer below 3500 rpm than stock.
AG	.030 in.	5% richer above 3500 rpm and 3 1/2% richer below 3500 rpm.

If precision machining is used to reduce the diameter of these rods, only the straight portion of the end should be changed. The distance from the bottom of the hook to top of the machined portion must be a maximum of 2.50 inches.

## VALVE TRAIN

### Camshafts

**IMPORTANT:** Production "W" car camshafts are developed on a dynamometer with cold-air induction, exhaust headers, and blocked carburetor heat. Indexing these camshafts to other-than-stock positions is not recommended. Additional per-

formance increases here are highly unlikely, since all "indexing" has already been done on the dynamometer. Camshaft specifications are:

PACKAGE	W-30		W-31		W-32	
Part No.	402569		402194		393859	
Opens	Int. 56 <sup>0</sup> BTC	Exh. 96 <sup>0</sup> BBC	Int. 40 <sup>0</sup> BTC	Exh. 86 <sup>0</sup> BBC	Int. 30 <sup>0</sup> BTC	Exh. 78 <sup>0</sup> BBC
Closes	92 <sup>0</sup> ABC 52 <sup>0</sup> ATC		88 <sup>0</sup> ABC 42 <sup>0</sup> ATC		76 <sup>0</sup> ABC 28 <sup>0</sup> ATC	
Overlap	108 <sup>0</sup>		82 <sup>0</sup>		58 <sup>0</sup>	
Duration	328 <sup>0</sup>	328 <sup>0</sup>	308 <sup>0</sup>	308 <sup>0</sup>	286 <sup>0</sup>	286 <sup>0</sup>
Lift	.475	.475	.474	.474	.472	.472

## Valve Springs

Production valve springs used on "W" cars are equipped with dampers on intake and exhaust. Part numbers and specifications are:

PACKAGE	W-30	W-31	W-32
Spring Assembly	404729	398247	397583
Material	Cr-Si. Heat Set Wire	Cr-Si. Heat Set Wire	High Carbon Wire
Max. Valve Closed @	125# at 1.670 in.	84# at 1.670 in.	84# at 1.670 in.
Max. Valve Open @	308# at 1.195 in.	218# at 1.196 in.	214# at 1.198 in.
Color Code	3 white stripes	2 blue or 1 aluminum stripe (s)	-----

Spring assemblies 404729 and 398247 have special heat-set wire that will not lose load after repeated high-rpm usage. 398247 spring assemblies may be used on W-32 cars, if desired.

Some people prefer to run the hydraulic valve lifters out until "near-zero" lash is achieved. If so, here's how to achieve this situation:

1. Run engine to insure that all lifters are filled with oil.
2. Stop engine and bring piston to top center on compression stroke

- Loosen rocker arm pivot studs until push rods can be rotated easily.
- Measure the clearance between the pivot and cylinder head.
- Using this clearance, less about .005 inch, make shims to go between the pivot and the head. This .005 inch will provide minimum hydraulic action, since these camshafts do not have ramps.

For a given pivot, shims must not be mismatched by more than .020 inch or the pivot will be cocked too severely.

## CYLINDER HEADS

Minimum cylinder head volume for NHRA:

<u>Car</u>	<u>W-30</u>	<u>W-31</u>	<u>W-32</u>
<u>minimum cc's.</u>	69.75	60.58	76.59

Removing .005 inch from bottom face of head will provide about 1 cc decrease in volume.

## EXHAUST HEADERS

Several manufacturers provide tubular headers for W-30, W-31, and W-32 cars. Headers with blocked carburetor heat can provide an increase of up to 35 hp. Carburetor heat can be blocked by the use of shim stock at the intake manifold gasket.

## BLUEPRINTING

All production W-30 and W-31 engines feature clearanced (select-fit) pistons, rods, main bearings, and combustion chamber volumes. For still greater performance output, however, complete blueprinting is required.

### **BLUEPRINTING THE W-30, W-31, AND W-32 ENGINE**

For optimum tune, after being carefully prepared, all reciprocating components should be critically balanced by a reputable mechanic.

The most important part of blueprinting is to open up piston-to-bore clearance. It should be .003 to .004 inches.

If forged pistons are used, the clearance should be .002 inch for each one inch in bore diameter. This clearance is needed since forged pistons expand more than Autothermic production pistons.

