sharp edge of the groove, in the block does not shave or nick the back of the seal, install seal in the block groove. Rotate the crankshaft, if necessary, while sliding seal into groove. **Care must be exercised not to damage the sealing lip.**

(6) Install other half of the seal into the lower seal retainer with paint stripe to rear.

(7) Install rear main bearing cap, tighten to 85 foot-pounds. **Do not use sealer or cement on seal ends or lips.**

Side Seals Installation

Perform the following operations as rapidly as possible. These side seals are made from a material that expands quickly when oiled.

(1) Apply mineral spirits or diesel fuel to the side seals.

(2) Install seals immediately in the seal retainer grooves.

(3) Install seal retainer and tighten screws to 30 foot-pounds.

Failure to pre-oil the seals will result in an oil leak.

Side Seals Installation

Perform the following operations as rapidly as possible. These side seals are made from a material that expands quickly when oiled.

(1) Apply mineral spirits or diesel fuel to the side seals.

(2) Install seals immediately in the seal retainer grooves.

(3) Install seal retainer and tighten screws to 30 foot-pounds.

Failure to pre-oil the seals will result in an oil leak.

OIL PAN

Removal

(1) Remove oil dipstick, disconnect battery.

(2) Raise vehicle on hoist, drain oil pan. If equipped with air compressor, remove oil return line from side of oil pan.

(3) Remove oil pan attaching bolts and pan.

Installation

(1) Inspect alignment of oil strainer. Bottom of strainer must be parallel with the machined surface of the cylinder block. Bottom of strainer must touch bottom of oil pan with 1/16 to 1/8 inch interference desirable.

(2) Clean oil pan gasket surface and mating surface of block. Inspect pan rail for distortion and flatten if necessary.

(3) Using a new pan gasket, install oil pan and torque screws to 200 inch pounds. Install compressor oil return line if so equipped.

(4) Lower vehicle, install dipstick, fill with proper grade and quantity of motor oil, connect battery ground cable.

ENGINE OILING

The engine oil system consists of an externally mounted rotor type oil pump and oil filter. Oil is forced by the oil pump to a series of oil passages in the engine.

OIL PUMP

Removal

(1) Remove oil pump attaching bolts.

(2) Remove pump and filter assembly from bottom side of the engine.

Disassembly

(1) Remove filter base and oil seal ring.

(2) Remove pump rotor and shaft and lift out outer pump rotor.

(3) Remove oil pressure relief valve plug and lift out spring and plunger.

Inspection

(1) Clean all parts thoroughly. Mating face of oil pump cover should be smooth. Replace cover if it is scratched or grooved.

(2) Lay a straightedge across the oil pump cover surface (Fig. 47). If a .0015 feeler gauge can be inserted between cover and straightedge, cover should be replaced.

(3) Measure diameter and thickness of outer rotor. If outer rotor length measures less than .943 inch (Fig. 48) and the diameter less than 2.469 inches, replace outer rotor.

(4) If inner rotor length measures less than .942 inch (Fig. 49), replace inner rotor.

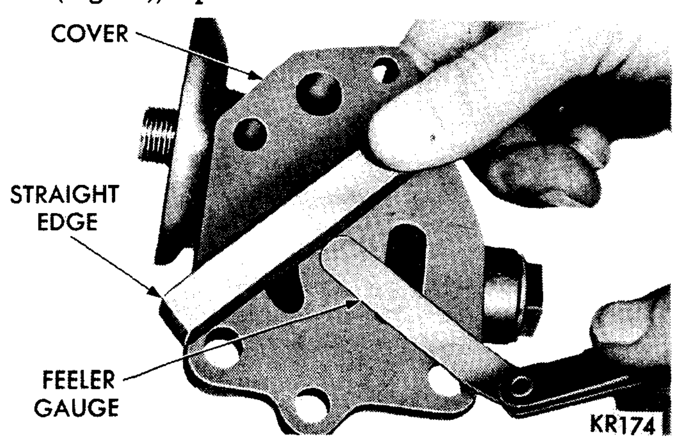


Fig. 47—Measuring Oil Pump Cover Flatness

Fig. 48—Measuring Outer Rotor Thickness

(5) Install outer rotor into pump body, pressing to one side with fingers and measure clearance between outer rotor and pump body (Fig. 50). If measurement is more than .014 inch, replace oil pump body.

(6) Install inner rotor into pump body and place a straightedge across the face between bolt holes (Fig. 51). If a feeler gauge of more than .004 inch can be inserted between the rotors and straightedge, replace pump body.

(7) If clearance between inner rotor and outer rotor (Fig. 52) is more than .010 inch, replace inner and outer rotors.

(8) Inspect oil pump relief valve plunger for scor-

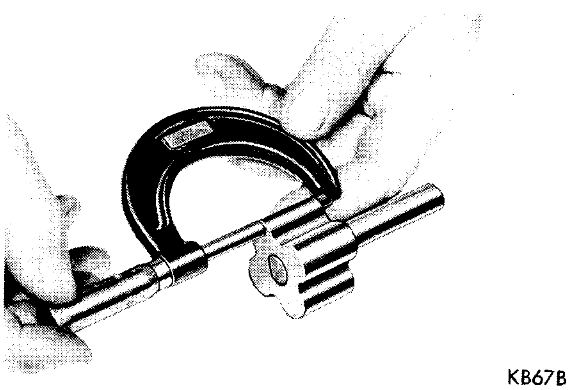


Fig. 49—Measuring Inner Rotor Thickness

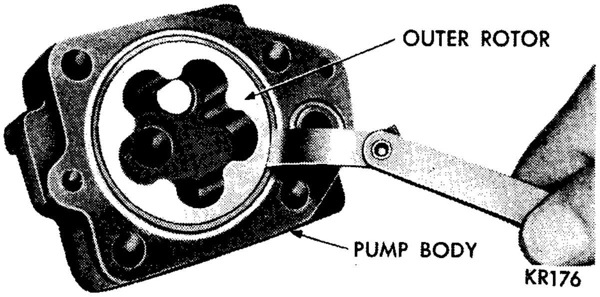


Fig. 50—Measuring Outer Rotor Clearance

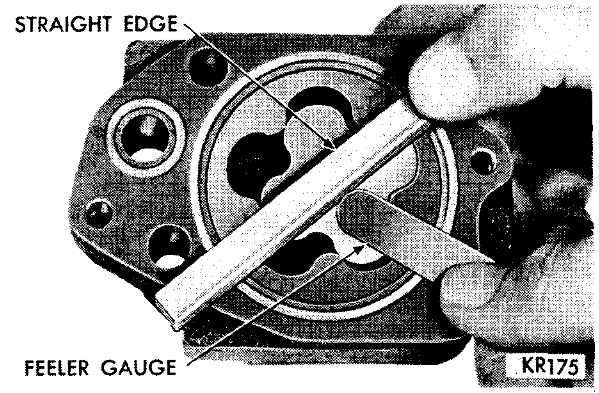


Fig. 51—Measuring Clearance Over Rotors

ing and for free operation in its bore. Small scores may be removed with 400 grit wet or dry paper.

(9) The relief valve spring has a free length of 2-1/4 inches and should test 22.3 to 23.3 lbs. when compressed to 1-19/32 inch. Discard spring that fails to meet specifications.

(10) If oil pressure is low, inspect for worn bearings, or look for other causes of possible loss of pressure.

Installation

When assembling oil pump, be sure to use new oil seal rings between filter base and body. Tighten the attaching bolts to 30 foot-pounds.

REPAIR OF DAMAGED OR WORN THREADS

Damaged or worn threads can be repaired by the use of Heli-Coils or equivalent. Essentially, this repair consists of drilling out worn or damaged threads, tapping the hole with a special Heli-Coil Tap or equivalent, and installing a Heli-Coil Insert or

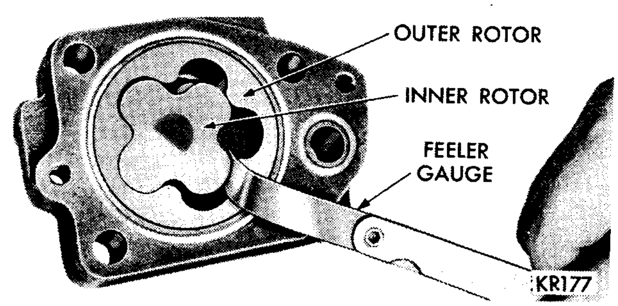


Fig. 52—Measuring Clearance Between Rotors

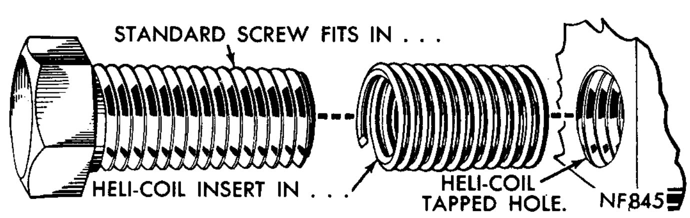


Fig. 53—Heli-Coil Installation

equivalent into the tapped hole. This brings the hole back to its original thread size (Fig. 53).

The following chart lists the threaded hole sizes which are used in the engine block and the necessary tools and inserts for repair of damaged or worn thread. Heli-Coil or equivalent tools and inserts are readily available from automotive parts jobbers or MOPAR.

HELI-COIL CHART

Thread Size	Mopar Part No.	Heli-Coil Part No.	Insert Length	Drill Size	Tap Steel Part No. (Aluminum)	Tap Part No. & Iron	Inserting Tool Part No.	Extracting Tool Part No.
10-24		1185-3CN	9/32"	13/64"	3 CPB	1187-3	2288-3	1227-6
1/4-20	5-40	1185-4CN	3/8"	17/64"	4 CPB	1187-4	2288-4	1227-6
5/16-18	5-41	1185-5CN	15/32"	21/64"	5 CPB	42187-5	2288-5	1227-6
3/8-16	5-42	1185-6CN	9/16"	25/64"	6 CPB	42187-6	2288-6	1227-6
7/16-14	5-43	1185-7CN	21/32"	29/64"	7 CPB	42187-7	2288-7	1227-16
1/2-13	5-44	1185-8CN	3/4"	33/64"* 17/32"**	8 CPB	42187-8	2288-8	1227-16

*In Aluminum
**In Cast Iron or Steel

SPECIFICATIONS

ENGINE—GROUP 9

225 CUBIC INCH

Engine Designation	225 & 225-1
Type	In-Line OHV
Bore	3.40"
Stroke	4.125"
Displacement (Cu. In.)	225
Compression Ratio	8.4 to 1
Minimum Compression pressure	100 psi
(Compression taken with engine warm, all spark plugs removed, throttle wide open, cranked with fully-charged battery.)	
Max. variation between cylinders	25 psi
Firing Order	1-5-3-6-2-4
Ignition Timing (See Emission Label)	
Recommended Governed Speed Full Load	3600 rpm
Camshaft—	
Bearing Clearance	.001"-.003"
Journal Diameter (1)	1.998"-1.999"
(2)	1.982"-1.983"
(3)	1.967"-1.968"
(4)	1.951"-1.952"
Camshaft Drive	225 Silent Tooth Chain/225-1 Roller Chain
Connecting Rods—	
Standard Bearing Clearance	.0005"-.0015"
Maximum Allowable	.0025"
Side Play (End)	.006"-.012"
Journal Diameter	2.1865"-2.1875"
Length	.985"
Bearing Material (Con. Rod.)	Aluminum Tri-Metal
Crankshaft—	
Bearing Clearance	.0005"-.0015"
End Play	.002"-.009"
Journal Diameter	2.7495"-2.7505"
Bearing Material (Main)	Babbitt
Cylinders—	
Maximum Allowable Taper **Before** Re-Boring	.010"
Maximum Allowable Out-of-Round **before** Re-boring	.005"
Maximum Taper and Out-of-Round **after** Reboring	.001"

Engine Designation		225 & 225-1
Pistons—		
Clearance Top Land		.025"-.030"
Skirt (Top)		.0005"-.0015"
Piston Sizes Available for Service		Std. and .020" Oversize
Piston Pins—		
Diameter		.9008"
Length		2.965"
Clearance in Piston		.00045"-.00075"
Interference in Rod		.0007"-.0017"
Service Fit—		
Thumb Push at Degrees F (in Piston)		Pressed-in @ 70°
Piston Rings—		
Oil Ring Width		.1860"-.1865"
Gap Width		.015"-.055"
Side Clearance		.001"-.003"
Compression Ring Width		.0775"-.0780"
Gap Width		.010"-.020"
Side Clearance		.0015"-.0030"
Valves (stem type)—		
Intake		Solid
Exhaust		Solid
Face Angle—Intake		45°
—Exhaust		43°
Seat Angle		45°
Lift—Intake		.394"
Exhaust		.390"
Positive Rotators Exhaust	225	Low friction lock
	225-1	Roto Caps
Stem Diameter—Intake		.372"-.373"
—Exhaust		.371"-.372"
Head Diameter—Intake		1.620"
—Exhaust		1.360"
Hardened Inserts		None
Guides (Removable)		No
Length—Intake		2.44"
—Exhaust		2.40"
Depth from cylinder head face—Intake		1.19"
—Exhaust		1.19"
Cyearance (Stem to Guide)—Intake		.001"-.003"
—Exhaust		.002"-.004"
Valve Springs—Free Length—Intake		1-59/64"
—Exhaust	225	1-59/64"
	225-1	1-7/8"
Valve Spring Pressure		
Intake—Valve Closed		49-57 lbs. @ 1-11/16"
—Valve Open		137-150 lbs. @ 1-5/16"
Exhaust—Valve Closed	225	49-57 lbs. @ 1-11/16"
	225-1	80-90 lbs. @ 1-9/16"
—Valve Open	225	137-150 lbs. @ 1-5/16"
	225-1	178-192 lbs. @ 1-5/32"
Valve Timing—		
Intake—Opens		BTC 16°
—Closes		ATC 228°
Exhaust—Opens		ATC 126°
—Closes		ATC 10°
Valve Overlap		26°
Intake Valve Duration		244°
Exhaust Valve Duration		244°
Tappets—Type		Mechanical
Adjusting Screw		Self-Locking
Tappet Clearance (Hot)—Intake		.010"
—Exhaust		.020"
Oil Capacity (Less Filter) Qts.		5

Engine Designation	**318-1**	**318-3**	**360**
Type	90° "V"	90° "V"	90° "V"
Number of Cylinders	8	8	8
Bore	3.91"	3.91"	4.00"
Stroke	3.312"	3.312"	3.580"
Piston Displacement	318 Cu. In.	318 Cu. In.	360 Cu. In.
Compression Ratio	8.5 to 1	7.8 to 1	8.4 to 1
Minimum Compression Pressure (with engine warm, all spark plugs removed, wide-open throttle, cranked with fully charged battery)	100 PSI	100 PSI	100 PSI
Maximum Compression Variation Between Cylinders	40 PSI	40 PSI	40 PSI
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Ignition Timing	See Emission Label	See Emission Label	See Emission Label
Recommended Governor Speed (No Load)	3900 RPM	3800 RPM	3800 RPM
Cylinder Numbering—Left side	1-3-5-7	1-3-5-7	1-3-5-7
—Right Side	2-4-6-8	2-4-6-8	2-4-6-8
Camshaft			
Drive	Silent Chain	Roller Chain	Silent Chain
Maximum Allowable Bearing Clearance	.005"	.005"	.005"
Thrust Taken By	Thrust Plate	Thrust Plate	Thrust Plate
End-Play	.002"-.010"	.002"-.006"	.002"-.010"
Maximum Allowable End-Play	.010"	.010"	.010"
Journal Diameter No. 1	1.998"-1.999"	1.998"-1.999"	1.998"-1.999"
No. 2	1.982"-1.983"	1.982"-1.983"	1.982"-1.983"
No. 3	1.967"-1.968"	1.967"-1.968"	1.967"-1.968"
No. 4	1.951"-1.952"	1.951"-1.952"	1.951"-1.952"
No. 5	1.5605"-1.5615"	1.5605"-1.5615"	1.5605"-1.5615"
Connecting Rod Journals			
Diameter	2.124"-2.125"	2.1235"-2.1245"	2.124"-2.125"
Maximum Allowable Out-of-Round	.001"	.001"	.001"
Maximum Allowable Taper	.001"	.001"	.001"
Connecting Rod Bearings			
Material	Aluminum	Tri-Metal	Tri-Metal
End-Play (Two Rods Connected)	.006-.014"	.006-.014"	.006-.014"
Desired Bearing Clearance	.0002"-.0022"	.001"-.002"	.0005"-.0025"
Maximum Allowable Bearing Clearance	.003"	.003"	.0025"
Bearing Available for Service	Std., .001", .002", .003", .010" & .012" Undersizes	Std., .001", .002", .003", .010" & .012" Undersizes	Std., .001", .002", .003", .010" & .012" Undersizes
Crankshaft			
Type	Counter-Balanced	Counter-Balanced	Externally Balanced
Number of Main Bearings	5	5	5
Bearing Material—No. 1, 2, & 4	Aluminum	Tri-Metal	Tin-Aluminum
No. 5	Babbitt	Babbitt	Babbitt
No. 3	Tin Aluminum	Tin Aluminum	Tin Aluminum
Thrust Taken By	No. 3	No. 3	No. 3
Main Bearing Clearance—Desired	.0005"-.0015"	.0005"-.0015"	.0005"-.0015"
—Maximum Allowable	.0025"	.0025"	.0025"
Main Bearing Journal Diameter	2.4995"-2.5005"	2.4995"-2.5005"	2.8095"-2.8105"
Maximum Allowable Out-of-Round	.001"	.001"	.001"
Maximum Allowable Taper	.001"	.001"	.001"

Engine Designation	318-1	318-3	360
Bearings Available for Service	Std., .001″, .002″, .003″, .010″ & .012″ Undersizes	Std., .001″, .002″, .003″, .010″ & .012″ Undersizes	Std., .001″, .002″, .003″, .010″ & .012″ Undersizes
Cylinders—Diameter of Bore (Nominal)	3.91″	3.91″	4.00″
Maximum Allowable Taper **Before** Re-boring	.010″	.010″	.010″
Maximum Allowable Out-of-Round **Before** Re-Boring	.005″	.005″	.005″
Maximum Allowable Taper **After** Re-Boring	.001″	.001″	.001″
Maximum Allowable Out-of-Round **After** Re-Boring	.001″	.001″	.001″
Pistons			
Type	Aluminum	Aluminum	Aluminum
Material	Alloy Tin-Coated	Alloy Tin-Coated	Alloy Tin-Coated
Land Clearance at Top of Skirt	.0005″-.0015″	.0005″-.0015″	.0005″-.0015″
Weight (Std. Thru .040″ Oversize)	594.6 Grams	594.6 Grams	584 Grams
Length (Overall)	3.45″	3.38″	3.17″
Pistons Available for Service	Std. and .020″ Oversize	Std. and .020″ Oversize	Std. and .020″ Oversize
Piston Pins			
Type	Interference Fit in Rod	Interference Fit in Rod	Interference Fit in Rod
Diameter	.9841″-.9843″	.9841″-.9843″	.9841″-.9843″
Length	2.990″-3.000″	2.990″-3.000″	2.990″-3.000″
Clearance in Piston (at 70°F)	.00045″-.00075″	.00045″-.00075″	.00025″-.00075″
End-Play	.004″-.026″	.004″-.026″	.004″-.026″
Interference in Rod	.0007″-.0014″	.0007″-.0014″	.0007″-.0017″
Pins Available for Service	Standard Only	Standard Only	Standard Only
Piston Rings			
Compression Rings—Number Used	2	2	2
Oil Rings—Number Used	1	1	1
Oil Ring Type	3-Piece Steel Rail—Chrome Face	3-Piece Steel Rail—Chrome Face	3-Piece Steel Rail—Moly Face
Compression Ring Gap	.010″-.020″	.010″-.020″	.010″-.020″
Oil Ring Gap—Steel Rails	.015″-.055″	.015″-.055″	.015″-.055″
Compression Ring Side Clearance in Groove	.0015″-.0030″	.0015″-.0030″	.0015″-.0030″
Oil Ring-Steel Rail Side Clearance in Groove	.0005″-.0050″	.001″-.0030″	.0005″-.0050″
Intake Valves			
Type	Solid Stem	Solid Stem	Solid Stem
Head Diameter	1.775″-1.785″	1.806″-1.816″	1.875″-1.885″
Overall Length	4.962″-4.987″	4.962″-4.997″	4.969″-4.994″
Stem Diameter	.372″-.373″	.372″-.373″	.372″-.373″
Stem-to-Guide Clearance—Maximum Allowable—(measured with tools C-3973 and C-3339 using wobble method)	.017″	.017″	.017″
Face Angle	45°	45°	45°
Valve Lift (Zero Lash)	.373″	.373″	.410″
Rotators	None	None	None
Valve Seat Inserts	None	None	None
Exhaust Valves			
Type	Solid Stem	Solid Stem/Stellite Face	Solid Stem
Head Diameter	1.495″-1.505″	1.512″-1.522″	1.595″-1.605″
Overall Length	4.985″-5.020″	4.983″-5.008″	4.983″-5.018″
Stem Diameter	.371″-.372″	.371″-.372″	.371″-.372″
Stem-to-Guide Clearance (Wobble Method)	.017″	.017″	.017″

Engine Designation	318-1	318-3	360
Face Angle	45°	45°	43°
Valve Lift (Zero Lash)	.400″	.400″	.400″
Rotators	L.D. Low Friction H.D. Positive	Positive	Positive
Seat Inserts	None	None	None
Cylinder Head			
Valve Seat Run-Out (Maximum)	.002″	.002″	.002″
Valve Seat Angle—Intake & Exhaust	45°	45°	45°
Valve Seat Width (Finished)—Intake	.065″-.085″	.080″-.105″	.065″-.085″
—Exhaust	.040″-.060″	.090″-.110″	.040″-.060″
Valve Guides—Type	Cast-In-Head	Cast-In-Head	Cast-In-Head
Guide Bore Diameter	.374″-.375″	.374″-.375″	.374″-.375″
Valve Springs			
Free Length—Intake	2.00″	2.00″	2.00″
—Exhaust	2″	1-13/16″	2″
Load When Compressed (lbs. @ in.)			
Intake—Valve Closed	88-98 @ 1-21/32″	78-88 @ 1-11/16″	78-88 @ 1-11/16″
—Valve Open	177-192 @ 1-1/4″	170-184 @ 1-5/16″	170-184 @ 1-5/16″
Exhaust—Valve Closed	88-98 @ 1-21/32″	78-88 @ 1-11/16″	78-88 @ 1-11/16″
—Valve Open	184-199 @ 1-9/32″	170-184 @ 1-5/16″	170-184 @ 1-5/16″
Spring Inside Diameter	1.010″-1.030″	1.010″-1.030″	1.010″-1.030″
Maximum Allowable Out of Square	1/16″	1/16″	1/16″
Installed Height—Seat to Retainer	1-5/8″-1-11/16″	1-5/8″-1-11/16″	1-5/8″-1-11/16″
—With Rotators		1-29/64″-1-33/64″	
Tappets—Type	Hydraulic	Hydraulic	Hydraulic
Body Diameter	.9035″-.9040″	.9035″-.9040″	.9035″-.9040″
Clearance in Block	.00175″	.0005″-.0018″	.0005″-.0018″
Tappets Available for Service	Std., .001″, .008″, & .030″ Oversizes	Std., .001″, .008″, & .030″ Oversizes	Std., .001″, .008″, & .030″ Oversizes
Dry Lash	.060″-.210″	.060″-.210″	.060″-.210″
Valve Timing			
Intake Opens (BTC)	10°	10°	16°
Intake Closes (ATC)	230°	230°	236°
Exhaust Opens (ATC)	128°	128°	120°
Exhaust Closes (ATC)	16°	16°	16°
Valve Overlap	26°	26°	32°
Intake Valve Duration	240°	240°	252°
Exhaust Valve Duration	248°	248°	256°
Engine Lubrication—Type	Full Pressure	Full Pressure	Full Pressure
Oil Pump—Type	Rotary	Rotary	Rotary
Location	In Sump	In Sump	In Sump
Drive	Camshaft Gear	Camshaft Gear	Camshaft Gear
Minimum Pump Pressure at Idle	8 lbs.	8 lbs.	8 lbs.
Operating Pressure At 2000 Engine RPM	30-80 lbs.	30-80 lbs.	30-80 lbs.
Oil Filter Type (All Full-Flow)	Spin-On* Throwaway	Replaceable Element	Spin-On* Throwaway
Oil Capacity (Less Filter) Qts.	5	6	5 360-3 6

*Replaceable Element Type Optional

Engine Designation	361-4	413-3
General Data		
Type	90° "V"	90° "V"
Number of Cylinders	8	8
Bore	4.125"	4.188"
Stroke	3.375"	3.75"
Piston Displacement	361 cubic in.	413 cubic in.
Compression Ratio	7.5 to 1	7.5 to 1
Minimum Compression Pressure	100 psi	100 psi
Max. Variation Between Cylinders	40 psi	40 psi
Firing-Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Ignition Timing	See Emission Label	See Emission Label
Recommended Governor Speed—No Load	3600 rpm	3600 rpm
Cylinder Numbering (from drivers seat, front to rear)—		
Left Bank	1-3-5-7	1-3-5-7
Right Bank	2-4-6-8	2-4-6-8
Camshaft—		
Drive	Roller Chain	Roller Chain
Thrust taken by	Cylinder Block	Cylinder Block
Camshaft Bearings (Number Used)	5	5
Clearance	.001"-.003"	.001"-.003"
Diameter		
Number 1	2.000"	2.000"
2	1.984"	1.984"
3	1.969"	1.969"
4	1.953"	1.953"
5	1.750"	1.750"
Connecting Rod Journals		
Diameter	2.374"-2.375"	2.374"-2.375"
Maximum Allowable Taper	.001"	.001"
Maximum Allowable Out-of-Round	.001"	.001"
Connecting Rod Bearings—		
Material	Tri-Metal	Tri-Metal
End Play (2 Rods)	.009"-.017"	.009"-.017"
Bearing Clearance	.001"-.002"	.001"-.002"
Crankshaft—		
No. of Main Bearings	5	5
Material of Main Bearings	Tri-Metal	Tri-Metal
No. 1, 2 3 & 5	—	—
No. 3	Aluminum	Aluminum
Thrust Taken by	No. 3	No. 3
End Play	.002"-.009"	.002"-.009"
Main Bearing Clearance	.0015"-.0025"	.0015"-.0025"
	2.6245"-2.6255"	2.7495"-2.7505"
Maximum Allowable Out-of-Round	.0005"	.0005"
Maximum Allowable Taper	.0005"	.0005"
Cylinders—		
Maximum Allowable Taper **Before** Reboring	.010"	.010"
Maximum Allowable Out-of-Round **Before** Reboring	.005"	.005"
Maximum Allowable **After** Reboring—Taper	.001"	.001"
Out-of-Round	.001"	.001"
Pistons		
Clearance at top of Skirt	.0005"-.0015"	.0003"-.0013"
Clearance at Piston Pin Centerline	—	.002"-.003"
Piston Length (Overall)	3.84"	3.96"
Pistons Available for Service	Std. and .020", Oversize	Std. and .020", Oversize
Piston Pins		
Type	Interference Fit in Rod	Interference Fit in Rod
Diameter	1.0935"-1.0937"	1.0935"-1.0937"
Length	3.440"-3.450"	3.555"-3.575"
Fit in Piston (Clearance at 70°F.)	.00045"-.00075"	.00045"-.00075"
Interference in Rod	.0007"-.0014"	.0007"-.0014"

Engine Designation	361-4	413-3
Piston Rings		
Compression Rings (Number Per Piston)	2	2
Oil Rings (Number Per Piston)	1	1
Side Clearance—Upper Compression Ring	.0025"-.004"	.001"-.0025"
—Second Compression Ring	.0025"-.0040"	.001"-.0025"
—Oil Ring (Steel Rails)	.001"-.0030"	.001"-.003"
Valves (Intake)	Solid Stem	Solid Stem
Head Diameter	1.875"-1.885"	1.875"-1.885"
Length (Overall)	5.6505"-5.6855"	5.6505"-5.6855"
Stem Diameter	.372"-.373"	.372"-.373"
Stem Guide Clearance	.001"-.003"	.001"-.003"
Maximum Allowable (Wobble Method)	.016"	.016"
Face Angle	45°	45°
Valve Lift	.360"	.360"
Rotators	Low Friction	Low Friction
Seat Inserts	No	No
Valves (Exhaust)	Sodium Filled—Stellite Faced	Sodium Filled—Stellite Faced
Head Diameter	1.495"-1.505"	1.495"-1.505"
Length (Overall)	5.6725"-5.7075"	5.6725"-5.7075"
Stem Diameter	.433"-.434'	.433"-.434'
Stem-to-Guide Clearance	.003'-.005"	.003'-.005"
Maximum Allowable (Wobble Method)	.018"	.018"
Face Angle	45°	45°
Valve Lift	.360"	.360"
Rotators	Positive	Positive
Seat Inserts	Yes	Yes
Valve Guides — Type	Replaceable	Replaceable
Ream—		
Std Size Valve ... Intake	.374"-.375"	.374"-.375"
Exhaust	.437"-.438"	.437"-.438"
.005 in. O.S. Valve	Replace Guides	Replace Guides
.015 in. O.S. Valve	Replace Guides	Replace Guides
.030 in. O.S. Valve	Replace Guides	Replace Guides
Replaceable — Length — Intake	3.28"	3.28"
Exhaust	3.09"	3.09"
Depth from Cylinder Head Face—		
Intake	1.14"	1.14"
Exhaust	1.30"	1.30"
Ream After Installation—		
Intake	.374"-.375"	.374"-.375"
Exhaust	.437"-.438"	.437"-.438"
Tappets—		
Type	Hydraulic	Hydraulic
Body Diameter	.9040"-.9045"	.9040"-.9045"
Clearance in Block	.0005"-.0018"	.0005"-.0018"
Springs—Free Length		
Intake	2-5/16"	2-5/16"
Exhaust	2-1/8"	2-1/8"
Load when compressed to		
Intake (Valve Closed)	75-85 lbs. @ 1-55/64"	75-85 lbs. @ 1-55/64"
Valve Open)	173-187 lbs. @ 1-15/32"	173-187 lbs. @ 1-15/32"
Exhaust (Valve Closed)	80-90 lbs. @ 1-3/4"	80-90 lbs. @ 1-3/4"
(Valve Open)	168-182 lbs. @ 1-21/64"	168-182 lbs. @ 1-21/64"
Oil Capacity (Less Filter) Qts.	8	8

Valve Timing	361-4, 413-3
Intake Opens (BTC)	24°
Intake Closes (ATC)	236°
Exhaust Opens (ATC)	120°
Exhaust Closes (ATC)	20°
Valve Overlap	44°
Intake Valve Duration	260°
Exhaust Valve Duration	260°

ENGINE	"400"	"440"
Type	90°V	90°V
Number of Cylinders	8	8
Bore	4.342″	4.320″
Stroke	3.375″	3.750″
Piston Displacement	400 cu. in.	440 cu. in.
Compression Ratio	8.2 to 1	8.2 to 1
Minimum Compression with Engine Warm, Spark Plugs Removed, Wide-Open Throttle	100 psi	100 psi
Maximum Variation Between Cylinders (any one engine)	40 psi	40 psi
Firing Order	1-8-4-3-6-5-7-2	1-8-4-3-6-5-7-2
Basic Timing ... Refer to emission control information label on vehicle.		
CYLINDER NUMBERING (front to rear)		
Left Bank	1-3-5-7	1-3-5-7
Right Bank	2-4-6-8	2-4-6-8
CYLINDER BLOCK		
Cylinder Bore (Standard) ± .00025″	4.342″—4.344″	4.320″—4.322″
Cylinder Bore Out-of-Round (Max. allowable before reconditioning)	.005″	.005″
Cylinder Bore Taper (Max. allowable before reconditioning)	.010″	.010″
Reconditioning Working Limits (for taper and out-of-round)	.001″	.001″
Maximum Allowable Oversize (cylinder bore)	.040″	.040″
Tappet Bore Diameter	.9051″—.9059″	.9051″—.9059″
Distributor Lower Drive Shaft Bushing (press fit in block)	.0015″—.0040″	.0015″—.0040″
Shaft to Bushing Clearance	.0007″—.0027″	.0007″—.0027″
PISTONS		
Type Material	Aluminum W/Steel Struts	Aluminum W/Steel Struts
Land Clearance (diametrical)	.027″—.035″	.027″—.035″
Clearance at Top of Skirt	.0003″—.0013″	.0003″—.0013″
Weight (Std. through .040″ oversize)	768.5 gms.	857.5 gms.
Piston Length (overall)	3.530″	3.650″
Ring Groove Depth		
No. 1	.220″	.220″
No. 2	.220″	.220″
No. 3	.208″	.208″
Pistons for Service	Std. and .020" Oversize	Std. and .020" Oversize
PISTON PINS		
Type	Press Fit in Rod	Press Fit in Rod
Diameter	1.0935″—1.0937″	1.0935″—1.0937″
Length	3.545″—3.585″	3.545″—3.585″
Clearance in Piston (Light Thumb Push @ 70° F.)	.00045″—.00075″	.00045″—.00075″
Interference in Rod	.0007″—.0014″	.0007″—.0014″
Pins for Service	Standard Only	Standard Only
PISTON RINGS		
Number of Rings per Piston	3	3
Compression	2	2
Oil	1	1
Oil Ring Type	3-piece Chrome-plated rails with Stainless steel expander-spacer	3-piece Chrome-plated rails with Stainless steel expander-spacer
Ring width		
Compression	.0775″—.0780″	.0775″—.0780″
Oil (Steel rails)	.025″ Max.	.025″ Max.
Ring Gap		
Compression	.013″—.023″	.013″—.023″
Oil (Steel rails)	.015″—.055″	.015″—.055″

ENGINE	"400"	"440"
Ring Side Clearance		
Compression	.0015"—.0030"	.0015"—.0030"
Oil (Steel rails)	.0000"—.005"	.000"—.005"
Service Rings		
Ring Gap		
Compression	.013"—.023"	.013"—.023"
Oil (Steel rails)	.015"—.062"	.015"—.062"
Ring Side Clearance		
Compression	.0015"—.004"	.0015"—.004"
Oil (Steel rails)	.0000"—.005"	.0000"—.005"
CONNECTING RODS		
Length (Center to Center)	6.356"—6.360"	6.766"—6.770"
Weight (less bearing shells)	812± 4 gms.	846± 4 gms.
Side Clearance (two rods)	.009"—.017"	.009"—.017"
Piston Pin Bore Diameter	1.0923"—1.0928"	1.0923"—1.0928"
CONNECTING ROD BUSHING		
Type	None	None
CONNECTING ROD BEARINGS	Aluminum	Aluminum
Diameter and Width	2.376"—.927"	2.376"—.927"
Clearance desired 2 bbl. carb.	.0005"—.0025"	———
4 bbl. carb.	.0005"—.0030"	.0005"—.0030"
Maximum Allowable	.0030"	.0030"
Bearings for Service	Std., .001", .002" .003", .010", .012" Undersizes	Std., .001", .002" .003", .010", .012" Undersizes
CRANKSHAFT		
Type	Fully Counter-Balanced or externally balanced	Fully Counter-Balanced or externally balanced
Bearings	Steel Backed Tin Aluminum	Steel Backed Tin Aluminum
Thrust Taken By	No. 3 Main Bearing	No. 3 Main Bearing
End Play	.002"—.009"	.002"—.009"
Maximum Allowable	.010"	.010"
Diametral Clearance Desired	.0005"—.002"	.0005"—.002"
Diametral Clearance Allowed	.0025"	.0025"
Finish at Rear Oil Seal Surface	Diagonal Knurling	Diagonal Knurling
MAIN BEARING JOURNALS		
Diameter	2.6245"—2.6255"	2.7495"—2.7505"
Maximum Allowable Out-of-Round and/or Taper	.001"	.001"
Bearings for Service Available in Standard and the following undersizes	.001", .002", .003" .010", .012"	.001", .002", .003" .010", .012"
CONNECTING ROD JOURNALS		
Diameter	2.375"—2.376"	2.375"—2.376"
Maximum Allowable Out-of-Round and/or Taper	.001"	.001"
CAMSHAFT		
Drive	Chain	Chain
Bearings	Steel Backed Babbitt	Steel Backed Babbitt
Number	5	5
Diametral Clearance	.001"—.003"	.001"—.003"
Maximum Allowable Before Reconditioning	.005"	.005"
Thrust Taken By	Cylinder Block	Cylinder Block
CAMSHAFT JOURNALS		
Diameter No. 1	1.998"—1.999"	1.998"—1.999"
No. 2	1.982"—1.983"	1.982"—1.983"
No. 3	1.967"—1.968"	1.967"—1.968"
No. 4	1.951"—1.952"	1.951"—1.952"
No. 5	1.748"—1.749"	1.748"—1.749"
CAMSHAFT BEARINGS		
Diameter No. 1	2.000"—2.001"	2.000"—2.001"
No. 2	1.984"—1.985"	1.984"—1.985"
No. 3	1.969"—1.970"	1.969"—1.970"
No. 4	1.953"—1.954"	1.953"—1.954"
No. 5	1.750"—1.751"	1.750"—1.751"

Engine	400 & 440
Valve Timing	
Intake Opens (BTC)	18°
Intake Closes (ABC)	62°
Exhaust Opens (BBC)	68°
Exhaust Closes (ATC)	20°
Valve Overlap	38°
Intake Valve Duration	260°
Exhaust Valve Duration	268°
TIMING CHAIN	
Number of Links	50
Pitch	.50"
Width	.75"
TAPPETS	
Type	Hydraulic
Body Diameter	.9035"—.9040"
Clearance in Block	.0011"—.0024"
Service Tappets Available	Std., .001", .008", .030"
Clearance Between Valve Stem and Rocker Arm Pad (Dry Lash)	.060"—.210"
CYLINDER HEAD	
Valve Seat Run-Out (Maximum)	.003"
Intake Valve Seat Angle	45°
Seat Width (finish)	.060"—.085"
Exhaust Valve Seat Angle	45°
Seat Width (finish)	.040"—.060"
Cylinder Head Gasket (Thickness compressed)	.022"
VALVE GUIDES	
Type	Cast in Head
Guide Bore Diameter (Standard)	.374"—.375"
Valves—Intake	
Head Diameter	2.08"
Length to (center of valve face)	4.87"
Stem Diameter	.3723"—.3730"
Stem to Guide Clearance	.0011"—.0028"
Maximum Allowable by rocking method	.017"
Face Angle	45°
Valve for Service (Oversize Stems Diameter)	Std., .005", .015", .030"
Lift (Zero Lash)	.434"
Valves—Exhaust	
Head Diameter	1.74"
Length to (center of valve face)	4.87"
Stem Diameter	
Hot End	.3713"—.3720"
Cold End	.3723"—.3730"
Stem to Guide Clearance	
Hot End	.0021"—.0038"
Cold End	.0011"—.0028"
Maximum Allowable by rocking method	.017"
Face Angle	45°
Valve for Service (Oversize Stem Diameter)	Std., .005", .015", .030"
Lift (Zero Lash)	.430"
Valve Springs	
Number	16
Free Length	2.58"
Load When Compressed to	
Valve Closed (pounds)	121-129 @ 1-55/64"
Valve Open (pounds)	192-208 @ 1-7/16"
Valve Spring I.D.	1.01"—1.03"
Maximum Allowable Out of Plumb	.060"
Valve Spring Installed Height (spring seat to retainer)	1-53/64"—1-57/64"
Use 1/16" Spacer to Reduce Spring Height when Over Specifications	
ENGINE LUBRICATION	
Pump Type	Rotary Full Pressure

ENGINE	400 & 440
Capacity (qts.)	5 U.S. or 4-1/4 Imperial***
Pump Drive	Camshaft
Minimum Pump Pressure @ Idle	8 psi
Operating Pressure at 2000 Engine RPM	30—80 lbs.
Pressure Drop Resulting from Clogged Filter	7—9 lbs.
Oil Filter Type	Full-Flow

***When filter is replaced, add 1 U.S. Quart or 3/4 Im perial Quart.

ENGINE–GROUP 9
225 CUBIC INCH

Location	Thread Size	Foot-Pounds
Alternator Adjusting Strap Bolt	5/16-18	200 (in.-lbs.)
Alternator Adjusting Strap Mounting Bolt	3/8-16	30
Alternator Bracket Bolt	3/8-16	30
Alternator Mounting Bolt	5/16-18	200 (in.-lbs.)
Camshaft Sprocket Lockbolt	7/16-14	50
Carburetor to Manifold Nut	3/8-16	30
Chain Case Cover Bolt	5/16-18	200 (in.-lbs.)
Connecting Rod Nut	3/8-24	45
Converter Brace to Aluminum Housing	7/16-14	40
Converter Brace to Engine Block	3/8-16	30
Clutch Housing Bolt	3/8-16	30
Crankshaft Rear Bearing Seal Retainer	3/8-16	30
Cylinder Head Cover Bolt	1/4-20	40 (in.-lbs.)
Cylinder Head Bolt	7/16-14	70
Distributor Clamp Bolt	1/4-20	75 (in.-lbs.)
Engine Front Mounting to Frame Nut	1/2-20	65
Engine Front Mounting to Block Nut	7/16-20	45
Engine Rear Mount Bolts	7/16-14	50
Exhaust Pipe Flange Nut	7/16-20	30
Exhaust Pipe Clamp Bolt	3/8-24	20
Exhaust Pipe Support Clamp Bolt	3/8-24	20
Fan Attaching Bolt	5/16-18	200 (in.-lbs.)
Flywheel Housing to Cylinder Block Bolt	7/16-14	50
Flywheel Housing Cover Bolt	1/4-20	40 (in.-lbs.)
Fuel Pump Attaching Bolt	3/8-16	30
Intake to Exhaust Manifold Cap Screw (Outboard)	5/16-18	200 (in.-lbs.)
Intake to Exhaust Manifold Stud Nut (Inboard)	3/8-16	240 (in.-lbs.)
Main Bearing Cap Bolt	1/2-13	85
Manifold Attaching Nuts	5/16-24	120 (in.-lbs.)
Oil Pan Drain Plug	1/2-20	20
Oil Pan Screws	5/16-18	200 (in.-lbs.)
Oil Pump Cover Bolt	1/4-20	95 (in.-lbs.)
Oil Pump Attaching Bolt	5/16-18	200 (in.-lbs.)
Oil Filter Standpipe	3/4-10	20
Oil Pressure Gauge Sending Unit	1/8-N.P.T.F.	60 (in.-lbs.)
Rocker Shaft Bracket Bolt	3/8-16	25
Rocker Shaft Bracket Bolt Rear	5/16-18	200 (in.-lbs.)
Spark Plugs	Tappered	10
Starter Mounting Bolt	7/16-14	50
Temperature Gauge Sending Unit	1/4-N.P.T.F.	180 (in.-lbs.)
Torque Converter Housing Bolt	3/8-16	30
Water Pump to Housing Bolt	3/8-16	180 (in.-lbs.)

