CHEVROLET

1950

ENGINEERING FEATURES

PASSENGER CARS

FOREWORD

One year ago, we brought out the widely accepted car that established the basic "post-war" Chevrolet.

The 1950 car that you will meet in these pages goes a full step ahead, combining beauty and utility in the good measure that the buying public has come to expect from us.

In addition to the full complement of value that is designed into this fine car, we are introducing a new automatic transmission that will be available at the customer's option.

In the Chevrolet cars described in past "yearbooks" were many features whose contributions to better driving have been memorable, but never, we think, has Chevrolet or any other car in its price class, offered the great step forward in simplified driving that is represented by this new torque converter transmission.

With its accompanying "high output" engine, this latest achievement of the engineering designers is something that we are proud to present -- to turn over to the selling organization as a finished design.

We feel sure that you will find the 1950 Chevrolet to be the kind of a car that will again find its place at the top of the list in public favor.

May we remind you that it is all-important that the contents of this book be kept confidential until after the official national public announcement has been made.

E. H. Kelley
Chief Engineer

STYLELINE DE LUXE BEL AIR

STYLELINE DE LUXE 4-DOOR SEDAN

FLEETLINE DE LUXE 4-DOOR SEDAN

DeLuxe SERIES • • • Eight Models

FLEETLINE 4-DOOR SEDAN
Six-Passenger
Model 2153

FLEETLINE 2-DOOR SEDAN
Six-Passenger
Model 2152

STYLELINE 4-DOOR SEDAN
Six-Passenger
Model 2103

STYLELINE 2-DOOR SEDAN
Six-Passenger
Model 2102


STYLELINE SPORT COUPE
Six-Passenger
Model 2124


STYLELINE BEL AIR
Six-Passenger
Model 2154


STYLELINE CONVERTIBLE
Five-Passenger
Model 2134


STYLELINE STATION WAGON
Eight-Passenger
Model 2119

Special SERIES • • • Six Models

FLEETLINE 4-DOOR SEDAN
Six-Passenger
Model 1553

FLEETLINE 2-DOOR SEDAN
Six-Passenger
Model 1552

STYLELINE 4-DOOR SEDAN
Six-Passenger
Model 1503

STYLELINE 2-DOOR SEDAN
Six-Passenger
Model 1502

STYLELINE SPORT COUPE
Six-Passenger
Model 1524

STYLELINE BUSINESS COUPE
Three-Passenger
Model 1504

STYLELINE DE LUXE BEL AIR

THE NEW MODELS

Improved styling of many details makes the 1950 Chevrolet even more beautiful than its predecessor. These changes make the new Chevrolet easy to identify, even though its basic lines are unchanged. Interior styling, fabrics, and colors also are new, and additional mechanical refinements have been made.

The Styleline and Fleetline body styles are continued in both De Luxe and Special Series of the Chevrolet line. Already impressive, the variety of models offered is expanded with the addition of the Bel Air, a De Luxe sport coupe style with the low, swift lines of the Convertible, but fitted with a stationary steel top of unusual design. Since customers have shown a far greater preference for the Styleline De Luxe Steel Station Wagon, the companion model with wood body construction is no longer built. As shown on the preceding pages, the total number of models remains fourteen. Eight of these are in the De Luxe Series, and the other six models comprise the Special Series.

Chevrolet's most notable achievement in 1950 is the introduction of a torque converter transmission, available at extra cost on any De Luxe model. Bringing to the low-price field, for the first time, a host of the newest fine car features, the new transmission subordinates previous standards of car performance, smoothness, and ease of handling. Furnished as a factory installed package unit, the transmission option includes a new, more powerful engine, and other components especially designed to exploit the many advantages of the torque converter.

CLEAN, BOLD LINES DOMINATE THE IMPRESSIVE FRONT APPEARANCE

EXTERIOR STYLING

The radiator grille retains the three main members: the header bar, and the two horizontal bars below it. With the exception of the outermost bar covering the grille-to-fender joint at each side, the vertical pieces between the two lower horizontal bars are eliminated. A massive vertical ornamental post is added below each parking light. Each post is decorated with three horizontal grooves, which are painted blue. The same blue enamel also fills the letters of the name on the header bar.

NEW PARKING LIGHTS contribute to the changed appearance of the radiator grille. They are mounted in the same locations as before, closely resembling the previous design. However, in keeping with the greater prominence of the vertical bar below each light, the chrome plated base now extends nearly 3/4 of an inch farther to the front.

THE HOOD EMBLEM styling is more attractive. The Chevrolet trademark, painted blue, is centered on horizontal, chrome plated wings. The lower part of the die cast emblem is a wide, gold-painted shield, bordered by a fluted, chrome frame.

BUMPER GUARDS, both front and rear, are designed to provide added protection and, at the same time, to create a heavier appearance. The height of these guards is increased two inches to reduce the danger of locking bumpers with other cars. Because they

PARKING LIGHTS ARE MORE PROMINENT

BACKGROUND DETAIL BRIGHTENS HOOD EMBLEM

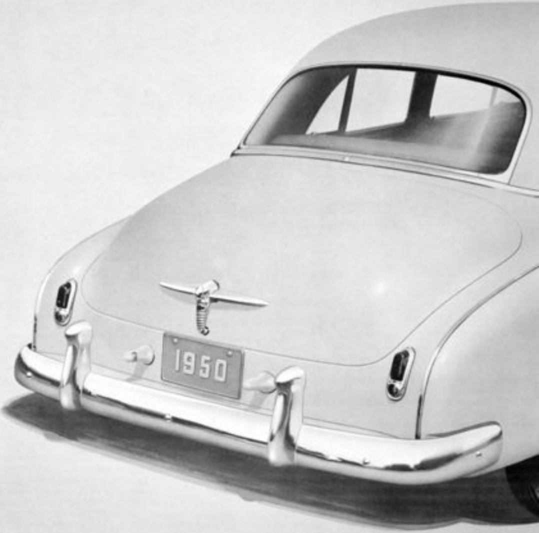
project farther from the bumper face bars, the overall length of the car is increased by a half inch.