To hone the bores for increased clearance the following is recommended:

1. Insert piston upside down in the bore and check clearance between the piston skirt and the bore.
2. Hone the block with a Sunnen rigid hone with a 200-grit stone to .003 to .004 inches.

The crankshaft should be ground to obtain .0015 inches connecting rod clearance and .0025-.003 inches main bearing clearance.

For increased bearing clearance the following method should be used: insert the bearings in the connecting rod or main bearing cap and torque to specifications. Check the ID with a micrometer. Grind the crank for desired clearance on a crankshaft grinder. The crank should be polished after grinding.

Connecting rod side clearance should be increased to .018-.020 inches. To check side clearance the rods should be installed on the crankshaft and torqued to specifications. Install a screw driver between the rods and gently pry apart. Be careful not to damage the thrust face when prying apart. Insert a feeler gauge between the rods to check clearance.

As an example, assume that this clearance is .010 inches. Then remove only one rod and surface-grind .005 inches from each side. This will total .020 inches clearance.

Piston-to-deck clearance minimum specification is .002 inches. Naturally, all pistons can't be made to this exacting tolerance. Pistons should be purchased with .006"- .008" deck clearance. Check this clearance when assembling.

For maximum performance, you must have maximum lubrication control. Oil pump pressure on all 1969 engines should be adequate for performance operation.

A shim can be inserted between the outer end of the oil pump pressure regulator valve spring if more pressure is desired. But do not increase to more than 75 psi with the engine hot. Toronado oil pump and pan are recommended for W-30 and W-32 engines. The Toronado has one quart more capacity.

## **BLUEPRINTING THE W-30, W-31, AND W-32 POWER TRAIN**

Now that you know how to make the extra horsepower, let's take a look at the recommended method of transmitting it rearward to the tires. The best torque transmission package for the four-speed-equipped cars is the explosion-proof aluminum clutch flywheel parts made by Schiefer Manufacturing.



The parts are interchangeable between the W-30, and W-31.

The pre-balanced aluminum flywheel carries part number 2568 for 1968 and 1969 cars and 2504-A for all earlier models. If bog is experienced with the aluminum flywheel then the heavier production flywheel is recommended. It is spin-tested to 19000 rpm.

The riveted disc is an RL-120-R and is good for all applications under 7000 rpm, and the pressure plate is a standard 10-1/2 inch Rev. Lok. Clutch pedal lash should be set at 1-inch; clutch disc-to-pressure plate clearance should be .050 inches. The Heavy-duty production clutch standard in W-30 and W-31 (W-32 is automatic only) are as good as the best available in production cars. Lash and disc-to-plate clearance is the same as for Schiefer assemblies, except the disc-to-plate clearance on the W-31 should be .035 inches.

The heavy-duty stock Olds rear axle is an excellent one, as is the H-D stock Anti-Spin differential. The best gear ratio for all around road performance is 3.91, while the 4.33 gear set should be reserved for off-the-road use. The ultimate ratio is 5.00 which is a dealer-installed option. The 5.00 gears can be installed in place of 3.42, 3.91, 4.33 and 4.66 ratios without replacing other parts. Parts are not interchangeable with past model differentials.

For maximum protection and to pass tech inspection in NHRA Super/Stock competition, the stock bellhousing must be replaced by an approved steel scatter-shield bellhousing. Lakewood Chassis makes a 1/4-inch thick steel model (No. PO-1) that will fit "W" cars.

## **BLUEPRINTING THE W-30, W-31, AND W-32 SUSPENSION**

The key to maximum performance with a modified stocker is a suspension that works for instead of against the driver.

Generally speaking, for top traction these cars need weld-on traction bars and specially-calibrated shocks, air lifts, and front end spacers.

The front end should be set up with 1/4-degree positive camber, 1-degree positive caster, and 1/16-inch toe-in.

The following chassis setup has proven successful.

### **Front Suspension**

#### **A. Springs**

W-30

No. 400870 (Pontiac) both sides. A (Olds) No. 400360 spacer under left front spring.

These springs are selected for their low rate and controlled load. They allow the car to lift more on acceleration.