318-360 CUBIC INCH ENGINE

Location	Thread Size	Torque Foot-Pounds
Alternator Adjusting Strap Bolt	5/16-18	200 (in.-lbs.)
Alternator Mounting Pivot Bolt or Nut	3/8-16	30
Camshaft Sprocket Bolt	7/16-14	50
Camshaft Thrust Plate Bolt	5/16-18	210 (in.-lbs.)
Chain Case Cover Bolt	3/8-16	35
Connecting Rod Nut—Plain	3/8-24	45
Crankshaft Bolt (Vibration Damper)	3/4-16	100
Cylinder Head Bolt	1/2-13	95
Cylinder Head Cover—Bolt	1/4-20	40 (in.-lbs.)
Nut	1/4-28	40 (in.-lbs.)
Exhaust Manifold—Bolt	5/16-18	20
Nut	5/16-24	20
Exhaust Manifold Ball Joint	3/8-16	24
Fan Attaching Bolt	5/16-24	200 (in.-lbs.)
Fuel Pump Attaching Bolt	3/8-16	30
Flywheel to Crankshaft	7/16-20	55
Flywheel Housing to Cylinder Block	7/16-14	50
Flex Plate to Crankshaft	7/16-20	55
Flex Plate to Converter	5/16-24	270 (in.-lbs.)
Flywheel Housing Cover Bolts	1/4-20	40 (in.-lbs.)
Ignition Distributor Clamp Bolt	5/16-18	200 (in.-lbs.)
Intake Manifold Bolt	3/8-16	35
Main Bearing Cap Bolt	1/2-13	85
Oil Pan Drain Plug	1/2-20	20
Oil Pan Screw	5/16-18	200 (in.-lbs.)
Oil Pump Cover Bolt	1/4-20	95 (in.-lbs.)
Oil Pump Attaching Bolt	3/8-16	30
Rocker Shaft Retainer Bolt	5/16-18	200 (in.-lbs.)
Spark Plugs		
318-1, 360	14MM	30
318-3	18MM	20
Starter Mounting Bolt	7/16-14	50
Thermostat Housing Bolt	3/8-16	35
Vibration Damper Pulley Bolt	5/16-24	200 (in.-lbs.)
Water Pump Bolt	3/8-16	35

361-413-400-440 CUBIC INCH ENGINE

Location	Thread Size	Torque Foot-Pounds
Alternator Bracket Bolts	3/8-16	30
Alternator Mounting Pivot Bolt or Nut	3/8-16	30
Alternator Adjusting Strap Bolt	5/16-18	200 (in.-lbs.)
Camshaft Sprocket Bolt	7/16-14	50
Chain Case Cover Bolt	5/16-18	200 (in.-lbs.)
	3/8-16	40
Connecting Rod Nut	3/8-24	45
Crankshaft Bolt (Vibration Damper)	3/4-16	135
Crankshaft Rear Bearing Seal Retainer	3/8-16	25
Cylinder Head Bolt	7/16-24	70
Cylinder Head Cover		
Bolt	1/4-20	40 (in.-lbs.)
Nut	1/4-28	40 (in.-lbs.)
Exhaust Manifold	3/8-16	30
Exhaust Manifold Flange Joint	7/16-20	40
Fan Attaching Bolt	5/16-18	200 (in.-lbs.)
Fuel Pump Attaching Bolt	3/8-16	30
Flywheel to Crankshaft	7/16-20	55
Flywheel Housing to Cylinder Block	7/16-14	50
Flex Plate to Crankshaft	7/16-20	55
Flex Plate to Converter	5/16-24	270 (in.-lbs.)
Flywheel Housing Cover Bolts	1/4-20	40 (in.-lbs.)
Ignition Distributor Clamp Bolt	5/16-18	200 (in.-lbs.)
Intake Manifold Bolt	3/8-16	45
Main Bearing Cap Bolt	1/2-13	85
Oil Pan Drain Plug	1/2-20	20
Oil Pan Screw	5/16-18	200 (in.-lbs.)
Oil Pump Cover Bolt	5/16-18	10
Oil Pump Attaching Bolt	3/8-16	30
Rocker Shaft Retainer Bolt	3/8-16	25
Spark Plugs	14MM	30
Starter Mounting Bolt	7/16-14	50
Thermostat Housing Bolt	3/8-16	35
Valve Tappet Cover End Bolt	1/4-20	180 (in.-lbs.)
Vibration Damper Pulley Bolt	5/16-24	200 (in.-lbs.)
Water Pump to Housing Bolt	3/8-16	30
Water Pump Housing to Cylinder Block Bolt	3/8-16	30

EXHAUST SYSTEM AND INTAKE MANIFOLD

CONTENTS

	Page
CARBURETOR AIR HEATER	2
DIAGNOSIS	2
EXHAUST MANIFOLDS	
318-360 Cubic Inch Engines	5
400-440 Cubic Inch Engines	6
GENERAL INFORMATION	1
INTAKE AND EXHAUST MANIFOLDS	
6 Cylinder Engine	4
INTAKE MANIFOLD (8 CYLINDER ENGINES)	6
MANIFOLD HEAT CONTROL VALVE	
6 Cylinder Engine	6
318-360 Cubic Inch Engines	7
400-440 Cubic Inch Engines	8
SPECIFICATIONS	17
TIGHTENING REFERENCE	17

GENERAL INFORMATION

The exhaust system on Dodge Trucks consists of the exhaust manifold, exhaust pipe, muffler and tail pipe, exhaust manifold heat control valve and on some models a catalytic converter.

The exhaust system is suspended from the frame by brackets and insulated supports. School Bus brackets and insulated supports rearward of the rear axle, are positioned outboard of the frame assembly.

A thermostatic heat control valve is incorporated in the exhaust manifold on some models to direct exhaust gas to the heat chamber beneath the carburetor during the warm-up period to help vaporize the fuel. On six cylinder engines, the valve is located on the left side of the engine. On 318-1, 360, 400, and 440-1 cubic inch V-8 engines, the valve is located in the right exhaust manifold (Fig. 1). Heavy Duty (-3) engines do not utilize a heat control valve.

The Federal 318-3, 361-4 and 413-3 are provided with a water heated intake manifold and, therefore, do not use a manifold heat control valve.

A heated inlet air system is used on some models to provide a faster warm up and improved carburetor icing resistance. Figure 2 shows the arrangement by which air is heated and drawn into the carburetor. The sheet metal stove is bolted over the exhaust manifold. A thermostatically-controlled air valve controls the air temperature at about 100 degrees F.

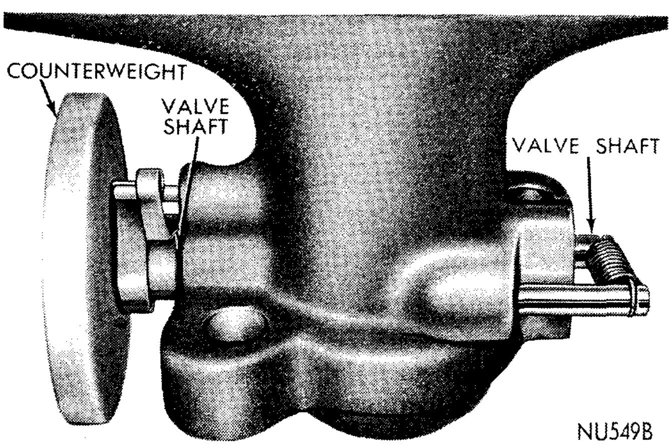


Fig. 1—Manifold Heat Control Valve (318, 360, 400 and 440 Cubic Inch Engines Typical)

EXHAUST GAS RECIRCULATION (EGR) D100 and W100 Models Below 6000# GVW and All California Models

To assist in the control of oxides of nitrogen (NOx) in engine exhaust, some engines are equipped with an exhaust gas recirculation system. The use of exhaust gas to dilute incoming air/fuel mixtures lowers peak

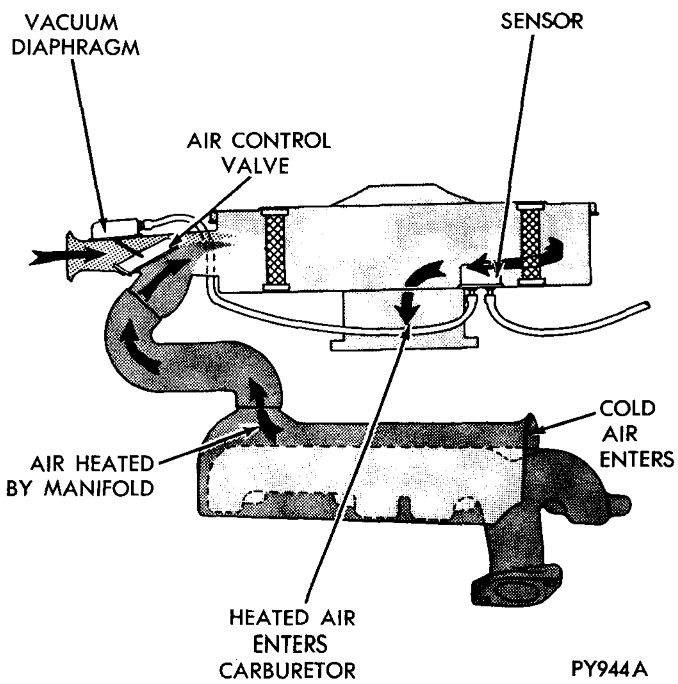


Fig. 2—Heated Inlet Air System

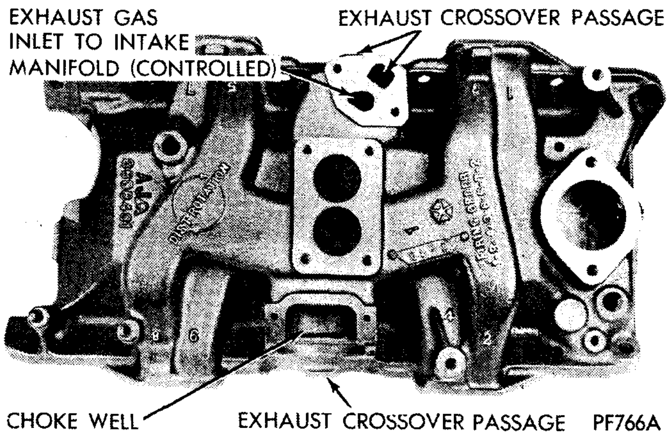


Fig. 3—Intake Manifold 318 and 360 Cubic Inch Engines (Typical)

flame temperatures during combustion, thus limiting the formation of NOx.

Exhaust gases are taken from openings in the exhaust gas crossover passage in the floor of the intake manifold (Fig. 3).

REFER TO SECTION 25 OF THIS MANUAL FOR A COMPLETE DESCRIPTION, DIAGNOSIS AND SERVICE PROCEDURES ON THE EXHAUST GAS RECIRCULATION SYSTEM AND COMPONENTS.

Orifice Spark Advance Control (OSAC) D100 and W100 Models Below 6000 Lbs. G.V.W. (If So Equipped.)

The OSAC system is used on some D100 and W100 models to aid in the control of NOx (oxides of Nitrogen). The system controls the vacuum to the vacuum advance actuator of the distributor. Refer to section 25 of this manual for description, diagnosis and service.

SERVICE DIAGNOSIS

Condition	Possible Cause	Correction
EXCESSIVE EXHAUST NOISE	(a) Leaks at pipe joints.	(a) Tighten clamps at leaking joints to specifications.
	(b) Burned or blown out muffler.	(b) Replace muffler assembly.
	(c) Burned or rusted out exhaust pipe.	(c) Replace exhaust pipe.
	(d) Exhaust pipe leaking at manifold flange.	(d) On 318 and 360 cu. in. engines, tighten ball joint connection attaching bolt nuts to 24 foot-pounds, on 400 and 440 cu. in. engines, tighten bolt nuts to 50 foot pounds, alternating. On all other engines, install a new gasket and tighten flange bolt nuts to 35 foot-pounds.
	(e) Exhaust manifold cracked or broken.	(e) Replace manifold.
	(f) Leak between manifold and cylinder head.	(f) Tighten manifold to cylinder head stud nuts or bolts to specifications.
LEAKING EXHAUST GASES	(a) Leaks at pipe joints.	(a) Tighten clamps at leaking joints to specifications.
	(b) Damaged or improperly installed gaskets.	(b) Replace gaskets as necessary.
	(c) Restriction in muffler or tail pipe.	(c) Remove restriction, if possible or replace as necessary.
ENGINE HARD TO WARM UP OR WILL NOT RETURN TO NORMAL IDLE	(a) Heat control valve stuck in open position.	(a) Free up manifold heat control valve using Solvent, Part Number 3419129 or equivalent when cold.
NOISE IN MANIFOLD	(a) Thermostat broken.	(a) Replace thermostat.
	(b) Weak or broken anti-rattle spring.	(b) Replace spring.
MANIFOLD HEAT CONTROL VALVE RATTLE	(a) Thermostat broken.	(a) Replace thermostat.
	(b) Broken or weak anti-rattle spring.	(b) Replace spring.

SERVICE PROCEDURES

CARBURETOR AIR HEATER

SIX CYLINDER ENGINE

Removal

(1) Disconnect air cleaner vacuum line from carburetor and flexible connector between air cleaner and carburetor air heater at heat stove. (Fig. 4).

NOTE: Flexible connector threads onto air cleaner.

(2) Disconnect breather cap to air cleaner line and remove air cleaner.

(3) Disconnect exhaust pipe at exhaust manifold.

(4) Remove two screw and washer assemblies attaching carburetor air heater to manifold and remove air heater.

(5) Inspect air heater; replace if damaged.

Installation

(1) Refer to figure 4, install carburetor air heater with two screw and washer assemblies. Tighten to 200 inch-pounds.

(2) Attach exhaust pipe to manifold flange, using a new gasket. Tighten stud nuts to 35 foot-pounds.

(3) Install air cleaner and connect air cleaner to breather cap line.

(4) Install air cleaner to carburetor vacuum line and flexible connector between air cleaner and carburetor air heater.

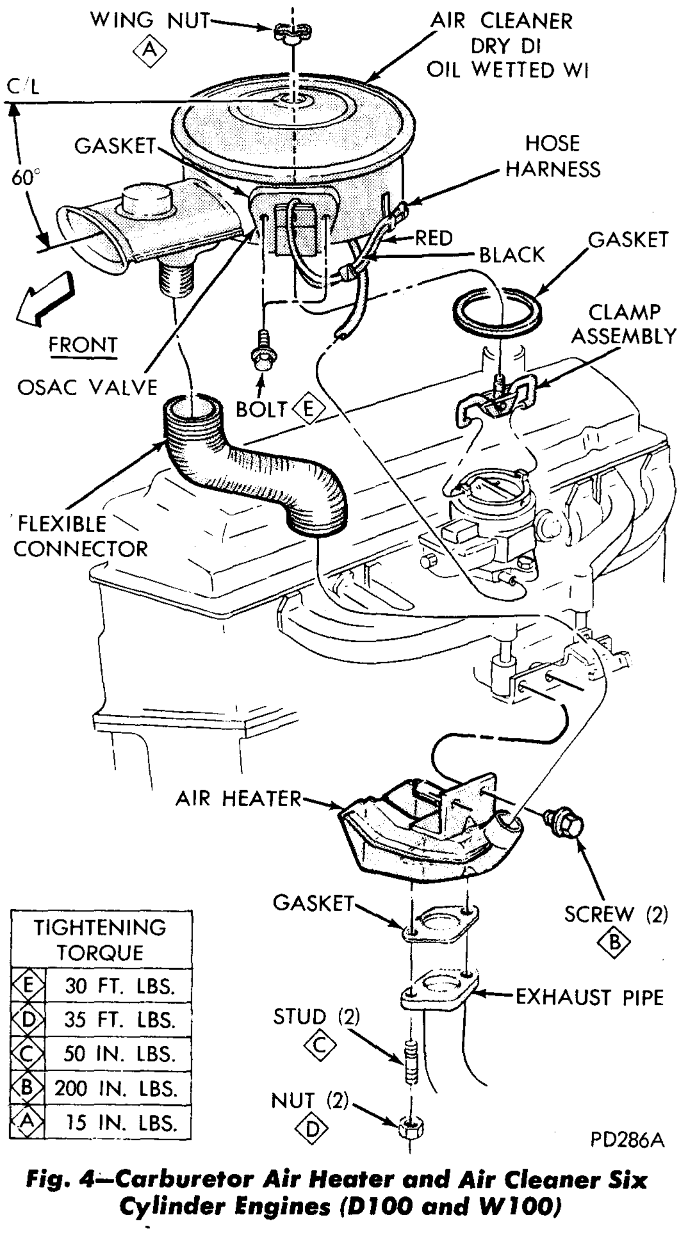


Fig. 4—Carburetor Air Heater and Air Cleaner Six Cylinder Engines (D100 and W100)

318 and 360 CUBIC INCH ENGINES

Removal

(1) Disconnect air cleaner vacuum line from carburetor and flexible connector between air cleaner and carburetor air heater at heat stove.

NOTE: Flexible connector threads onto air cleaner.

(2) Disconnect breather cap to air cleaner line and remove air cleaner.

(3) Refer to figure 5, to remove carburetor air heater and attaching screws.

(4) Inspect air heater; replace if damaged.

Installation

(1) Refer to figure 5, install carburetor air heater with attaching screws, bolts, nut, and washer assemblies. Tighten to 25 foot-pounds.

(2) Install air cleaner and connect air cleaner to breather cap line.

(3) Install air cleaner to carburetor vacuum line, flexible connector between air cleaner and carburetor air heater at heat stove.

361 and 413 CUBIC INCH ENGINE

Removal

(1) Disconnect flexible connector between air cleaner and carburetor air heater at the heat stove.

NOTE: Flexible connector threads onto air cleaner.

(2) Refer to figure 6, remove attaching screws, nut and washer assemblies and remove carburetor air heater.

(3) Inspect air heater; replace if damaged.

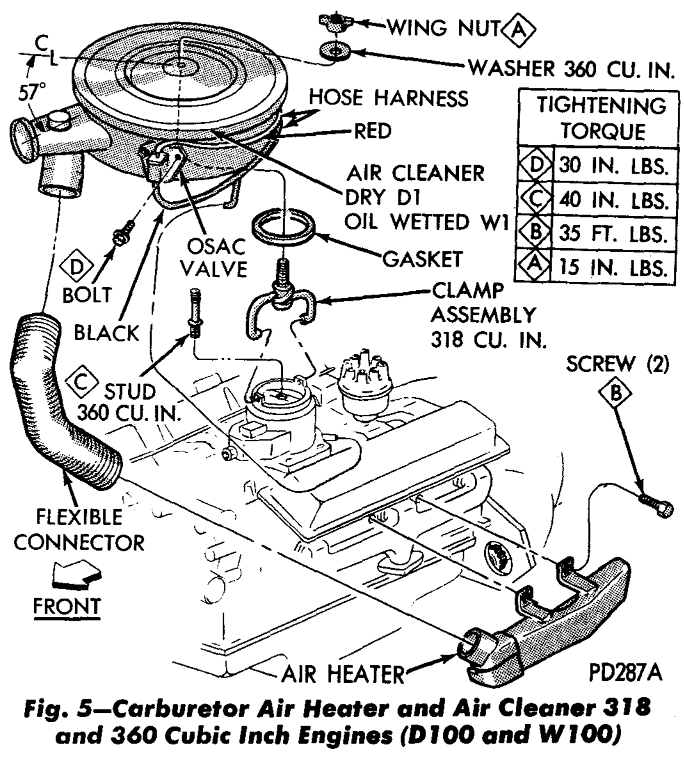


Fig. 5—Carburetor Air Heater and Air Cleaner 318 and 360 Cubic Inch Engines (D100 and W100)

Installation

(1) Refer to figure 6, install carburetor air heater with attaching screws, bolts, nut and washer assemblies. Torque to specifications.

(2) Install flexible connector between air cleaner and carburetor air heater.

INTAKE AND EXHAUST MANIFOLD ASSEMBLY (6-Cylinder Engines)

Removal

(1) Disconnect air cleaner vacuum line from carburetor and flexible connector between air cleaner and carburetor air heater at the heat stove and lines from OSAC unit if so equipped.

(2) Disconnect crankcase inlet air cleaner to air cleaner hose and remove air cleaner.

(3) Disconnect distributor vacuum control line, crankcase ventilator valve hose.

(4) Disconnect fuel line, automatic choke rod and throttle linkage from carburetor and remove carburetor. Disconnect EGR hoses and remove EGR valve if so equipped.

(5) Disconnect exhaust pipe at exhaust manifold.

(6) Remove carburetor air heater if so equipped.

(7) Remove nuts and washers attached manifold assembly to cylinder and remove manifold (Fig. 7).

(8) Remove three screws securing intake manifold to exhaust manifold and separate manifolds.

Cleaning and Inspection

(1) Discard gasket and clean all gasket surfaces on manifolds. Wash manifolds in solvent and dry with compressed air.

(2) Test mating surfaces of manifolds for flatness, with a straightedge. Surfaces should be flat within .008 inch.

(3) Inspect manifolds for cracks or distortion.

(4) Test operation of manifold heat control valve. If shaft is binding, apply a suitable manifold heat control valve solvent. Then, work valve back and forth until it turns freely.

Installation

(1) Install a new gasket between the two manifolds and install the three long screws securing the manifolds. **Do not tighten screws at this time.**

(2) Position manifold assembly on cylinder head, using a new gasket. Install triangular washers and nuts on upper studs and on the four lower studs opposite numbers 2 and 5 cylinders. The eight triangular washers should be positioned squarely on the machined surfaces of both intake and exhaust manifold retaining pads. These washers must be installed with **cup side against manifold. Install nuts and washers only when engine is cold.**

(3) Install steel conical washers with cup side facing manifold, one on center upper stud and two on center lower studs. Install brass washers at each end with flat side to manifold. Install nuts with flat side away from washer. Snug all nuts.

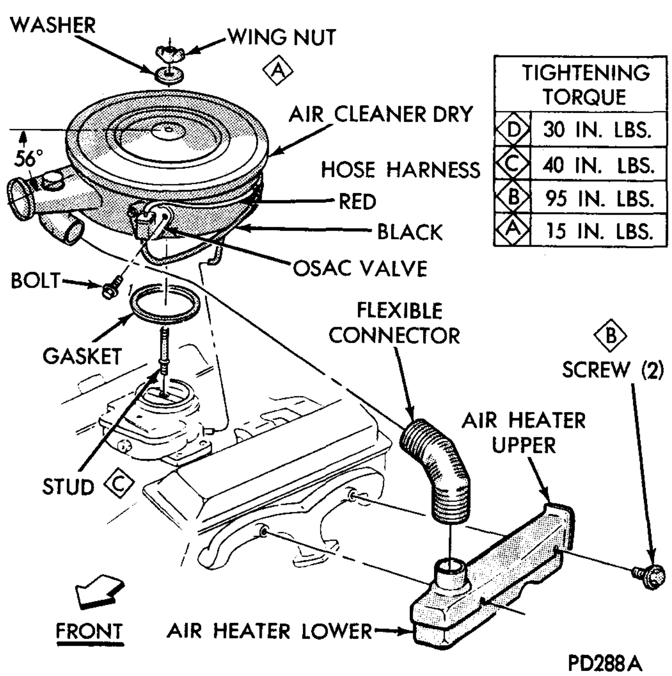
CAUTION: Do not over-tighten

(4) Tighten **inboard** intake to exhaust manifold screw to 200 inch-pounds.

(5) Tighten **outboard** intake to exhaust manifold screws to 240 inch-pounds.

(6) Repeat tightening procedures 4 and 5 until all three intake to exhaust manifold screws are at specified torque.

(7) Tighten intake and exhaust manifold assembly nuts to cylinder head to 120 inch-pounds. Start at



TIGHTENING TORQUE	
D	30 IN. LBS.
C	40 IN. LBS.
B	95 IN. LBS.
A	15 IN. LBS.

Fig. 6—Carburetor Air Heater and Air Cleaner 361 and 413 Cubic Inch Engines

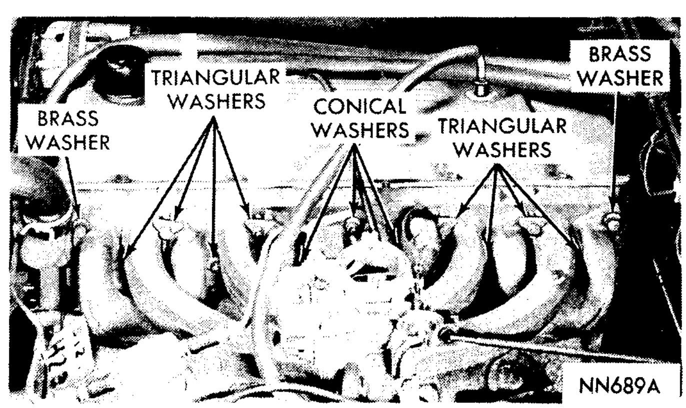


Fig. 7—Installing Manifold Assembly (Six Cylinder Engines)

center and progress outward in both directions. **Do not over-tighten.**

(8) Repeat tightening procedure 7 until all intake and exhaust manifold assembly nuts are at specified torque.

(9) Install carburetor air heater. Tighten to 200 inch-pounds.

(10) Attach exhaust pipe to manifold flange, using a new gasket and tighten stud nuts to 35 foot-pounds.

(11) Install carburetor and connect fuel line, automatic choke rod and throttle linkage. Install EGR valve.

(12) Install distributor vacuum control line and carburetor bowl vent line if so equipped.

(13) Install air cleaner and connect breather cap to air cleaner line.

(14) Install air cleaner vacuum line to carburetor and flexible connector between air cleaner and carburetor air heater.

(15) Connect all OSAC and EGR lines if so equipped.

INTAKE MANIFOLD (318, 360 Cu. In. Engines)

Remove intake manifold as outlined in Group 9, "Engine".

Servicing

(1) Clean manifold in solvent and blow dry with compressed air. Inspect manifold for cracks.

(2) Inspect mating surfaces of manifold for flatness with a straightedge.

(3) Inspect exhaust crossover passages through manifold (Fig. 8). If passages are coated with hard, black carbon, they should be scraped clean and sandblasted to remove the carbon deposits.

(4) Install intake manifold, using new gaskets. Tighten manifold screws to 35 foot-pounds.

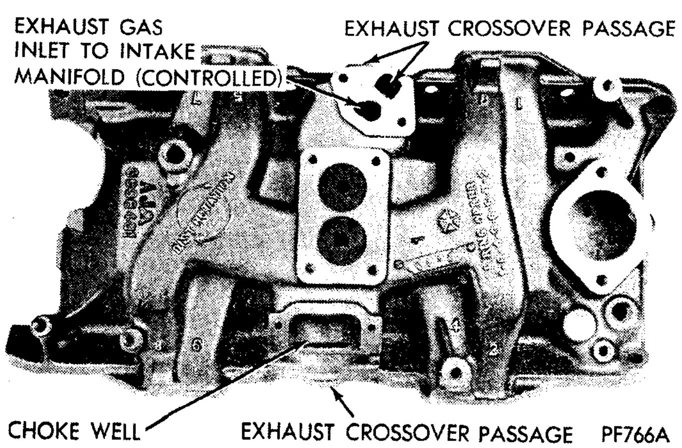


Fig. 8—Intake Manifold 318 and 360 Cubic Inch Engines (Typical)

EXHAUST MANIFOLD (318, 360 Cu. In. Engines)

Removal

(1) Remove bolts and nuts attaching exhaust pipe to manifold.

(2) Remove bolts, nuts and washers attaching manifolds to cylinder heads. Remove manifolds from cylinder heads.

Cleaning and Inspection

(1) Clean mating surfaces on cylinder heads and manifolds, wash with solvent and blow dry with compressed air. Inspect manifolds for cracks.

(2) Inspect mating surfaces of manifold for flatness with a straightedge. Gasket surfaces must be flat within .008 inch.

(3) On **right hand** manifold test manifold heat control valve for free operation if so equipped. If necessary to free up, apply a suitable manifold heat control valve solvent to both ends of valve shaft. A suitable solvent is available under Part Number 3419129, Manifold Heat Control Valve Solvent or equivalent. Be sure manifold is **COOL** and solvent is allowed to soak a few minutes to dissolve deposits. Then, work valve back and forth until it turns freely.

Installation

CAUTION: If studs come out with the nuts, install new studs, applying sealer on the coarse thread ends. If this precaution is not taken, water leaks may develop at the studs.

(1) Position two outboard arms of manifolds on the two studs on cylinder heads, using new gaskets. Install conical washers and nuts on studs (Fig. 9).

(2) Install two screws and conical washers at inner ends of outboard arms of manifold. Install two screws **without** washers on center arm of manifold (Fig. 9). Tighten screws and nuts, starting at center arm and working outward, to 25 foot-pounds.

(3) Assemble exhaust pipe to manifold, and secure with bolts, nuts and washers. Tighten nuts to 24 foot-pounds alternating as the nuts are drawn up.

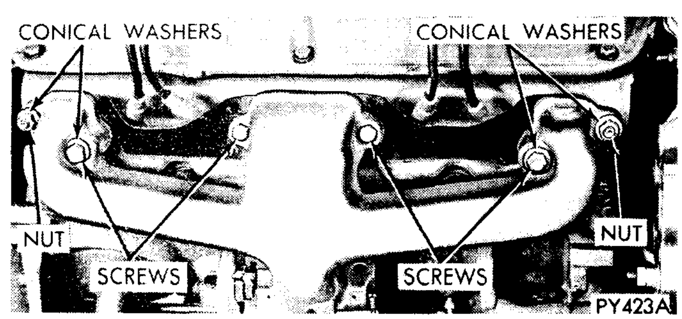


Fig. 9—Installing Exhaust Manifold—318 and 360 Cubic Inch Engines (Typical)

INTAKE MANIFOLD (361, 413, 400 and 440 Cu. In. Engine)

Remove Intake Manifold as outlined in Group 9, "Engine".

Servicing

(1) Clean manifold in solvent and blow dry with compressed air.

(2) Inspect exhaust crossover passages and pressure test for any leakage into intake passages.

(3) Inspect mating surfaces for flatness.

(4) Use new gaskets when installing manifold. Reinstall manifold as outlined in Group 9, "Engine".

EXHAUST MANIFOLD (361, 413, 400 and 440 Cu. In. Engine)

Removal

(1) Remove spark plugs.

(2) Remove alternator.

(3) Disconnect exhaust pipe at exhaust manifolds.

(4) Remove stud nuts attaching exhaust manifolds to cylinder heads. Slide manifolds off studs and away from cylinder heads.

Cleaning and Inspection

(1) Clean manifolds in solvent and blow dry with compressed air.

(2) Inspect manifolds for cracks and distortion.

(3) On **right hand** manifold test manifold heat control valve for free operation if so equipped. If necessary to free up, apply a suitable manifold heat control valve solvent to both ends of valve shaft. A suitable solvent is available under Part Number 3419129, Manifold Heat Control Valve Solvent or equivalent. Be sure manifold is **COOL** and solvent is allowed to soak a few minutes to dissolve deposits. Then, work valve back and forth until it turns freely.

Installation

CAUTION: If studs came out with the nuts, install new studs, applying sealer on the coarse thread ends. If this precaution is not taken, water leaks may develop at the studs.

(1) Install manifolds on cylinder heads, gaskets are required. Tighten stud nuts to 30 foot-pounds.

(2) Install exhaust pipes on exhaust manifolds. Tighten nuts to 24 foot-pounds, alternating as drawn up.

(3) Install alternator and adjust belt tension.

(4) Install spark plugs and tighten to 30 foot-pounds.

MANIFOLD HEAT CONTROL VALVE

Operation of the manifold heat control valve should be inspected periodically. With engine idling, accelerate momentarily. The counterweight on six cylinder engines should respond by moving **counterclockwise** approximately 1/2 inch and to its original position. On all other engines, the counterweight should move **clockwise.** If no movement is observed, shaft is binding due to accumulation of deposits or thermostat is weak or broken.

The application of a suitable manifold heat control valve solvent, every oil change, to both ends of manifold heat control valve shaft at bushings, will keep valve working freely. A suitable solvent is available under Part Number 3419129, Manifold Heat Control Valve Solvent or equivalent. The solvent should be applied when manifold is **COOL** and allowed to soak a few minutes to dissolve deposits. Then, work valve back and forth until it turns freely.

SIX CYLINDER ENGINE

Remove intake and exhaust manifold as outlined in removal.

(1) Position valve plate, grind off spot welds from valve plate and shaft.

(2) Remove counterweight and shaft assembly, valve plate.

(3) Press out bushings and cup seals from manifold (Fig. 10).

(4) Inspect vent holes and clean out if necessary.

Installation

(1) **Press** in cup seals flush with inside walls (Fig. 10) with cupped ends facing outward.

(2) **Press** in bushings flush with outer edge of exhaust manifold.

(3) Line ream bushings and seals .3095 to .3110 inch diameter. Test for free fit of shaft in bushings and seals.

(4) Mark one end of shaft with a suitable dye at 1.240 inches, press counterweight on marked end of shaft until flush with end of shaft.

(5) Install thermostatic spring on counterweight with center end of tab pointing **right** and outer end or hook pointing **left.**

(6) Install valve stop on counterweight with looped ends facing away from thermostatic spring hook end.

(7) Holding thermostatic spring wrapped 215 degrees in a **clockwise** direction viewed from counterweight end, install shaft assembly in manifold and valve plate with strap facing outboard; attach hook end of thermostatic spring to stop pin (Fig. 10).

(8) With counterweight end of shaft positioned 1.240 inches (previously identified) away from manifold, valve plate centered between seals and positioned 2.05 inches from center of inside tapped hole (intake to exhaust manifold attaching screw) (Fig. 10).

(9) Arc weld valve plate to shaft with stainless steel rod. **Arc welding ground must be made at counterweight.**

(10) Test for free operation. Install anti-rattle spring.

(11) Complete assembly and installation.

318 AND 360 CUBIC INCH ENGINES

Removal

(1) Remove exhaust pipe from manifold.

(2) Remove exhaust manifold from engine.

(3) Position valve plate, grind off spot welds from valve plate and shaft.

(4) Remove counterweight and shaft assembly, valve plate. Press out bushings and seals from manifold (Fig. 11).

(5) Inspect vent holes and clean out if necessary.

Installation

(1) **Press** in cup seals until seals extend into manifold .100 inch on each side with cupped ends facing outward (Fig. 11).

(2) **Press** in bushings flush with outer edge of exhaust manifold.

(3) Line ream bushings and seals, .3095 to .3110 inch diameter. Test for free operation of shaft in bushings and seals.

(4) Mark one end of shaft with a suitable dye at 1.240 inches, press counterweight on marked end of shaft until flush with end of shaft.

(5) Position thermostat so center end or tab is pointing **left** and hook or outer end points **down,** install thermostat on counterweight.

(6) Install valve stop on counterweight so looped ends face away from thermostatic spring hook end.

(7) Holding thermostatic spring wrapped 140 degrees in a **counterclockwise** direction viewed from counterweight end, install shaft assembly through outer bushing, seal and valve plate with center strap facing flange end of manifold; attach hook end of thermostatic spring to stop pin (Fig. 11).

(8) With counterweight end of shaft positioned 1.240 inches (previously identified) away from manifold, valve plate centered between seals and valve plate closed (Fig. 11).

(9) Arc weld valve plate to shaft with stainless

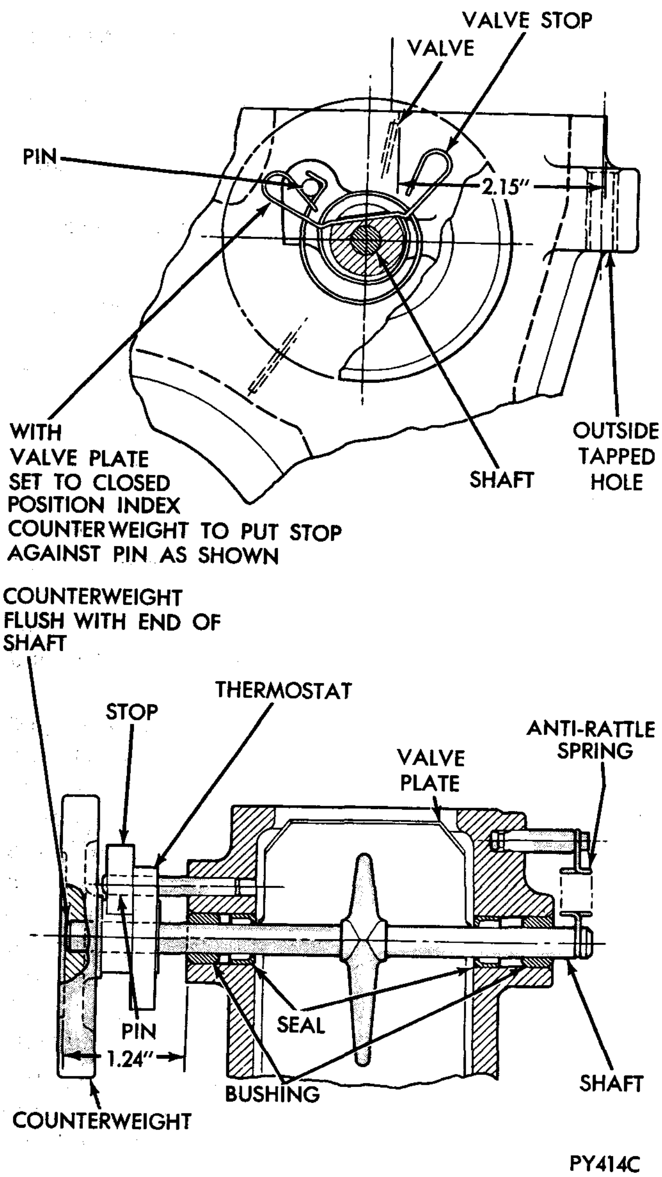


Fig. 10—Proper Manifold Heat Control Valve Installation Six Cylinder Engines

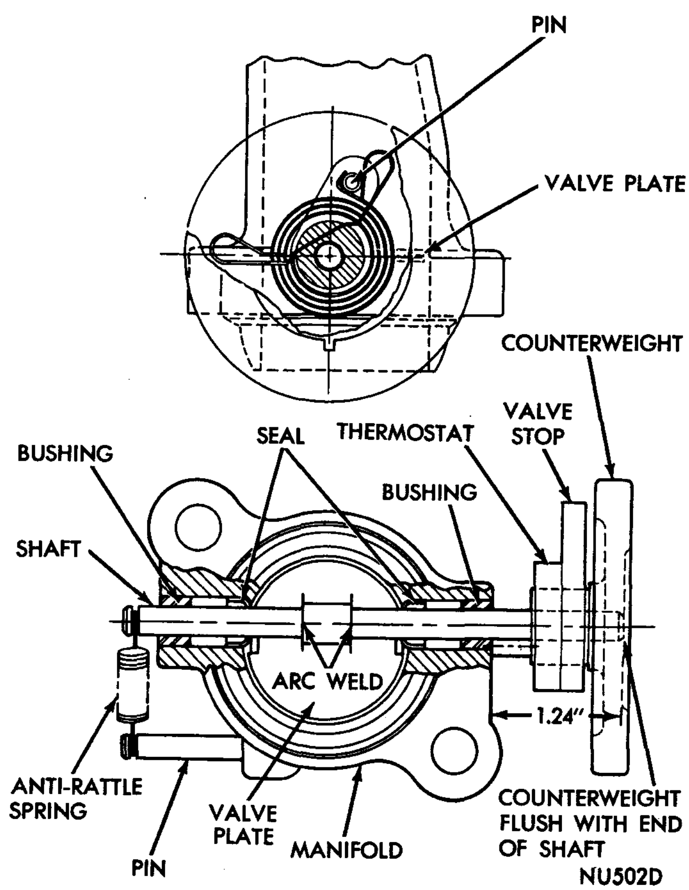


Fig. 11—Proper Manifold Heat Control Valve Installation (318 and 360 Cubic Inch Engines)

steel rod. **Arc welding ground must be made at counterweight.**

(10) Test for free operation. Install anti-rattle spring.

(11) Position new gasket on studs, install exhaust manifold and tighten to 25 foot-pounds.

(12) Install exhaust pipe to manifold (no gasket used) and tighten to 24 foot-pounds.

400-440 CUBIC INCH ENGINE

Removal

Remove exhaust manifold.

(1) Position valve plate, grind off welds from valve plate and shaft.

(2) Remove counterweight and shaft assembly, valve plate.

(3) Press out bushings and cup seals from manifold (Fig. 12).

(4) Inspect vent holes and clean out if necessary.

Installation

(1) **Press** in cup seals until seals extend into manifold .100 inch on each side with curved ends facing outwards (Fig. 12).

(2) **Press** in bushings flush with outer edge of exhaust manifold.

(3) Line ream bushings and seals .3095 to .3110 inch diameter. Test for free fit of shaft in bushings and seals.

(4) Mark one end of shaft with a suitable dye at 1.240 inches, press counterweight on marked end of shaft until flush with end of shaft.

(5) Install thermostatic spring on counterweight with center end or tab pointing **left** and outer end or hook pointing right.

(6) Install valve stop on counterweight with looped ends facing away from thermostatic spring hook end.

(7) Holding thermostatic spring wrapped 215 degrees in a **counterclockwise** direction viewed from counterweight end, install shaft assembly in manifold and valve plate with strap facing flange end of manifold; attach hook end of thermostatic spring to stop pin (Fig. 12).

(8) With counterweight end of shaft positioned 1.240 inches (previously identified) away from manifold, valve plate centered between seals and valve plate closed (Fig. 12).

(9) Arc weld valve plate to shaft with stainless steel rod. **Arc welding ground must be made at counterweight.**

(10) Test for free operation. Install anti-rattle spring.