On the Station Wagon, the new, higher guards are used on the front bumper only, since the lower rear guards must be retained to preserve clearance for lowering the tail gate. Therefore, the overall length of this model is increased only 1/4 of an inch.

The license guard at the front of the car is now a horizontal tie bar, extending between the bumper guards. It is mounted approximately two inches above the top of the bumper, and the license plate bracket is attached on its lower side. Formerly, the license guard was separate from the bumper guards, and was bolted directly to the bumper.

MORE MASSIVE BUMPER GUARDS AFFORD GREATER PROTECTION

ATTRACTIVE SIMPLICITY MARKS THE REAR VIEW



THE DECK LID HANDLE IS A FUNCTIONAL ORNAMENT

THE REAR OF THE CAR, like the front, has a new appearance for 1950. In addition to the change in bumper guards, both deck lid hardware and tail lights are revised.

The deck lid emblem and separate handle, used previously, are now combined in one functional unit. The T-shaped handle is replaced by a vertical, loop-type handle, which is stationary, as before. The top of the new handle contains the lock cylinder, which has a hinged cover that may be moved to one side to uncover the keyhole. The operation of the lock itself is unchanged from 1949. The face of the handle below the lock is decorated with the Chevrolet trademark, painted blue. A rectangular background for the trademark, and six horizontal grooves below it are filled with gold paint. Smooth, narrow wings, extending prominently from the top of the handle, complete the decorative effect. Each wing is a chrome plated steel stamping, 8-1/4 inches in length. The tail gate emblem on the Station Wagon is continued without change.

The new tail lights extend farther from the surface of the body. The plastic lens stands out one inch from the rim of the light at the top, and tapers to the surface of the rim at the bottom. In other respects, the appearance of the tail lights is unchanged.

The centrally located tail light on the Station Wagon, with its automatic positioning linkage concealed in the tail gate, remains unchanged.

Another improvement in appearance is found in the color scheme for the hub caps. The circular field surrounding the blue trademark is now painted gold instead of red. This rounds out the color harmony of the various emblems on the car. In other respects, the hub caps are the same as before.

TAIL LIGHT LENSES ARE PRISM-SHAPED

THE BEL AIR—A NEW DE LUXE COUPE STYLE

THE REAR WINDOW OF THE BEL AIR AFFORDS A WIDE PERSPECTIVE

BEL AIR is the name Chevrolet has chosen for its new special sport coupe model. It is the only addition to the Chevrolet line for 1950, and differs only in minor details from the luxurious hand-built model shown last year at the New York display of General Motors cars. The Bel Air is grouped with the De Luxe Styleline models, combining features of both the Convertible and the regular Sport Coupe. This ingenious design, with its vigorous, youthful lines, has previously been available only in much more expensive automobiles.

The low silhouette of the Bel Air results from utilization of the same lower body shell, windshield, and side windows that are used in the Convertible. Exceptional visibility, and a graceful, open appearance are gained by making the rear window a wide sweep of curved glass, which extends, collar-like, around the corners of the top. Because of the large expanse of this window, the area of the all-steel top is greatly reduced at the rear quarters.

Bright metal moldings are generously employed to emphasize the contours of the Bel Air. The drip molding is designed to be decorative, as well as functional. It forms a line of stainless steel across the top above the windshield, and continues around the top just over the side windows, to terminate at the belt line. The windshield reveal and body belt moldings are like those for the Convertible, as are the side windows, set in chrome plated frames. The rear window opening is framed by a stainless steel reveal, and two vertical bars divide the glass area into three sections. A short section of molding carries the lower line of the rear window reveal across each rear quarter panel above the belt molding. Other decoration on the Bel Air is the same as for conventional De Luxe models.

Both the door windows and the rear quarter windows may be lowered into the body, as in the Convertible, leaving an unobstructed opening from the belt line to the top. This is because the center pillars terminate at the window sills. Passengers can thus enjoy much of the feeling of riding in an open car, but with the additional protection afforded by the sturdy, all-steel top.

EXTERIOR COLORS are carefully selected each year to complement the styling of the new cars, and to appeal to the current color preferences of customers throughout the country. Of nine basic colors for 1950, five are new. These are Falcon Gray, Windsor Blue, Mist Green, Rodeo Beige, and Moonlite Cream. The color designated as Crystal Green, in the combinations listed on the opposite page, is the same as that called Ice Green in 1949. Both Crystal Green and Windsor Blue are deep-luster metallic lacquer, the popular new type of paint introduced in the Chevrolet line last year. Falcon Gray and Rodeo Beige, on the other hand, are regular metallic lacquer, a finish which has been used by Chevrolet with great success for many years.

WINDOW FRAMES LOWER TO CREATE AN OPEN CAR EFFECT

Following are the 1950 color combinations and the models to which they apply:

SINGLE COLORS
For all except the Station Wagon, Convertible, and Bel Air Models.

Body, Sheet Metal, and Wheels	Wheel Stripes
Mayland Black (regular)	Argent Silver
Oxford Maroon	Argent Silver
Grecian Gray	Mayland Black
Crystal Green	Argent Silver
Falcon Gray	Argent Silver
Windsor Blue	French White
Mist Green	Mayland Black
Rodeo Beige	French White

TWO-TONE COMBINATIONS
For all Styleline models except the Station Wagon, Convertible, and Bel Air.