- |                                    |  |
|------------------------------------|--|
| B. Shocks                          | Cure Ride 90/10. Available from speed shops and auto parts houses.   |
| C. Front stabilizer shaft bushings | Ream hole out to 1.0". This decreases effectiveness of front stabilizer bar. This hole can be reamed with a 1" stone and electric drill. |
| D. Upper control arm bumper        | Cut off top of bumper so that base is 3/8" thick.  |
| E. Tires                           | 2-ply polyester cord with narrow tread. 8.15 x 15 non-low profile.   |

## Rear Suspension

- |                         |  |
|-------------------------|--|
| A. Springs              | No. 9793915 Oldsmobile                 |
| B. Shocks               | No. 3192803 (Standard on 1969 4-4-2)   |
| C. Control arm bushings | Replace all (8) with No. 388266 (Olds) |
| D. Helper Springs       | Use Air Lift H-D Type                  |
- Start with 4 psi on both sides. Add air in 2 psi increments on the side opposite the sideways motion of rear end until car goes in straight line. For off-the-road use, a likely starting point is 5 psi left and 20 psi right.

## PARTS IDENTIFICATION

The following is a list of high performance parts for 1969 Oldsmobile Cutlass and 4-4-2 models. Part numbers are shown as listed in Parts & Accessories Catalog (PA 310). They are sometimes different from engineering numbers due to packing procedures, which may include mounting parts, gaskets, bolts, etc.

### **Engine**

W-30 - 4-4-2, 400 Cu. In.

<u>PART</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
*Engine (Syncromesh)	403698	
Cylinder head	230612	
Intake valve	403350	2-1/16" x 30°
Exhaust valve	401762	1-5/8" x 45°
Valve spring assy.	404729	Silicone steel - heat set.
Carburetor	7016939	Calibrated for W-30 camshaft.
Camshaft	402569	328° duration on intake and exhaust (.475 in. lift).
Piston	400618	
Distributor	1111933	

### **Engine**

W-31, 350 cu. in.

<u>PART</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
*Engine (Syncromesh)	403695	
Cylinder head	230619	
Valve intake	389451	2" x 45°
Valve exhaust	401762	1-5/8" x 45°
Valve spring assembly	398247	Silicone steel heat set.
Piston	230645	
Carburetor	7016955	
Camshaft	402194	308° duration - .474 in. lift.
Distributor	1111930	

### **Engine**

W-32 - 442, 400 cu. in.

<u>PART</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
Engine	404968	
Cylinder head	230343	
Intake valve	403350	2 1/16" x 30°
Exhaust valve	401762	1 5/8" x 45°
Valve spring assy.	397583	Carbon spring wire

<u>PART</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
Piston	400618	
Carburetor	7016951	
Camshaft	393859	286° duration - .472 in. lift.
Distributor	1111973	

### **Ram Air Parts**

Air cleaner	6485003	Dual snorkle.
Duct assembly - carb. air rt.	403180	Fits beneath bumper.
Duct assembly - carb. air lt.	403181	Fits beneath bumper.
Hose - duct to air cleaner	400674	
Clamp - hose to duct	451245	
Clamp - hose to air cleaner	400964	

\*Engines are select fit.

### **Differentials**

The following differential parts are for 1969 Cutlass and 4-4-2 models.

Parts are made from high strength materials for maximum horsepower and torque considerations. Parts are interchangeable with differentials with 3.42, 3.91, 4.33 and 4.66 ratios.

Standard differentials with 2.56, 2.78, 3.08 and 3.23 ratios are different from above and parts will not interchange.

<u>PART</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
Axle sub-assembly	402778 (4.33-1)	Ltd. slip. ) *Axle sub-assemblies ) can be ordered only
Axle sub-assembly	402776 (3.42-1)	Ltd. slip. ) during current model ) year production
Axle sub-assembly	402777 (3.91-1)	Ltd. slip. ) Following the current ) model run individual ) service parts are ) required.
Axle shaft assembly	403601	
Gear set ring and pinion	230812 (4.33-1)	
Gear set ring and pinion	230038 (3.42-1)	
Gear set ring and pinion	230039 (3.91-1)	
Gear set ring and pinion	230813 (4.66-1)	Dealer installed only.
Gear set ring and pinion	230814 (5.00-1)	Fits 3.42, 3.91 or 4.33 case.
Case assembly differential	230812	