(11) Complete assembly and installation.

EXHAUST PIPES, MUFFLERS AND TAIL PIPES

Removal—General

(1) Raise vehicle on hoist and apply penetrating oil to all clamp bolts and nuts to loosen rust and corrosion.

(2) Remove clamps and supports from tail pipe, muffler and exhaust pipe (Figs. 13 through 20).

(3) Disconnect exhaust pipe at exhaust manifolds and remove exhaust pipe. On models using gaskets at exhaust pipe flanges, discard gaskets and carefully clean manifold flanges of any gasket particles.

(4) On some models it will be necessary to raise rear end of vehicle to relieve weight from rear springs to remove the tail pipe.

(5) Remove muffler and extension pipe assembly.

Installation

(1) Assemble front exhaust pipe to exhaust manifold using a new flange gasket. **Do not fully tighten flange at this time. No gaskets are required at ball joint seating connections.**

(2) Loosely assemble rear exhaust pipe, muffler tail pipe or pipes: **line up stud with slot if so equipped.**

(3) Align exhaust system, making sure components have sufficient clearance with underbody and adjacent parts.

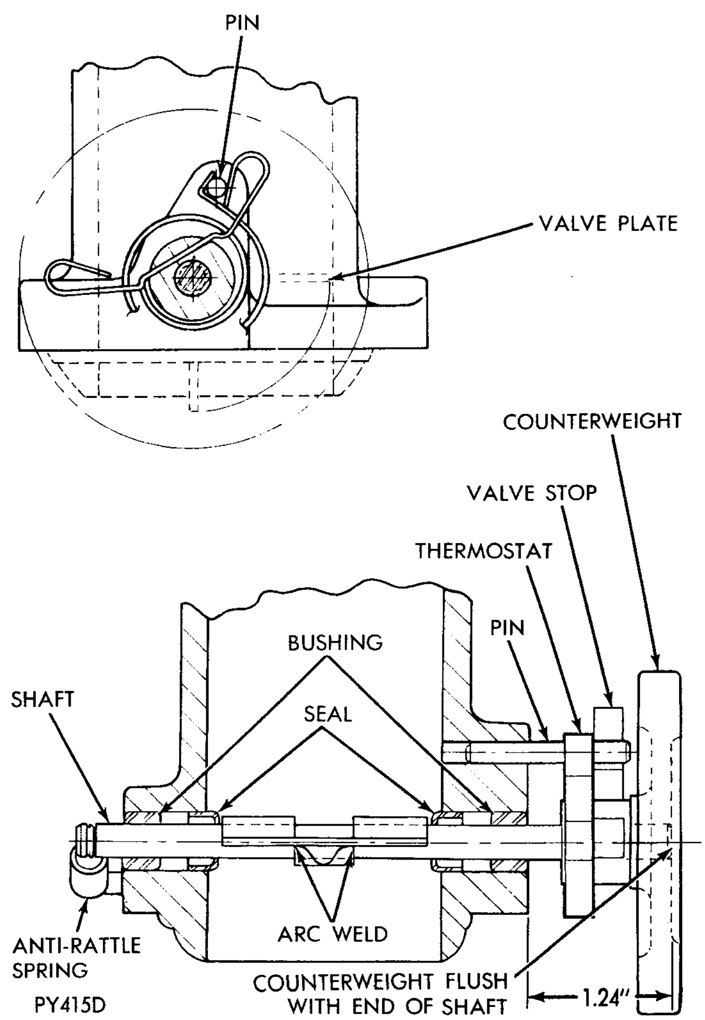
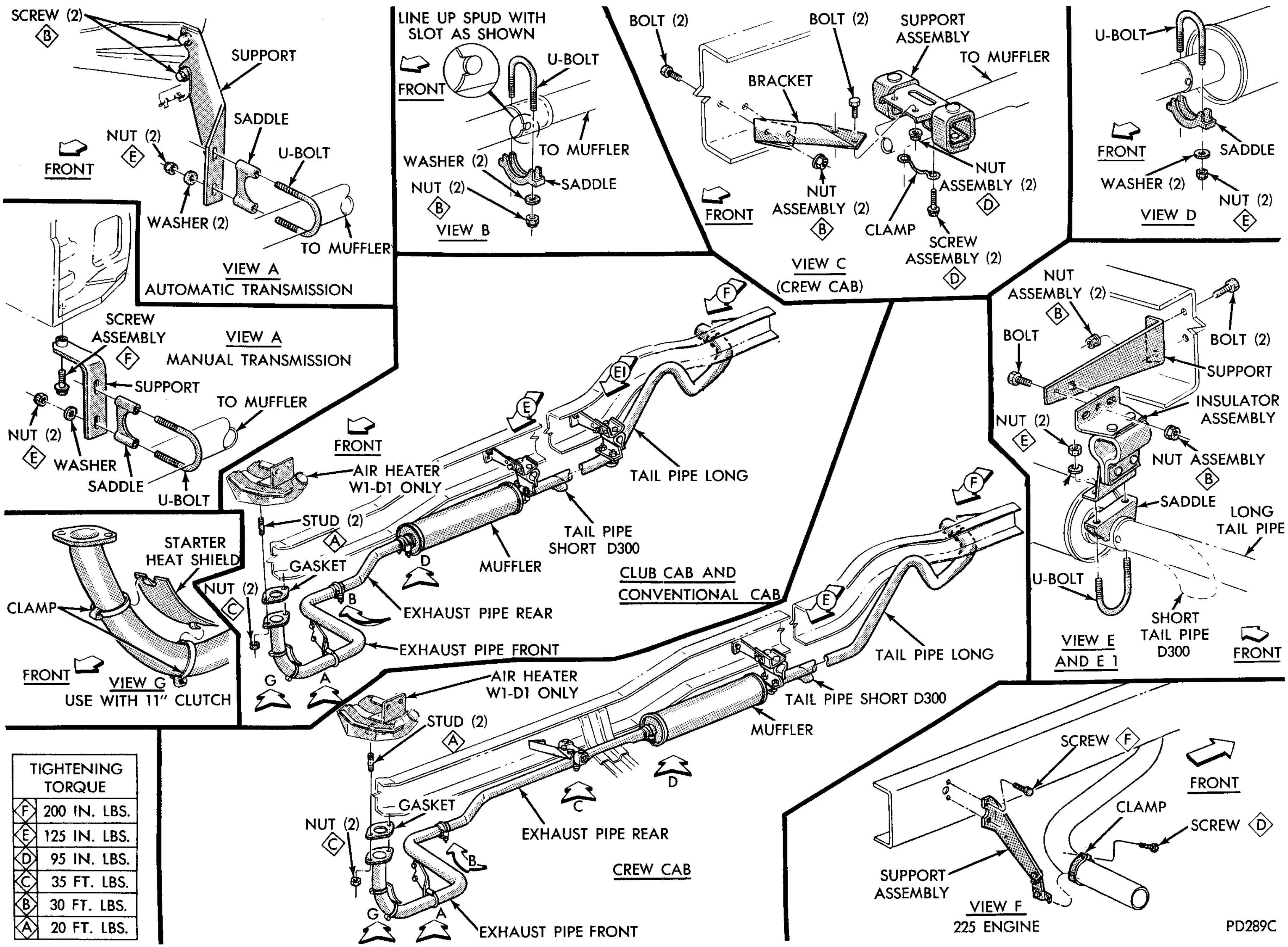
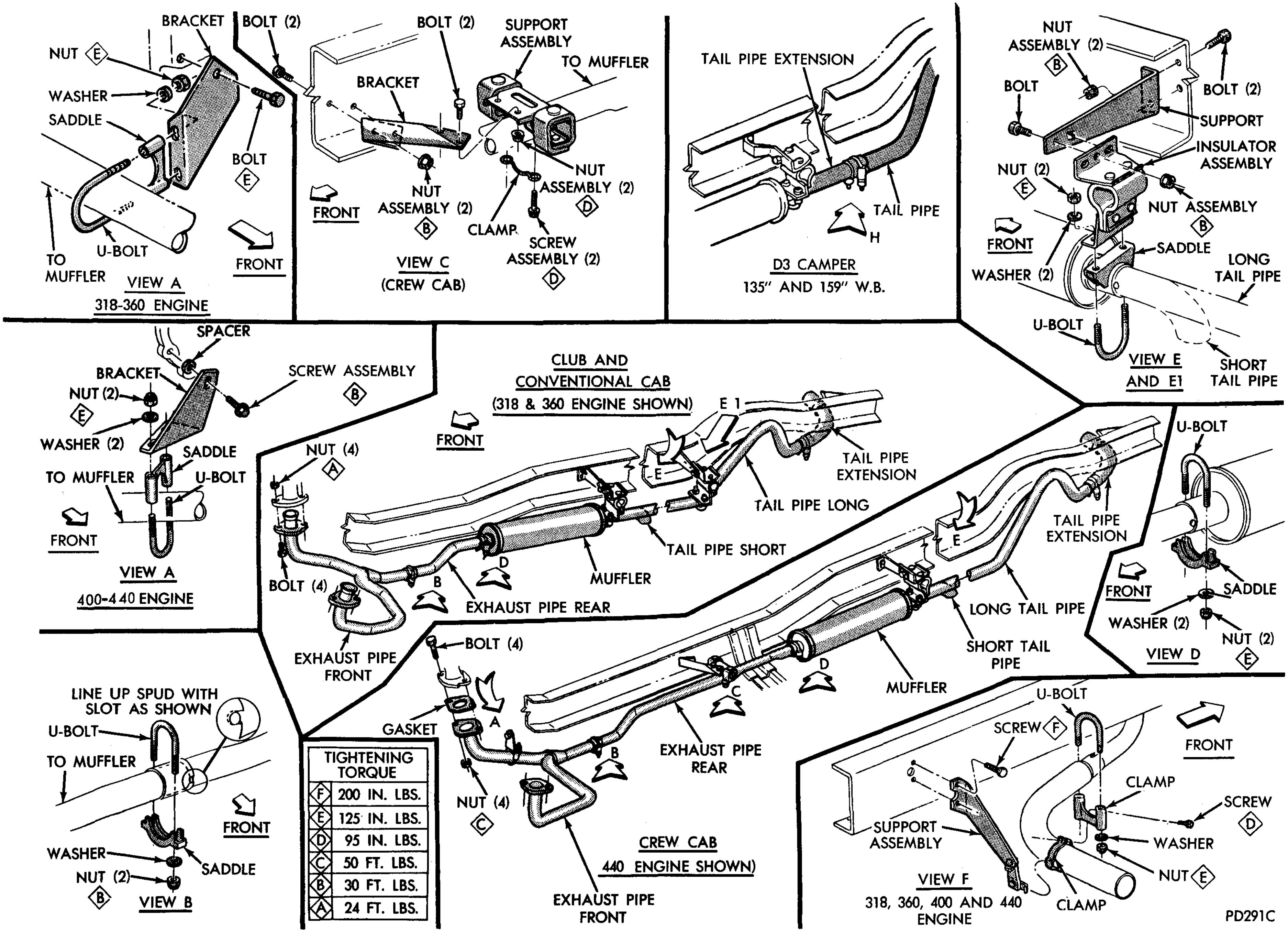


Fig. 12—Proper Manifold Heat Control Valve Installation (400 and 440 Cubic Inch Engines)



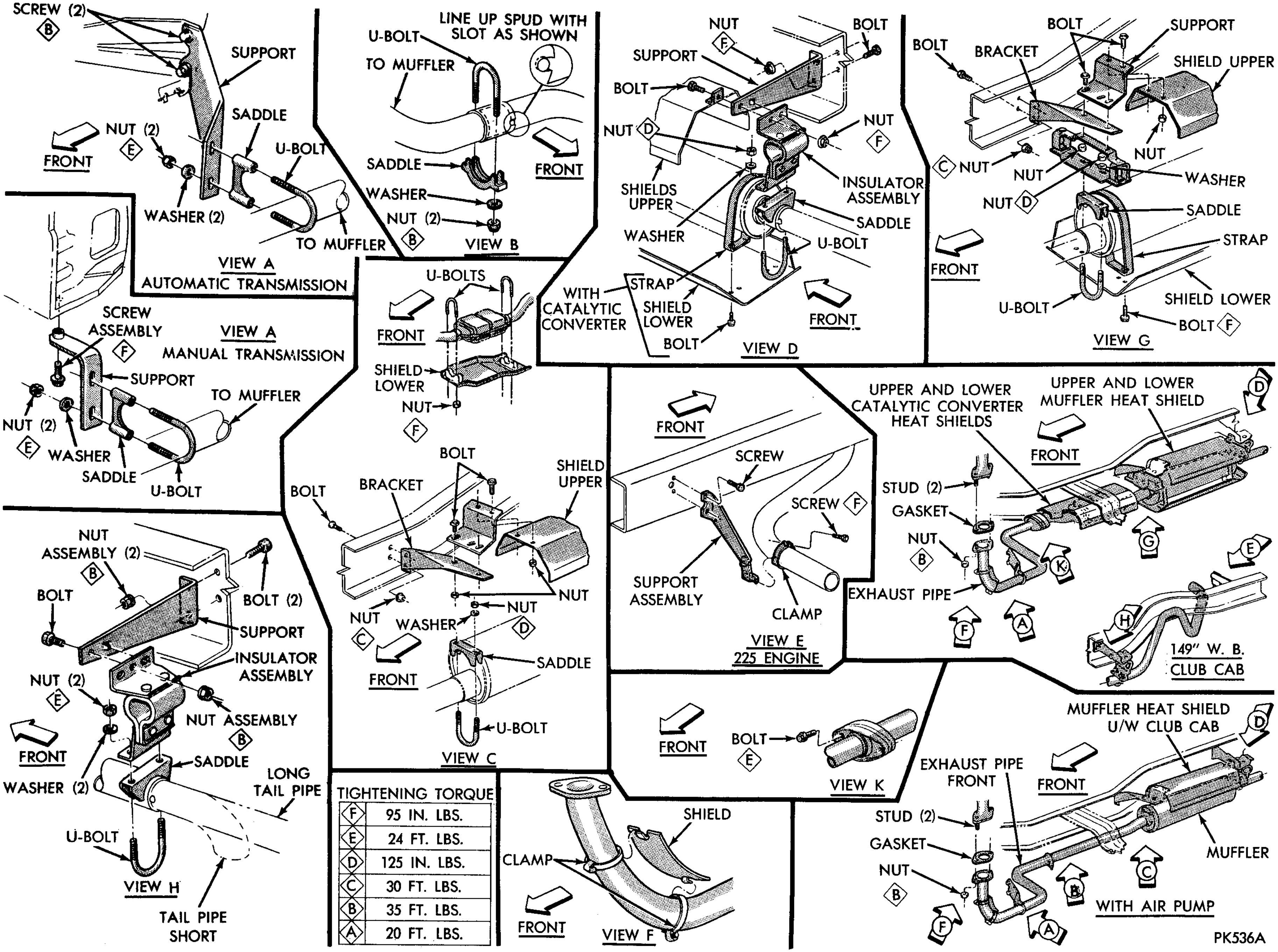
TIGHTENING TORQUE	
F	200 IN. LBS.
E	125 IN. LBS.
D	95 IN. LBS.
C	35 FT. LBS.
B	30 FT. LBS.
A	20 FT. LBS.

Fig. 13—W and D 100, 200, 300 Exhaust System (225 Cubic Inch Engine)



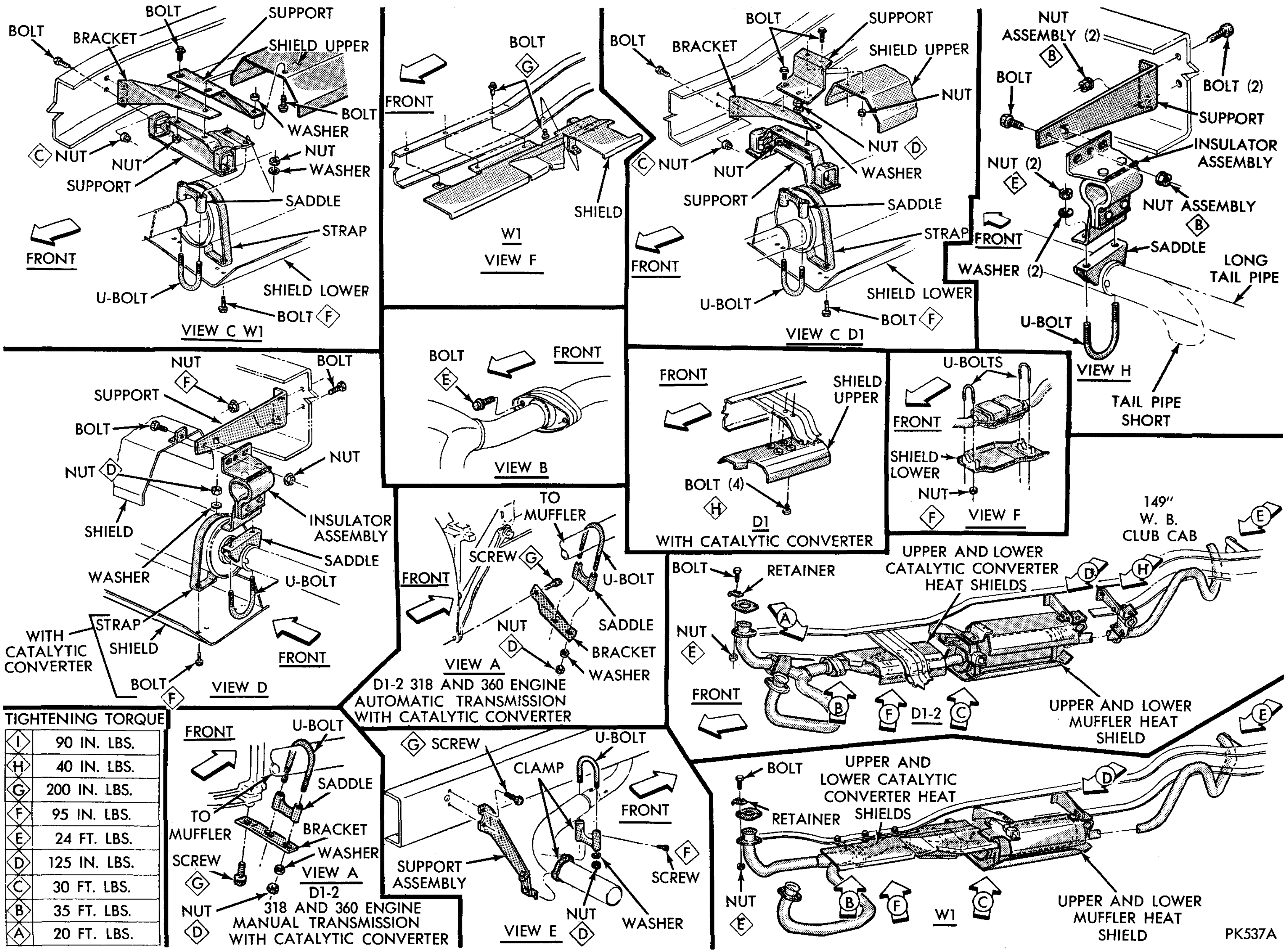
TIGHTENING TORQUE	
Ⓕ	200 IN. LBS.
Ⓔ	125 IN. LBS.
Ⓓ	95 IN. LBS.
Ⓒ	50 FT. LBS.
Ⓑ	30 FT. LBS.
Ⓐ	24 FT. LBS.

Fig. 14—W and D100, 200, 300 Exhaust System (318, 360, 400 and 440 Cubic Inch Engines)



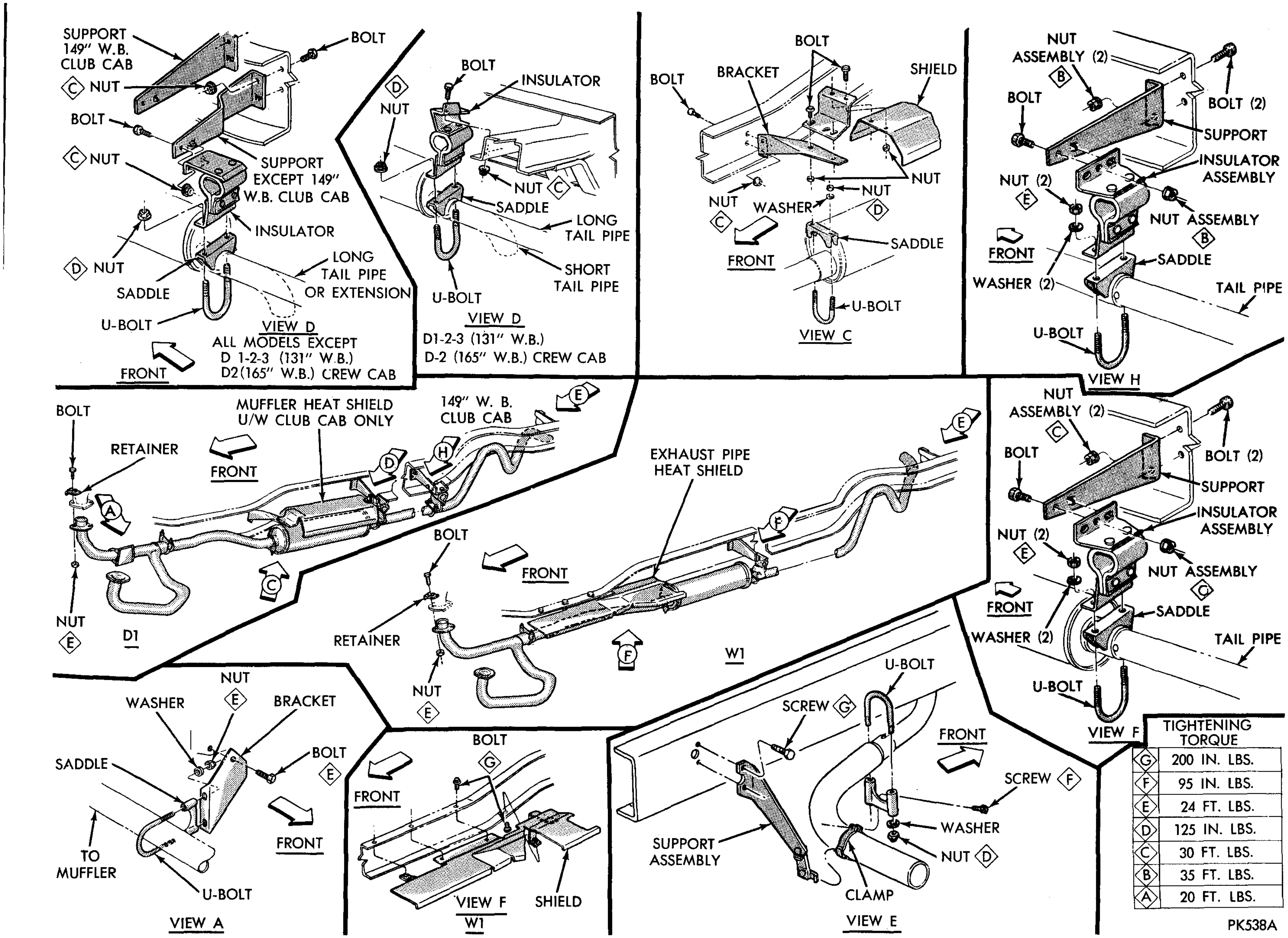
TIGHTENING TORQUE	
F	95 IN. LBS.
E	24 FT. LBS.
D	125 IN. LBS.
C	30 FT. LBS.
B	35 FT. LBS.
A	20 FT. LBS.

Fig. 15—D100 and W100 With Catalytic Converter (225 Cubic Inch Engine)



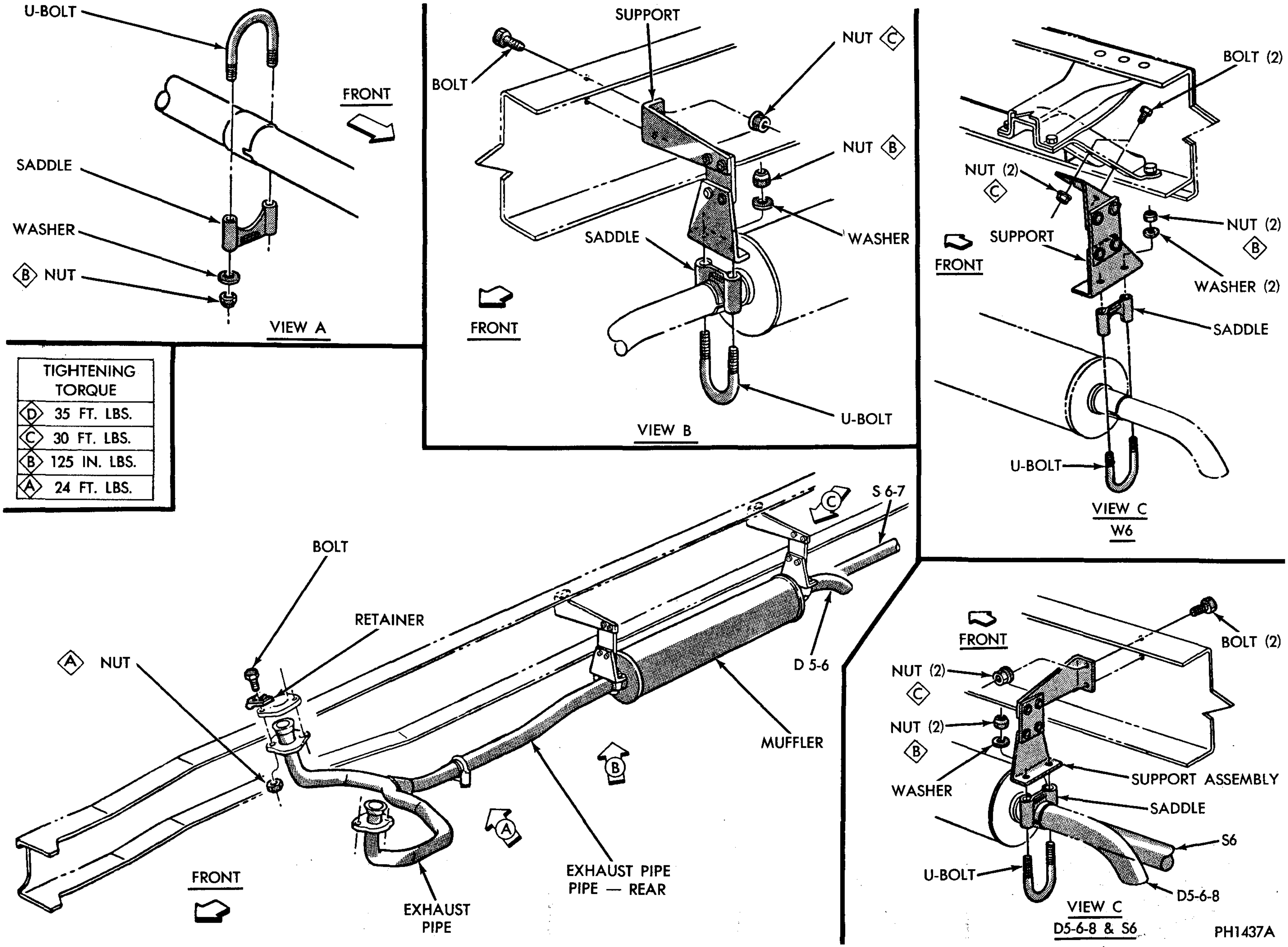
TIGHTENING TORQUE	
I	90 IN. LBS.
H	40 IN. LBS.
G	200 IN. LBS.
F	95 IN. LBS.
E	24 FT. LBS.
D	125 IN. LBS.
C	30 FT. LBS.
B	35 FT. LBS.
A	20 FT. LBS.

Fig. 16—D100, 200 and W100 With Catalytic Converter (318 and 360 Cubic Inch Engine)



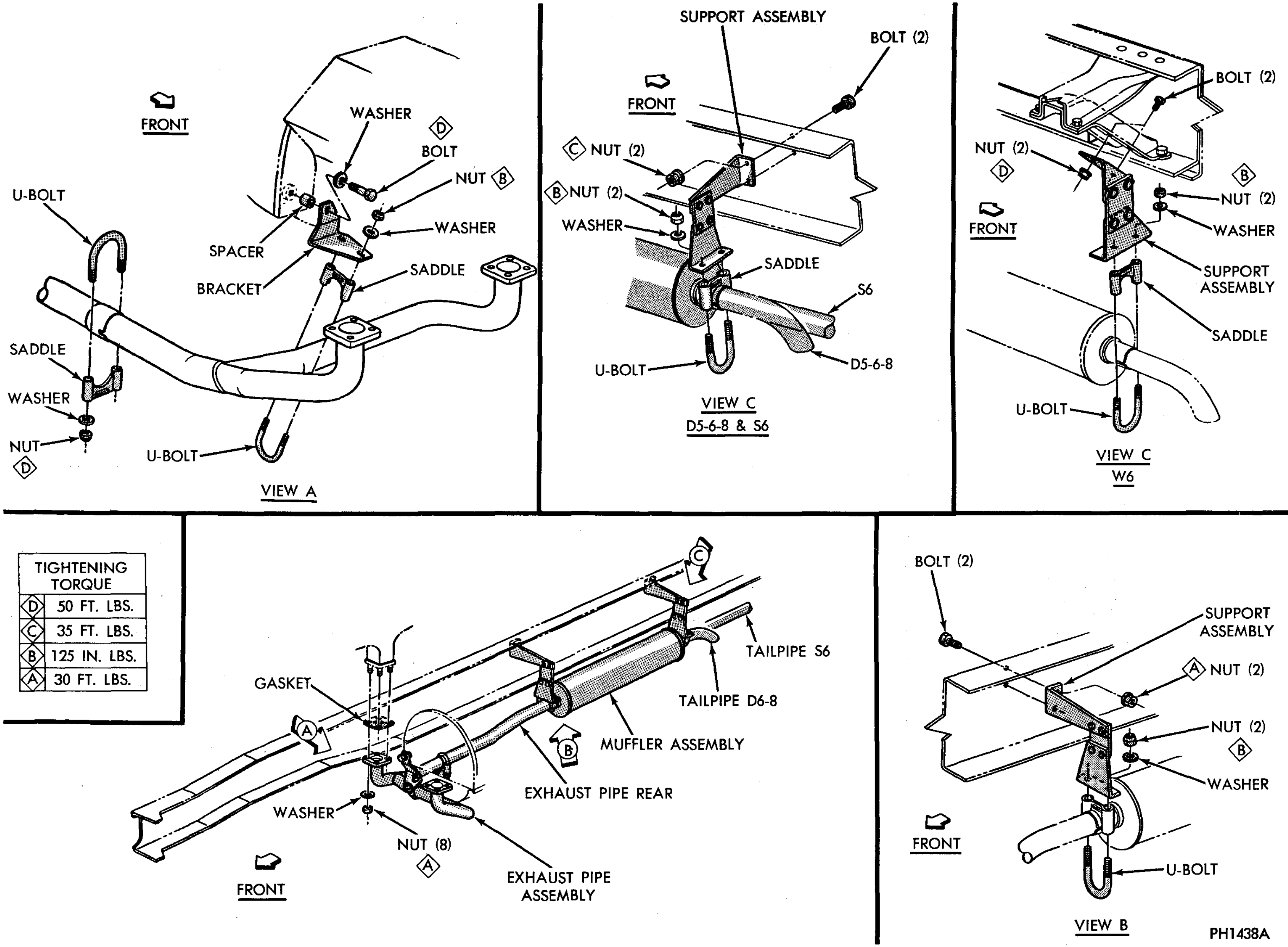
TIGHTENING TORQUE	
G	200 IN. LBS.
F	95 IN. LBS.
E	24 FT. LBS.
D	125 IN. LBS.
C	30 FT. LBS.
B	35 FT. LBS.
A	20 FT. LBS.

Fig. 17—D and W Models With Air Pump (360 Cubic Inch Engine California)



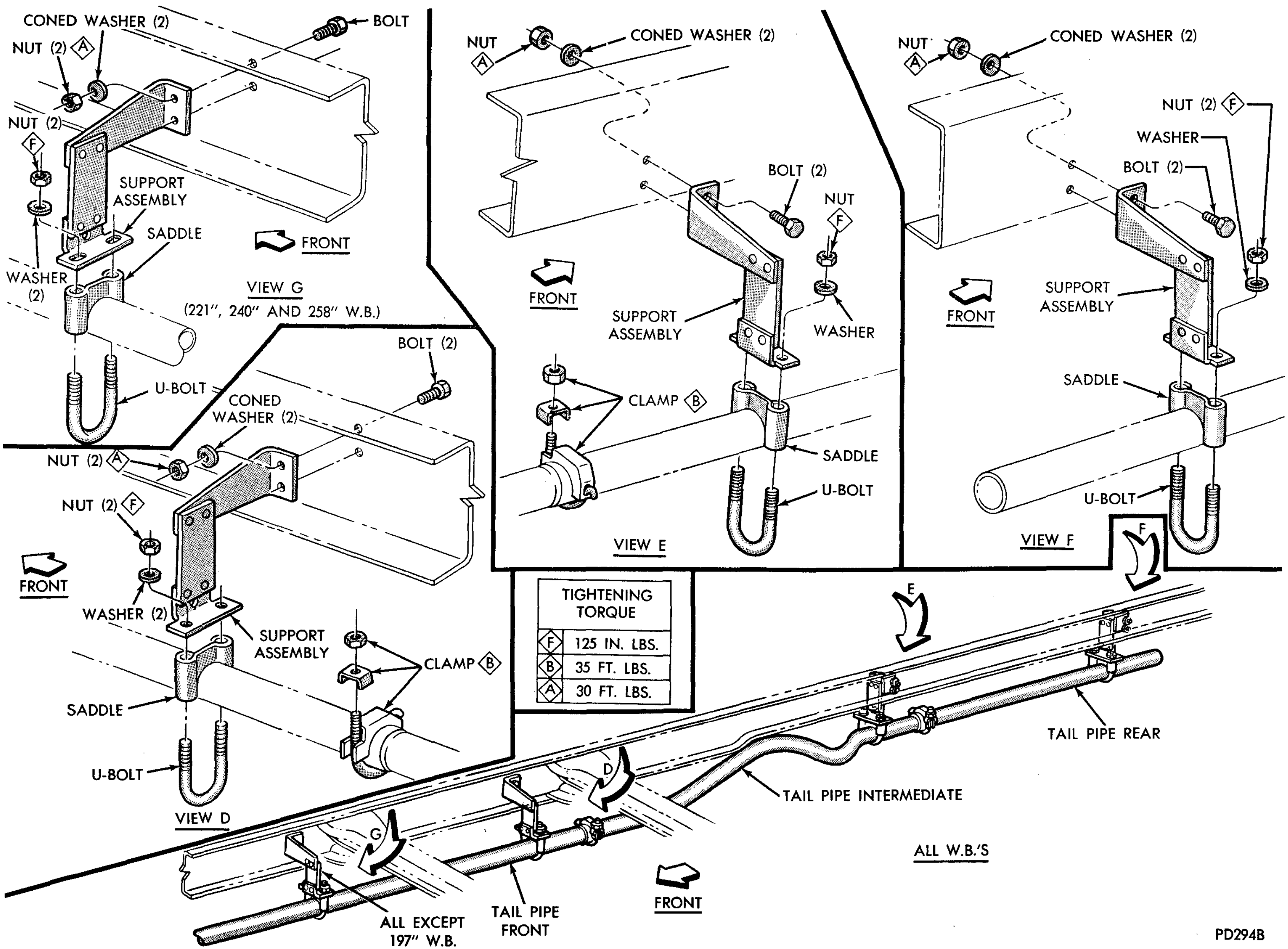
TIGHTENING TORQUE
D 35 FT. LBS.
C 30 FT. LBS.
B 125 IN. LBS.
A 24 FT. LBS.

Fig. 18—D500, 600, S600 and W600 Exhaust System (318 and 360 Cubic Inch Engine)



TIGHTENING TORQUE	
D	50 FT. LBS.
C	35 FT. LBS.
B	125 IN. LBS.
A	30 FT. LBS.

Fig. 19—D600, 700, 800 and S600, 700 Exhaust System (361 and 413 Cubic Inch Engine)



TIGHTENING TORQUE	
F	125 IN. LBS.
B	35 FT. LBS.
A	30 FT. LBS.

Fig. 20—S600, 700 Exhaust System (Tailpipe)

(4) Tighten to specifications, see Figures 13 through 20.

Vehicles Equipped With Catalytic Converters

Unleaded gasolines only must be used in vehicles equipped with catalyst emission control systems. All trucks, so equipped, have labels located on the instrument panel and adjacent to the fuel filler cap that state, "UNLEADED GASOLINE ONLY." These vehicles also have fuel filler tubes specially designed to accept the smaller diameter unleaded gasoline dispensing nozzles only.

Do not use fuel system cleaning agents added to the fuel tank or added to the carburetor for induction into the engine of trucks equipped with catalyst emission control systems. These materials may be detrimental to the catalytic converter.

TIGHTENING REFERENCE

	FOOT-POUNDS					
	225	318	360	361	400-440	413
Air Heater To Exhaust Manifold Screws	200 (in-lbs)	25	35	95 (in-lbs)	95 (in-lbs)	95 (in-lbs)
Exhaust Pipe to Manifold Nuts	35	24	24	50	24	50
Exhaust Manifold To Cylinder Head Nuts	120 (in-lbs)	25	25	30	30	30
Intake Manifold to Cylinder Head Screws/Nuts	120 (in-lbs)	35	35	40	40	40
Intake To Exhaust Manifold Screws—Outboard	200 (in-lbs)	—	—	—	—	—
Intake to Exhaust Manifold Nut—Inboard	240 (in-lbs)	—	—	—	—	—

SPECIFICATIONS

SIX CYLINDER ENGINES

Truck Model Designation Engine	W100, W200, W300 225-1 Cu. In.	D100, D200, D300 225-1 Cu. In.
Muffler Type	Two Passage	Two Passage
Material	Aluminized	Aluminized
Length (inches)	26	26
Diameter (inches)	5	5
Exhaust Pipe - Diameter (inches)	2.00	2.00
Tail Pipe - Diameter (inches)	1.75	1.75
Manifold Heat Control	Thermostatic	Thermostatic

EIGHT CYLINDER ENGINES

Truck Model Designation Engine	D100, D200, D300 W100, W200, W300 318-1, 360, 400, 440	S600 D500, D600, W600 318-3	D700, S700 D600†, D800, S600† 361-413
Muffler Type	Tri-Flo—318-1, 360, 440	Tri-Flo	Off Set with mixing chamber
Material	Aluminized Steel	C. R. Steel	Aluminized Steel
Length (inches)	26	26	30
Diameter (inches)	6-1/2	6-1/2	7
Exhaust Pipe Diameter (inches)	Front 1.88-318, 360 2.50, 400, 440	Front 1.88	Front 2.50
	Rear 2.25-All Except 400, 440	Rear 2.25	Rear 2.50
Tail Pipe Diameter (inches)	2.50-400, 440 2.25	2.00	2.50
Manifold Heat Control	Thermostatic	Water Heated Intake Manifold	Water Heated Intake Manifold

†413 Engine not available.

FRAME STRUCTURES

CONTENTS

	Page		Page
GENERAL INFORMATION	1	SPECIFICATIONS	8
INSPECTION PROCEDURES	3	TIGHTENING REFERENCE	9
SERVICE PROCEDURES	4		

GENERAL INFORMATION

The main function of the truck frame is to provide support for all chassis components, body mounting and to carry the payload while keeping deflections at a tolerable level.

The frame is a complex structural mechanism which reacts to applied loads and road inputs by bending and twisting. The main bending members are the siderails. Resistance to frame twist is provided by crossmembers which are rigidly attached to the siderails with either rivets or bolts to form the so-called "ladder type" frame (Fig. 1).

Frame Siderail Material

Carbon steel with a minimum yield strength of 32000 psi is used to fabricate the light and the medium duty truck frame siderails.

Since the yield strength for the same steel can vary considerably it has been Dodge's practice to specify the minimum yield strength. Thus the 32000 psi minimum frame has in reality a range of 32000 to 44000 psi with a typical average value of 38000 psi.

Low alloy—High Strength Steel siderails are used on medium duty trucks for more severe service. This steel has a minimum yield strength of 50000 psi.

For most severe applications, the high strength steel frame siderails with an L-shaped reinforcement of the same steel is used.

This type of steel can be identified by a triangular hole located in the web of the siderails and placed 3" behind the front axle.

Frame Load-Carrying Capacity

Since by far the most important factor of frame action is its flexing, it is customary to compare the frames by their "Resisting Bending Moment" (R.B.M.), term denoting the maximum bending the siderails can safely withstand.

The resisting bending moment can be used for quick comparison of frames having different rail configuration and materials.

The Resisting Bending Moment consists of two terms: Section Modulus and Material Yield Strength.

(Section Modulus x Yield Strength = R.B.M.)

The greater the section modulus and the higher the yield strength, the stronger the siderails.

The term Section Modulus pertains to the cross-section of the siderail and is determined by rail depth, flange width and material thickness.

Yield strength is a measurement in psi of stress at which a material exhibits a specified permanent deformation.

Light Duty Trucks

Light Duty truck frames are of a ladder type, drop center section channel siderail and crossmembers. Crossmembers are riveted or bolted to the frame. Body support and suspension mounting brackets are riveted to siderails. (See Figs. 1 thru 4 illustrations for inch dimensions.)

D100-300 frames are designed to accommodate independent front suspension with the suspension crossmember as a part of the frame assembly as are engine front mounting brackets which are welded to the suspension crossmember and riveted to the siderail.

W100-300 (four-wheel drive vehicles) frames are basically the same, except front suspension crossmember is replaced with a smaller engine support crossmember. Engine brackets are riveted to frame assembly.

Medium Duty Trucks

Medium duty truck frames are of a ladder type, straight top of siderail, with riveted or bolted crossmembers. Body and engine support brackets as well as rear suspension support brackets are bolted to the siderails. Frame reinforcements are used for heavy duty applications and are standard on W600—four-wheel drive vehicle. (See Fig. 5 illustration for inch dimensions.)