Upper Body	Lower Body, Sheet Metal, and Wheels	Wheel Stripes
Falcon Gray	Grecian Gray	Mayland Black
Crystal Green	Mist Green	Mayland Black

SPECIAL COLORS will be used on a limited number of torque converter demonstrator cars in two combinations. Styleline and Fleetline De Luxe sedans in Grecian Gray will have Empire Red wheels with Argent Silver stripes. Other Styleline De Luxe sedans will have Empire Red as the upper body and wheel color, and Grecian Gray as the lower color.

STATION WAGON COLORS

Top, Lower Body Panels, Sheet Metal, and Wheels	Wheel Stripes
Oxford Maroon (regular)	Argent Silver
Rodeo Beige	French White
Crystal Green	Argent Silver

CONVERTIBLE COLORS

Body, Sheet Metal, and Wheels	Top Fabric	Interior Leather	Wheel Stripes
Mayland Black (regular)	Black	Red	Argent Silver
Grecian Gray	Black	Red	Mayland Black
Windsor Blue	Tan	Blue	French White
Mist Green	Black	Green	Mayland Black
Moonlite Cream	Black	Black	Mayland Black

BEL AIR COLORS

Upper Body	Lower Body, Sheet Metal, and Wheels	Interior Leather
Mayland Black	Mayland Black (regular)	Red
Falcon Gray	Grecian Gray	Red
Mayland Black	Mist Green	Green
Grecian Gray	Windsor Blue	Blue
Falcon Gray	Moonlite Cream	Black

Note...
Wheel stripes are the same as those shown for corresponding wheel colors on the Convertible.

PREDOMINANT COLORS ARE REPEATED IN THE INSTRUMENT PANEL AND CONTROLS

BEL AIR AND CONVERTIBLE INTERIORS

The interior of the new Bel Air is closely related in color and style to the exterior, creating a pleasing harmony in the overall design of the car. Upholstery materials and appointments are of excellent quality, embodying the newest styling trends.

The light, Silver Gray paint on the lower half of the instrument panel, the instrument cluster colors, and the control knobs are the same as in other De Luxe models. These details are described in a later section. The steering column, gearshift upper control shaft and lever, and inner steering wheel spokes are Silver Gray. Sharply contrasting black is used for the gearshift knob, the steering wheel rim, and the outer circle of the steering wheel hub ornament. The blue trademark on the ornament has a circular background, painted silver. Other special details include chrome plating in place of paint on the back of the rear view mirror, and sunshades of the type provided on Convertibles. However, the covering for the sunshades is headlining cloth, with gray leather fabric for hand grips and binding.

In the previous section, the exterior colors for the Bel Air were listed, together with the interior leather color used with each paint combination. The color of the leather is the key to the interior color scheme, since it is repeated in the leather fabric, carpets, and the paint for the garnish moldings and upper instrument panel.

SEAT UPHOLSTERY is a two-tone combination of leather and gray, striped-cord cloth. Genuine, deep buff leather forms a bolster effect across the tops of the seat backs, continuing down the outer sides, and across the ends of the cushions. Matching leather fabric covers the entire back and lower side panels of the front seat.

The pile cord fabric covering the remaining area of the seats is composed of alternating stripes of low pile weave and flat cord, similar to Bedford Cord. The pile and cord stripes react differently when the cloth is dyed, and a two-tone coloring results. The gray tones of this fabric, and its unusual combination

INTERIOR OF THE BEL AIR

LEATHER TRIM ON PILE-CORD FABRIC MAKES THE SPACIOUS REAR SEAT ATTRACTIVE

of textures, contrast smartly with the adjoining leather, whether it is red, blue, green, or black.

TRIM FOR THE DOORS and rear quarter panels repeats the dual tones of the seats. The style of the door panels, moldings, and stitching are the same as in the 1949 Convertible. The materials are interchanged, however, and seat cloth borders the main, streamlined panel of leather fabric. Door arm rests are like those in other De Luxe models, except that genuine leather covering is used.

The rear seat arm rests are formed by the lower part of the rear quarter sidewalls. The quarter panel trim is leather fabric, except for a panel of seat cloth above the arm rest.

GARNISH MOLDINGS assume new importance in the Bel Air, since they not only frame the vision openings, but form a continuous border around the roof line, unifying the interior in both line and color. Stainless steel moldings underline this border, just as they do the garnish moldings at the bases of the side windows. Divider bars for the rear window are also bright metal, and windshield garnish moldings are painted to match the color of the leather.

An interior light is fitted into the garnish molding on each rear quarter panel. The light frames are chrome plated and styled in harmony with the molding contours. An automatic switch in each hinge pillar turns on both lights whenever either door is opened. A manual switch is also provided on the left

TWO INTERIOR LIGHTS ARE FURNISHED

hand rear quarter panel. A six-candle power bulb in each light assures a high level of illumination.

Headlining is light gray cloth. It is crossed by exposed, chrome plated roof bows, which simulate the functional bows of the Convertible top. Extra sound insulation is provided between the headlining and the top, as introduced last year on other De Luxe models. This is, of course, in addition to the usual layer of single ply felt deadener lining the steel top panel.

Door handles and window regulators are the low hub type, as in De Luxe sedans. Special rear seat ash trays are recessed in the top surfaces of the arm rests. They are chrome plated units, similar to those in the Convertible.

As mentioned earlier, carpets match the interior leather in color. This is true also of the genuine carpet inserts in the front floor mat, which is dark gray rubber. The luggage compartment is like that in the De Luxe Sport Coupe.

SIX PASSENGER interior roominess is provided in the Bel Air, because the rear seat is wider than that in the five passenger Convertible. Approximately seven inches are added to both hip and shoulder room dimensions of the rear seat, because the space for the Convertible folding top mechanism is utilized for seat width. Rear seat hip room and shoulder room in the Bel Air are nearly the same, about 52-1/2 inches. Other interior dimensions are essentially the same as for the Convertible.

CONVERTIBLE INTERIOR styling is the same as in the Bel Air, except for the obvious differences in top construction. Also, the Convertible sunshades match the top fabric color. Top fabric and interior leather colors are shown with exterior colors on page 25.