## GENERAL SPECIFICATIONS

### 4-4-2 W-30 SPECIFICATIONS Registered NHRA limits

Engine type	90° Air-Inducted Rocket V-8
Displacement, cu. in.	400.10671 max. 399.76725 min.
Bore and stroke	3.870" x 4.250"
Compression ratio	10.5 Nominal 11.28:1 Max. clean 11.58:1 Max. w/normal carbon build-up
Max. bhp	360 at 5400 rpm
Max. Torque ft. lbs.	440 at 3600 rpm
Cyl. head volume	69.75 cc min.
Head gasket thickness, compressed	0.023"-.027"
Head gasket volume	5.32305 cc min.
Deck clearance, min.	0.002" below block
Min. combustion chamber vol.	79.63804 cc min.
Piston type	Dished
Displacement of dish	1.70 cc min.
Cyl. head, part number	400370
casting number	400370
Carburetion, type	4-bbl Rochester, specially calibrated
Model w/SM Trans	4MV
Model w/Auto trans	4MV
Part number w/SM trans	7029254
Part number w/Auto trans	7029254
Intake manifold casting no.	398662
Material	cast iron
Camshaft type	Hydraulic
Part No.	402570
Assembly No.	402569
Casting No.	389410
Rocker arm ratio	1.6:1
Camshaft timing	
Opens, intake & exhaust	56° BTC, 96° BBC
Closes, intake & exhaust	92° ABC, 52° ATC
Overlap	108°
Duration, intake & exhaust	328°, 328°
Valves	
Head diameter, intake & exhaust	2.077" max., 1.630" max.
Angle of seat & face, intake	60°, 60°
exhaust	45°, 46°
Lift, max., intake & exhaust	0.475", 0.475"





## 4-4-2 W-32 SPECIFICATIONS Registered NHRA limits

Engine Type	90° Air-Inducted Rocket V-8
Displacement, cu. in.	400.10671 max. 399.76725 min.
Bore and stroke	3.870" x 4.250"
Compression ratio	10.25:1 Design 10.47:1 Max. clean 10.77 Max. w/normal carbon build up
Max. bhp	350 at 4800 rpm
Max. Torque ft. lbs.	440 at 3200 rpm
Cyl. head volume	76.59 cc min.
Head gasket thickness, compressed	0.023"-.027"
Head gasket volume	5.32305 cc min.
Deck clearance, min.	0.002" below block
Min. combustion chamber vol.	86.47804 cc min.
Piston type	(Dished)
Displacement of dish	1.70 cc min.
Cyl. head, part number	394500
casting number	394548
Carburetion, type 4-bbl Rochester, specially calibrated	
Model w/SM Trans.	(DNA)
Model w/Auto Trans.	(4MV)
Part number w/SM Trans.	DNA
Part number w/Auto Trans.	7029251
Intake manifold casting no.	398662
Material	Cast iron
Camshaft type	Hydraulic
Part No.	393854
Assembly No.	393859
Casting No.	389410
Rocker arm ratio	1.6:1
Camshaft timing	
Opens, intake & exhaust	30.0 BTC, 78.0 BBC
Closes, intake & exhaust	76.0 ABC, 28.0 ATC
Overlap	28°, 58°
Duration, intake & exhaust	286°, 286°
Valves	
Head diameter, intake & exhaust	2.077" max. 1.630" max.
Angle of seat and face, intake	60°, 60°
exhaust	45°, 46°
Lift, max., intake & exhaust	0.472", .472"
Springs	
Outer valve closed, intake	84# at 1.670" max.
exhaust	84# at 1.670" max.
Outer valve open, intake	214# at 1.198" max.
exhaust	214# at 1.198" max.



Inner valve closed, intake	Damper
exhaust	Damper
Inner valve open, intake	Damper
exhaust	Damper
Nominal valve spring loads, closed	80 lbs.
open	205 lbs.
Wheels	H-D 14-inch with 6-inch rims
Axle ratios, H-D Anti-Spin	
Standard	(3.42:1)
Available	5.00, 4.66, 4.33, 3.91, 3.23, 3.08, 2.78:1
Wheelbase	112 in.
Curb weight, Holiday Coupe	3579 lbs.
	wts. same as W-30 with same NHRA weights.