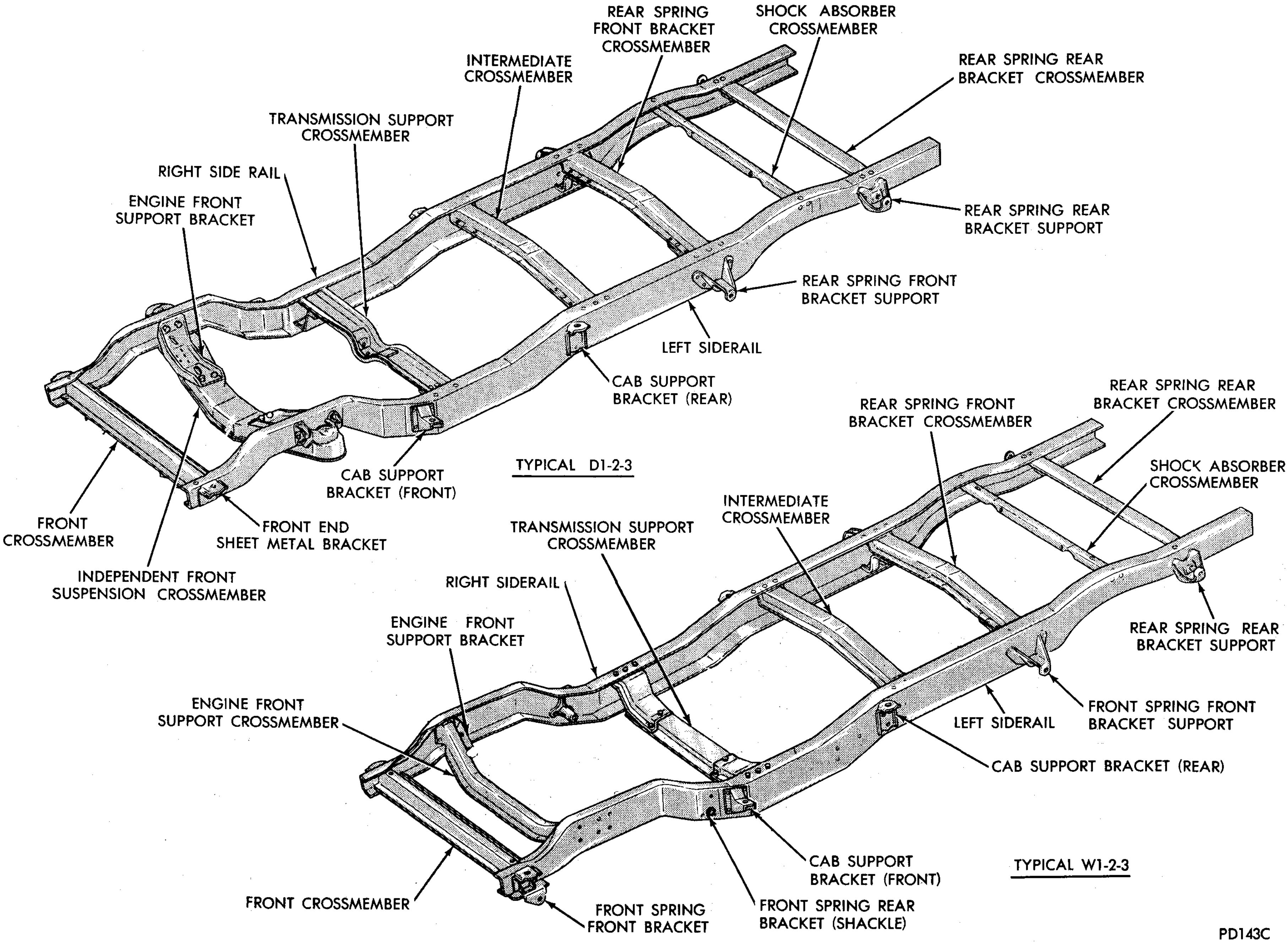


Fig. 1—Frame Structures (Typical) D and W Models, 100 thru 300

INSPECTION PROCEDURES

INDEX

	Page		Page
Dimensions	3	Inspection	3
General Information	3	Measurements	4

GENERAL INFORMATION

Improper frame alignment is usually a result of an accident or vehicle being operated with excessive loads or with loads not positioned in a reasonably distributed manner.

A distorted frame will affect front wheel or rear axle alignment and cause excessive tire wear, mechanical failures in power train, window glass cracks and door opening problems. Vehicle performance, handling and ride quality can be impaired.

INSPECTION

Before proceeding with frame alignment checks, inspect all frame parts for visible damage such as cracks, twist, bend or other excessive deformations. Also, riveted, bolted or welded connections, looseness or missing parts.

All damaged areas must be repaired or parts replaced as necessary.

Horizontal or Diagonal

Determine frame deviation from being square by the following procedure:

(1) Select several points along one siderail, preferably at crossmember locations.

(2) Transfer these with a plumb bob to floor, paper sheets can be fastened to floor at these points for better accuracy.

(3) Locate corresponding points on other siderail and transfer them in the same manner to the floor.

(4) Move truck away and measure between all points diagonally and parallel to siderails, corresponding measurements should not differ by more than 1/4 inch.

(5) Take measurement across at front and rear marks and by dividing distances in half, indicate the two points on floor.

(6) Stretch a chalk-line between points 1 and 2 in Fig. 2 and snap string.

(7) Check to see how close centerline is to diagonal intersection points A, B, C, D, E and F in Fig. 2.

(8) Markings on floor will now give an indication of frame distortion in plain view.

(9) Any point on one siderail should be within 1/8 inch ahead or behind corresponding point on opposite side.

(10) Frame bow sideways should not exceed 1/8 inch per 100 inch length of frame.

(11) Overall width of frame should not vary more than 1/8 inch.

(12) Repeat steps (1) through (11) after straightening frame.

Vertical or Sideview

Determine twist of frame and degree of siderails not being parallel to one another as follows:

Vertical dimensions are measured from a level floor to corresponding points on left and right siderails. Dimensions should then be plotted to scale vertical and horizontal on a sheet of paper and points connected for each sidemember separately. Graph will show the relative position of the sidemembers.

Points on siderail or for horizontal check are selected at rear frame crossmembers and any one of these points on one sidemember should be maximum

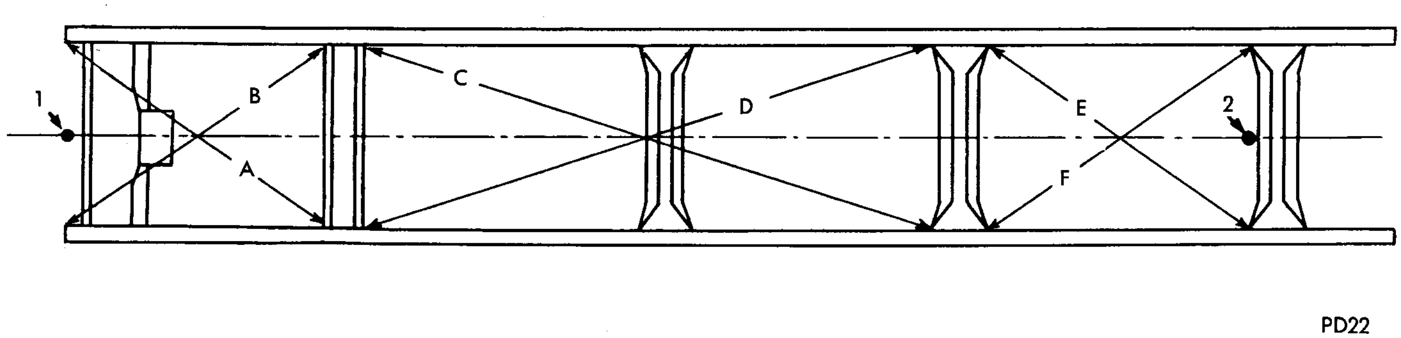


Fig. 2—Alignment Marking

1/8 inch above or below corresponding point on other siderail.

MEASUREMENTS

Obtain measurements for frame alignment checks with the body on truck. Figures 3, 4, and 5 as identified, indicate dimensions in chosen areas to determine frame alignment. The procedures are recommended as follows:

(1) Place truck on level floor.

(2) If vehicle is loaded, make sure payload does not exceed specified limit and the load is distributed as evenly as possible. For better accuracy of measurements, all payload should be removed.

(3) Check tires for recommended air pressure and adjust as necessary.

SERVICE PROCEDURES

INDEX

	Page
General Information	4
Repairing	4

GENERAL INFORMATION

Frames which are bent or twisted can be straightened, if necessary by heat application. The temperature is to be kept under 1050F. (a dull red glow) as excessive heat will impair the strength of the material, resulting in a weakened frame.

This heat method is permissible on Light and Medium duty frames only. Never use heat on Heavy Duty heat treated siderails with a yield strength of 110,000 psi. Damaged frame rails, crossmembers and brackets can be repaired by straightening or replaced.

Welded connections between rails and crossmembers are not recommended.

Straightening

Straightening should be limited to parts not severely damaged. New bolts or rivets for attaching the parts should be of same specifications as original bolts or rivets.

Replacement

Replacement is recommended as the original shape of the part may not be easily recognizable. Also, improperly straightened frame components will have harmful effects on alignment.

REPAIRING

Drilling

No holes should be drilled in siderail flanges as this will reduce frame strength. Holes drilled in siderail vertical web must be 1-1/2 inches minimum from top and bottom flanges.

New holes should be located a distance away from existing holes, as not to reduce cross section of siderails in any one vertical section by more than 30%.

Welding

Welding of siderails and crossmembers should be done preferably with electric welding equipment as it retains heat in a small area limiting the change of hardness of metal.

Never weld Heavy Duty heat treated frame siderails with a yield strength of 110,000 psi.

A damaged frame member is to be closely inspected for cracks. It is possible that cracks will appear as a result of straightening of a member. In either case, crack or cracks are to be repaired as follows:

(1) Stop-drill at the end point of the crack with 1/8 inch drill.

(2) V-groove crack to allow good weld penetration.

(3) Weld up the crack.

(4) Grind surface smooth if reinforcement is to be used.

Use of Fasteners

Bolts or rivets can be used in repairing frames or adding reinforcement. When it is more practical to substitute a bolt for a rivet, use next larger size bolt to prevent bolt from working loose. Ream holes if necessary.

Coned washers are preferred to split lock type. Generally Grade 5 bolts will suffice in the repair work. Grade 3 bolts should be avoided. Proper torque is mandatory to provide adequate locking and preclude loosing of fasteners. Refer to the following torque chart.

Reinforcing

Reinforcement can be made from channel, angle or flat stock of a common carbon steel and approximately equal in thickness to the part to be repaired. It is not possible to recommend proper reinforcement for all possible repairs. A reinforcement should provide an adequate section in cracked area and have sufficient overlap with the original part and be properly attached.

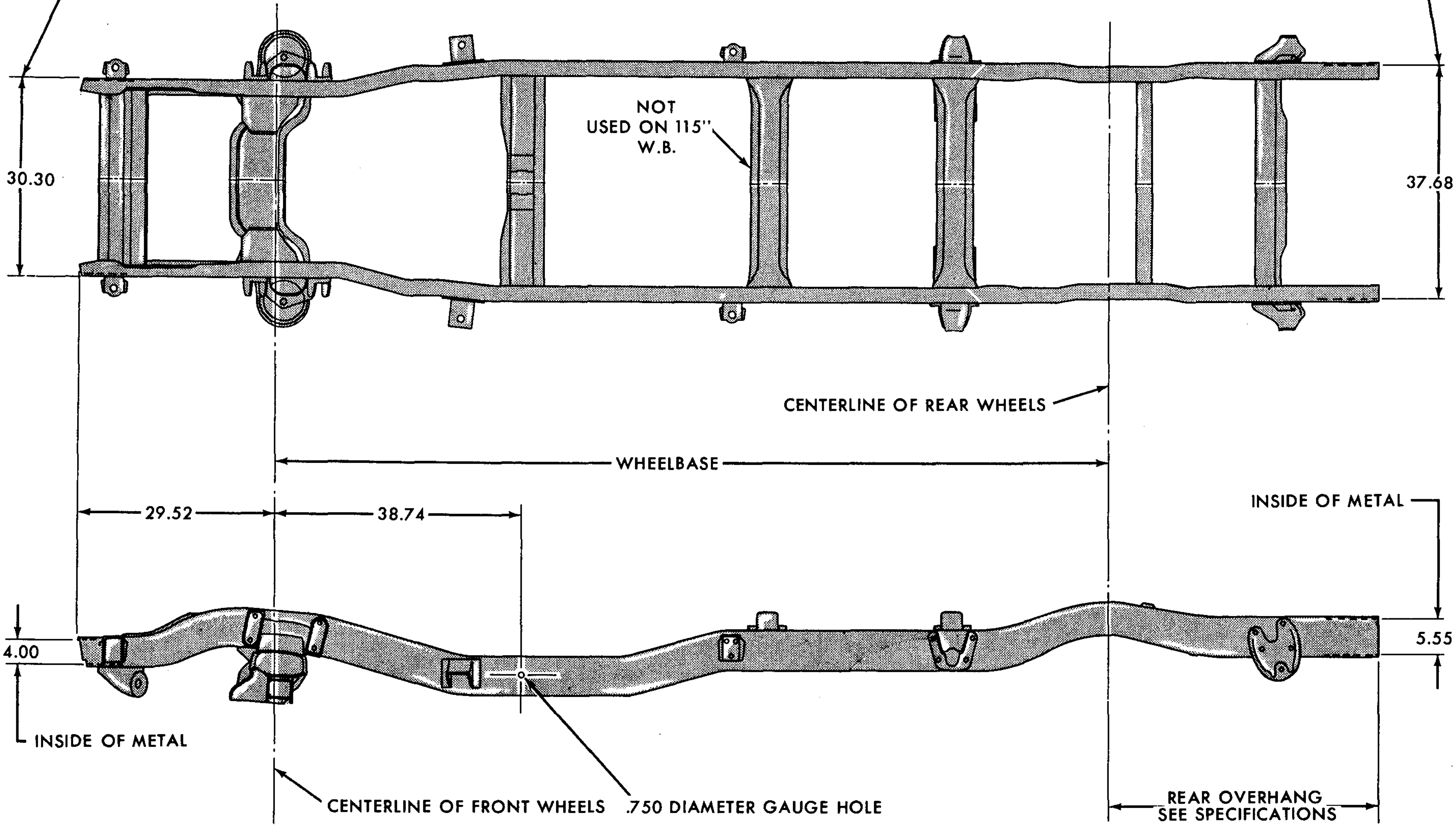


Fig. 3—Frame Dimensions—D100, D200, D300

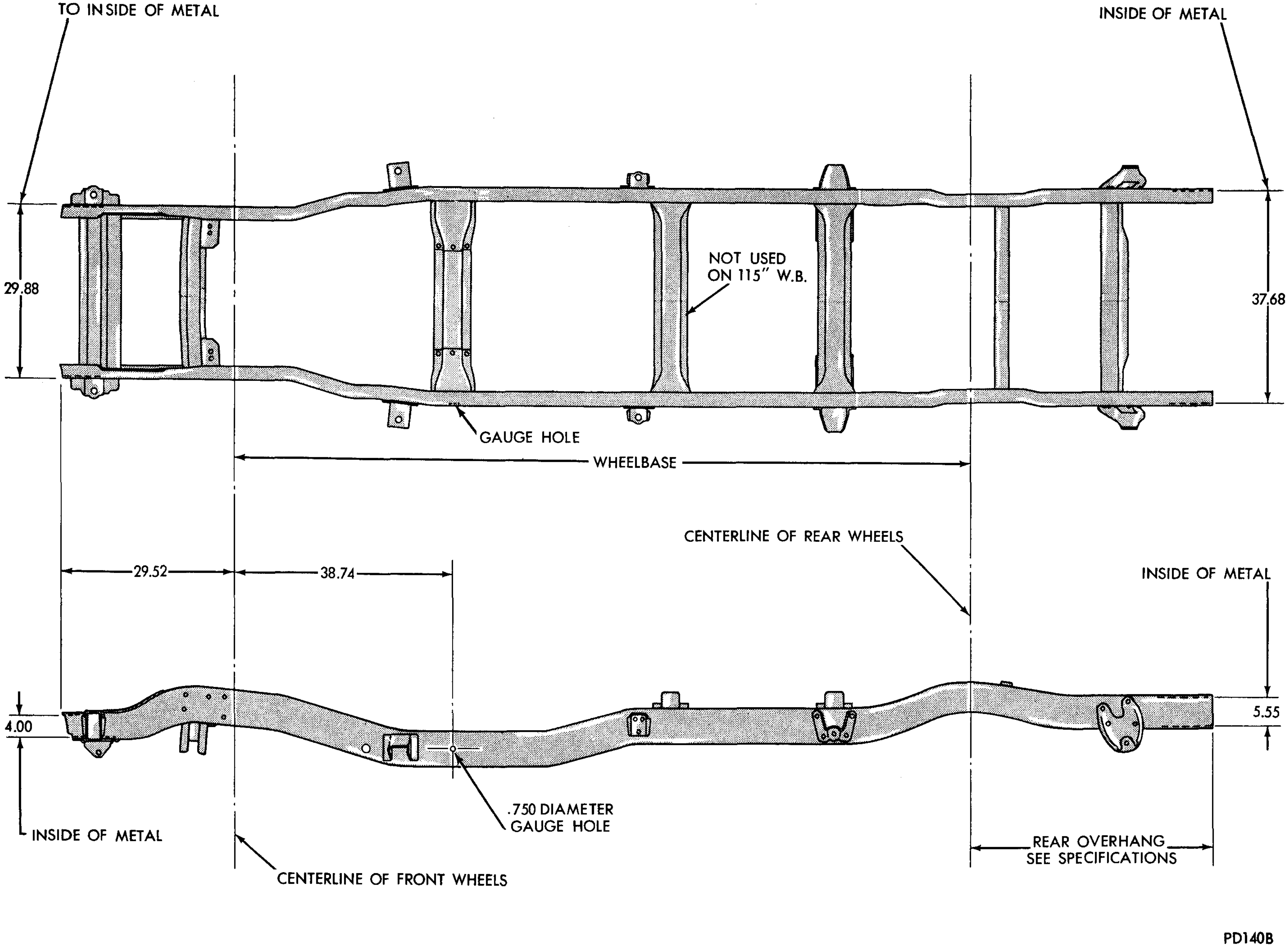


Fig. 4—Frame Dimensions—W100, W200, W300

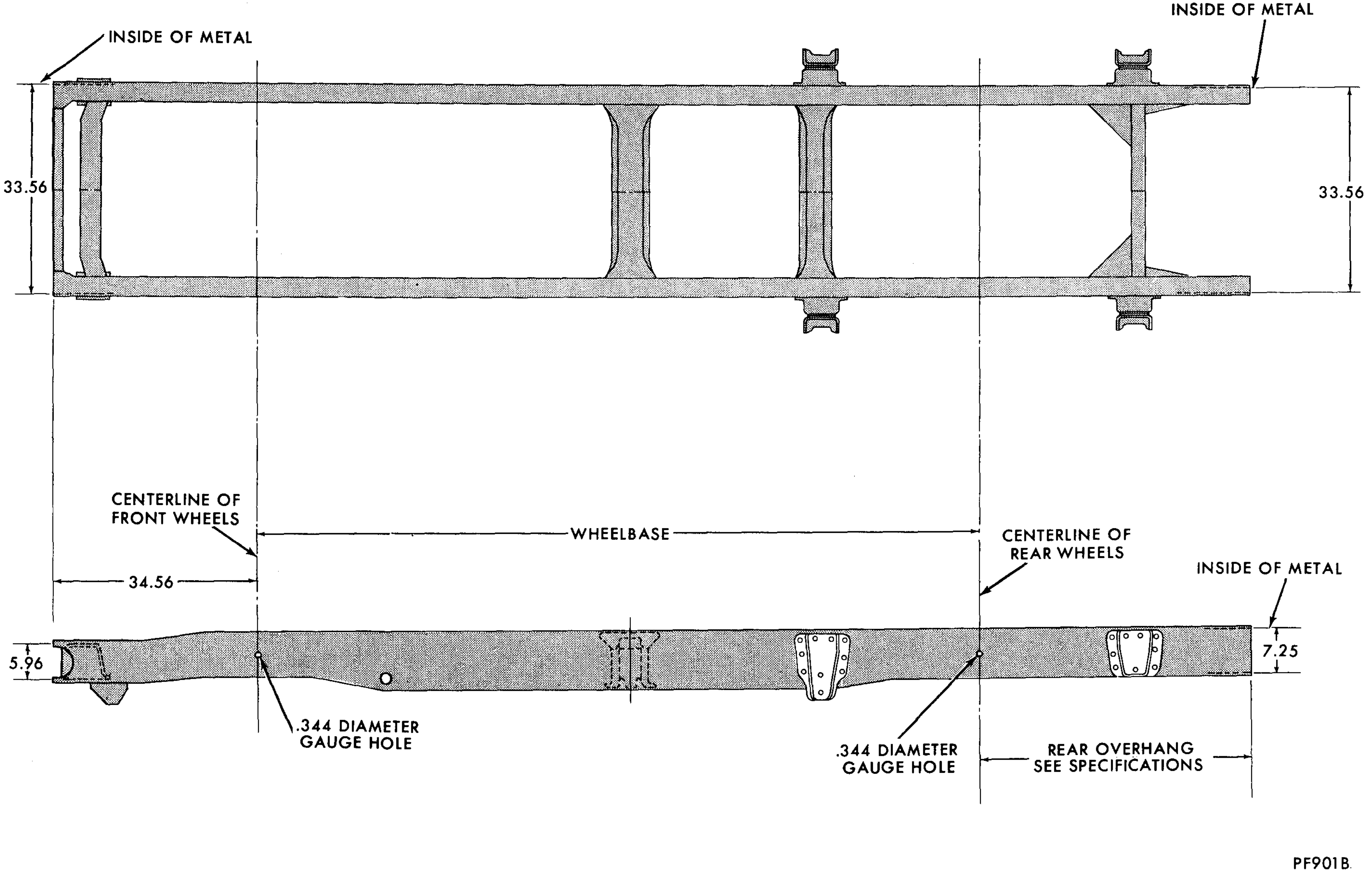


Fig. 5—Frame Dimensions—D500, D600, D700, D800, S600, S700

Reinforcing channel should have flanges shorter than sidemember flanges to preclude welding along edge of rail flange. Otherwise, longitudinal welds are quite acceptable. Complete transverse welds are to be avoided.

SPECIFICATIONS

Values of the section modulus, yield strength and R.B.M. are shown for each siderail in the following tables.

LIGHT DUTY MODELS

Model	Wheel Base	Depth	Siderail Section Flange	Siderail Section Gage	Section Modulus	R.B.M.*	Rear Overhang
Conventional Cab							
D1	115	6.06	2.27	.156	2.86	91520	38.25
D1	131	6.06	2.27	.156	2.86	91520	42.25
D2	131	6.17	2.32	.210	3.88	124160	42.25
**	131	7.20	2.73	.194	5.02	160640	42.25
D3	135	7.20	2.73	.194	5.02	160640	42.25
D3	159	7.31	2.79	.250	6.56	160640	48.25
W1	115	6.12	2.30	.188	3.43	109760	38.25
W1-2	131	6.17	2.32	.210	3.88	124160	42.25
W3	125	7.20	2.73	.194	5.02	160640	48.25
CLUB CAB							
D1	133	7.16	2.72	.176	4.57	146240	38.25
D1-2	149	7.20	2.73	.194	5.02	160640	42.25
D3	149	7.23	2.75	.210	5.47	175040	42.25
W1	133	7.18	2.72	.188	4.75	152000	38.25
W1-2	149	7.23	2.75	.210	5.47	175040	42.25
CREW CAB							
D2	149	7.20	2.73	.194	5.02	160640	38.25
D2-3	165	7.31	2.79	.250	6.56	209920	42.25
W2	149	7.20	2.73	.194	5.02	160640	38.25

*Resisting Bending Moment based on 32000 psi minimum yield strength of siderail steel.
**D2, D3 Heavy Duty

MEDIUM DUTY MODELS

Model	Equipment	Wheelbase 135	145	157	175	181	197	211	221	240	258
D500	Std	A	—	A	A	—	—	—	—	—	—
	Ex	C,E	—	C,E	C,E	—	—	—	—	—	—
D600	Std	A	A	A	A	A	C	C	C	—	—
	Ex	C,E	C,E	C,E	C,E	C,E	E	E	E	—	—
D700	Std	A	A	A	A	A	C	C	C	—	—
	Ex	C,E	C,E	C,E	C,E	C,E	E	E	E	—	—
D800	Std	C	C	C	C	C	C	C	—	—	—
	Ex	E	E	E	E	E	E	E	—	—	—
S600	Std	—	—	C	C	—	C	—	C	C	C
S700	Std	—	—	—	—	—	—	—	—	C	C
W600	Std	—	—	E	E	—	—	—	—	—	—

A—9:31 x 3.00 x .250, Section Modulus 9.67 in.; steel: 32000 psi minimum yield, RBM = 309440 in-lbs.
C—9.31 x 3.00 x .200, Section Modulus 9.67 in.; Steel: 50000 psi minimum yield, RMB = 483500 in-lbs.
E—Same as C plus L-shaped reinforcement 10.5 x 1.88 x .210 of 50000 psi steel; Section Modulus 14.50 in., RBM = 725000 in-lbs.
Std—Standard
Ex —Extra Equipment

TIGHTENING REFERENCE

Bolt Size	(Torque in Ft.-Lbs.) Grade 5	Grade 8
3/8 x 16	20-40	30-50
3/8 x 24	25-45	30-60
7/16 x 14	35-65	50-80
7/16 x 20	40-70	60-90
1/2 x 13	55-95	80-120
1/2 x 20	65-105	85-135
9/16 x 12	80-130	110-160
9/16 x 18	90-140	125-175

FUEL SYSTEM

CONTENTS

	Page
CARTER CARBURETOR (MODEL BBD)	24
FUEL PUMPS	120
FUEL TANKS	114
GOVERNORS	123
HOLLEY CARBURETOR (MODEL 1945)	9
HOLLEY CARBURETORS (MODEL 2210 AND 2245)	41
HOLLEY CARBURETOR (MODEL 2300G)	62
HOLLEY CARBURETOR (MODEL 4150G)	78
SERVICING THE CARBURETOR	8
SERVICE DIAGNOSIS	3
SPECIFICATIONS	125
THERMO-QUAD® CARBURETOR	99
THROTTLE LINKAGE	125

GENERAL INFORMATION

The Fuel System consists of the fuel tank, fuel pump, fuel filter, carburetor, fuel lines and vacuum lines.

The **Fuel Tank Assembly** consists of the fuel tank, filler tube, a fuel gauge sending unit assembly and a pressure-vacuum filler cap.

Also, to be considered part of the fuel system is the **Evaporation Control System,** which is designed to reduce the emission of fuel vapor into the atmosphere and the **Electric Assist Choke System,** which helps to reduce HC and CO emissions during engine warm up. The description and function of these related systems is detailed in the Emission Control section, Group 25 of this manual.

Fuel Filters

There are three fuel filters in the present fuel system. One is part of the gauge unit assembly located inside the fuel tank on the end of the fuel suction tube. This filter does not normally need servicing, but can be replaced if necessary.

The second filter is a paper element sealed, disposable type unit (Light Duty Cycle) located in the fuel line in the engine compartment. This filter should be replaced every 30,000 miles (48,000 Km).

The third filter is a paper element throwaway type (Heavy Duty Cycle). Under normal operating conditions the filter should be disassembled, the case thoroughly wiped clean and the paper element replaced every 18,000 miles (29,000 Km).

Fuel Usage Statement

Use gasolines having a minimum anti-knock index (Octane Value) of 87 (R+M) / 2, or a gasoline classification number of 2 (See Fig. 1). These designations are comparable to 91 Research Octane Number.

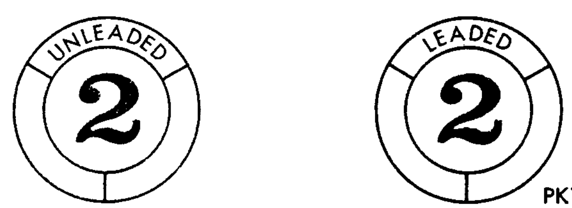
Unleaded gasolines only must be used in vehicles equipped with catalyst emission control systems. All vehicles, so equipped, have labels located on the instrument panel and adjacent to the fuel filler cap that state, "UNLEADED GASOLINE ONLY." These vehicles also have fuel filler tubes specially designed to accept the smaller diameter unleaded gasoline dispensing nozzles only.

HEAVY DUTY CYCLE

Vehicles **not** equipped with catalyst emission control systems were designed to provide optimum efficiency using leaded gasolines having the same minimum anti-knock values shown above. It is recommended that these vehicles be operated on **leaded gasolines only.**

Materials Added to Fuel

Indiscriminate use of fuel systems cleaning agents should be avoided. Many of these materials intended for gum and varnish removal may contain highly active solvents or similar ingredients that can be harmful to gasket and diaphragm materials used in fuel system component parts.



PK149A

Fig. 1—Gasoline Symbol

DRIVEABILITY SYMPTOM DIAGNOSIS

COLD STARTING SYMPTOM

Engine cranks but will not start:

(1) Choke not closing—check binding or interferences hot and cold and with accessories on.

(2) No ignition firing.

(3) Too long delay between key on and start—choke comes off due to electric heat.

Engine fires, runs up, then dies:

(1) Choke vacuum kick setting too wide.

(2) EGR system on at start—check CCEGR valve and timer and solenoid for proper operation—also EGR valve.

(3) Fast idle speed set too low or cam index incorrect.

(4) Vacuum leak.

(5) Inadequate fuel pump output.

(6) Low fuel level in carb—reset floats.

Engine dies on kickdown after start:

(1) Check vacuum kick, cam index, hot fast idle speed mis-set.

Engine fires, runups, then idles slowly with black smoke:

(1) Choke vacuum diaphragm leaks or is not receiving vacuum signal.

(2) Choke vacuum kick setting too tight.

(3) Cam index and/or hot fast idle mis-set too low.

(4) EGR system on during warmup—check CCEGR and timer.

Engine fires, but noes not run up and dies when key is released:

(1) Choke vacuum diaphragm leaks or is not receiving vacuum signal.

(2) Choke linkage binding preventing proper closing or breathing of blade.

(3) Timing mis-set.

COLD ENGINE DRIVEABILITY SYMPTOM

Engine stalls when transmission placed in gear:

(1) Improper choke vacuum kick setting.

(2) Fast idle speed or cam index mis-set.

(3) Ignition timing—vacuum advance—OSAC.

Engine stalls, hesitates or sags during acceleration tip-ins during first mile:

(1) Choke vacuum kick setting.

(2) Choke control switch in high heat at low ambients.

(3) Incorrect float heights—low fuel level.

(4) EGR on during warm-up—defective CCEGR.

(5) Weak or low output carburetor, accelerator pump.

(6) Secondary lockout mis-set—4 bbl. carb.

(7) Defective OSAC—no vacuum advance.

Engine hesitates or sags, stalls after first mile of warmup:

(1) Choke control switch in high heat at lower ambients.

(2) Weak or poor output accelerator pump.

(3) Incorrect float heights—low fuel level.

(4) EGR on during warmup—defective CCEGR (low ambients).

(5) Ignition system—OSAC, vacuum advance, etc.

WARMED UP DRIVEABILITY SYMPTOM

Hesitation sag, stumble: (with slight accelerator pedal movement)

(1) Vacuum leak—hose off or misrouted.

(2) Mis-set timing or defective distributor governor or vacuum advance.

(3) Weak or defective accelerator pump in carburetor-output to only one bore results in backfire on 2- or 4-bbl. carburetor.

(4) Incorrect float height in carb—low fuel level.

(5) Sticking or binding carburetor power valve—(Holley) or metering rod carrier binding or sticking (Carter).

(6) Heated inlet air stuck in either full hot or full cold position, due to binding door hinge or plugged sensor.

(7) Carburetor transfer or idle system plugged or obstructed.

(8) Plugged or restricted OSAC giving little or no vacuum advance.

(9) Binding, bent or defective EGR valve or control system, resulting in excessive EGR rates.

Hesitation, sag, stumble: (with heavy accelerator pedal movement)

(1) Weak or defective accelerator pump.

(2) Major vacuum leak.

(3) Sticking or binding carburetor power valve or step-up rods.

(4) Mis-set basic timing or distributor governor advance faulty.

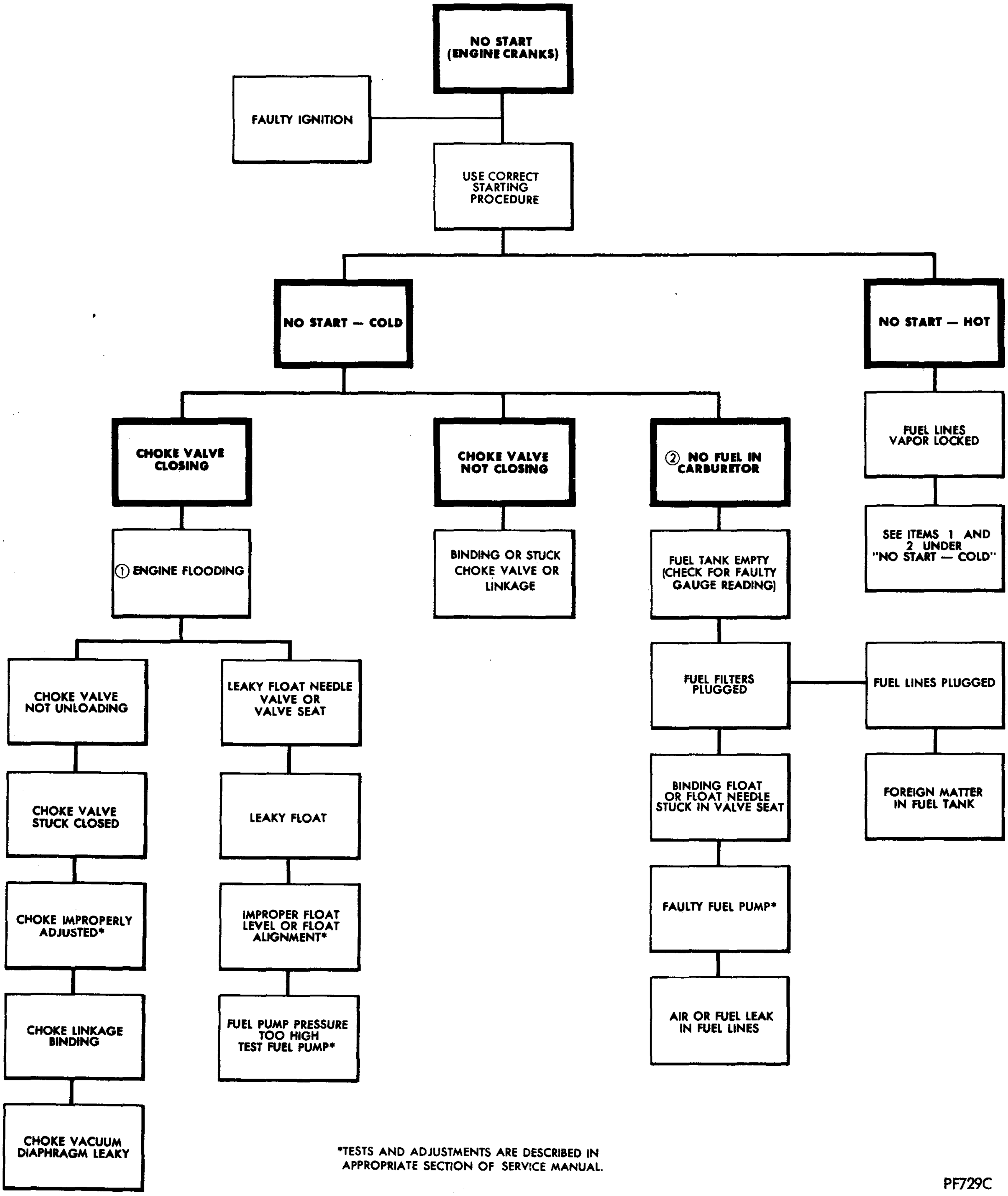
(5) Mis-set carburetor float levels—low fuel.

(6) Faulty fuel pump—obstructed lines or filter.

(7) Binding or bent carburetor float arms—inadequate fuel.

(8) Mis-set air door tension on 4-bbl. carburetors too light causing premature opening.

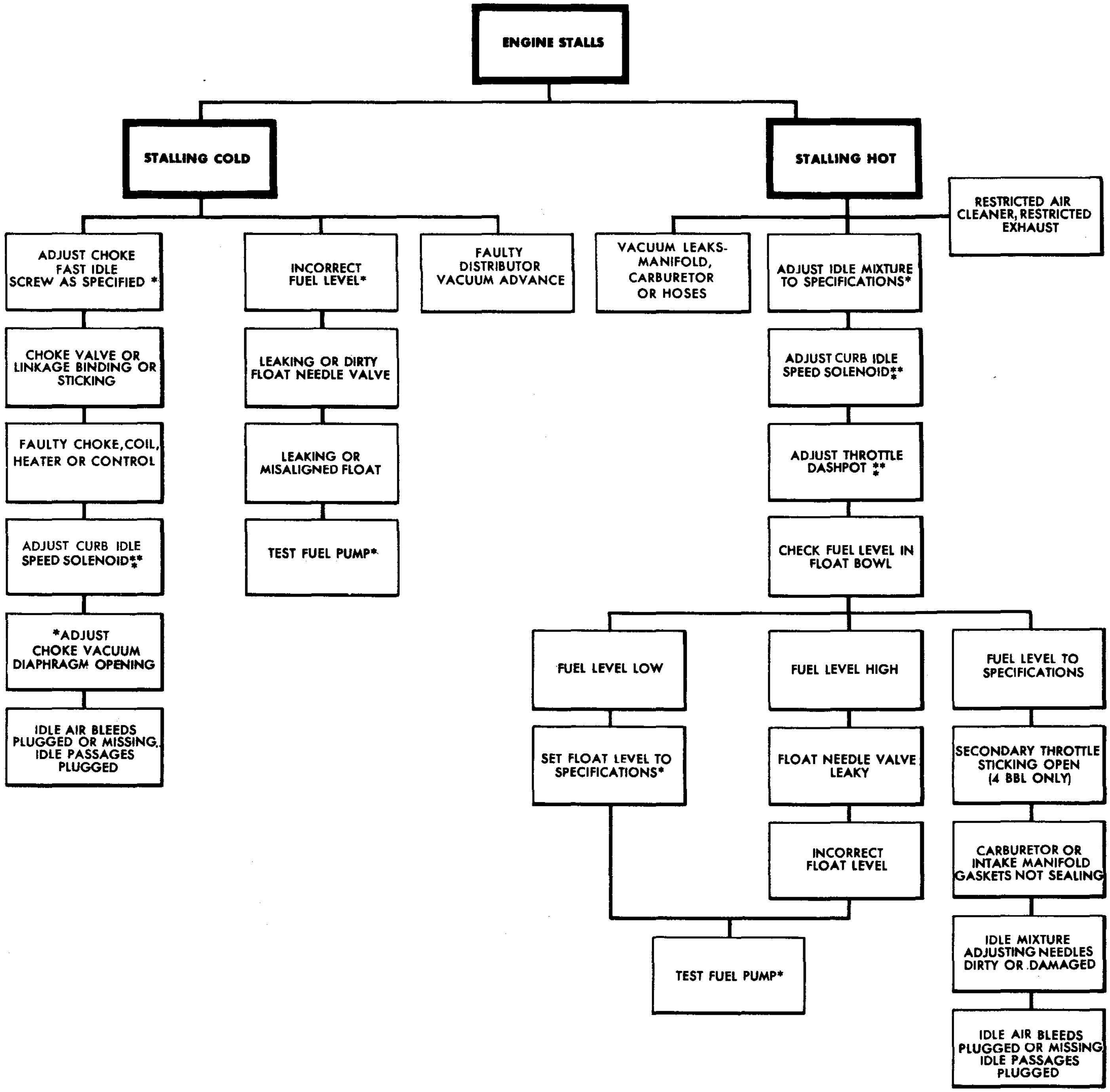
FUEL SYSTEM DIAGNOSIS PART 1



*TESTS AND ADJUSTMENTS ARE DESCRIBED IN APPROPRIATE SECTION OF SERVICE MANUAL.