EXPOSED ROOF BOWS ARE CHROME PLATED

REAR COMPARTMENT
STYLELINE DE LUXE 4-DOOR SEDAN

De Luxe INTERIORS

Interior colors and fabrics of the De Luxe sedans and Sport Coupe are new. In conjunction with these, re-styling of the sidewall and seat back rest trim creates an entirely different appearance.

A theme of two-tone gray replaces the former combination of tan and brown. Fabrics are of the flat type, and the optional pile trim is no longer offered.

NEW FABRICS. Fine broadcloth on the seats has a light gray background, with a subdued pattern of variable width, darker gray stripes. Plain, dark gray broadcloth covers the shoulder area of the back rests in a broad band. It curves down at the sides to blend with the design of the sidewall trim. The front seat back and lower side panels, and the body center pillars also are finished in dark gray broadcloth.

Sidewall trim is two-tone gray. The main panel is light gray fabric, and the reshaped upper panel is dark gray broadcloth. Two bright metal moldings accent the lines of the darker area. Scuff pads are dark gray, but are unchanged in other respects.

ARM RESTS. Door-mounted arm rests are new for 1950. Similar in appearance to the front door arm rests used in 1948, they continue to provide the convenient door-pull feature. In two-door models, the rear seat arm rests fitted with ash trays, are continued from 1949. Leather fabric, cloth, and painted areas are dark gray on both types.

INSTRUMENT PANEL colors are Titan Gray for the upper half, with lighter, Silver Gray below. Titan Gray, a dark metallic shade, is used for the garnish moldings, steering column, gearshift lever, and other painted interior parts, as well. On the steering wheel, the rim is Silver Gray, and the inner spokes are Titan Gray. The outer rim of the center ornament is Titan Gray, and the circular background for the trademark is painted silver. Other details of the ornament are unchanged.

The plastic knobs are now dark gray, except the gearshift and ventilator control knobs, which are light gray. Black paint on the background surfaces of the chrome plated radio grille bars, and new instrument cluster and clock colors complete the appearance change in the instrument panel.

THE INSTRUMENT CLUSTER outer bezel ring is Titan Gray, and the inner ring is chrome plated. The face of the cluster is plastic, as before, with the figures etched on the back surface. The outer dial is Titan Gray, and the inner dial, for the speedometer, is Silver Gray. Other details are unchanged.

The outer face of the clock is now Silver Gray, so that it matches the lower half of the instrument panel. To facilitate reading, a series of twelve graduations, arranged in a circle, are painted in Titan Gray on the inner, spun aluminum face of the clock. Continued from mid-1949 are the longer clock winding stem and the relocated ash tray knob, which is somewhat lower than before. Both of these changes were made to provide more space for the fingers when winding the clock.

The center of the windshield wiper knob contains a small, cylindrical plastic insert. When the accessory windshield washer is installed, this insert is

ARM REST SHAPE ACCENTS DOOR STYLE

DE LUXE TRIM PANEL DESIGN FOR 1950

FRONT COMPARTMENT
STYLELINE DE LUXE 4-DOOR SEDAN

replaced by the washer control push button. Formerly, the washer was actuated by turning the wiper knob.

Another improvement is the new position of the glove compartment light in the upper left corner of the opening. Formerly, the light was in the upper right hand corner, and when the compartment door was opened at night, the light shone directly in the driver's eyes.

Materials such as the headlining, the carpet, and the front compartment floor mat are new in color to harmonize with the gray color theme. The luggage compartment trim is continued without change in materials or colors.

THE STATION WAGON interior is changed only in the front compartment, where the steering wheel, instrument panel, windshield garnish molding, and other incidental parts incorporate the changes noted for De Luxe sedans. The brown leather fabric seat upholstery, the natural wood sidewalls, and the leather fabric headlining are continued without change.

Special INTERIORS

The interior treatment in models of the Special Series is more beautiful than any previously offered by Chevrolet in its "thrift" line. The conservative pile fabrics, traditionally supplied in these models, are replaced with flat woven cloth. The modern appearance is further enhanced by a two-tone color combination, a feature reserved for De Luxe models in the past. Appointments are the same as in 1949, except the robe cord is eliminated in four-door sedans.

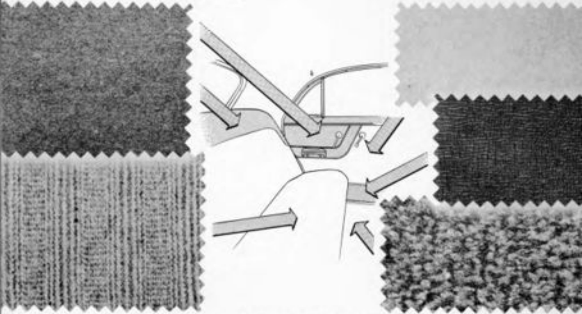
SEAT UPHOLSTERY is a newly developed, modern weave, flat cloth. A striped pattern is formed by the different shades of gray threads in the weave. It answers, specifically, the desires of many customers for a durable upholstery with a rich sheen and a deep texture. Even with all of its appearance value, the wearing quality of this material has been found to be equal to or better than that of the pile fabric it replaces. Another advantage is the comparative ease with which one may slide over this cloth, as when the driver enters the car from the curb side.

The front seat back and lower side panels are plain gray broadcloth, which matches the darkest stripe in the seat material. This same broadcloth covers the body center pillars and the upper panel of the two-toned sidewalls. The lower cloth of the sidewalls is light gray, and the scuff pads at the bases of the doors are plain dark gray. Carpet and headlining materials also are changed to shades of gray.