PF729C

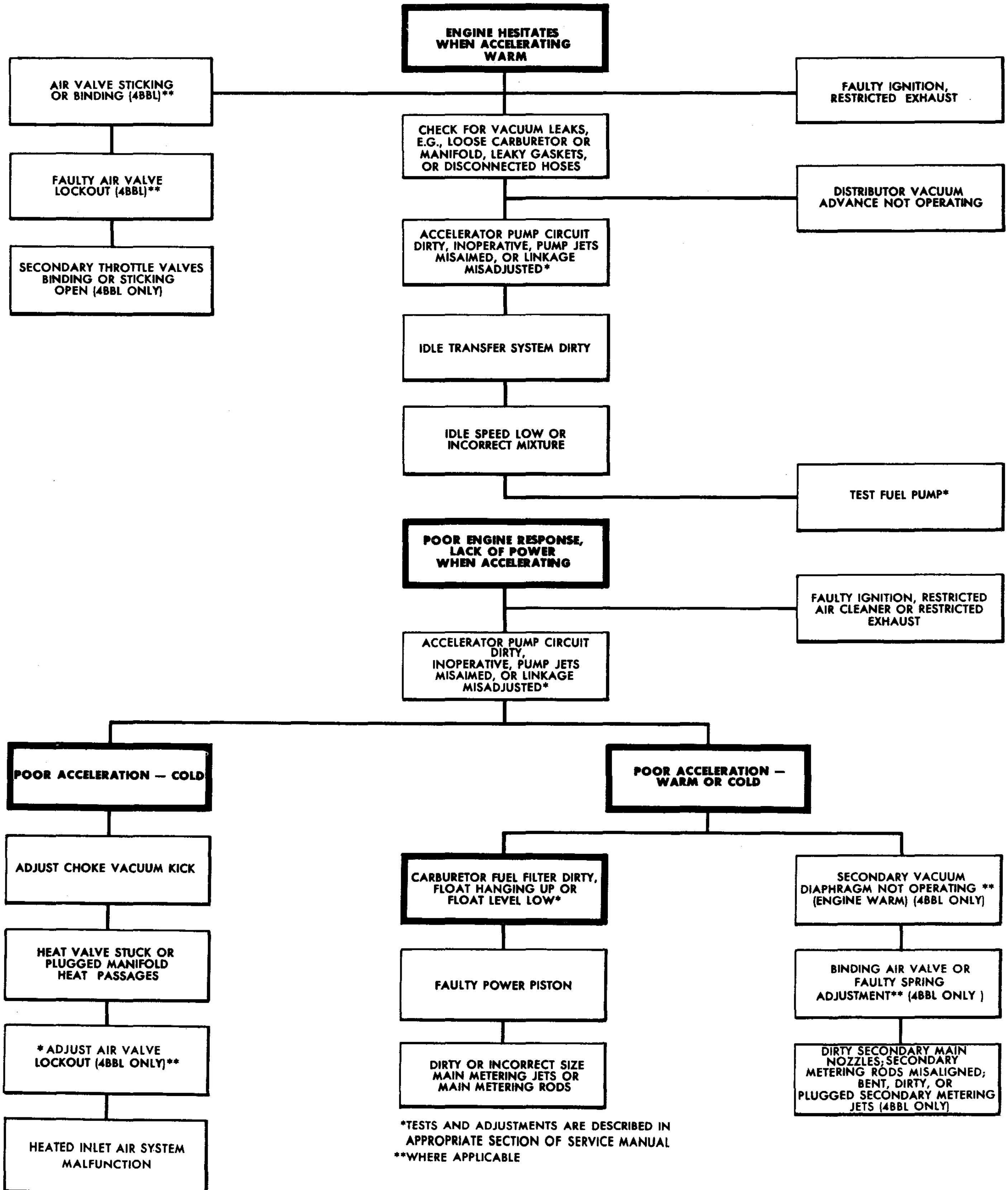
FUEL SYSTEM DIAGNOSIS PART 2



*TESTS AND ADJUSTMENTS ARE DESCRIBED IN APPROPRIATE SECTION OF THE SERVICE MANUAL
**WHERE APPLICABLE

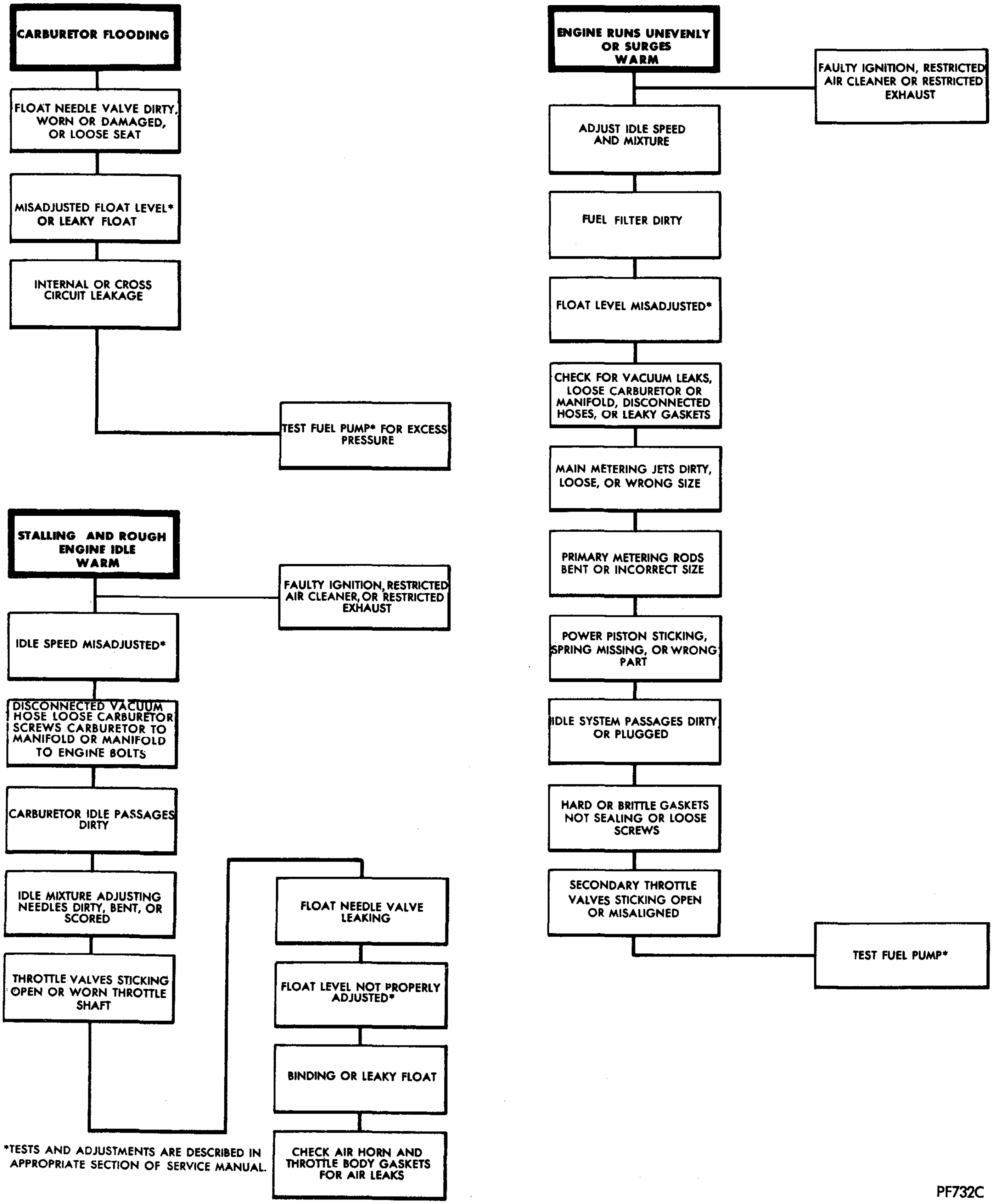
PF730C

FUEL SYSTEM DIAGNOSIS PART 3



PF731C

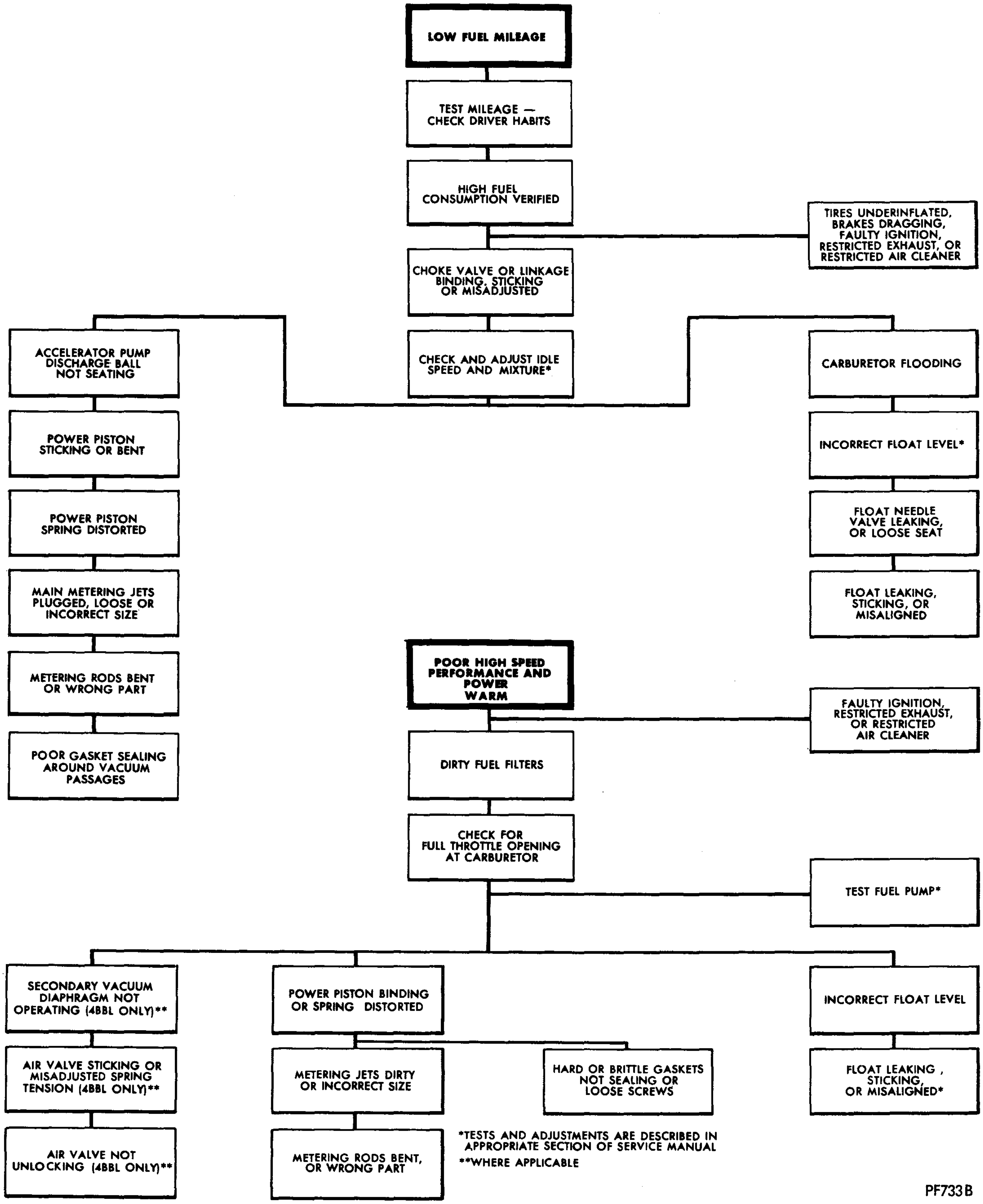
FUEL SYSTEM DIAGNOSIS PART 4



*TESTS AND ADJUSTMENTS ARE DESCRIBED IN APPROPRIATE SECTION OF SERVICE MANUAL.

PF732C

FUEL SYSTEM DIAGNOSIS PART 5



*TESTS AND ADJUSTMENTS ARE DESCRIBED IN APPROPRIATE SECTION OF SERVICE MANUAL

**WHERE APPLICABLE

PF733B

Surge at constant speed:

Low Speed

(1) Vacuum leak—hoses off.

(2) Mis-set timing—failed vacuum advance.

(3) Defective OSAC—plugged or restricted giving no vacuum advance.

(4) Partially plugged idle or transfer system in carb—including mis-set idle.

(5) Incorrect float setting—low fuel level.

(6) Defective PCV—stuck in high flow position.

(7) Heated air system stuck in cold position at low ambient.

High Speed

(1) Incorrect spark advance—defective distributor or OSAC valve plugged.

(2) Major vacuum leak.

(3) Defective or sticking gradient power valve (Holley Carb).

(4) Incorrect float setting—low fuel level.

(5) Restricted fuel supply.

Servicing the Carburetor

A thorough road test and check of minor carburetor adjustments should precede major carburetor service. Specifications for some adjustments are listed on the Vehicle Emission Control Information label found in each engine compartment.

Many performance complaints are directed at the carburetor. Some of these are a result of loose, misadjusted or malfunctioning engine or electrical components. Others develop when vacuum hoses become disconnected or are improperly routed. The proper approach to analyzing carburetor complaints should include a routine check of such areas.

(1) Inspect all vacuum hoses and actuators for leaks. See "Emission Control Systems," Group 25, for proper vacuum hose routing.

(2) Tighten intake manifold bolts and carburetor mounting bolts to specifications.

(3) Perform cylinder compression test.

(4) Clean or replace spark plugs as necessary.

(5) Test resistance of spark plug cables. Refer to "Ignition System Secondary Circuit Inspection," Electrical Section.

(6) Inspect ignition primary wire and vacuum advance operation. Test coil output voltage, primary and secondary resistance. Replace parts as necessary. Refer to "Ignition System" and make necessary adjustment.

(7) Reset ignition timing with vacuum advance line disconnected.

(8) Set carburetor idle mixture adjustment and balance 2 and 4 BBL carburetors. Adjust throttle stop screw to specifications. Refer to Emission Control Label in engine compartment.

(9) Test fuel pump for pressure and vacuum.

(10) Inspect manifold heat control valve in exhaust manifold for proper operation.

(11) Remove carburetor air filter element and blow out dirt gently with an air hose. Install a new recommended filter element if necessary.

(12) Inspect crankcase ventilation system.

(13) Road test vehicle as a final test.

Carburetor Removal

CAUTION: Do not attempt to remove the carburetor from the engine of a vehicle that has just been road tested. Allow the engine to cool sufficiently to prevent accidental fuel ignition or personal injury.

(1) Disconnect battery ground cable.

(2) Remove air cleaner.

(3) Remove fuel tank pressure vacuum filler cap. (Fuel tank could be under a small pressure).

(4) Place a container under fuel inlet fitting to catch any fuel that may be trapped in fuel line.

(5) Disconnect fuel inlet line using two wrenches to avoid twisting line.

(6) Disconnect throttle and choke linkage and all vacuum hoses.

(7) Remove carburetor mounting bolts or nuts and carefully remove carburetor level to avoid spilling fuel from fuel bowl.

Installation

Inspect the mating surfaces of carburetor and intake manifold. Be sure both surfaces are clean and free of nicks, burrs or other damage.

Place a new flange gasket on manifold surface.

Some flange gaskets can be installed up-side down or backwards. To prevent this, match holes in the flange gasket to holes on bottom of carburetor, then place gasket properly on intake manifold surface.

(1) Install carburetor on manifold being careful not to trap choke rod under carburetor linkage.

(2) Install carburetor mounting bolts or nuts and tighten alternately, a little at a time, to compress flange gasket evenly. To prevent vacuum leakage between carburetor and intake manifold the bolts or nuts must be drawn down tightly.

(3) Connect throttle and choke linkage and all vacuum hoses. Refer to the "Emission Control" section, Group 25 of this manual and install all vacuum hoses accordingly. Make sure the choke plate opens and closes fully when operated.

(4) Connect fuel inlet line using two wrenches to avoid twisting line.

(5) Install fuel tank pressure vacuum filler cap.

(6) Install air cleaner (clean and replace air cleaner if necessary).

(7) Connect battery ground cable.

CAUTION: The practice of priming an engine by pouring gasoline into the carburetor air horn for starting after servicing the fuel system, should be

strictly avoided. Cranking the engine, and then priming by depressing the accelerator pedal several times should be adequate.

Diagnosing carburetor complaints may require that the engine be started and run with the air cleaner removed.

CAUTION: While running the engine in this mode it is possible that the engine could backfire. A backfiring situation is likely to occur if the carburetor is malfunctioning, but removal of the air cleaner alone can lean the air fuel ratio in the carburetor to the point of producing an engine backfire.

The battery cable should be removed from the negative terminal of the battery before any fuel system component is removed. This precaution will prevent the possibility of ignition of fuel during servicing.

Air Cleaner Removal

If air cleaner must be loosened from carburetor for any purpose, remove it from underhood area. Damage to carburetor linkage can result when cleaner rests against or hooks onto control levers or links. All carburetor air fittings which could leak air must be capped if engine is to be run while cleaner is off.

Cleaning Carburetor Parts

There are many commercial carburetor cleaning solvents available which can be used with good results.

The choke diaphragm, choke heater and some plastic parts of the carburetor can be damaged by solvents. Avoid placing these parts in **ANY** liquid. Clean the external surfaces of these parts with a clean cloth or a soft brush. Shake dirt or other foreign material from the stem (plunger) side of the diaphragm. Compressed air can be used to remove loose dirt **but should not be connected to the vacuum diaphragm fitting.**

IMPORTANT: If the commercial solvent or cleaner recommends the use of water as a rinse, "HOT" water will produce better results. After rinsing, all trace of water must be blown from the passages with air pressure. Never clean jets with a wire, drill, or other mechanical means, because the orifices may become enlarged, making the mixture too rich for proper performance.

When checking parts removed from the carburetor, it is at times difficult to be sure they are satisfactory for further service. It is therefore recommended that in such cases, new parts be installed.

Balance Idle Screws

(1) Carefully remove the plastic caps from the two idle screws in base of carburetor to avoid damaging the screws.

(2) With a screwdriver, turn the two idle screws clockwise until they are both **lightly** seated.

(3) Turn both idle screws 1 turn counter-clockwise as a starting point (experience may dictate more or less turns as a rough setting but both screws should be turned equally).

(4) Start engine and adjust **MIXTURE SETTING** (refer to Emission Control Label in engine compartment for proper procedure).

(5) Install the proper replacement caps over the idle screws with tab against the maximum rich stop.

HOLLEY MODEL 1945 CARBURETOR

INDEX

	Page
Carburetor Adjustments	18
Choke Vacuum Kick	20
Fast Idle Cam Position	19
Fast Idle Speed (On Vehicle)	20
Float Setting	
Off Vehicle	18
On Vehicle	22
Idle Speed Adjustment	21
Disassembling Carburetor	13
General Information	9
Inspection and Reassembly	15
Service Diagnosis	3
Service Procedures	13
Special Service Tools	129
Specifications	125

CARBURETOR APPLICATION

Requirement	Transmission	Engine	BBLS	Carburetor	Model Number
Federal and Canada	Manual	225-cu. in.	Single	Holley	R-7847A
Federal and Canada	Manual W/4 Speed O.D.	225-cu. in.	Single	Holley	R-7849A
Federal and Canada	Automatic	225-cu. in.	Single	Holley	R-7848A
California	Manual	225-cu. in.	Single	Holley	R-7815A
California	Automatic	225-cu. in.	Single	Holley	R-7816A

GENERAL INFORMATION

The Holley Model 1945 carburetor (Fig. 1) is a single venturi concentric downdraft carburetor designed for use on 225 CID engines. Internally the fuel bowl completely surrounds the venturi. Dual nitrophyl

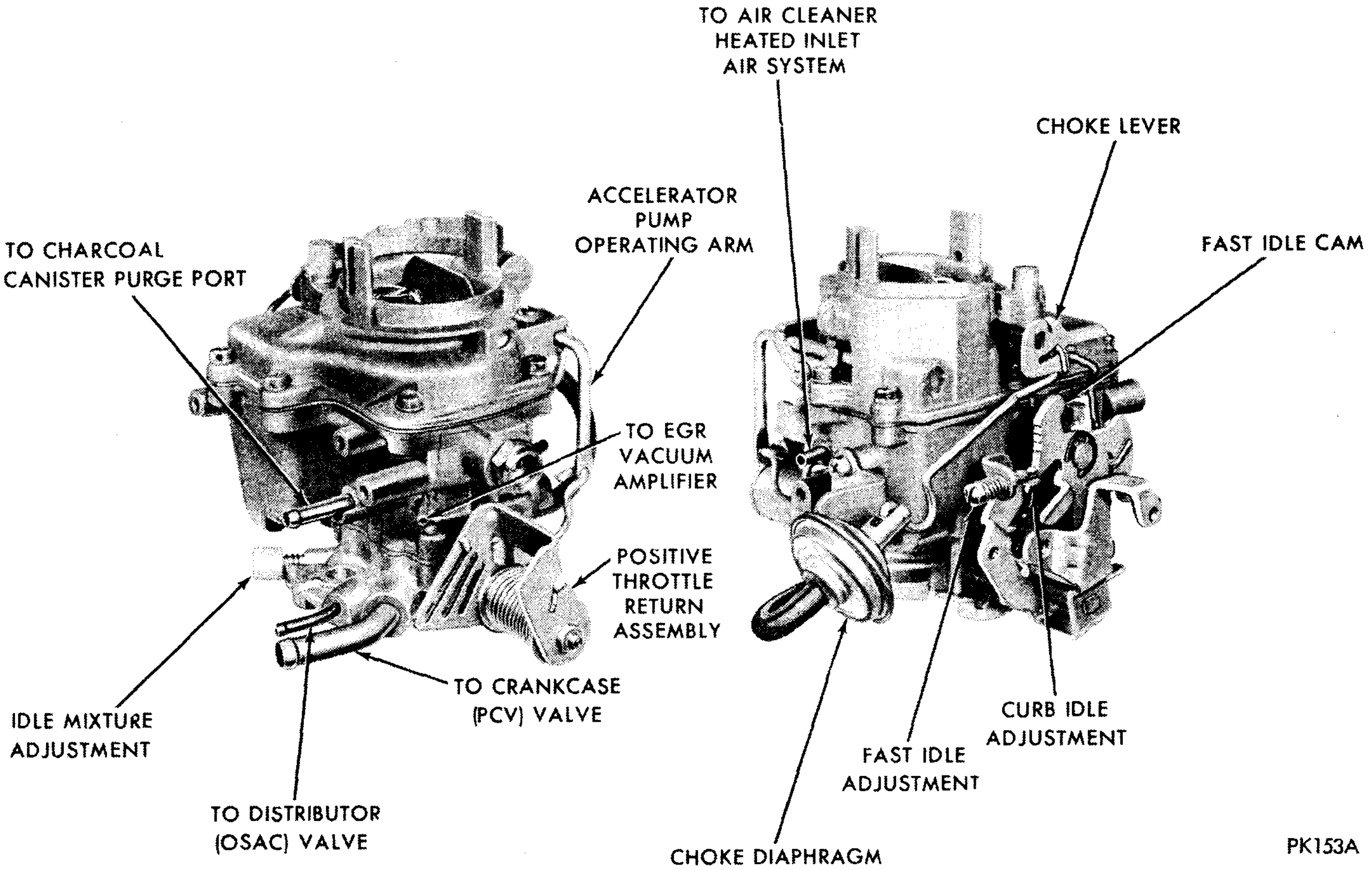


Fig. 1—Carburetor Assembly—Holley Model 1945

floats control a fuel level which permits high angularity operation to meet the severest driving conditions. The closed-cell nitrophyl material also eliminates the possibility of malfunction due to a punctured metal float.

Principal sub-assemblies include a bowl cover, carburetor body and throttle body. A thick gasket between the throttle body and main body retards heat transfer to the fuel to resist fuel percolation in warm weather. To correctly identify the carburetor model, always check the part number stamped on the main body or attached tag. The carburetor includes four basic fuel metering systems. The idle system provides a rich mixture for smooth idle and a transfer system for low speed operation. The main metering system provides an economical mixture for normal cruising conditions. The accelerator system provides additional fuel during acceleration. The power enrichment system provides a richer mixture when high power output is desired.

In addition to these four basic systems, there is a fuel inlet system that constantly supplies the fuel to the basic metering systems. A choke system temporarily enriches the mixture to aid in starting and running a cold engine.

Fuel Inlet System (Fig. 2)

All fuel enters the fuel bowl through the fuel inlet fitting in the carburetor body. The "Viton" tipped fuel inlet needle seats directly in the fuel inlet fitting. The needle is retained by a cap that permits the fuel to flow out holes in the side of the cap. The design of the fuel bowl eliminates the necessity of a fuel baffle. The fuel inlet needle is controlled by a dual lung nitrophyl float (a closed cellular buoyant material which cannot collapse or leak) and a stainless steel float lever which is hinged by a stainless steel float shaft.

The fuel inlet system must constantly maintain the specified level of fuel as the basic fuel metering systems are calibrated to deliver the proper mixture only when the fuel is at this level. When the fuel level in the bowl drops the float also drops permitting additional fuel to flow past the fuel inlet needle into the bowl. The float chamber is vented internally into the air-horn.

Idle System (Fig. 3)

Fuel used during curb idle and low speed operation flows through the main metering jet into the main well.

An angular connecting idle well intersects the main well. An idle tube is installed in the idle well. Fuel travels up the idle well and mixes with air which enters through the idle air bleed located in the bowl cover.

At curb idle the fuel and air mixture flows down the

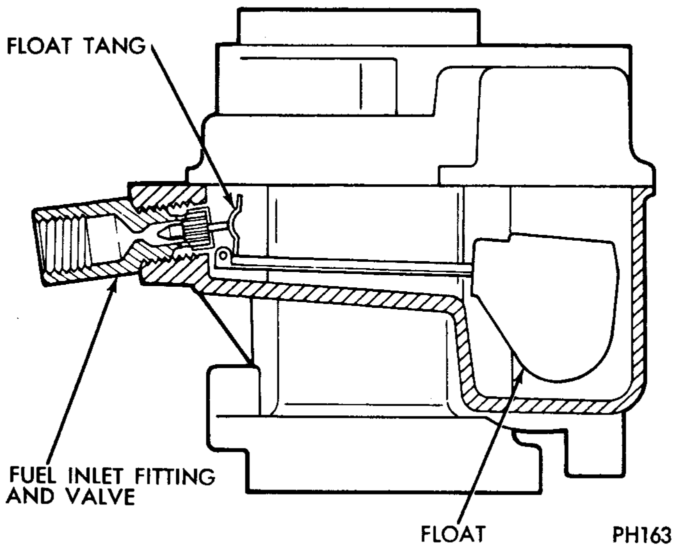


Fig. 2—Fuel Inlet System

idle channel and is further mixed or broken up by air entering the idle channel through the transfer slot which is above the throttle plate at curb idle.

During low speed operation the throttle plate moves exposing the transfer slot and fuel begins to flow through the transfer slot as well as the idle port. As the throttle plates are opened further and engine speed increases, the air flow through the carburetor also increases. This increased air flow creates a vacuum or depression in the venturi and the main metering system begins to discharge fuel.

Main Metering System (Fig. 4)

As the engine approaches cruising speed the increased air flow through the venturi creates vacuum (low pressure area) in the venturi of the carburetor. Near-atmospheric pressure present in the fuel bowl

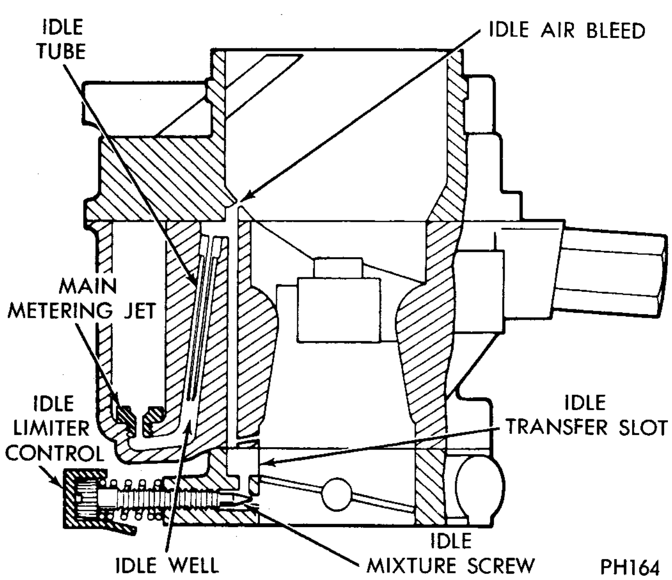


Fig. 3—Idle System

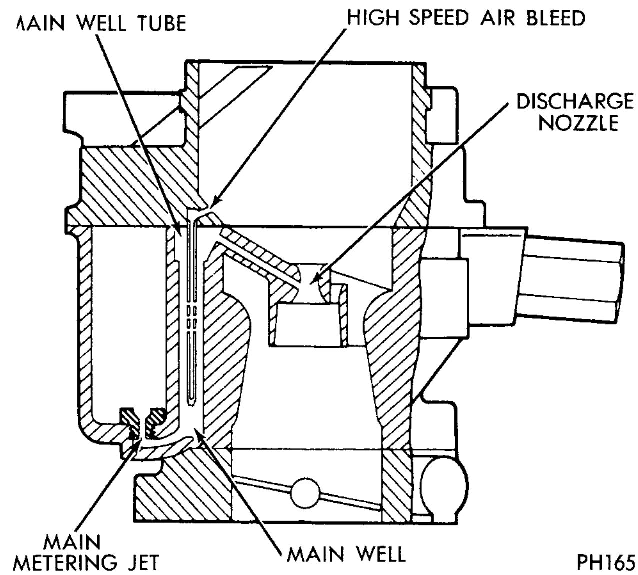


Fig. 4—Main Metering System

in the area above the fuel causes the fuel to flow to the lower pressure area created by the venturi and magnified by the dual booster venturi.

Fuel flows through the main jet into the main well; air enters through the high speed air bleed and into the main well through holes in the main well tube. The mixture of fuel and air being lighter than raw fuel responds faster to changes in venturi vacuum and is also more readily vaporized when discharged into the venturi.

The main discharge nozzle passage is a part of the dual booster venturi which is an integral part of the main body casting.

The main metering system is calibrated to deliver a lean mixture for best overall economy. When additional power is required a vacuum operated power system enriches the fuel-air mixture.

Power Enrichment System (Modulated Power Valve) (Fig. 5)

During high speed (or low manifold vacuum) the carburetor must provide a mixture richer than is needed when the engine is running at cruising speed under no great power requirements. Added fuel for power operation is supplied by a vacuum modulated power enrichment system.

A vacuum passage in the throttle body transmits manifold vacuum to the vacuum piston chamber in the bowl cover. Under light throttle and light load conditions, there is sufficient vacuum acting on the vacuum piston to overcome the piston spring tension. When the throttle valves are opened to a 55° angle, vacuum that is acting on the piston is bled to atmosphere and manifold vacuum is closed off, which in turn insures proper mixture for this throttle opening. The vent port is right in line with the throttle shaft. The throttle shaft has a small hole drilled through it. When the

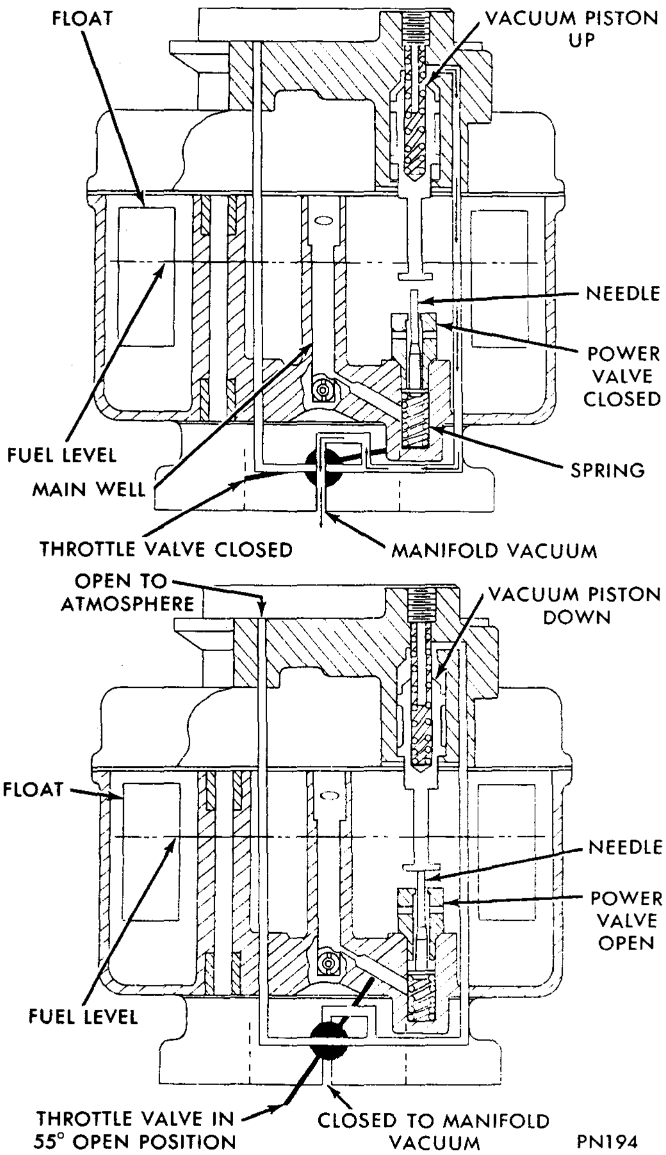


Fig. 5—Power Enrichment System with Modulated Power Valve

throttle valve is opened to 55° the hole in the throttle shaft will line up with the port in the base of the carburetor and vent the piston vacuum chamber to atmosphere allowing the spring loaded piston to open the power valve.

As engine power demands are reduced, and the throttle valve begins to close, manifold vacuum increases. The increased vacuum acts on the vacuum piston, overcoming the tension of the piston spring. This closes the power valve and shuts off the added supply of fuel which is no longer required.

Accelerating Pump System (Fig. 6)

When the throttle plates are opened suddenly the air flow through the carburetor responds almost immediately. However, there is a brief time interval or lag before the fuel can overcome its inertia and maintain the desired fuel-air ratio.

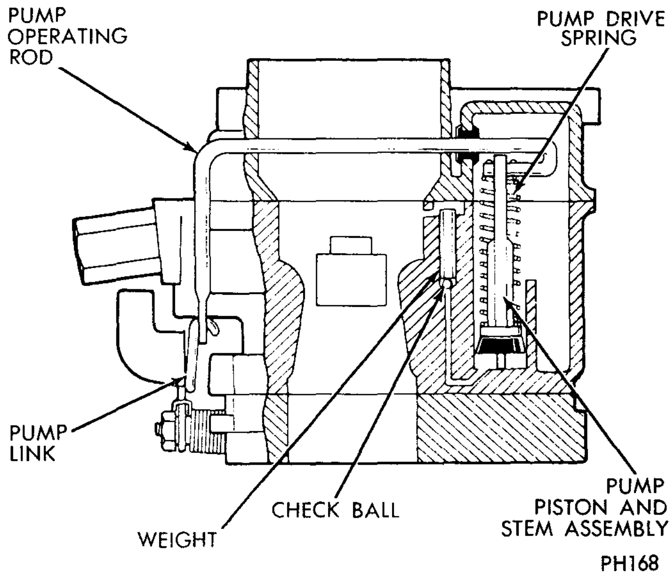


Fig. 6—Accelerating Pump System

The piston type accelerating pump system mechanically supplies the fuel necessary to overcome this deficiency for a short period of time.

Fuel enters the pump cylinder from the fuel bowl through the pump cup with the fuel level well above the normal position of the pump piston.

As the throttle lever is moved the pump link operating through a system of levers and a pump drive spring pushes the pump piston down seating the pump cup against the face of the stem. Fuel is forced through a passage around the pump discharge needle valve and out the pump discharge jet which is drilled in the main body.

When the pump is not in operation vapors or bubbles forming in the pump cylinder can escape around the pump stem through the inlet of the floating piston cup.

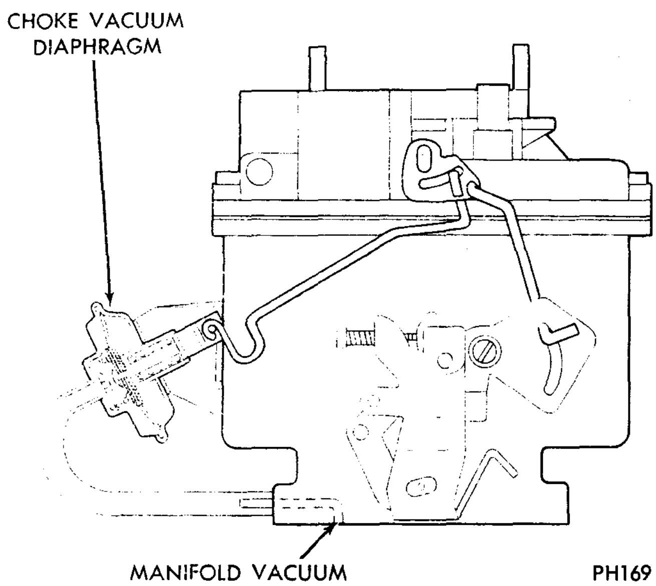


Fig. 7—Automatic Choke Vacuum Kick System

Automatic Choke (Vacuum Kick) System (Fig. 7)

The automatic choke provides richer fuel-air mixture required for starting and operating a cold engine. A bi-metal spring inside the choke housing, which is installed in a well in the intake manifold, pushes the choke valve toward the closed position.

When the engine starts, manifold vacuum is applied to the choke diaphragm through a rubber hose from the throttle body. The adjustment of the choke valve opening, when the engine starts and vacuum is applied to the choke diaphragm, is called vacuum kick.

Manifold vacuum alone is not strong enough to provide the proper degree of choke opening during the entire choking period. The impact of in rushing air past the offset choke valve provides the additional opening force.

As the engine warms up manifold heat transmitted to the choke housing relaxes the bi-metal spring until it eventually permits the choke to open fully.

An electric heater assists engine heat to open the choke rapidly in summer temperatures.

Exhaust Gas Recirculation (EGR System)

The venturi vacuum control system utilizes a vacuum tap at the throat of the carburetor venturi to provide a control signal for the Exhaust Gas Recirculation (EGR) system (Fig. 1). See "Emission Control System", Group 25, of this manual for more detailed information.

SERVICE PROCEDURES

DISASSEMBLING CARBURETOR

(1) Place carburetor assembly on repair stand to prevent damage to throttle valves and to provide a suitable base for working.

(2) Remove the fast idle cam retaining clip, fast idle cam and link. Disconnect link (Fig. 8).

(3) Remove choke vacuum diaphragm, link and bracket assembly. Disengage link from slot in choke lever; place diaphragms to one side to be cleaned as special items (Fig. 9).

(4) Remove the positive throttle return spring and pump rocker arm and linkage assembly (Fig. 10).

CAUTION: BE SURE TO RELEASE THE SPRING TENSION AS SHOWN IN INSET BEFORE REMOVING RETAINING NUT AND LOCK WASHER.

(5) Remove dash pot if so equipped. Remove seven bowl cover screws and lift bowl cover straight up until vacuum piston stem, accelerator pump and main well tubes are clear of the main body (Fig. 11).

Do not immerse the dashpot assembly in cleaner.

Separate the bowl cover from the carburetor body by tapping with a plastic hammer or handle of a screwdriver. Do not pry cover off with screwdriver blade.

Remove the bowl cover gasket. If any gasket material is remaining on either surface, remove with a suitable cleaner. Do not use a metal scraper such as a carbon scraper or screwdriver on either the bowl cover surface or carburetor body surface. A nylon or hard plastic material such as a delrin body moulding remover, may be used as a suitable scraper.

(6) Remove the accelerating pump operating rod retainer screw and retainer.

(7) Rotate the pump operating rod and disconnect the pump drive spring and accelerating pump assembly (Fig. 12). Set the pump stem and cup aside. Do not immerse it in cleaner.

(8) Rotate the pump operating rod and remove from bowl cover (Fig. 13). **Do not remove mechanical modulator rod.** (Fig. 14).

(9) Remove the pump operating rod grommet.

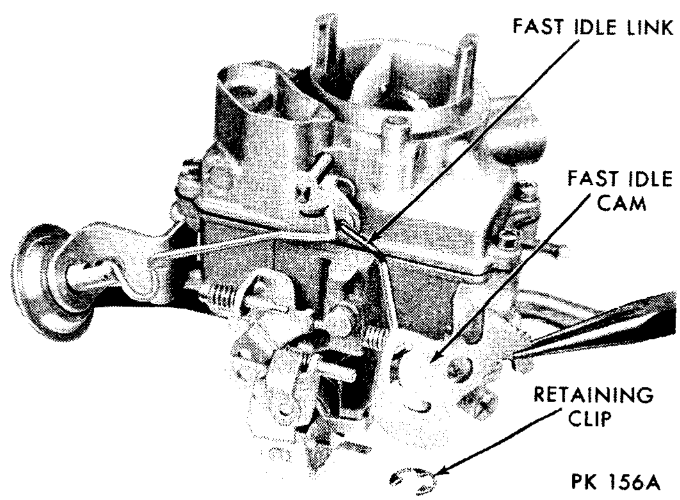


Fig. 8—Removing or Installing Fast Idle Cam and Link

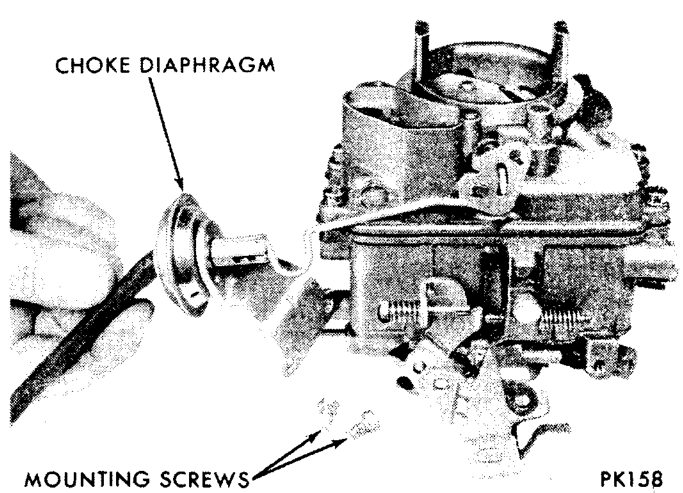


Fig. 9—Removing or Installing Choke Diaphragm

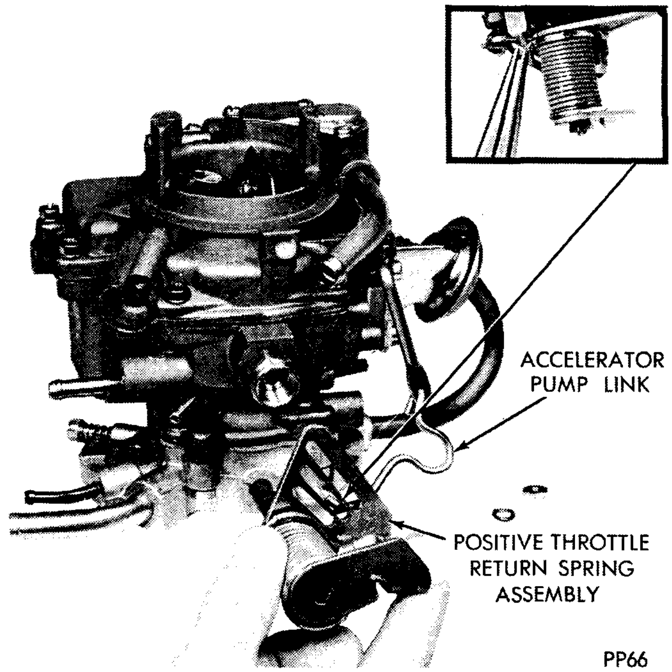


Fig. 10—Removing or Installing Positive Throttle Return Spring Assembly

(10) The power piston assembly retaining ring is staked in position and care must be taken at removal. Remove staking with a suitable sharp tool then remove the vacuum piston from the bowl cover by depressing the piston and allowing it to snap up against the retaining ring (Fig. 14).

This completes disassembly of the bowl cover. The main well tube cannot be removed and must be blown out carefully from both inside and outside of the cover.

(11) Remove the fuel inlet fitting valve assembly from the main body. Separate the gaskets from the parts.

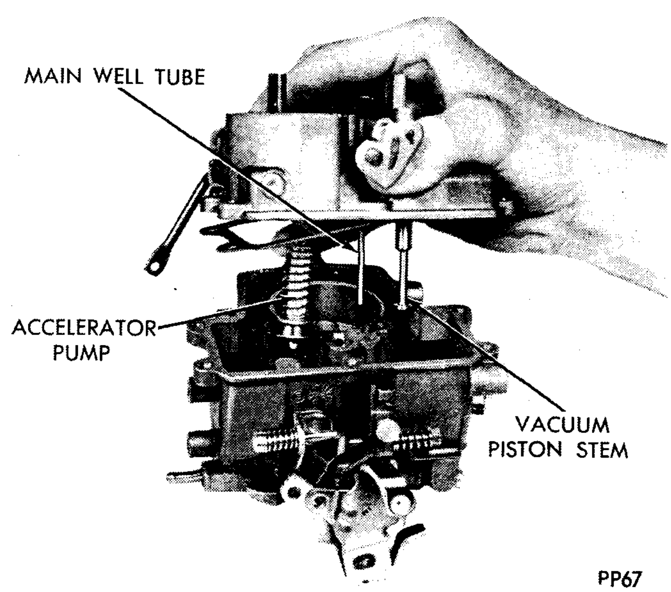


Fig. 11—Removing or Installing Bowl Cover

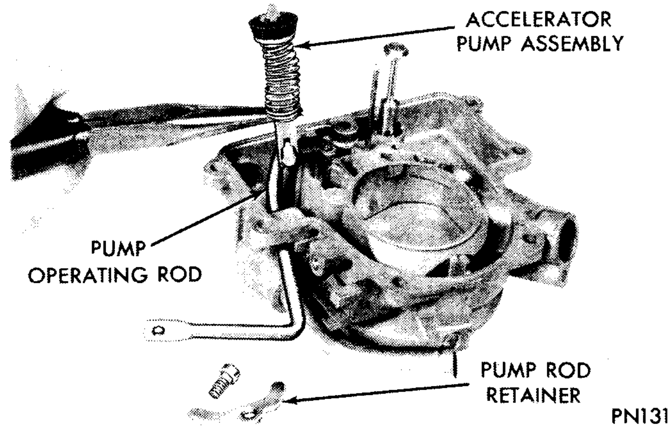


Fig. 12—Removing or Installing Accelerator Pump

(12) Remove the spring float shaft retainer, float shaft and float assembly (Fig. 15).

(13) Turn the main body upside down and remove the pump discharge check ball and weight.

(14) Remove the main jet with Special Tool Number C-3748 (Fig. 16). A 3/8 inch or wider screwdriver can also be used, but be sure it has a good square blade.

(15) Carefully depress the power valve needle with a 3/8 inch wide screwdriver until screwdriver blade is squarely seated in slot on top of the valve. Remove valve. The power valve assembly consists of seat needle and spring. All of these components of the service power valve should be used if replacement is required. (Fig. 17).

This completes disassembly of the main body. Remove the three main body-to-throttle body screws. Separate the throttle body from the main body and remove the gasket (Fig. 18).

THROTTLE BODY DISASSEMBLY

(1) Remove the curb idle speed screw.

(2) Turn the idle limiter cap to its leanest position

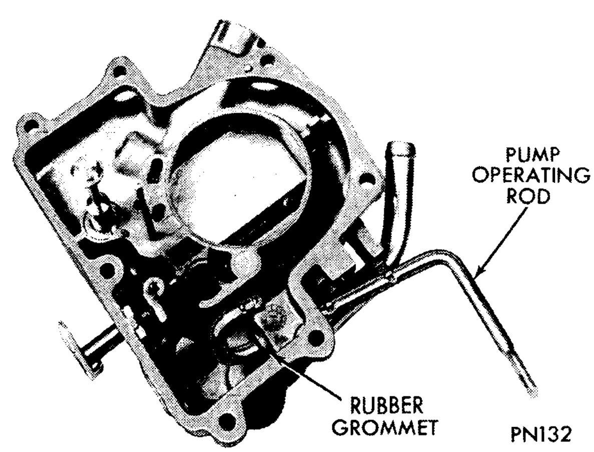


Fig. 13—Removing Accelerator Pump Operating Rod

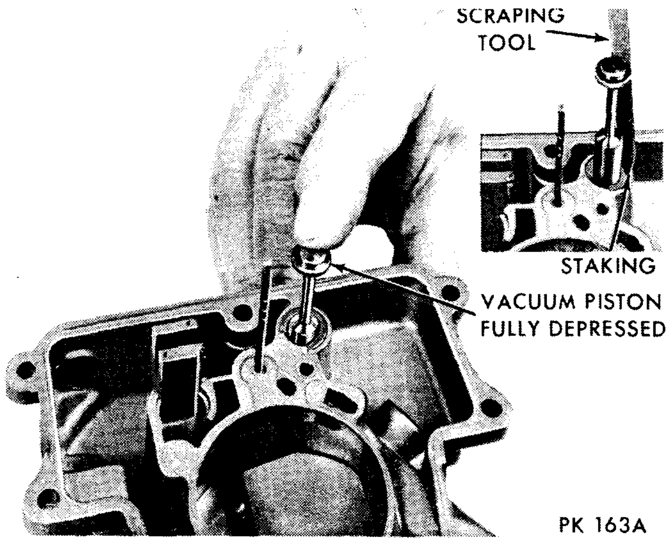


Fig. 14—Removing Vacuum Piston

and remove the cap. Gently turn the idle mixture screw clockwise until it seats. Record the starting position and the exact number of turns required to seat the screw. This is necessary to re-install it in the same position after removal and cleaning.

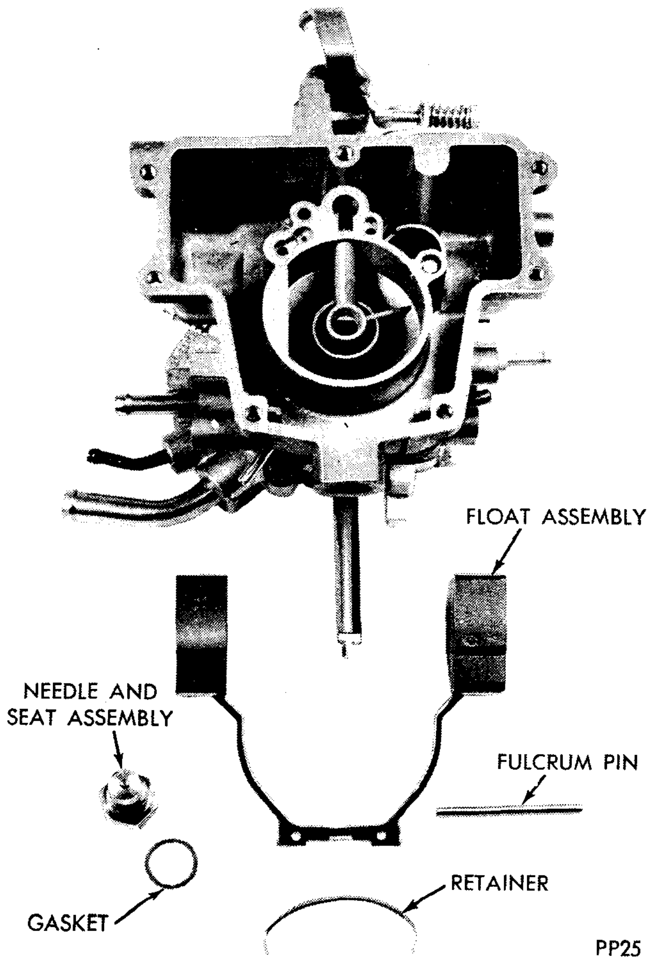


Fig. 15—Removing Float Assembly

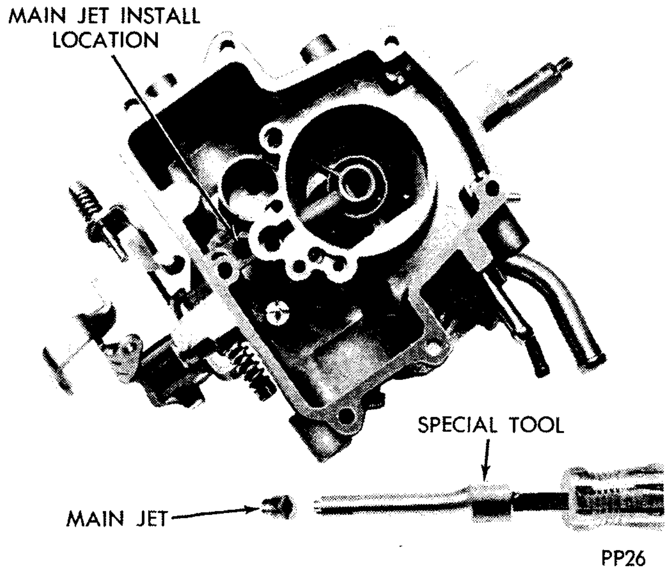


Fig. 16—Removing Main Jet

CLEANING CARBURETOR PARTS

Refer to General Information Section at front of Fuel System, for cleaning instructions.

INSPECTION AND REASSEMBLY

Throttle Body

(1) Check throttle shaft for excessive wear in body. If wear is extreme, it is recommended that carburetor assembly be replaced rather than installing a new shaft in old body.

(2) Install idle mixture screw and spring in body. (The tapered portion of the screw must be straight and smooth. If tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control). Turn screw light-

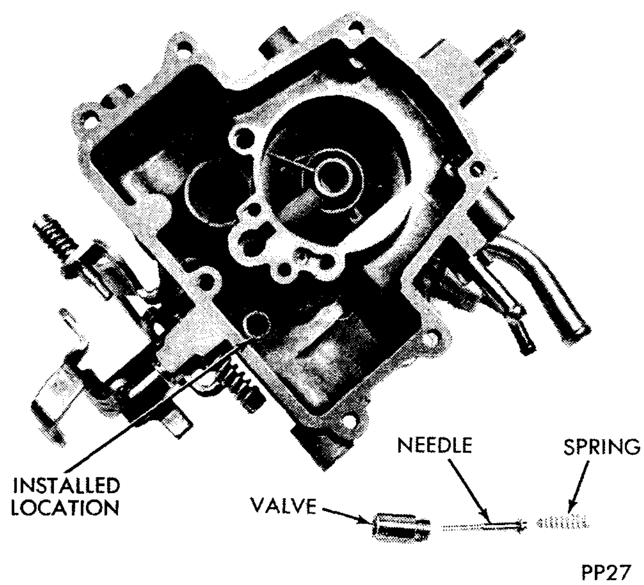


Fig. 17—Removing or Installing Power Valve

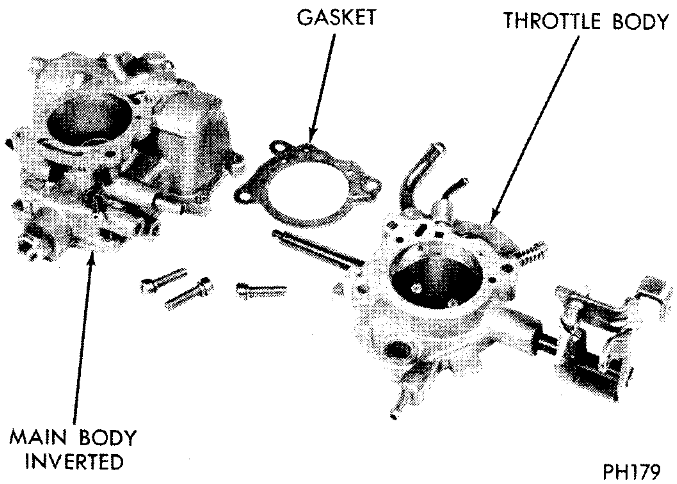


Fig. 18—Separation of Main Body from Throttle Body

ly against its seat with fingers. **Do not use a screwdriver.** Back off number of turns counted at disassembly. Install new plastic cap with tab against maximum rich stop.

(3) Using a new gasket, install throttle body to main body, torque screws to 30 inch pounds.

Bowl Cover

(1) Before installing the vacuum piston assembly in bowl cover, be sure and remove all staking from the retainer cavity. Install the spring and piston in the vacuum cylinder, seat the retainer and stake lightly with a suitable tool (Fig. 19).

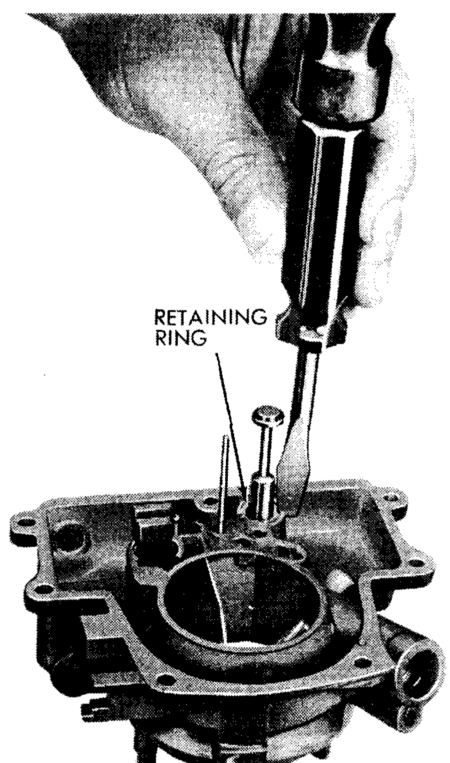


Fig. 19—Staking Vacuum Piston Retaining Washer

(2) Test the accelerator pump discharge check ball and seat prior to assembly by coating the pump piston with oil, or filling the fuel bowl with clean fuel. Install accelerating pump discharge check ball and weight (Fig. 20). Hold the discharge check ball and weight down with a small brass rod and operate the pump plunger by hand. If the check ball and seat are leaking, no resistance will be experienced when operating the plunger (Fig. 21). If the valve is leaking, remove weight and stake the ball using a suitable drift punch. Exercise care when staking the ball to avoid damaging the bore containing the pump weight. After staking the old ball, remove and replace with new ball from tune-up kit. Install weight and re-check for leaks. If no leaks, remove check ball and weight from main body and install accelerator pump, pump operating rod, and rod retainer in bowl cover.

Main Body

(1) Install power valve assembly in bottom of fuel bowl and tighten securely. Be sure needle valve operates freely.

(2) Install main metering jet with special tool, C-3748.

(3) Install float shaft and position the assembly in the float shaft cradle. Insert retaining spring. Check float alignment to prevent binding against bowl casting.

NOTE: A nitrophyl float can be checked for fuel absorption by lightly squeezing between fingers. If wetness appears on surface or float feels heavy (check with known good float), replace the float assembly.

(4) Place a new gasket on fuel inlet fitting and in-

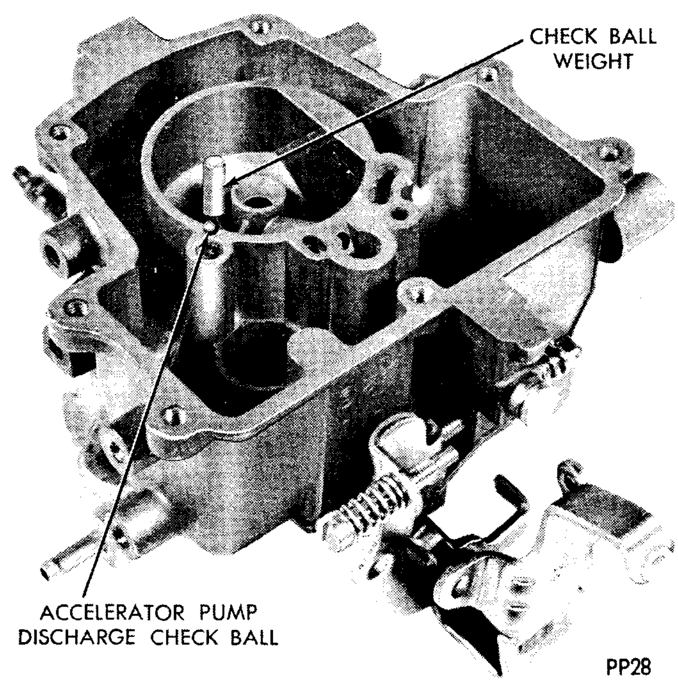


Fig. 20—Accelerator Pump Discharge Check Ball and Weight Location

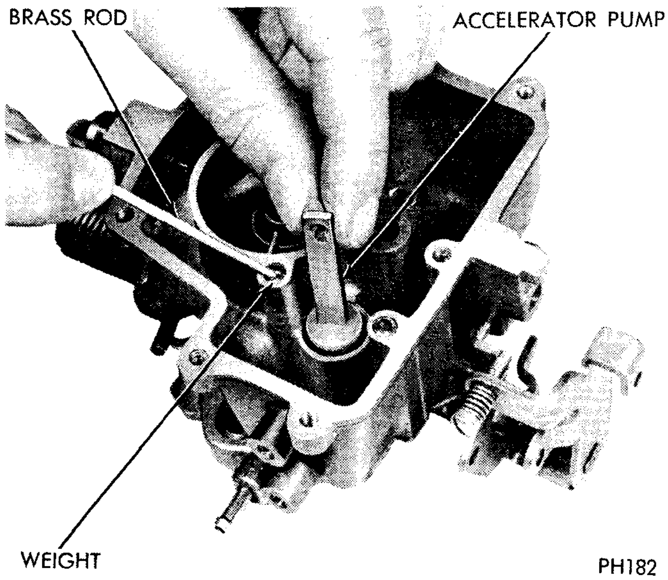


Fig. 21—Testing Accelerator Pump Discharge Check Ball and Seat

stall assembly into main body, tighten securely.

When replacing the needle and seat assembly (inlet fitting), the float level must also be checked, as dimensional difference between the old and new assemblies may change the float level. If necessary, adjust as follows:

(5) Place bowl cover gasket on top of the fuel bowl. Hold gasket in place and invert the bowl (refer to carburetor adjustments). Place a straight edge across the gasket surface. The portion of the float lungs farthest from the fuel inlet should just touch the straight edge. If adjustment is necessary, bend the float tang (see Fuel Inlet System, Fig. 2) to obtain this adjustment.

(6) Insert check ball and weight into accelerator pump discharge well.

(7) Carefully position bowl cover on top of gasket. Be sure the leading edges of the accelerator pump cup are not damaged as it enters the pump bore. Be careful not to damage the main well tube (Fig. 11).

(8) Install seven bowl cover screws and tighten alternately, a little at a time, to compress the gasket evenly.

(9) Install positive throttle return spring (Fig. 10).

(10) Install fast idle cam and link (Fig. 8).

(11) Install choke vacuum diaphragm (Fig. 9).

(12) Install dashpot if so equipped.

Choke Unloader (Wide Open Kick)

The choke unloader is a mechanical device designed to partially open the choke valve at wide open throttle. It is used to eliminate choke enrichment during cranking of an engine. Engines which have flooded or stalled by excessive choke enrichment can be cleared by use of the unloader. Refer to carburetor adjustments for adjusting procedure.

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to insure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the vacuum fitting to seal the opening. Release the diaphragm stem. If the stem moves more than 1/16 inch in 10 seconds, the leakage is excessive and the assembly must be replaced.

Choke Vacuum Kick

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Vacuum can be supplied by an auxiliary vacuum source.

Fast Idle Speed

Fast idle engine speed is used to overcome cold engine friction, stalls after cold starts and stalls because of carburetor icing. Set this adjustment after the vehicle odometer indicates over 500 miles to insure a normal engine friction level. Prepare engine by driving at least 5 miles. Refer to carburetor adjustments for adjusting procedure.

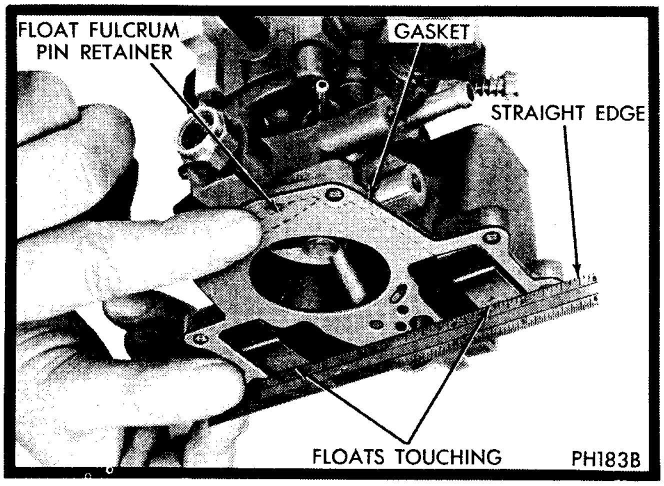
Fast Idle Cam Position

This adjustment is important to assure that the speeds of each cam step occur at the proper time during engine warm-up.

HOLLEY 1945 CARBURETOR ADJUSTMENTS

1. FLOAT SETTING ADJUSTMENT

dry float setting (± 1/32") flush with top of bowl cover gasket	R-7815A R-7816A R-7847A	R-7848A R-7849A



(1) Install float shaft and position the assembly in the float shaft cradle.

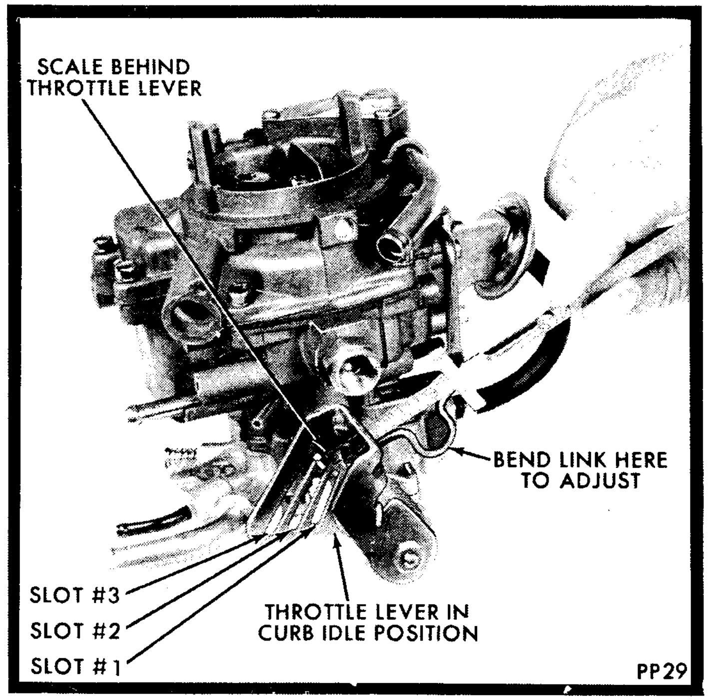
(2) Install retaining spring and place bowl cover gasket on top of the fuel bowl.

(3) Hold gasket in place and invert the bowl.

(4) Place a straight edge across the gasket surface. The portion of the float lungs, farthest from the fuel inlet, should just touch the straight edge. If adjustment is necessary, bend the float tang.

2. ACCELERATOR PUMP PISTON STROKE ADJUSTMENT

2-7/32" slot #2	R-7847A R-7849A
slot #3 2-21/64"	R-7815A R-7816A R-7848A

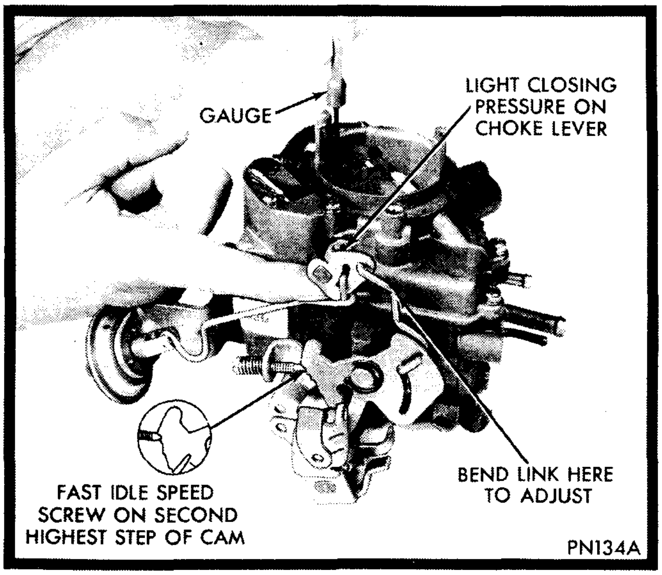


(1) Position the throttle in the curb idle position with the accelerator pump operating link in the proper slot in the throttle lever.

(2) Measure the pump operating link as shown in above illustration. This measurement must be as shown in the specifications.

3. FAST IDLE CAM POSITION ADJUSTMENT

.080"	R-7815A	R-7848A
	R-7816A	R-7849A
	R-7847A	



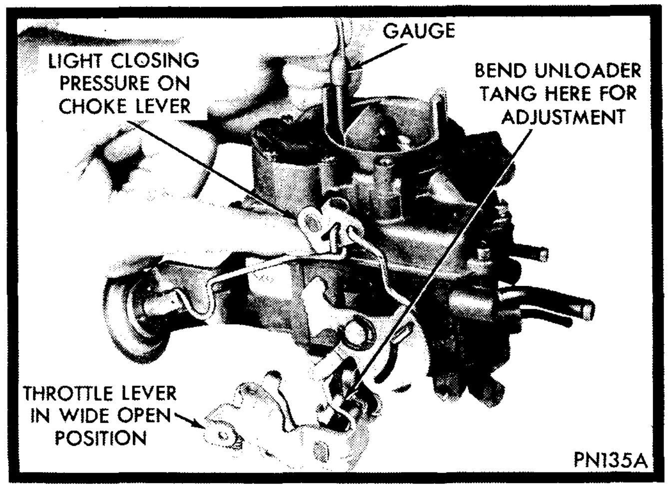
(1) With fast idle speed adjusting screw contacting second highest step on fast idle cam, move choke valve toward closed position with light pressure on choke control lever.

(2) Insert specified gauge between top of choke valve and wall of air horn.

(3) If an adjustment is necessary, bend fast idle link at upper angle, until correct valve opening has been obtained.

4. CHOKE UNLOADER ADJUSTMENT (WIDE OPEN KICK)

.250"	R-7815A	R-7848A
	R-7816A	R-7849A
	R-7847A	

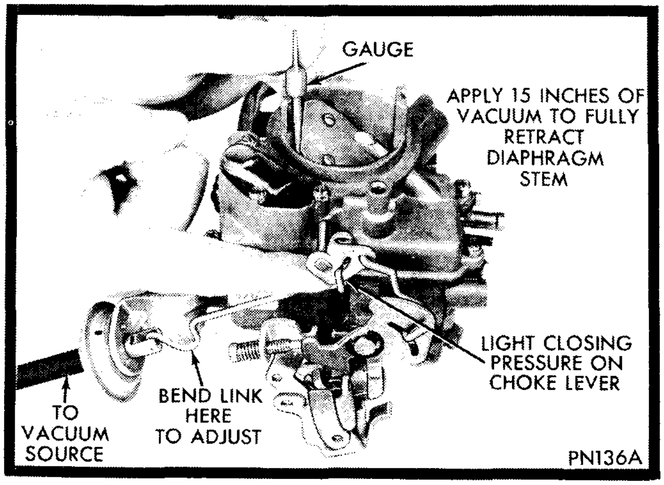


(1) Hold throttle valves in wide open position. Insert specified gauge between upper edge of choke valve and inner wall of air horn.

(2) With a finger slightly pressing against the control lever, a slight drag should be felt as gauge is being withdrawn. If an adjustment is necessary, bend unloader tang on throttle lever until correct opening has been obtained.

5. CHOKE VACUUM KICK ADJUSTMENT

.110″	R-7815A R-7816A R-7847A	R-7848A R-7849A



PN136A

(1) Using an auxiliary vacuum source, disconnect vacuum hose from carburetor and connect it to hose from vacuum supply with a small length of tube to act as a fitting. Apply a vacuum of 15 or more inches of mercury.

(2) Insert specified gauge between top of choke valve and wall of air horn.

Apply sufficient closing pressure on lever to which choke rod attaches to provide a minimum choke valve opening without distortion of diaphragm link. Note that the cylindrical stem of diaphragm will extend as internal spring is compressed. This spring must be fully compressed for proper measurement of vacuum kick adjustment.

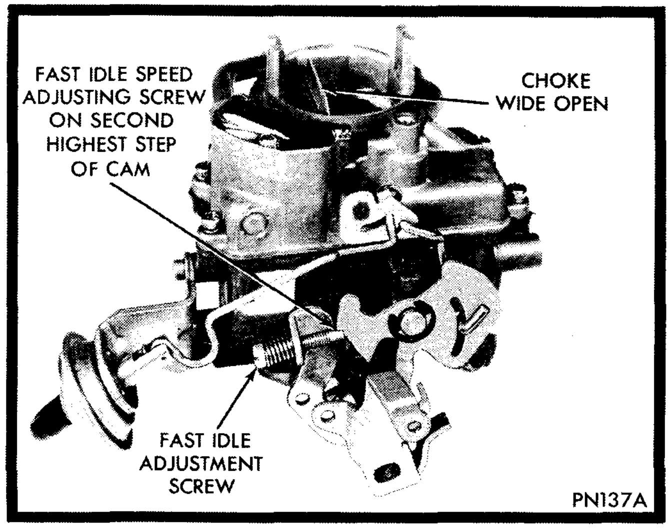
(3) Adjustment is necessary if slight drag is not obtained when removing the gauge. Shorten or lengthen diaphragm link to obtain correct choke valve opening. Length changes should be made by carefully opening or closing the U-bend provided in the link. **Do not apply twisting or bending force to diaphragm.**

(4) Make following check. With vacuum applied to diaphragm the CHOKE VALVE MUST MOVE FREELY between open and adjusted positions. If movement is not free, examine linkage for misalignment or interference caused by bending operation. Repeat adjustment if necessary to provide proper link operation.

(5) Reinstall vacuum hose on correct carburetor fitting.

6. FAST IDLE SPEED ADJUSTMENT

fast idle speed after 500 miles



PN137A

(1) Remove the air cleaner and disconnect vacuum hoses from the carburetor that lead to the heated air control and OSAC valve. If not equipped with OSAC valve, disconnect the hose that leads directly to the distributor (eliminates vacuum advance) disconnect EGR hose and cap all vacuum ports at the carburetor.

(2) With engine off, transmission in NEUTRAL and parking brake set, open throttle and close choke.

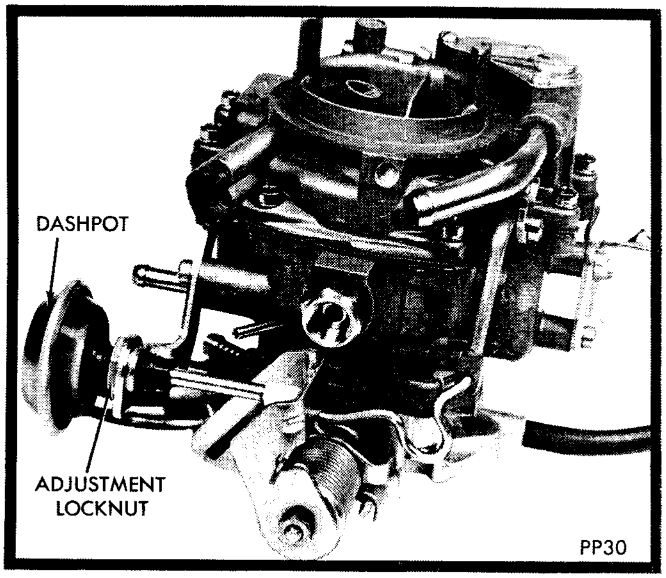
(3) Close throttle to place fast idle speed screw on highest speed step.

(4) Move fast idle cam until screw drops to second highest speed step.

(5) Start engine and determine stabilized speed. Turn fast idle speed screw to obtain speed shown in specifications. Reposition speed screw on cam after each speed adjustment to provide correct throttle closing torque.

7. DASHPOT ADJUSTMENT (MANUAL TRANSMISSION ONLY)

2500 RPM	R-7815A R-7849A



(1) With the curb idle speed and mixture properly set and a tachometer installed, start the engine and position the throttle lever so that the actuating tab on the lever is contacting the stem of the dashpot but not depressing it.

(2) Allow about 30 seconds for engine to stabilize. If adjustment is necessary, loosen the lock nut and screw the dash pot in or out as required.

(3) Tighten the lock nut on the dashpot against the bracket. Check to make sure curb idle returns to specified speed consistantly.

8. IDLE SETTING ADJUSTMENT

refer to procedure below	R-7815A R-7816A R-7847A	R-7848A R-7849A

(1) Make all adjustments with engine fully warmed up.

(2) Place transmission in neutral and set parking brake.

(3) Headlights off and air conditioning compressor not operating.

(4) Remove hose at distributor and plug hose.

(5) Check timing (refer to Emission Control Label in engine compartment).

(6) Adjust mixture setting (refer to Emission Control Label in engine compartment).

NOTE: On a new vehicle (under 300 miles) idle speed setting should be reduced 75 RPM for both propane enriched speed and curb idle speed.

FLOAT ADJUSTMENT (ON VEHICLE)

1/4" float setting (± 1/32") flush with top of bowl cover gasket	R-7815A R-7816A R-7847A	R-7848A R-7849A

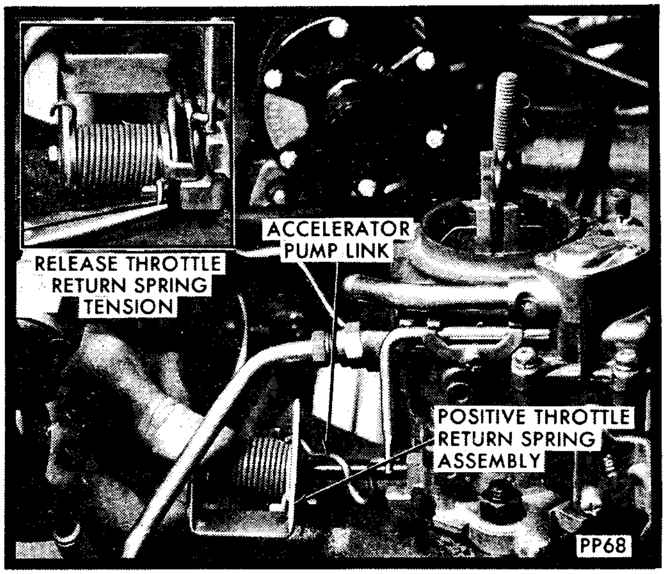


Fig. 1—Removing or Installing Positive Return Spring Assembly

(1) Remove air cleaner assembly and air cleaner gasket.

(2) Remove bowl vent hose.

(3) Disconnect choke assembly and air cleaner gasket.

(4) Remove fast idle cam retaining clip, cam and link.

(5) Remove vacuum kick diaphragm, link and hose.

(6) Remove dash pot if equipped.

(7) Remove positive throttle return spring, pump rocker arm and linkage assembly (Fig. 1).

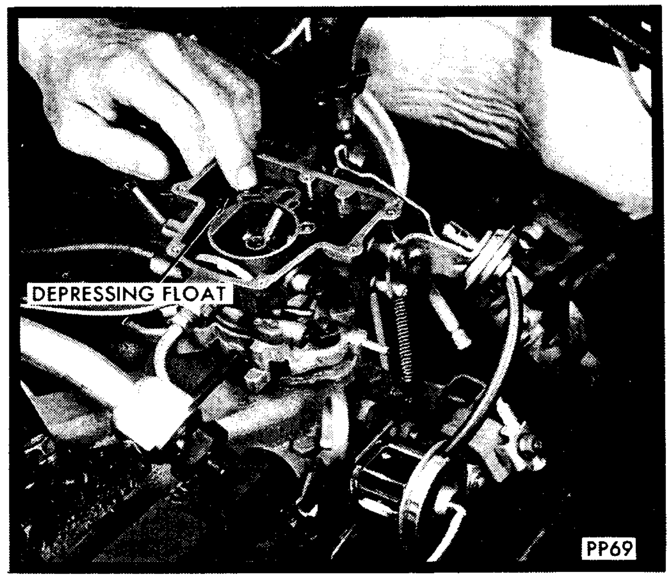


Fig. 2—Overfilling Float Bowl

(8) Remove seven bowl cover screws and lift bowl cover straight up until vacuum piston stem, accelerator pump, and main well tube are clear of the main body.

(9) Depress float manually to allow residual line pressure to overfill the bowl to within 1/8 to 1/4 inch below the top of the fuel bowl (Fig. 2). If line pressure is not enough to fill the bowl, use an external supply.

(10) Using two wrenches, back off flare nut and tighten inlet fitting to recommended torque (170 inch-pounds).

(11) Place bowl cover gasket on top of fuel bowl.

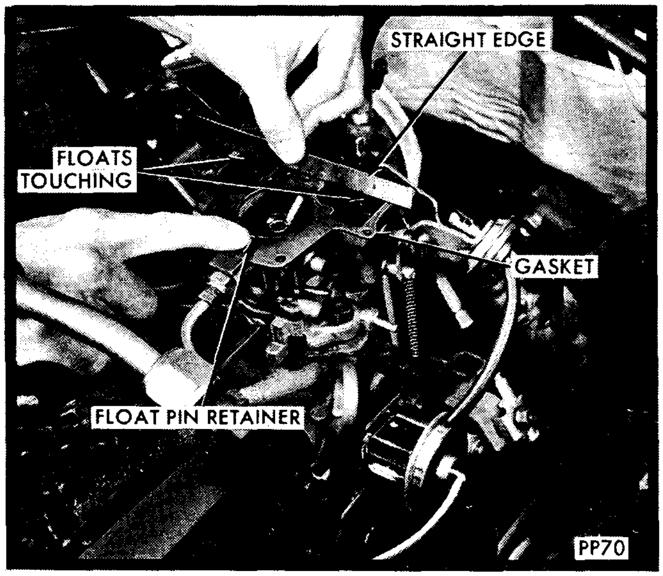


Fig. 3—Seating Float Pin Retainer

(12) Firmly seat the float pin retainer by hand while measuring float height with a straight edge across the gasket surface. The portion of the float lungs farthest from the fuel inlet should just touch the straight edge (Fig. 3). If adjustment is necessary, bend the float tang.

(13) Remove bowl cover gasket. Drain fuel from accelerator pump well with syringe type tool (Fig. 4). This is done to prevent the discharge check ball and weight from leaving its position during assembly of the bowl cover.

(14) Position bowl cover gasket on bowl cover. Carefully install bowl cover on main body. Be sure the leading edge of the accelerator pump cup is not damaged as it enters the pump bore. Be careful not to damage the main well tube.

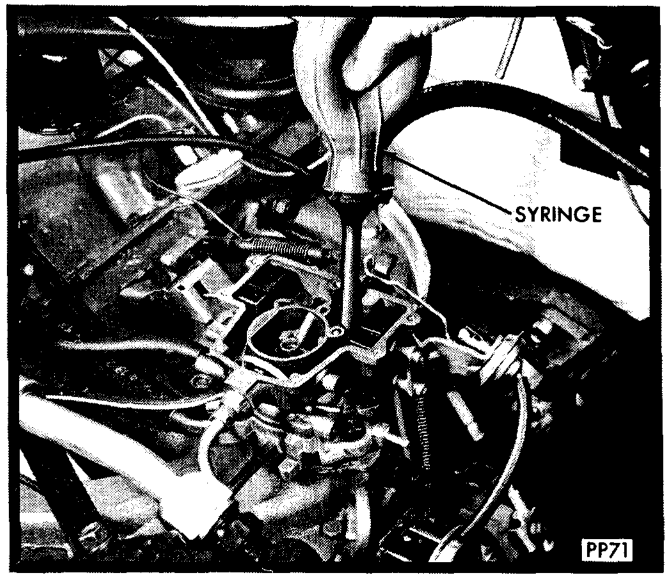


Fig. 4—Draining Fuel From Accelerator Pump Well

(15) Install seven bowl cover screws and tighten alternately to compress the gasket evenly.

(16) Install positive throttle return spring, pump rocker arm and linkage assembly (Fig. 1).

(17) Install dash pot if equipped.

(18) Install vacuum kick diaphragm, link and hose.

(19) Install fast idle cam retaining clip, cam and link.

(20) Install bowl vent hose.

(21) Connect choke assembly.

(22) Install air cleaner and gasket.

(23) Adjust idle speed with tachometer. If adjustment is necessary refer to Emission Control Information in engine compartment for proper procedure and specification.

CARTER CARBURETOR MODEL BBD

INDEX

	Page
Carburetor Adjustments	33
Accelerator Pump	34
Checking Float Setting	
Off Vehicle	33
On Vehicle	39
Choke Unloader (Wide Open Kick)	35
Choke Vacuum Kick	35
Dashpot Adjustment	37
Fast Idle Cam Position	34
Fast Idle Speed (On Vehicle)	36
Idle Enrichment Valve Test	36
Idle Speed Adjustment	36
Disassembling Carburetor	27
Inspection and Reassembly	29
Service Diagnosis	3
Service Procedures	27
Special Service Tools	129
Specifications	126
Vacuum Throttle Positioner	32

CARBURETOR APPLICATION

Requirements	Transmission	Engine	BBLS	Carburetor	Model Number
Federal and Canada	Manual and Automatic	225-1	Dual	Carter	BBD-8110S
Federal and Canada	Manual	318-1	Dual	Carter	BBD-8085S
Federal and Canada	Automatic	318-1	Dual	Carter	BBD-8081S
Federal and Canada	Manual W/4 Speed O.D.	318-1	Dual	Carter	BBD-8115S
Federal and Canada	Manual	318-1	Dual	Carter	BBD-6536S
Federal and Canada	Automatic	318-1	Dual	Carter	BBD-8121S
Federal and Canada	Manual and Automatic	318-3	Dual	Carter	BBD-6586S
California	Manual	318-1	Dual	Carter	BBD-8082S
California	Automatic	318-1	Dual	Carter	BBD-8108S
California	Manual and Automatic	318-1	Dual	Carter	BBD-8113S
Federal (High Altitude)	Automatic	318-1	Dual	Carter	BBD-8112S

GENERAL INFORMATION

The BBD-8082S carbureter is equipped with a dash pot which retards the return of the throttle to idle position. (Manual Transmission Only).

The proper adjustment of the dash pot is very important. (See Carburetor Adjustments).