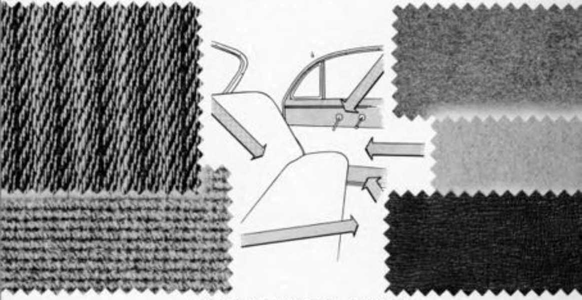
THE INSTRUMENT PANEL and garnish moldings are painted Titan Gray. Stripes on the garnish moldings are light gray. Plastic knobs throughout the car also are light gray. Except for the bezel, the instrument cluster colors are the same as those in De Luxe models. The bezel has a Titan Gray outer rim, and a Silver Gray inner rim, in place of the chrome plating on the 1949 model. Another change on the instrument cluster is a slight revision in the sectional shape of the chrome circle separating the two figure rings.

THE STEERING WHEEL is Titan Gray, and the painted area around the blue trademark on the horn button is Grecian Gray, a very light shade. The steering column, gearshift control parts, and the painted sections of the parking brake are Titan Gray.

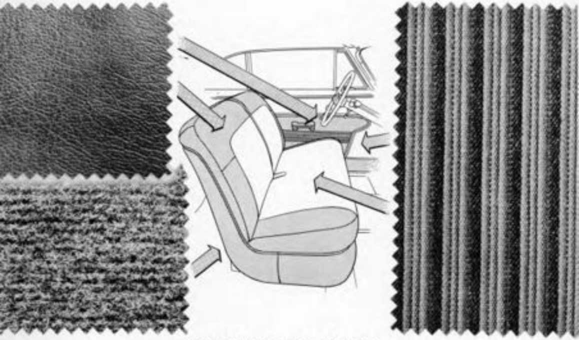
UPHOLSTERY FABRICS



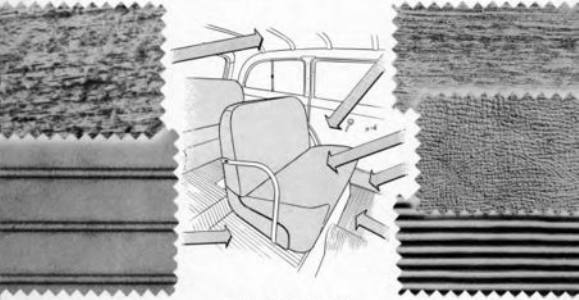
***DE LUXE* SEDANS AND SPORT COUPE**



***SPECIAL* SEDANS AND COUPES**



CONVERTIBLE AND BEL AIR



STATION WAGON

BODIES AND SHEET METAL

Since the basic styling of the bodies and sheet metal is retained from the previous models, only minor changes are made in the structure of these parts. In addition to these changes, however, several improvements, that were incorporated during the 1949 season, are carried over into 1950 production.

FUEL FILLER provisions, in the left rear fender area of the body, are of new design on all models except the Station Wagon. A direct drain to the ground prevents spilled gasoline from flowing down the surface of the fender. Thus, the new drain eliminates unsightly accumulations of dust, and possible damage to the paint.

The new filler neck housing consists of a steel tube of more than five inches diameter, which extends from the filler housing in the fender, downward through the body, to a hole in the floor pan. The tube is welded to the floor of the fender compartment at the top, and to the body floor pan at the bottom. Thus, the passage formed by the tube is sealed from the interior of the body, but is open from the filler door in the fender to the ground. The trim panel on the left side of the luggage compartment conceals the housing.

The filler pipe itself is mounted within the larger tube, and is secured by a small bracket at the top. The clearance between the filler pipe and the tube provides an outlet to the ground for fuel which may escape from a full tank when the car is on a side grade, or when heat from the sun causes the contents of the tank to expand. Except in cases of extreme carelessness, this provision also prevents fuel, spilled while filling the tank, from running down the outside of the fender.

FUEL FILLER IS IMPROVED

In the previous design, the filler pipe extended through the luggage compartment. Seals at the top and bottom were provided to exclude gasoline seepage and road splash from the body. Therefore, the filler compartment in the fender was sealed from the body interior, and any spilled gasoline could only drain over the outside of the fender.

REAR VIEW MIRRORS. On all Styleline models, except the Bel Air, Convertible, and Station Wagon, the inside rear view mirror is now mounted 3/4 of an inch lower. In its new position, the mirror may be adjusted through a wider vertical range, to prevent image interference from the top of the rear window. Distance visibility behind the car is thereby increased, especially for tall persons.

SIDE DOOR LOCKS. The keyholes in the front door locks are now closed by small, spring-loaded doors, instead of sliding shutters. The door-type closures seal the keyholes more securely, and are more easily pushed open by the key, if the locks are coated with ice.

CONVERTIBLE TOP. Improved construction of the Convertible top permits the operation of raising it to be performed entirely from the front seat. The sides of the top now extend downward into the quarter panels, where they are attached to the body, above the wheelhouses. To provide a weather-tight seal between the sides of the top and the upper edge of the quarter panel, sponge rubber pads are enclosed in the top material in those areas. When the top is raised, an arm of its framework presses firmly against each padded area, sealing the joint between top fabric and quarter panel.

Formerly, the top fabric extended on each side only to the belt molding on the outside of the quarter panel, and it had to be hand-fastened to a metal flange, after the top was raised. Since this same flange was also used for attaching the top boot, fasteners for this purpose are now attached to the belt molding, just behind the quarter windows.

BOX SECTION construction of the roof rails for sedan and coupe bodies replaces the former channel design, to make the rails even more rigid. In conjunction with the improved cross section, a stiffer body framework is achieved by welding the roof rails directly to the wheelhouses. Previously, the roof rails terminated at the rear lock pillars, and were extended to the wheelhouses through gussets.