The Carter model BBD dual venturi carburetor (Fig. 1) utilizes three basic fuel metering systems. The idle System provides a mixture for idle and low speed performance; the Accelerator Pump System provides additional fuel during acceleration; the Main Metering System, provides an economical mixture for normal cruising conditions.

In addition to these three basic systems, there is a fuel inlet system that constantly supplies the fuel to the basic metering systems, and a choke system (with electric assist) which temporarily enriches the mixture to aid in starting and running a cold engine.

Some vehicles equipped with an automatic transmission will have carburetors with idle metering systems which supply an enriched air/fuel mixture for short periods after cold starts.

Idle System (Fig. 2)

Fuel used during curb idle and low speed operation flows through the main metering jet into the main well.

Fuel continues into an idle fuel pick up tube where the fuel is mixed with air which enters through idle air bleeds located in the venturi cluster screws.

At curb idle the fuel and air mixture flows down the idle channel and is further mixed or broken up by air entering the idle channel through the transfer slot which is above the throttle valve at curb idle.

During low speed operation the throttle valve moves exposing the transfer slot and fuel begins to flow through the transfer slot as well as the idle port. As the throttle valves are opened further and engine speed increases the air flow through the carburetor also increases. This increased air flow creates a vacuum or depression in the venturi and the main metering system begins to discharge fuel.

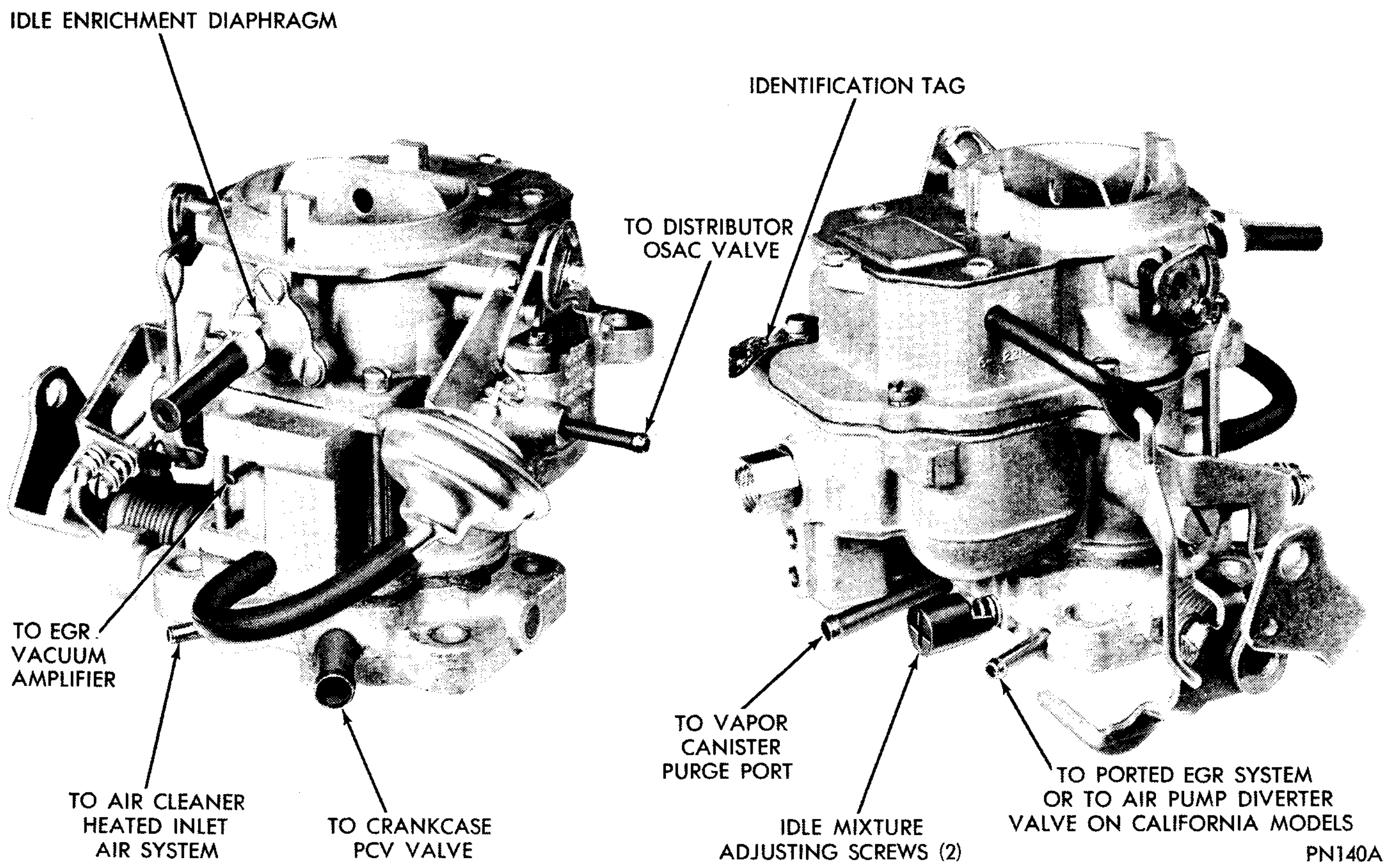


Fig. 1—Carburetor Assembly (Model BBD Series)

Idle Enrichment System (Automatic Transmission) (318 Cu. In. Engine)

The purpose of the idle enrichment system is to reduce cold engine stalling by use of a metering system related to the basic carburetor instead of the choke.

The system enriches carburetor mixtures in the off idle area during that portion of vehicle operation related to cold or semi-cold operation.

A small vacuum controlled diaphragm mounted near the top of the carburetor controls idle system air. When control vacuum is applied to the diaphragm, idle system air is reduced. Air losses within the idle system strengthen the small vacuum signal and fuel flows increase. As a result of more fuel and less air, the fuel-air mixtures enrich (Fig. 3).

Vacuum signal to the carburetor diaphragm is controlled by a thermal switch threaded into contact with engine coolant. Cold engines have switches in an open condition to pass the vacuum signal to the carburetor diaphragm. During warm-up the switches close to eliminate vacuum signals and return carburetor metering to normal, lean levels. In one type system, vehicles rely on this engine coolant vacuum switch to control idle system enrichment duration.

In a second system, vehicles have similar coolant vacuum switches, but the switch receives its vacuum signal through a solenoid valve operated by an electric timer. Enrichment duration is approximately 35 seconds after the engine starts. The thermal switch will prevent additional cycles of idle system enrichment after the engine reaches a warm condition, but while

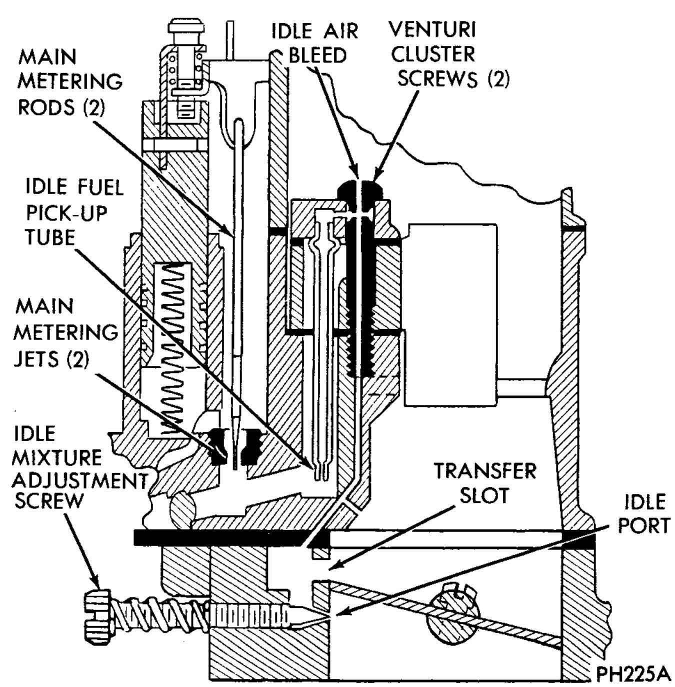


Fig. 2—Idle and Low Speed System (Manual Transmission)

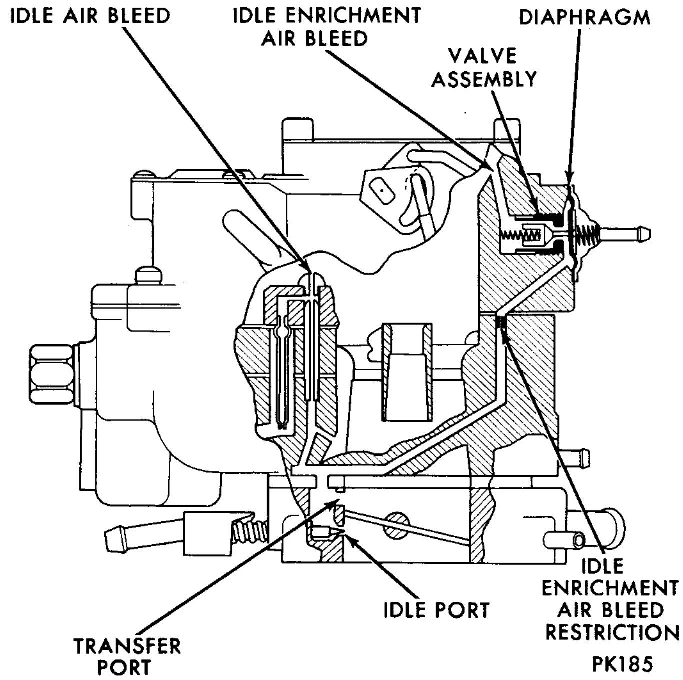


Fig. 3—Idle Enrichment System

the engine is cold, each restart cycles another 35 seconds of enrichment.

Engines which have cooled below the switch opening temperature will benefit by having enriched idle after restart. Duration of the enrichment will be controlled as described above for each type system.

Solenoid controlled systems have switches which close at 150°F while others close at 98°F. Switches open approximately 12°F below closing temperatures (these are approximate temperatures).

Accelerator Pump System (Fig. 4)

When the throttle valves are opened suddenly the air flow through the carburetor responds almost immediately. However, there is a brief time interval or lag before the fuel can overcome its inertia and maintain the desired fuel-air ratio.

The piston type accelerating pump system mechanically supplies the fuel necessary to overcome this deficiency for a short period of time.

Fuel enters the pump cylinder from the fuel bowl through a port in the bottom of the pump well below the normal position of the pump piston. When the engine is turned off, fuel vapors in the pump cylinder are vented through the area between the pump piston and pump cup.

As the throttle lever is moved the pump link, operating through a system of levers, and a pump drive spring pushes the pump piston down. Fuel is forced through a passage around the pump discharge check ball and out the pump discharge jets which are in the venturi cluster.

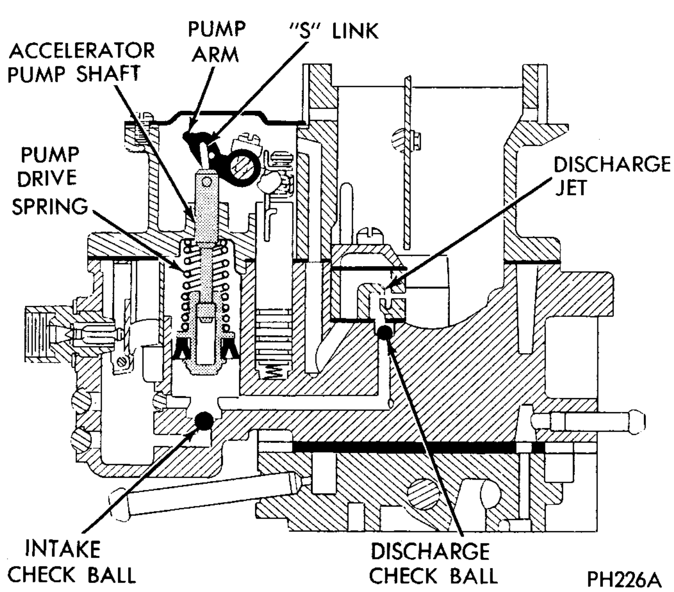


Fig. 4—Accelerator Pump System

Main Metering System (Fig. 5)

As the engine approaches cruising speed the increased air flow through the venturi creates vacuum (low pressure area) in the venturi of the carburetor. Atmospheric pressure present in the bowl in the area above the fuel causes the fuel to flow to the lower pressure area created by the venturi and magnified by the booster venturi.

Fuel flows through the main jet into the main well; air enters through the main well air bleeds. The mixture of fuel and air being lighter than raw fuel responds faster to changes in venturi vacuum

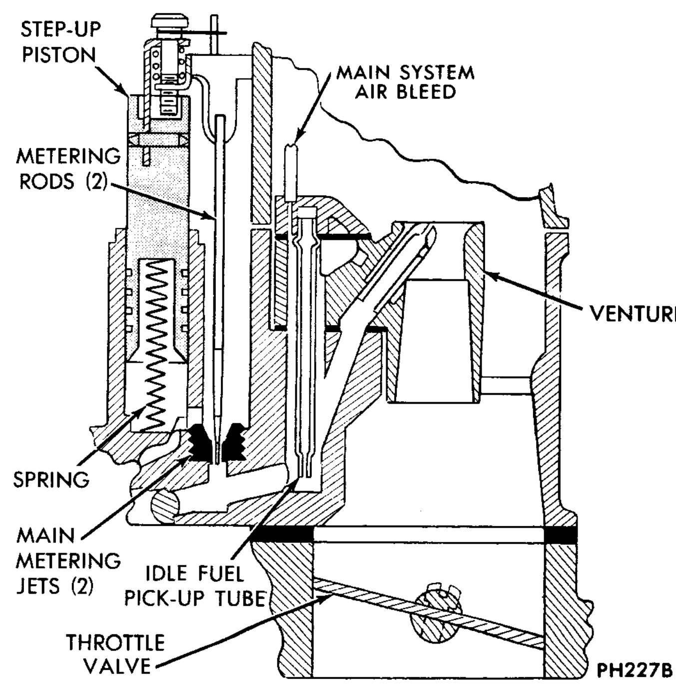


Fig. 5—Main Metering System

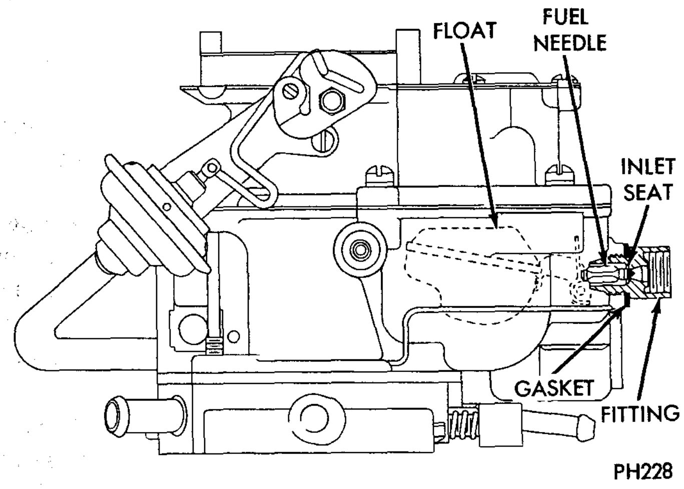


Fig. 6—Fuel Inlet System

and is also more readily vaporized when discharged into the venturi.

Fuel Inlet System (Fig. 6)

All fuel enters the fuel bowl through the fuel inlet fitting in the bowl.

The fuel inlet needle seats directly in the fuel inlet seat. The fuel inlet needle is controlled by dual floats which are hinged by a float fulcrum pin.

The fuel inlet system must constantly maintain the specified level of fuel as the basic fuel metering systems are calibrated to deliver the proper mixture only when the fuel is at this level. When the fuel level in the bowl drops, the float also drops permitting additional fuel to flow past the fuel inlet needle into the bowl. The float chamber is vented internally into the air horn.

ALTITUDE COMPENSATOR

To maintain the proper fuel/air mixture while operating under the reduced atmospheric pressures at higher altitudes (above 4000 ft.), an idle and main system compensation device has been designed for the BBD carburetor and is offered on models sold in high altitude areas. This device, a movable cluster bleed cap, is manually operated by either the owner or the dealer. Adjustment is made by a single positioning screw located under the carburetor choke blade.

To accomplish the mixture changes required, an auxiliary bleed is installed in one idle system for each throttle bore similar to the existing idle air bleed in the cluster screw. At sea level setting, one movable cluster cap blocks the auxiliary bleed providing sea level mixtures. In the raised position the cap exposes the auxiliary bleed leaning the idle and off idle mixtures to the altitude calibration. In a similar fashion, the movable cluster bleed cap restricts to standard size an oversize main air bleed installed in the carburetor. This restriction provides normal part throttle and wide open throttle for sea level operation. In the raised position the enlarged main air bleed leans the part throttle and wide open throttle mixtures to the proper level for altitude operation.

Exhaust Gas Recirculation (EGR System)

The venturi vacuum control system utilizes a vacuum tap at the throat of the carburetor venturi to provide a control signal for the Exhaust Gas Recirculation (EGR) system (Fig. 1). See "Emission Control System", Group 25, of this manual for more detailed information.

SERVICE PROCEDURES

DISASSEMBLING CARBURETOR

(1) Place carburetor on repair stand to protect throttle valves from damage and to provide a stable base for working.

(2) Remove idle enrichment vacuum diaphragm, vacuum nipple and diaphragm return spring by removing three screws. (Fig. 7).

(3) Remove retaining clip from accelerator pump arm link and remove link.

(4) Remove step-up piston cover plate and gasket from top of air horn. (Fig. 8).

(5) Remove the screws and locks from the accelerator pump arm and the vacuum piston rod lifter. Then slide the pump lever out of the air horn. (Fig. 9). The vacuum piston and step-up rods can now be lifted straight up and out of the air horn as an assembly (Fig. 10).

(6) Remove vacuum hose from between carburetor main body and choke vacuum diaphragm.

(7) Remove choke diaphragm, linkage and bracket assembly and place to one side to be cleaned as a sep-

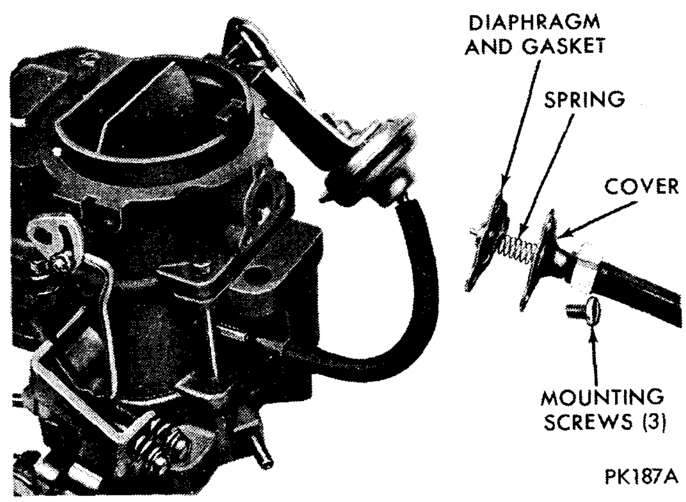


Fig. 7—Removing Idle Enrichment Valve Assembly

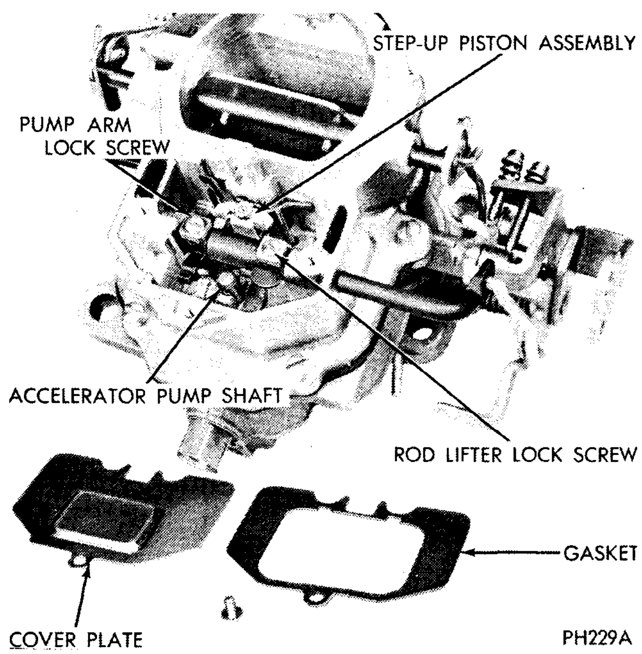


Fig. 8—Removing Step-Up Piston Cover Plate

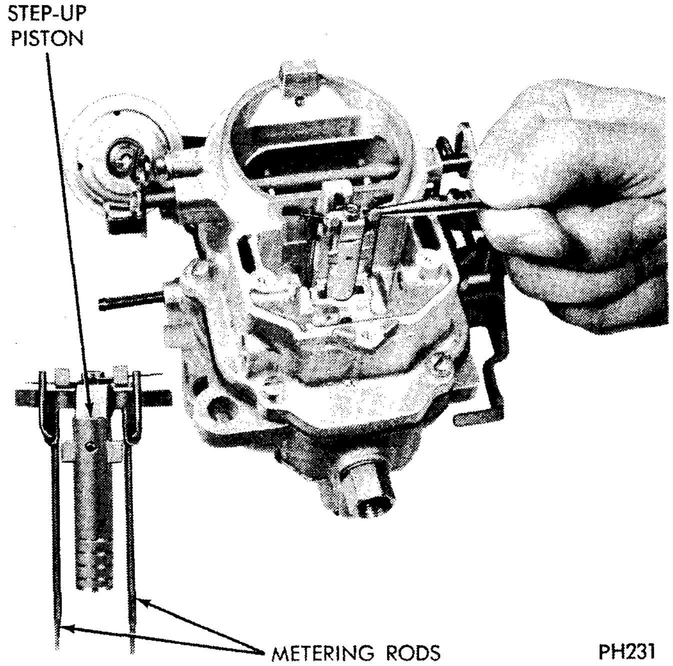


Fig. 10—Removing or Installing Step-Up Piston Assembly

arate item. **A liquid cleaner may damage diaphragm material.** This also applies to the dashpot assembly (if so equipped).

(8) Remove fast idle cam retaining screw and remove fast idle cam and linkage.

(9) Remove air horn retaining screws and lift air horn straight up and away from main body (Fig. 11) discard gasket.

(10) Invert the air horn and compress accelerator pump drive spring and remove "S" link from pump shaft. Pump assembly can now be removed.

(11) Remove fuel inlet needle valve, seat and gasket from main body.

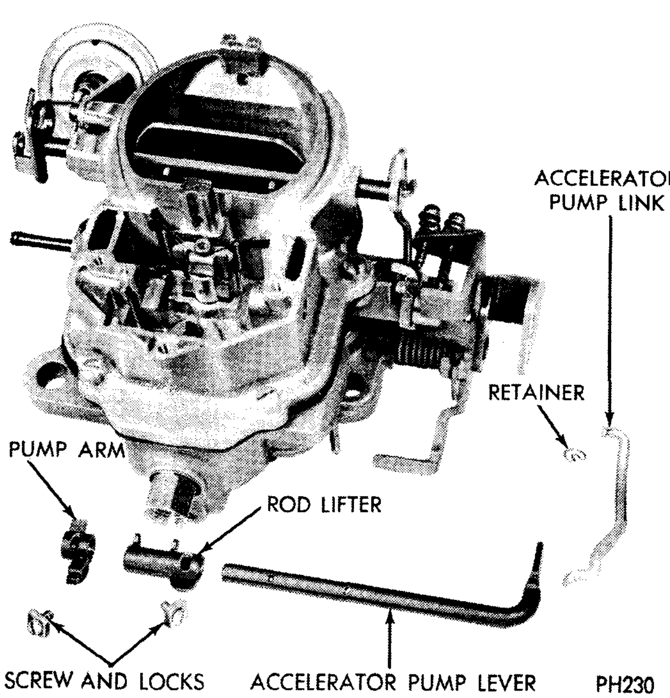


Fig. 9—Removing or Installing Accelerator Pump Lever

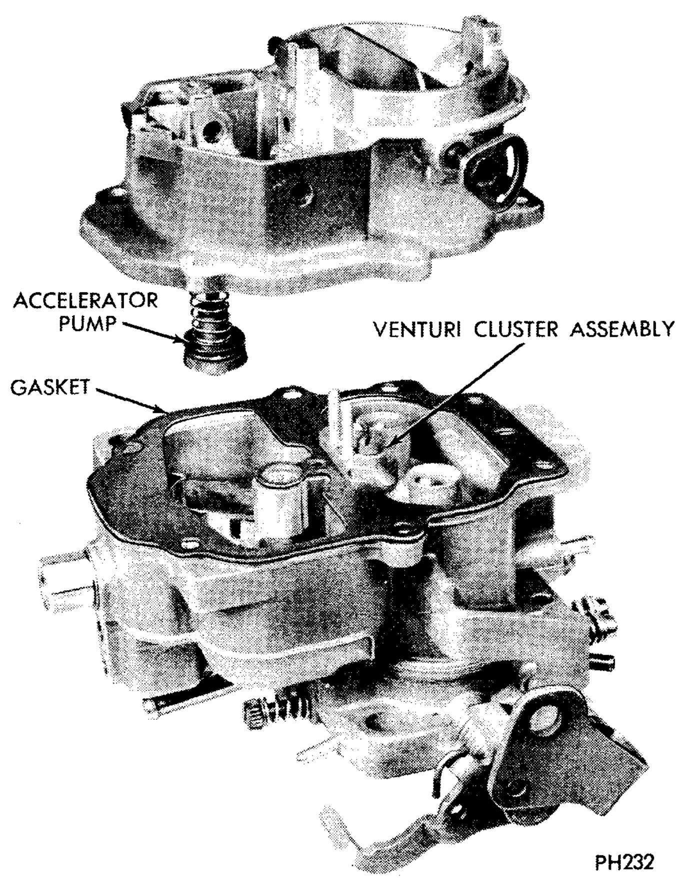


Fig. 11—Removing or Installing Air Horn

(12) Lift out float fulcrum pin retainer and baffle, then lift out floats and fulcrum pin. (Fig. 12).

(13) Remove main metering jets (Fig. 13).

(14) Remove venturi cluster screws, then lift venturi cluster and gaskets up and away from main body (Fig. 14). Discard gaskets. Do not remove the idle orifice tubes or main vent tubes from the cluster. They can be cleaned in a solvent and dried with compressed air.

(15) Invert carburetor and drop out accelerator pump discharge and intake check balls.

(16) Turn idle limiter caps to stop. Remove plastic limiter caps from idle air mixture screws carefully to avoid damaging screws. (Be sure and count number of turns to seat the screw, as the same number of turns (from the seat) must be maintained at installation.) Remove screws and springs from throttle body.

(17) Remove screws that attach throttle body to main body. Separate bodies.

(18) Test freeness of choke mechanism in air horn. The choke shaft must float free to operate correctly. If choke shaft sticks in bearings, or appears to be gummed from deposits in air horn, a thorough cleaning will be required.

The carburetor now has been disassembled into three main units, the air horn, main body and throttle body and the component parts of each disassembled as far as necessary for cleaning and inspection.

CLEANING CARBURETOR PARTS

Refer to General Information Section at front of Fuel System, for cleaning instructions.

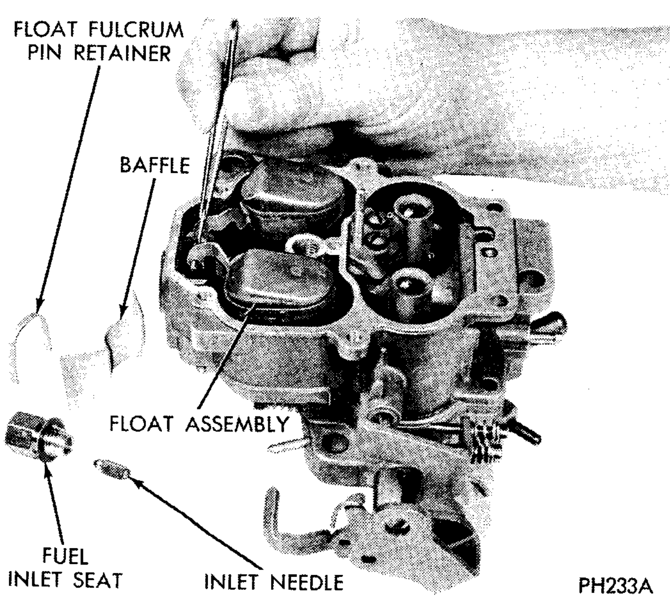


Fig. 12—Removing or Installing Float Assembly

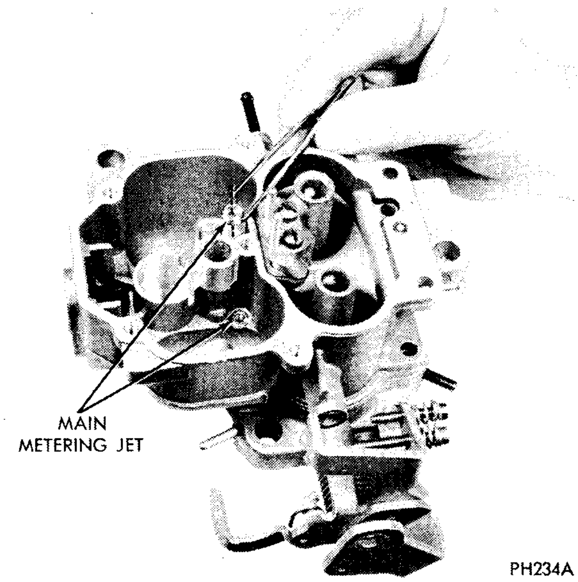


Fig. 13—Removing or Installing Main Metering Jets

INSPECTION AND REASSEMBLY

Throttle Body

(1) Check throttle shaft for excessive wear in throttle body. (If wear is extreme, it is recommended that throttle body assembly be replaced rather than installing a new shaft in old body.)

(2) Install idle mixture screws and springs in body. (The tapered portion must be straight and smooth. If tapered portion is grooved or ridged, a new idle mixture screw should be installed to insure having correct idle mixture control). **DO NOT USE A SCREW DRIVER.** Turn screws lightly against their seats with fingers. Back off number of turns counted at disassembly. Install new plastic caps with tab against the maximum rich stop.

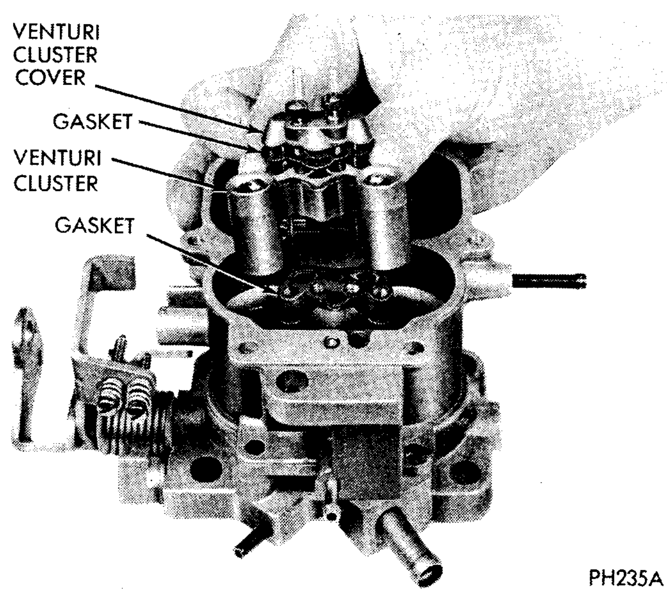


Fig. 14—Removing or Installing Venturi Cluster

Main Body

(1) Invert main body and place insulator in position, then place throttle body on main body and align. Install screws and tighten securely.

(2) Install accelerator pump discharge check ball (5/32 inch diameter) in discharge passage, (Fig. 15). Drop accelerator pump intake check ball (3/16 inch diameter) into bottom of the pump cylinder.

To check the accelerator pump system; fuel inlet and discharge check balls, proceed as follows:

(3) Pour clean gasoline into carburetor bowl, approximately 1/2 inch deep. Remove pump plunger from container of mineral spirits and slide down into pump cylinder. Raise plunger and press lightly on plunger shaft to expel air from pump passage.

(4) Using a small clean brass rod, hold discharge check ball down firmly on its seat. Again raise plunger and press downward. No fuel should be emitted from either intake or discharge passage, (Fig. 16).

If any fuel does emit from either passage, it indicates the presence of dirt or a damaged check ball or seat. Clean passage again and repeat test. If leakage is still evident, stake check ball seats (place a piece of drill rod on top of check ball and lightly tap drill rod with a hammer to form a new seat), remove and discard old balls, and install new check balls. The fuel inlet check ball is located at bottom of the plunger well. Remove fuel from bowl.

(5) Install discharge check ball. Install new gaskets on venturi cluster, then install in position in main body. (Fig. 14) Install cluster screws and tighten securely.

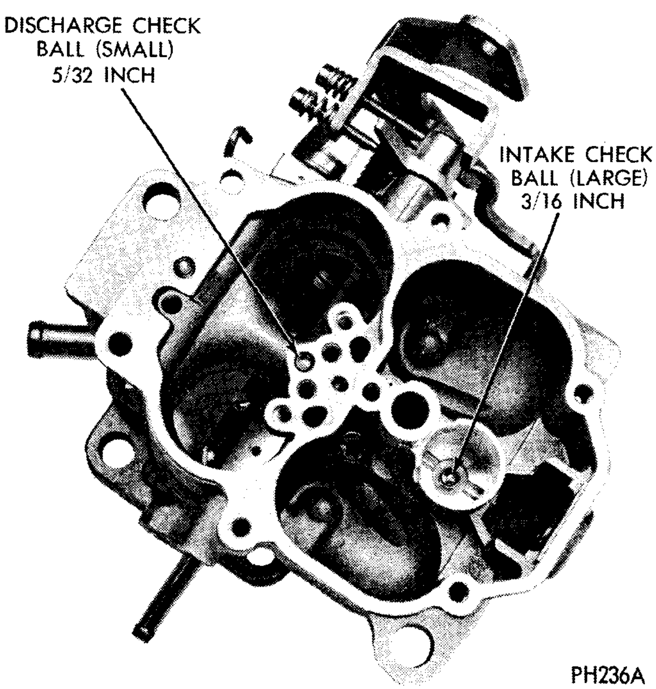


Fig. 15—Installing Accelerator Pump Intake and Discharge Check Balls

Float

The carburetors are equipped with a synthetic rubber tipped fuel inlet needle. The needle tip is a rubber material which is not affected by gasoline and is stable over a wide range of temperatures. The tip is flexible enough to make a good seal on the needle seat, and to give increased resistance to flooding.

The use of the synthetic rubber tipped inlet needle requires that care be used in adjusting the float setting. Care should be taken to perform this accurately in order to secure the best performance and fuel economy.

When replacing the needle and seat assembly (inlet fitting), the float level must also be checked, as dimensional difference between the old and new assemblies may change the float level. Refer to carburetor adjustments for adjusting procedure.

Air Horn

(1) Place the accelerator pump drive spring on pump plunger shaft then insert shaft into air horn. Compress spring far enough to insert "S" link.

(2) Drop intake check ball into pump bore. Install baffle into main body. Place step-up piston spring in piston vacuum bore. Position a new gasket on the main body and install air horn. Tighten retaining screws alternately, a little at a time, to compress the gasket evenly.

(3) Carefully position vacuum piston metering rod assembly into bore in air horn making sure metering rods are in main metering jets. Then place the two

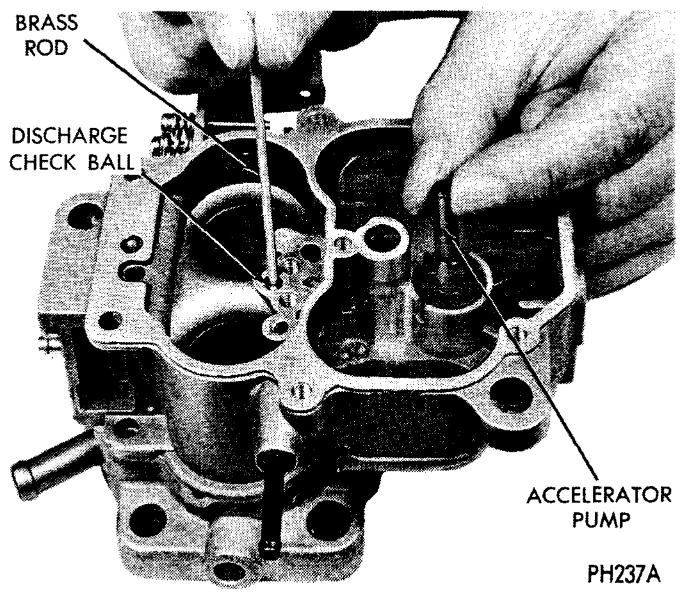


Fig. 16—Testing Accelerator Pump Intake and Discharge Check Balls

lifting tangs of the plastic rod lifter under piston yoke. Slide shaft of the accelerator pump lever through rod lifter and pump arm. Install two locks and adjusting screws, but do not tighten.

The accelerator pump arm must be installed so that operating "S" link is in the outer hole, if the arm has two holes.

(4) Install fast idle cam and linkage. Tighten retaining screw securely.

(5) Connect accelerator pump linkage to pump lever and throttle lever. Install retaining clip.

Choke Vacuum Diaphragm

Inspect the diaphragm vacuum fitting to insure that the passage is not plugged with foreign material. Leak check the diaphragm to determine if it has internal leaks. To do this, first depress the diaphragm stem, then place a finger over the vacuum fitting to seal the opening. Release the diaphragm stem. If the stem moves more than 1/16 inch in 10 seconds, the leakage is excessive and the assembly must be replaced.

Install the diaphragm assembly on the air horn as follows:

(1) Engage choke link in slot in choke lever.

(2) Install diaphragm assembly, secure with attaching screws.

(3) Inspect rubber hose for cracks before placing it on correct carburetor fitting. Do not connect vacuum hose to diaphragm fitting until after vacuum kick adjustment has been made. (See Carburetor Adjustments.)

(4) Loosen choke valve attaching screws slightly. Hold valve closed, with fingers pressing on high side of valve. Tap valve lightly with a screw driver to seat in air horn. Tighten attaching screws securely and stake by squeezing with pliers.

(5) Position idle enrichment diaphragm on air horn with center pin toward air valve. Place diaphragm return spring in cup in center of diaphragm and cover with vacuum nipple. Secure with three screws.

Choke Vacuum Kick

The choke diaphragm adjustment controls the fuel delivery while the engine is running. It positions the choke valve within the air horn by action of the linkage between the choke shaft and the diaphragm. The diaphragm must be energized to measure the vacuum kick adjustment. Vacuum can be supplied by an auxiliary vacuum source.

Choke Unloader (Wide Open Kick)

The choke unloader is a mechanical device to partially open the choke valve at wide open throttle. It is used to eliminate choke enrichment during cranking of an engine. Engines which have been flooded or stalled by excessive choke enrichment can be cleared by use of the unloader. Refer to carburetor adjustments for adjusting procedure.

Fast Idle Speed

Fast idle engine speed is used to overcome cold engine friction, stalls after cold starts and stalls because of carburetor icing. Set this adjustment after the vehicle odometer indicates over 500 miles to insure a normal engine friction level. Prepare engine by driving at least 5 miles. Refer to carburetor adjustments for adjusting procedure.

Wide Open Throttle Dump Valve

In order to assure the elimination of EGR at wide open throttle, it is necessary to incorporate a mechanically activated "signal dump valve." This device bleeds the venturi vacuum signal to the amplifier, causing the EGR valve to close. Refer to Carburetor Adjustments for adjusting procedure.

Fast Idle Cam Position

This adjustment is important to assure that the speeds of each cam step occur at the proper time during engine warm-up.

Vacuum Throttle Positioner

Carburetor model BBD-8110S, and BBD-8113S, are equipped with a throttle positioner system which consists of an electronic speed switch, an electrically controlled vacuum solenoid valve and a vacuum actuated throttle positioner. (Fig. 17).

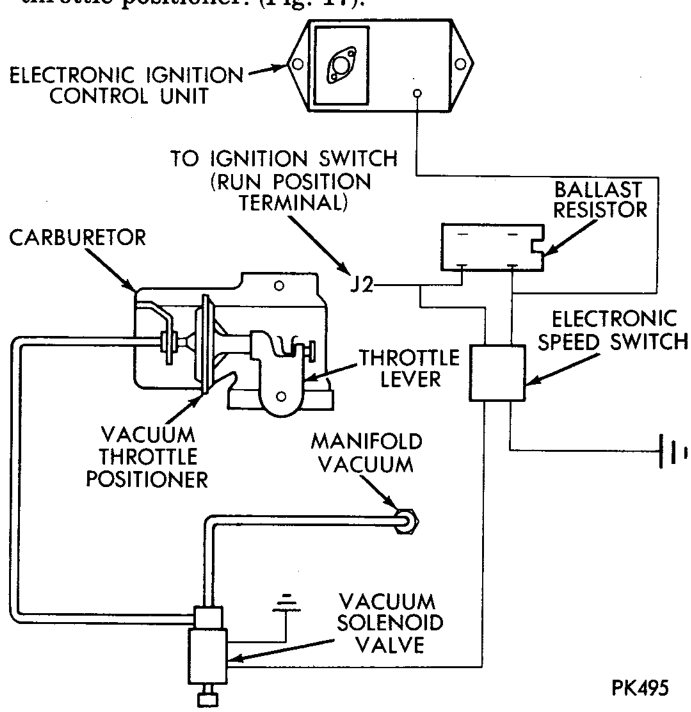


Fig. 17—Throttle Positioner System (California Requirement)

The system's function is to prevent unburned hydrocarbons from entering the atmosphere through the vehicle's exhaust system when the engine is decelerated from a high RPM. The electronic speed switch receives ignition pulses from the five ohm ballast resistor terminal connecting to the electronic ignition control unit. It then senses when the engine speed exceeds 2000 RPM and allows vacuum to energize the throttle positioner. When this positioner is energized, a throttle stop is provided which will inhibit the throttle from returning to the idle position. When the throttle is released, it will return to the new stop position (positioner energized) calibrated for a steady-state engine speed of 1750 RPM. As the engine is decelerating, the electronic speed switch senses when the engine speed drops below 2000 RPM and de-energizes the throttle positioner. This allows the throttle to return to the normal idle stop position and the engine will continue to decelerate to idle speed. This operation positions the throttle partially open (1750 RPM idle) whenever the engine decelerates from a speed above 2000 RPM to a speed just below 2000 RPM. This provides sufficient air flow through the engine to adequately dilute the air-fuel mixture.