SEVERAL REVISIONS in body construction were put into production during the 1949 model year. This policy was followed so the benefits from these revisions could be realized as rapidly as possible.

On four-door sedans, channel shaped reinforcements were added to the sides and tops of the upper door areas. Similar channels were added to brace the upper parts of the center pillars. The purpose of these changes was to strengthen the body upper structure, in order that the doors might remain properly fitted longer. The Station Wagon front doors and center pillars, as well as the doors and center pillars on steel-top, two-door models, were revised in a similar manner. The sides and upper corners of the Station Wagon lift gate were also reinforced with channel sections.

As part of the same program, thicker steel was specified for the flanged channel, vertical center divider of the windshield to increase its strength. A steadier mirror mounting was obtained by extending the mirror mounting plate upward to the windshield header. By increasing the number of T-bolts from two to three, a more rigid assembly of the windshield center divider also was achieved.

EXTERNAL HOOD RELEASE. So filling station attendants can open the hood without inconvenience to the driver, an external hood release was adopted during 1949. A great many passenger car owners have asked for this feature, and it has been well regarded by operators of the more than 775,000 trucks built by Chevrolet since the introduction of the "Advance Design" models in 1947.

The remote control knob and cable, formerly required to unlatch the hood from inside the car, are eliminated. These parts are replaced by a simple release lever attached to the hood lock plate. The lever is conveniently located just to the right of the centerline of the car, and is hidden by the radiator grille header bar. The hood safety catch is retained without change.

The end of the front fender molding on De Luxe models, at its junction with the front of the door, was revised during 1949 to remove the pointed projection. Tapered in the same manner as the end of the door section of the molding, the end of the fender molding is no longer a personal hazard. Possible damage to the door molding, when the door is wide open, also is eliminated.

REDUCED WIND NOISE, during high-speed operation, was accomplished by reshaping the outer surfaces of the ventipane uprights. Formerly flat, these vertical bars are now V-shaped, and they project farther into the airstream.

FRONT DOOR SEAL. To eliminate persistent leaks between the front door and hinge pillar, below the body belt line, the rubber seal was replaced by a wide boot. The boot is made of rubber-impregnated glass fiber, and is cemented at one edge to the front face of the door. From there, it extends across the opening to the adjacent cowl structure, where it is attached with screws and cement, forming a continuous barrier to the entrance of water from the belt line to the bottom of the door.

The weather seal on the upper part of the door is continued, but its lower end, at the belt line, overlaps the new boot, so that water from above is carried to the outside.

CARBURETOR PERFORMANCE IS SMOOTHER AND MORE RESPONSIVE

ENGINE AND CHASSIS

Foremost among the improvements made in the engine is a completely new carburetor. Incorporating radical changes in design, the new carburetor provides quicker response to power demands, smoother acceleration, and improved performance on hills and curves, and after sudden stops.

Chevrolet's foresight in following a policy of constant improvement of its products is well illustrated by the results of the latest certified production engine performance test. The test shows that the 1950 passenger car engine develops a gross horsepower of 92, and a gross torque of 176 foot pounds (net horsepower: 85; net torque: 170 foot pounds). Each of these values is greater by two integers than the corresponding figures for the 1949 engine.

These increases are significant because they are the results of not one, but several changes made in the engine since 1941. Three of these are: modified valve timing, in 1948; higher compression ratio, in 1949; and for 1950, larger exhaust valves.

EXHAUST VALVES ARE 1/32 of an inch larger in diameter, making them interchangeable with those in the new 105 horsepower engine, furnished with the optional torque converter transmission. In addition, the seat angle on the exhaust valves is changed from 30 to 45 degrees to increase their strength. The larger head diameter results in a four per cent increase in area. A similar increase in the throat passage is accomplished by making the throat diameter 3/64 of an inch larger. The metal added to the valve heads and seats by these changes, combined with the steeper seat angle, results in stronger, more durable exhaust valves, which offer less resistance to expulsion of gases from the combustion chambers.

OIL GALLERY. To improve the structure of the cylinder case casting, the position of the oil gallery, with relation to the surrounding water jackets, is changed. Previously, only 3/16 of an inch of metal separated the two passages, so the slightest porosity would allow leakage between them, necessitating rejection of the casting. Now, however, with approximately an inch of metal between the water jackets and the oil gallery, the casting structure is strengthened, and the leakage problem is eliminated.

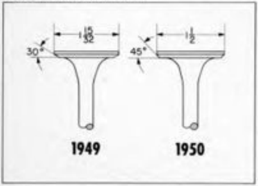
AN IMPROVED THERMOSTAT, incorporating a vibration damper, was introduced in 1949 engines in mid-season, and is continued for 1950. The old design was subject to failure due to vibration. This vibration was caused by the high velocity of water flow at the thermostat valve during engine warm-up periods, or at high road speeds. In the new thermostat, a flat spring rests against the valve stem, damping vibration effectively.

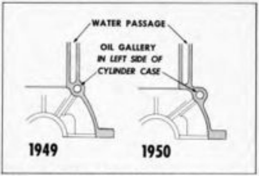
ENTIRELY NEW CARBURETOR. Embodying the latest carburetion techniques and methods of construction, the new carburetor has the clean, unified appearance that results from functional design. Following is a list of its main advantages over previous designs:

1. More constant fuel level in main nozzle passages.
2. Better protection against vapor lock.
3. Continuous fuel flow during transition from idling to higher speeds.
4. More uniform air distribution in carburetor throat.
5. Vacuum-operated fuel enrichment valve for accurate response to varying loads, regardless of accelerator position.
6. Smoother, quicker response to accelerator.
7. Improved, fully enclosed accelerator pump.
8. Efficient, trouble-free ball-type valves used exclusively.
9. Easier servicing, because of simplified construction.

The most important improvement in carburetion is brought about by a relocation of the float bowl, which, in the new design, is arranged concentrically about the carburetor throat. Previously, the bowl and float were located ahead of the throat. This position made it difficult to maintain a constant fuel level in the main nozzle passages, because the main nozzle is

EXHAUST VALVES ARE LARGER





THE OIL GALLERY IS RELOCATED

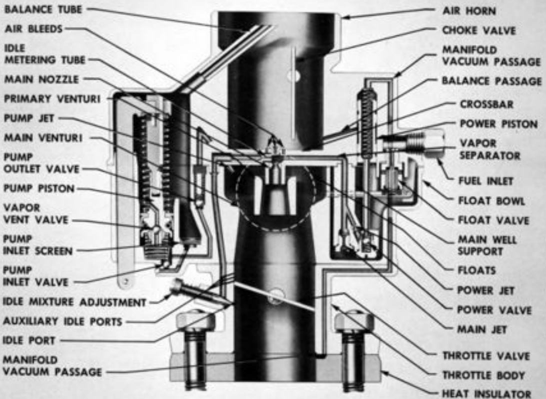
located in the center of the throat, but the float controls the fuel level only with relation to its vertical axis. Consequently, if the carburetor was tilted too far upward (as it might be on a very steep upgrade), the fuel level could rise high enough at the back of the bowl to flood the main nozzle passages, spilling excess fuel from the nozzle. Conversely, a sudden stop, or a steep downgrade, could starve the nozzle momentarily.

With the concentric float bowl, however, the carburetor throat is completely surrounded by fuel, and twin floats are used, one on each side of the throat. The floats are connected by a wishbone-shaped arm, and, since their centerlines coincide with that of the main nozzle, the fuel level in the nozzle passages remains substantially constant, regardless of either transverse or longitudinal inclinations of the carburetor. Formerly cast iron, the new float bowl is a symmetrically shaped die casting, containing only the accelerator pump mechanism and the primary and main venturis. All jets and all major functional parts are included in the air horn assembly, which is the compact center of operations in the new carburetor. It contains the twin floats and float valve, the main and power jets and the vacuum-operated power valve, the main well, main nozzle, idle metering tube, and accelerator pump jet. Also, the air horn encloses the accelerator pump upper mechanism completely, eliminating the need for a separate cover of the type used in 1949. Only four screws are used to attach the air horn to the float bowl, so that it becomes a simple matter to remove the entire assembly for inspection or service.

Construction of the main well support is unique. Suspended from the air horn, the entire well, containing the main and power jets, and the power valve, is surrounded by the fuel in the float bowl. In this position, it is ideally insulated by the fuel against heat from the manifold. Additional insulation is provided by gaskets at the air horn, at the bowl, and at the throttle body, and by a thick insulator at the manifold, providing superior protection against vapor lock.

Another design feature of the new carburetor is the provision of a common fuel passage to both the main

DETAILS OF THE NEW CARBURETOR



nozzle and the idle port. In conventional carburetors, there is a distinct time lag at the point where fuel delivery is transferred from the idle port to the main nozzle. With the main nozzle located in the same passage that leads to the idle port, however, the supply of fuel to either is continuous. This is accomplished by means of a drilled crossbar in the carburetor throat. One end of the passage in the crossbar is connected to the main well, while the other end is connected to a passage in the float bowl, leading directly to the idle port in the throttle body. At the center of the crossbar is the main nozzle, which projects downward into the opening of the primary venturi. Thus, fuel sprayed from the nozzle is already moving in the same direction as the air in the throat, improving performance at low speeds. Moreover, the symmetrically designed main nozzle crossbar and primary venturi support struts contribute to a more uniform distribution of air in the carburetor throat.

Fuel percolation is no problem in the new carburetor, due to the design of the main well support, with its jet orifices open only to the cooler fuel at the bottom of the float chamber. However, if engine temperatures are abnormally high, some fuel vapors may be present in the main nozzle passages. This is often the case when the engine is allowed to idle after a hard run on a hot day. For additional protection in such conditions, a vapor separator bar is located in the crossbar passage to the main nozzle. Any bubbles in the main passage will rise to the top of the crossbar passage, where they will be separated from the liquid fuel. The vapors pass over the separator bar, while the liquid fuel flows underneath without interruption.

The throttle-operated metering rod, used in previous Chevrolet carburetors, is replaced by a vacuum-operated power valve in the new design. Mechanical wear of the jet orifice is obviated by the elimination of the metering rod, and the power jet itself is located in a short tube leading to the main jet passage. Space formerly occupied by the metering rod is now taken up by the power valve and its actuating mechanism.

The richer fuel mixtures necessary for high speeds, or whenever greater power output is required, were formerly supplied by means of the stepped metering rod, which allowed an increasing flow of fuel as it was lifted farther out of the jet orifice by mechanical linkage to the throttle. Therefore, the richest (power) mixture was available only when the accelerator was fully depressed. The power valve in the new carburetor, on the other hand, opens to admit additional fuel to the main nozzle passage whenever manifold vacuum drops to within 2-1/2 pounds of atmospheric pressure. This is a more accurate method of adjusting the flow of power mixtures to power requirements, since a demand for greater power output from the engine is always accompanied by a drop in manifold vacuum. The 1950 Chevrolet reflects this fact in noticeably quicker response to the accelerator, and smoother acceleration at low speeds, especially from second gear starts.

An improved accelerator pump is used in the new carburetor. As before, the pump piston is submerged in fuel to prevent air leakage past the leather seal, but, in addition, the piston assembly contains a ball check valve, which provides an outlet for vapors from overheated fuel that may be trapped in the pump cylinder. Since the ball is not spring-loaded, the passage through the vapor vent valve is always open, except during operation of the accelerator pump, when the pressure created by the descending piston forces the ball into the opening. The new pump employs a spring below the piston, as well as one above. The rates of the two springs are calibrated to insure a smooth, sustained charge of fuel from the pump jet. To facilitate installation of the piston in the pump cylinder, the entrance is tapered--a feature service mechanics will appreciate.