It is essential that the curb idle speed adjustment be made using **only** the curb idle speed screw on the carburetor. Curb idle speed adjustment **must not** be made using the adjustment for the vacuum throttle positioner. Improper adjustment of the throttle positioner may result in excessive curb idle speed.

At completion of all idle set or throttle positioner adjustments, engine must be cycled to a speed above 2500 RPM manually to check for proper idle return.

Diagnosis Procedure—Vacuum Throttle Positioner

(1) If vacuum throttle positioner does operate as described in Step 1 under adjustment, the faulty component can be diagnosed as described below.

(2) Check all wiring harness and hose connections in system.

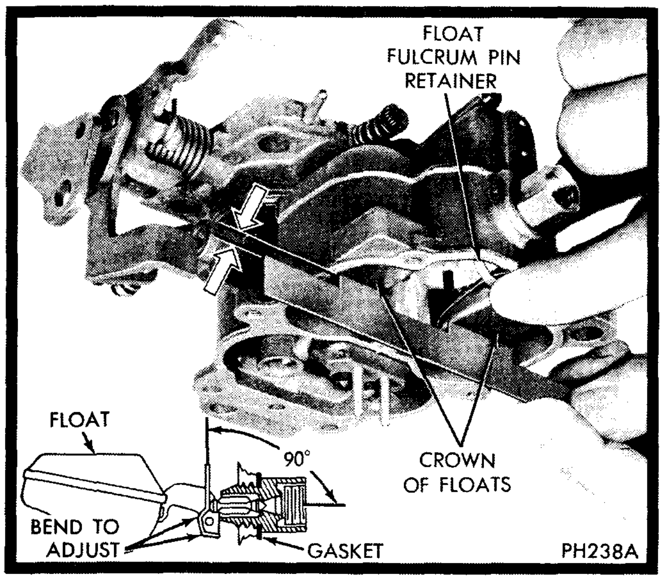
(3) **Vacuum Actuator Test**—Apply vacuum from an external source to the actuator. If actuator does not operate, replace. If actuator operates, pinch off supply hose and observe actuator. If actuator remains in operating position for one minute or more, unit is satisfactory.

(4) **Vacuum Solenoid Test**—Apply vacuum from an external source to manifold supply hose connection on solenoid valve. Disconnect wiring harness from solenoid and ground one terminal of solenoid. Connect 12 volts to other terminal and observe vacuum actuator operation. If actuator does not cycle as 12 volts is applied, replace solenoid. If operation is normal, it will be necessary to replace the speed switch.

BBD CARBURETOR ADJUSTMENTS

1. FLOAT SETTING ADJUSTMENT

1/4" at center of floats (± 1/32")	BBD-6536S BBD-6586S BBD-8081S BBD-8082S BBD-8085S BBD-8108S	BBD-8110S BBD-8112S BBD-8113S BBD-8115S BBD-8121S



(1) Install floats with fulcrum pin and pin retainer in main body.

(2) Install needle, seat and gasket in body and tighten securely.

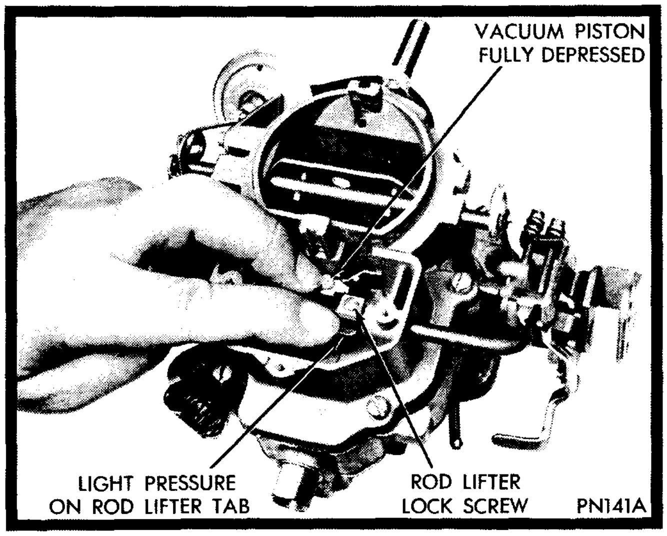
(3) Invert main body (catch pump intake check ball) so that weight of floats **only,** is forcing needle against seat. Hold finger against retainer to fully seat fulcrum pin.

(4) Using a straight-edge scale, check float setting. The measurement from the surface of the fuel bowl to the crown of each float at center should be as indicated in specifications.

If an adjustment is necessary, hold the floats on the bottom of the bowl and bend the float lip toward or away from the needle. Recheck the setting again then repeat the lip bending operation as required. **When bending the float lip, do not allow the lip to push against the needle as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.**

2. VACUUM STEP-UP PISTON ADJUSTMENT

refer to illustration below	BBD-6536S BBD-6586S BBD-8081S BBD-8082S BBD-8085S BBD-8108S	BBD-8110S BBD-8112S BBD-8113S BBD-8115S BBD-8121S



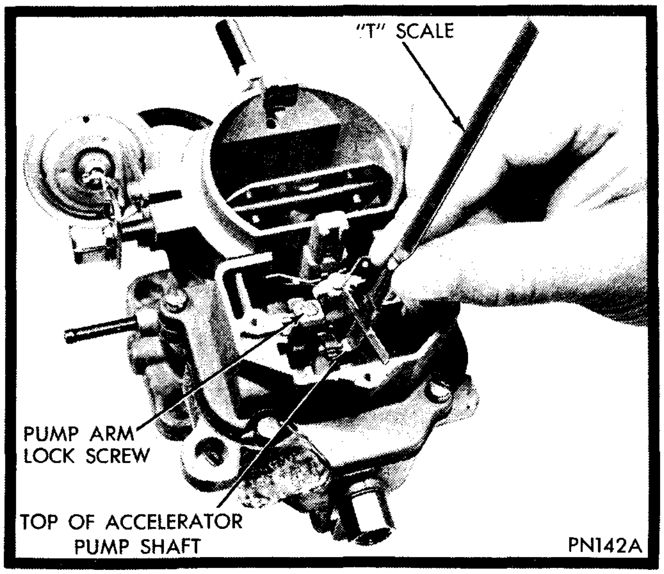
(1) Back off curb idle adjustment screw until throttle valves are completely closed. Count number of turns so that screw can be returned to its original position.

(2) Fully depress step-up piston while holding moderate pressure on the rod lifter tab. While in this position, tighten rod lifter lock screw.

(3) Release piston and rod lifter, then return curb idle screw to its original position.

3. ACCELERATOR PUMP STROKE MEASUREMENT (AT IDLE)

.500″	BBD-6585S	BBD-8113S
	BBD-6586S	BBD-8115S
	BBD-8081S	BBD-8121S
	BBD-8082S	BBD-8146S
	BBD-8108S	BBD-8147S
	BBD-8110S	BBD-8085S
	BBD-8112S	



To establish an approximate curb idle on newly assembled carburetors, back off curb idle speed adjusting screw to completely close the throttle valve (Fast idle cam must be in open choke position). Then turn the curb idle screw clockwise until it just contacts stop. Then continue to turn two complete turns.

(1) Be sure accelerator pump "S" link is in the outer hole of the pump arm if arm has two holes.

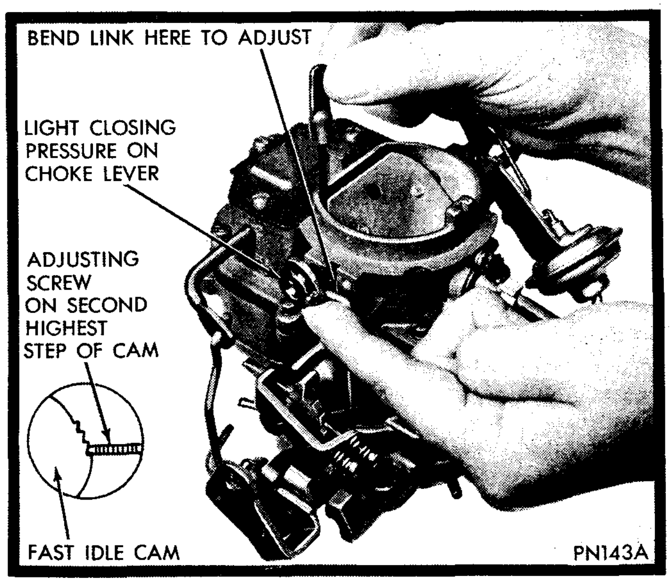
(2) Measure the distance between surface of air horn and top of accelerator pump shaft this measurement must be as shown in specifications.

(3) To adjust pump travel, loosen pump arm adjusting lock screw and rotate sleeve until proper measurement is obtained, then tighten lock screw.

(4) Install step-up piston cover plate and gasket.

4. FAST IDLE CAM POSITION ADJUSTMENT

.070″	BBD-6585S	BBD-8112S
	BBD-6586S	BBD-8113S
	BBD-8081S	BBD-8115S
	BBD-8082S	BBD-8121S
	BBD-8085S	BBD-8146S
	BBD-8108S	BBD-8147S
	BBD-8110S	



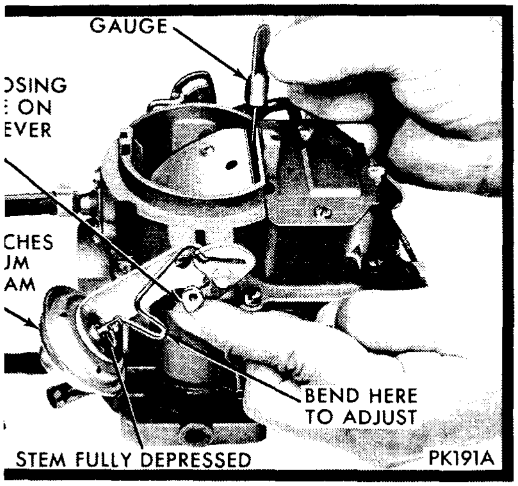
(1) With fast idle speed adjusting screw contacting second highest speed step on fast idle cam, move choke valve towards closed position with light pressure on choke shaft lever.

(2) Insert specified gauge between choke valve and wall of air horn. An adjustment will be necessary if a slight drag is not obtained as gauge is being removed.

(3) If an adjustment is necessary, bend fast idle connector rod at angle until correct valve opening has been obtained.

VACUUM KICK ADJUSTMENT

	;BD-8085S	.150′	BBD-8081S
	;BD-8115S		BBD-8108S
	;BD-8082S		
	;BD-8113S	.070″	BBD-6536S
			BBD-8146S
	;BD-8112S		BBD-8147S
			BBD-8121S
		.095″	BBD-8110S



an auxiliary vacuum source, disconnect ɘ from carburetor and connect it to hose n supply with a small length of tube to ıg. Removal of hose from diaphragm may :es which damage the system. Apply a 5 or more inches of mercury.

specified gauge between choke valve and ıorn. Apply sufficient closing pressure on ch choke rod attaches to provide a mini- valve opening without distortion of dia- :. Note that the cylindrical stem of dia- extend as internal spring is compressed. must be fully compressed for proper ıt of vacuum kick adjustment.

:ment is necessary if slight drag is not ıen removing the gauge. Shorten or phragm link to obtain correct choke valve ıgth changes should be made carefully by :losing the U-bend provided in the link. nding causes contact between the U-sec- diaphragm assembly.

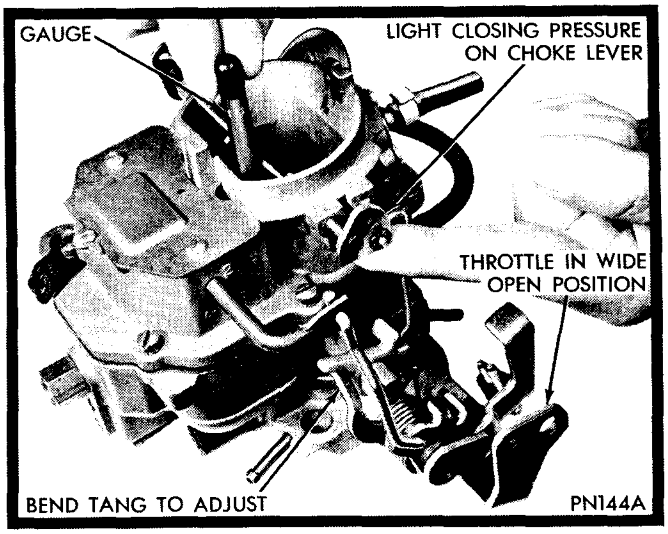
ꞌ twisting or bending force to diaphragm.

:ollowing check. With vacuum applied to the CHOKE VALVE MUST MOVE tween open and adjusted positions. If ; not free, examine linkage for misalign- ɜrferences caused by bending operation. ıtment if necessary to provide proper link

ɜll vacuum hose on correct carburetor

6. CHOKE UNLOADER ADJUSTMENT (WIDE OPEN KICK)

.280″	BBD-8085S	.310	BBD-8108S
	BBD-8115S		BBD-8147S
	BBD-8081S		BBD-8121S
	BBD-8082S		BBD-8113S
	BBD-6536S		BBD-8112S
	BBD-8146S		
	BBD-8110S		

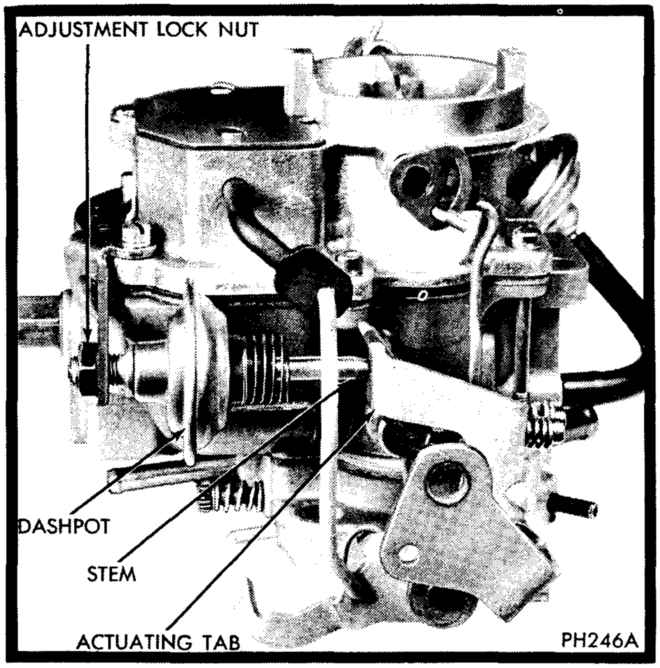


(1) Hold throttle valves in wide open position. Insert specified gauge between upper edge of choke valve and inner wall of air horn.

(2) With a finger lightly pressing against choke lever, a slight drag should be felt as gauge is being withdrawn. If an adjustment is necessary, bend unloader tang on throttle lever until correct opening has been obtained.

9. DASHPOT ADJUSTMENT (MANUAL TRANSMISSION ONLY)

refer to illustration below — BBD-8082S

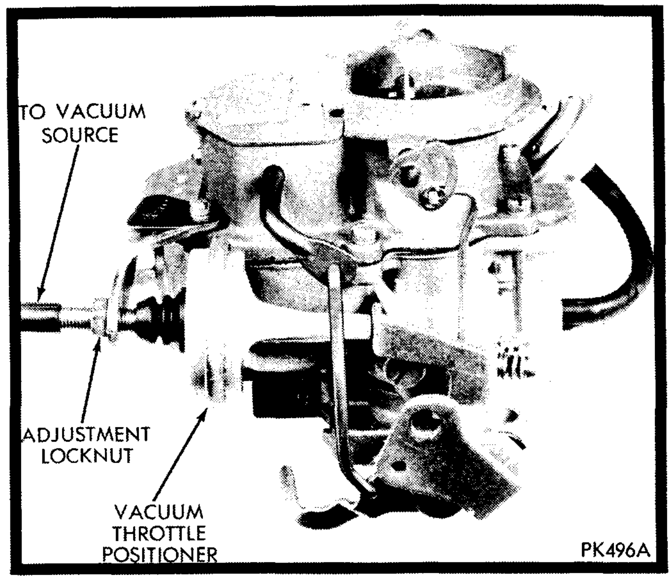


(1) With the curb idle speed and mixture properly set and a tachometer installed, start the engine and position the throttle lever so that the actuating tab on the lever is contacting the stem of the dashpot but not depressing it. Allow about 30 seconds for engine to stabilize. The tachometer should read 2500 rpm with throttle lever in this position if the setting is correct.

(2) To adjust the setting, loosen the lock nut and screw the dashpot in or out as required. When the desired setting is obtained, tighten the lock nut on the dashpot against the bracket. Check to make sure curb idle returns to specified speed consistantly.

10. VACUUM THROTTLE POSITIONER ADJUSTMENT

2500 RPM — BBD-8110S, BBD-8113S



(1) Start engine and allow to idle in Neutral, then accelerate engine to a speed above 2000 RPM and verify that vacuum positioner unit operates and can withstand a hand applied load in the operating position. If operation is not proper, determine cause of failure before proceeding, using diagnosis procedure.

(2) If unit operates properly as described above, adjust to operate at specified speed using the following procedure:

(3) Accelerate engine manually to the RPM shown above.

(4) Loosen positioner adjustment lock nut and rotate complete vacuum positioner assembly until positioner just contacts throttle lever.

(5) Release throttle, then slowly adjust positioner to decrease engine speed until a sudden drop in speed occurs (over 1000 RPM). At this point, continue adjusting vacuum positioner in decreasing direction 1/4 additional turn and tighten lock nut. Accelerate engine manually to approximately 2500 RPM and release throttle, engine should return to normal idle. This completes the adjustment.

11. IDLE SETTING PROCEDURES

refer to procedure below	BBD-6536S	BBD-8112S
	BBD-8081S	BBD-8115S
	BBD-8082S	BBD-8121S
	BBD-8085S	BBD-8146S
	BBD-8108S	BBD-8147S
	BBD-8113S	BBD-8110S
	BBD-6585S	BBD-6586S

(1) Make all adjustments with engine fully warmed up.

(2) Place transmission in neutral and set parking brake.

(3) Headlights off and air conditioning compressor not operating.

(4) Remove hose at distributor and plug hose.

(5) Check timing (refer to Emission Control Label in engine compartment).

(6) Adjust mixture setting (refer to Emission Control Label in engine compartment).

NOTE: On a new vehicle (under 300 miles) idle speed setting should be reduced 75 RPM for both propane enriched speed and curb idle speed.

FLOAT ADJUSTMENT (ON VEHICLE)

1/4" at center of floats (± 1/32") All	BBD-6536S BBD-6586S BBD-8081S BBD-8082S BBD-8085S BBD-8108S BBD-6585S	BBD-8110S BBD-8112S BBD-8113S BBD-8115S BBD-8121S BBD-8146S BBD-8147S

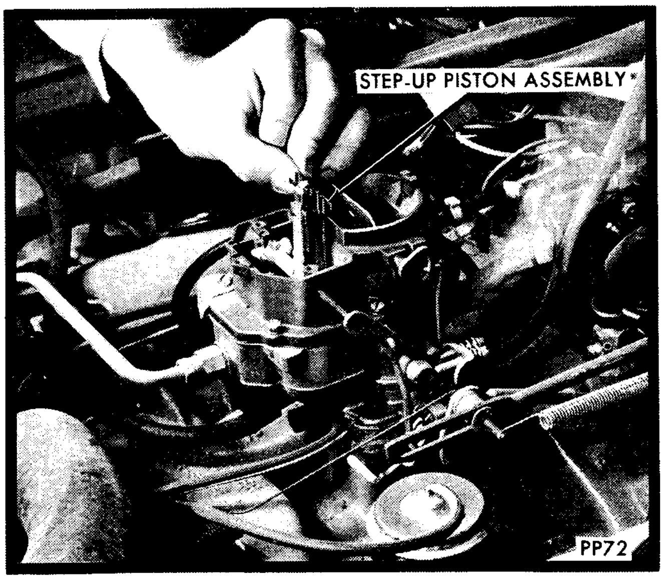


Fig. 1—Removing or Installing Step-Up Piston Assembly

(1) Remove air cleaner assembly and air cleaner gasket.

(2) Remove air cleaner mounting bolt assembly.

(3) Remove choke assembly.

(4) Disconnect vacuum kick and idle enrichment diaphragm hoses.

(5) Remove retaining clip from accelerator pump arm link and remove link.

(6) Remove fast idle cam retaining clip and remove link.

(7) Remove step-up piston cover plate and gasket from top of air horn.

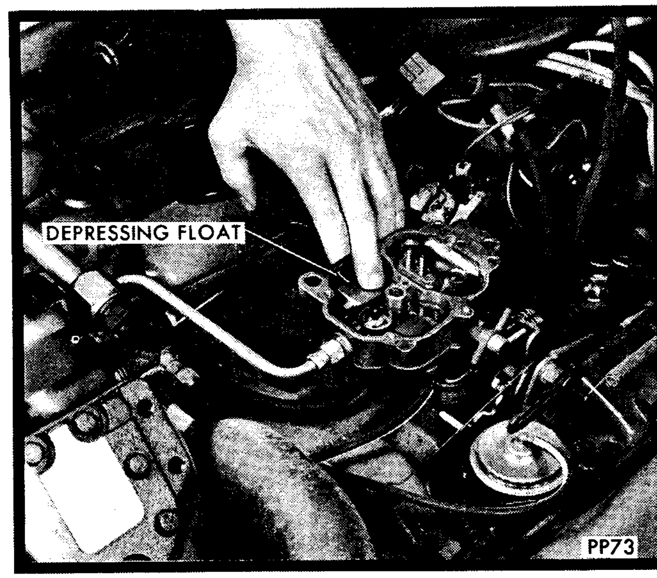


Fig. 2—Overfilling Fuel Bowl

(8) Remove metering rod lifter lock screw.

(9) Lift step-up piston and metering rod assembly straight up and out of the air horn. (Fig. 1).

(10) Remove air horn retaining screws and lift air horn straight up and away from main body.

(11) Remove float baffle.

(12) Overfill the float bowl by depressing the float manually or from an external supply to within 1/4 to 3/8 inch from the top of the fuel bowl. This will provide adequate inlet needle screwing force (Fig. 2).

(13) Using two wrenches, back off flare nut and tighten inlet fitting to recommended torque (200 inch-pounds).

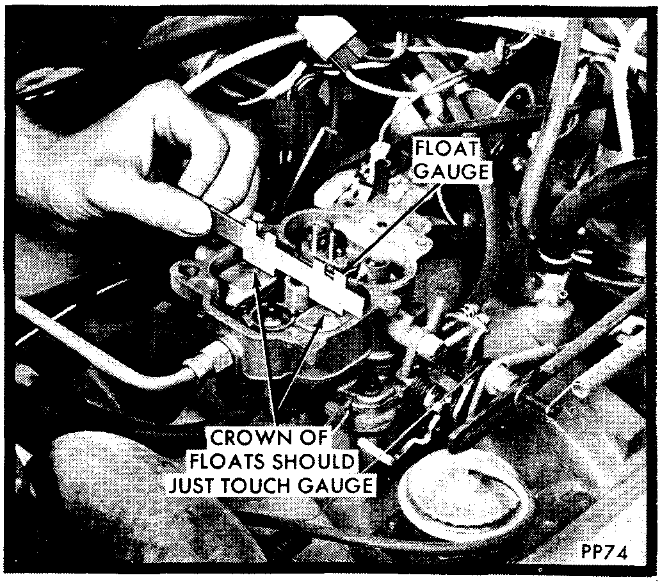


Fig. 3—Checking Float Setting

(14) Firmly seat the float pin retainer by hand while measuring height. The measurement from the surface of the fuel bowl to the crown of each float at center should be as indicated in specifications. If adjustment is necessary, hold the floats on the bottom of the bowl and bend the float lip toward or away from the needle (Fig. 3).

When bending the float lip, do not allow the lip to push against the needle as the synthetic rubber tip can be compressed sufficiently to cause a false setting which will affect correct level of fuel in the bowl.

(15) Install float baffle.

(16) Install air horn on main body. Be sure the leading edge of the accelerator pump cup is not damaged as it enters the pump bore. Alternately tighten attaching screws to compress gasket evenly.

(17) Install step-up piston and metering rod assembly in air horn.

(18) Install metering rod lifter lock screw.

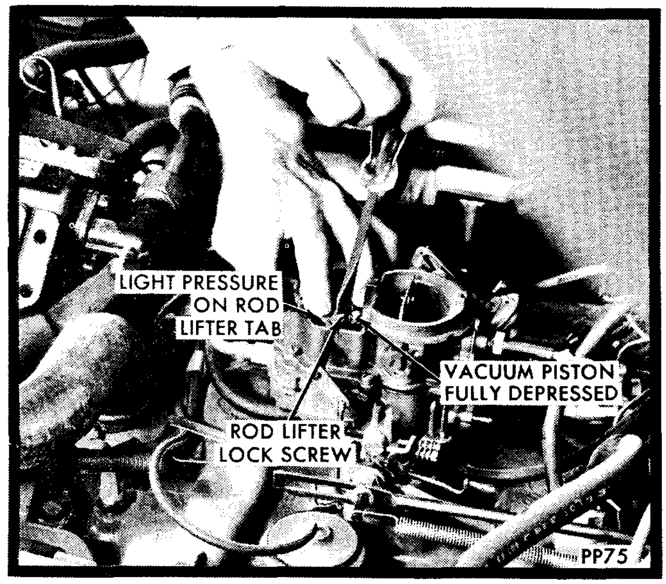


Fig. 4—Adjusting Step-Up Piston Assembly

(19) Back off idle adjustment screw until throttle valves are completely closed. Count the number of turns so that screw can be returned to its original position.

(20) Fully depress step-up piston while holding light pressure on metering rod lifter tab and tighten lock screw (Fig. 4).

(21) Install step-up piston cover plate and gasket.

(22) Return idle adjustment screw to its original position.

(23) Install fast idle cam link and retaining clip.

(24) Install accelerator pump arm link and retaining clip.

(25) Connect vacuum kick and idle enrichment diaphragm hoses.

(26) Install choke assembly.

(27) Install air cleaner mounting bolt assembly.

(28) Install air cleaner gasket and air cleaner.

(29) Check idle speed with tachometer. If adjustment is necessary refer to Emission Control Information Label in engine compartment for proper procedure and specifications.

HOLLEY MODEL 2210 and 2245 CARBURETOR

INDEX

	Page
Carburetor Adjustments	54
Accelerator Pump	56
Choke Unloader (Wide Open Kick)	56
Fast Idle Speed and Cam Position	55
Fast Idle Speed (On Vehicle)	57
Idle Speed Adjustment	59
Measuring Float Setting	
Off Vehicle	54
On Vehicle	60
Vacuum Kick	55
Vacuum Throttle Positioner	58
Cleaning Carburetor Parts	49
Disassembling Carburetor	46
General Information	41
Inspection and Reassembly	49
Service Diagnosis	3
Service Procedures	46
Special Service Tools	129
Specifications	127
Vacuum Throttle Positioner	53

CARBURETOR APPLICATION

MODEL 2210

Requirements	Transmission	Engine	BBLS	Carburetor	Number
Federal and Canada	Manual	360-1 Cu. In.	Dual	Holley	R-6764A
Federal and Canada	Automatic	360-1 Cu. In.	Dual	Holley	R-7870A
Federal and Canada	Man. Auto.	400 Cu. In.	Dual	Holley	R-6886-1A

MODEL 2245

Requirements	Transmission	Engine	BBLS	Carburetor	Number
California	Automatic	360-1 Cu. In.	Dual	Holley	R-7697A
Federal and Canada	Auto. Man.	360-1 Cu. In.	Dual	Holley	R-7871A
Federal and Canada	Automatic	360-3 Cu. In.	Dual	Holley	R-7088A
Federal and Canada	Manual	360-3 Cu. In.	Dual	Holley	R-7091A
Federal and Canada	Man. Auto.	360-3 Cu. In.	Dual	Holley	R-7103A
Federal and Canada	Automatic	360-3 Cu. In.	Dual	Holley	R-7092A
California	Manual and Automatic	360-3 Cu. In.	Dual	Holley	R-7698A

GENERAL INFORMATION

Service procedures for the Holley 2210 and 2245 model carburetors are basically the same, therefore, the illustrations in the following pages will be primarily of the 2245 model. Exceptions will be noted.

The Holley dual venturi carbuetor (Figs. 1 and 2) utilizes five basic fuel metering systems. Two of the systems are within the idle area, an Idle Enrichment System provides an enriched mixture for a short period after cold starts and the basic Idle System provides a mixture for idle and low speed; the Accelerator Pump System, provides additional fuel during acceleration; the Main Metering System, provides an economical mixture for normal cruising conditions; and the Power Enrichment System, provides a richer mixture when high power output is desired.

In addition to these five basic systems, there is a fuel inlet system that constantly supplies the fuel to the basic metering systems, and a choke system which temporarily enriches the mixture to aid in starting and running a cold engine.

Fuel Inlet System (Fig. 3)

All fuel enters the fuel bowl through the fuel inlet fitting in the bowl cover.

The "Viton" tipped fuel inlet needle seats directly in the fuel inlet seat. The fuel inlet needle is controlled by a nitrophyl float (a cellular buoyant material which cannot collapse or leak) and stainless steel float lever which is hinged by a "Delrin" float fulcrum pin.

The fuel inlet system must constantly maintain the specified level of fuel as the basic fuel metering systems are calibrated to deliver the proper mixture only when the fuel is at this level. When the fuel level in the bowl drops, the float also drops permitting additional fuel to flow past the fuel inlet needle into the bowl. A baffle over the needle assists in separating the air bubbles from the fuel to provide a more solid fuel supply in the bowl.

The float chamber is vented internally into the air

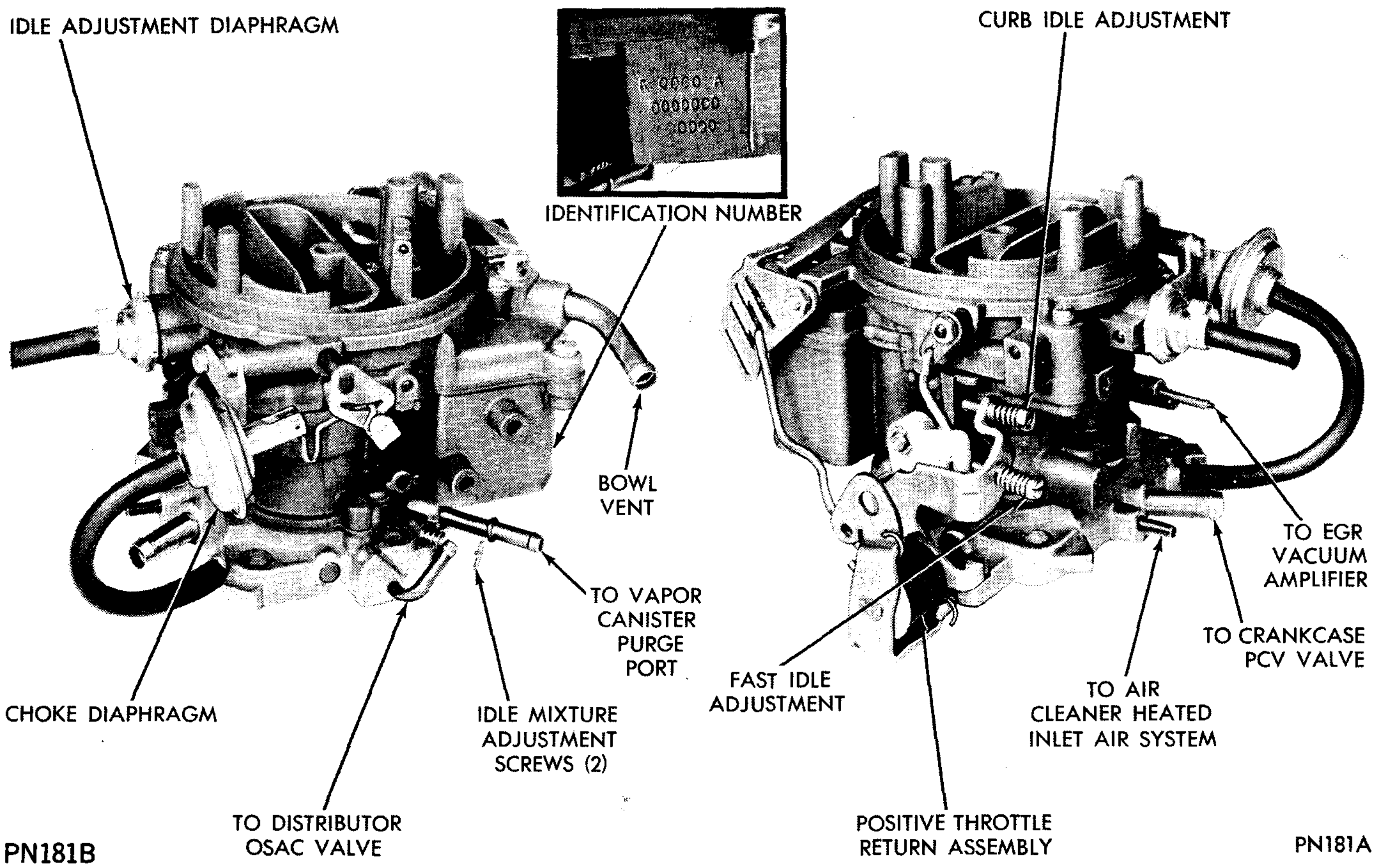


Fig. 1—Carburetor Assembly Holley Model 2245

horn. A vent actuated by the pump lever is opened at curb idle or when the engine is not running to release fuel vapors from the bowl into the charcoal vapor canister.

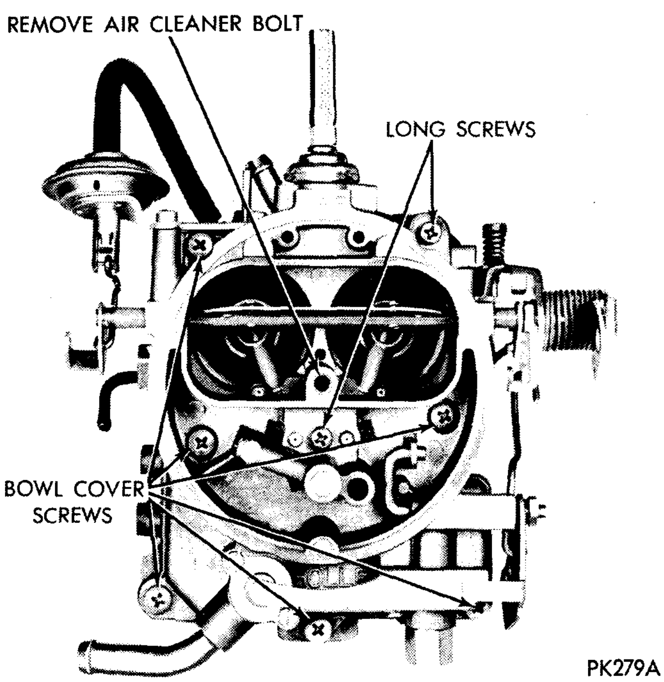


Fig. 2—Bowl Cover Screw Location

Idle System (Fig. 4)

Fuel used during curb idle and low speed operation flows through the main metering jet into the main well.

A horizontal connecting passage permits the fuel to flow from the main well into the idle well. Fuel continues up the idle well and through an idle feed restriction into an idle channel where the fuel is mixed with air which enters through idle air bleeds located in the air horn.

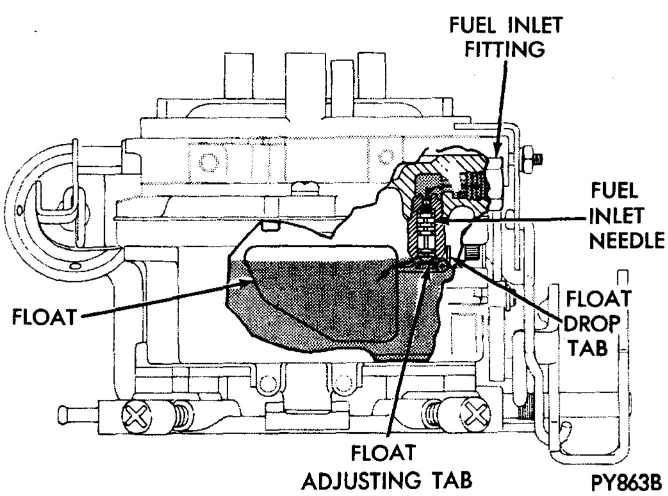


Fig. 3—Fuel Inlet System

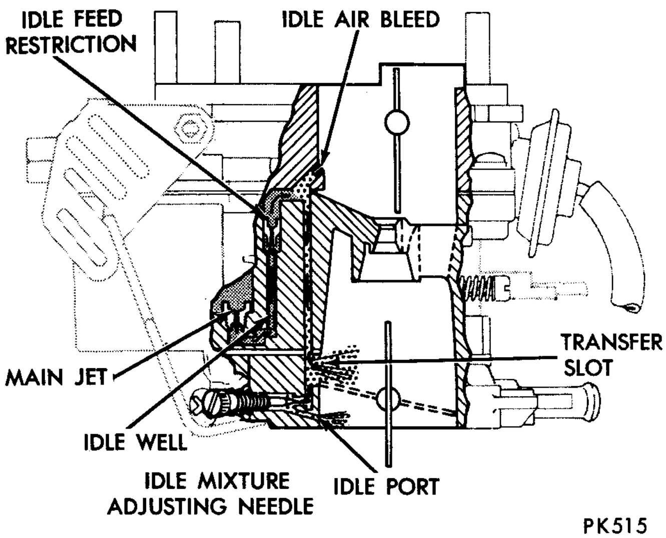


Fig. 4—Idle System

At curb idle the fuel air mixture flows down the idle channel and is further mixed or broken up by air entering the idle channel through the transfer slot which is above the throttle valve at curb idle.

During low speed operation the throttle valve moves exposing the transfer slot and fuel begins to flow through the transfer slot as well as the idle port. As the throttle valves are opened further and engine speed increases the air flow through the carburetor also increases. This increased air flow creates a vacuum or depression in the venturi and the main metering system begins to discharge fuel.

Idle Enrichment System (Automatic Transmission) (Fig. 5)

The purpose of the idle enrichment system is to reduce cold engine stalling by use of a metering system related to the basic carburetor instead of the choke.

The system enriches carburetor mixtures in the off idle area during that portion of vehicle operation related to cold or semi-cold operation.

A small vacuum controlled diaphragm mounted near the top of the carburetor controls idle system air. When control vacuum is applied to the diaphragm, idle system air is reduced. Air losses within the idle system strengthen the small vacuum signal and fuel flows increase. As a result of more fuel and less air, the fuel-air mixture is enriched.

Vacuum signal to the carburetor diaphragm is controlled by a thermal switch threaded into contact with engine coolant. Cold engines have switches in an open condition to pass the vacuum signal to the carburetor diaphragm. During warm-up the switch closes to eliminate the vacuum signal and returns the carburetor metering to normal, lean levels. In one type system, vehicles rely on this engine coolant vacuum switch to control idle system enrichment duration.

In a second system, vehicles have similar coolant vacuum switches, but the switch receives its vacuum signal from a solenoid valve operated by an electric timer. Enrichment duration is approximately 35 seconds after the engine starts. The thermal switch will prevent additional cycles of idle system enrichment after the engine reaches a warm condition, but while the engine is cold, each restart cycles another 35 seconds of enrichment.

Engines which have cooled below the switch opening temperature will benefit by having enriched idle after restart. Duration of the enrichment will be con-

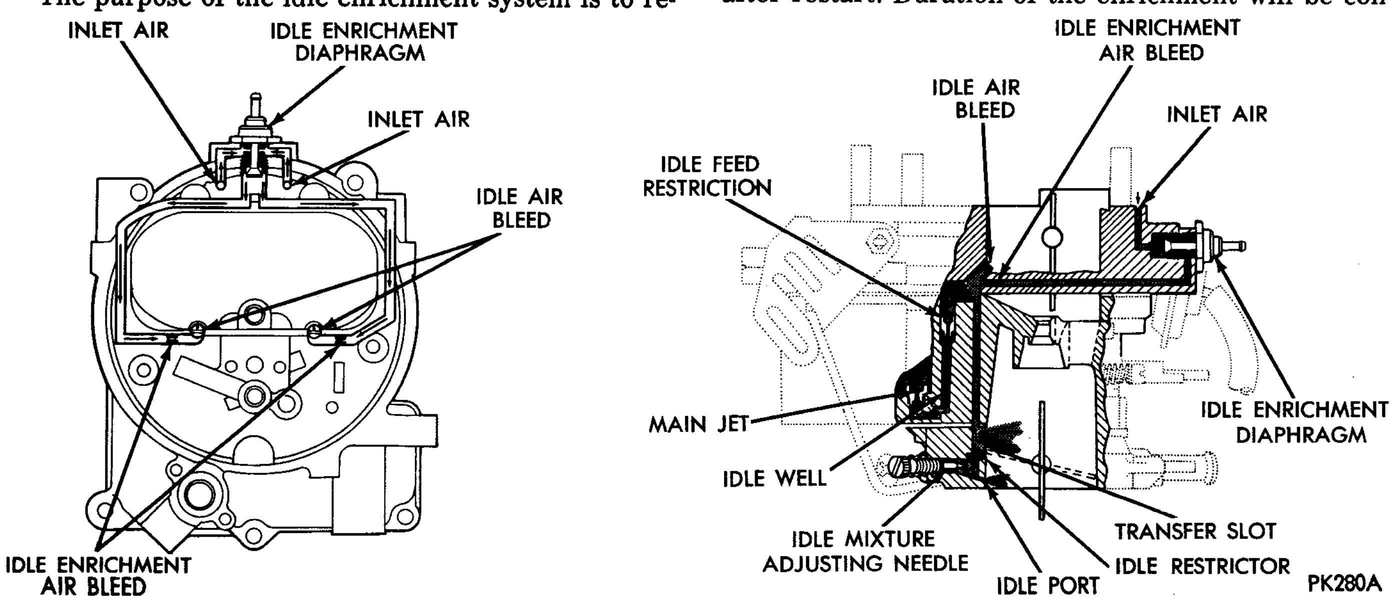


Fig. 5—Idle Enrichment System