Disk-type inlet and outlet valves are replaced by ball checks, which provide better seals and are less susceptible to clogging. Also, the outlet ball check is spring-loaded, so that strong suction in the carburetor throat cannot lift it from its seat. In the 1949 carburetor, only the force of gravity kept the valve closed, since the pump jet was designed to deliver small amounts of fuel by suction alone, under certain conditions. Ball-type valves are also used at the vapor vent and power valves, described previously.

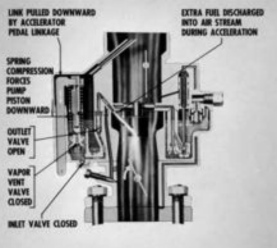
As in 1949, a fast-idle device is provided for more efficient starting and faster warm-up in cold weather. The slotted fast-idle link, which was attached directly to the throttle valve shaft, is replaced by a spring-loaded lever, pivoted at the center. The upper end of the lever is operated by a cam attached to the choke valve shaft, while the lower end bears against the idle speed adjusting screw on the throttle shaft lever. When the choke lever is operated, the turning cam on the choke valve shaft moves the fast-idle link clockwise around its pivot, the motion being transferred proportionately to the throttle shaft lever.

As before, a balance tube vents the float bowl to the carburetor throat to equalize air pressures. If the bowl were vented to atmosphere, any reduction in pressure of the air entering the throat (such as would be caused by a dirty air cleaner) would not be matched by a corresponding reduction over the fuel in the float bowl. Fuel flow then would be abnormal, resulting in erratic performance. However, with the bowl open only to the air that passes through the air cleaner, any changes in pressure are automatically equalized. An additional balance passage, extending from a space around the power piston to the carburetor throat, prevents the application of suction to the fuel in the float bowl. The passage, instead of the float bowl, supplies any air that may be drawn past the piston by the high manifold vacuum.

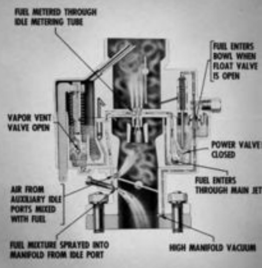
To the service mechanic, the simplicity of this new carburetor is one of its most outstanding features. Float level setting is the only internal adjustment required, while the conventional idle speed and mixture adjustments bring the total only to three. In addition, both the idle metering tube and the accelerator pump jet are pressed permanently into place at the factory, and they never require service or replacement.

CARBURETOR OPERATION

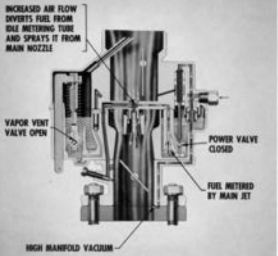
ACCELERATOR PUMP



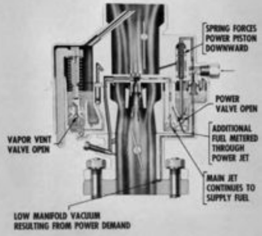
IDLE SYSTEM



PART THROTTLE SYSTEM



POWER SYSTEM



Unusual carburetion requirements, such as those created by continual operation at high altitudes, can be met by the use of main jets having different flow rates than the one furnished with the carburetor. These jets are available through service channels at a nominal price.

The illustrations on the opposite page, in conjunction with the following text, describe various phases in the operation of the new carburetor.

ACCELERATOR PUMP. All fuel that enters the pump cylinder from the float bowl must first pass through the pump screen, which excludes dirt from the system. The upward stroke of the pump piston draws the fuel into the cylinder through the pump inlet valve. Upon acceleration, the pressure caused by the descending piston closes the pump inlet valve, forcing the fuel through the outlet passage. The pump outlet valve is forced open by the fuel, which is then discharged from the pump jet into the carburetor throat. The stream is directed against the lower edge of the primary venturi support strut, which assists the air stream in vaporizing the fuel.

IDLE SYSTEM. Fuel for the idle system is supplied through the main jet, which supplies fuel during all phases of operation. Manifold vacuum draws the fuel upward through the main well support and into the crossbar passage. Since the throttle valve is closed, the high manifold vacuum is applied only to the idle port below it. Consequently, the fuel in the crossbar passage is drawn across the main nozzle opening and into the idle metering tube. As it crosses this opening, the fuel is partially atomized by the addition of air drawn through the air bleeds in the top of the crossbar passage. This mixture, calibrated by the idle metering tube, is then drawn downward through the passage in the float bowl and sprayed into the manifold from the idle port.

As the throttle valve is opened, the three auxiliary idle ports in the throttle body are exposed in turn to manifold vacuum, becoming nozzles that supply additional fuel to meet the increasing demand for power.

PART THROTTLE SYSTEM. Opening the throttle still further increases the suction of the main nozzle, while decreasing the suction at the idle ports. When the suction in the main nozzle has become greater than that at the idle ports, the fuel is no longer drawn across the opening in the crossbar passage. Instead, it is diverted downward into the main nozzle, from which it is sprayed through the primary venturi into the carburetor throat.

Economical fuel-air ratios are maintained throughout a wide speed range by the calibration of the main jet and the crossbar air bleeds.

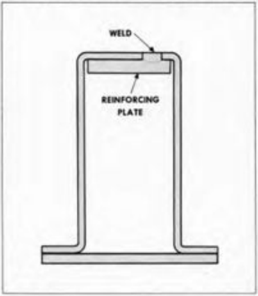
POWER SYSTEM. The power valve is actuated by manifold vacuum, through a passage leading directly from the power cylinder to the intake manifold. During normal engine operation, the power piston is held against the top of the cylinder by the high manifold vacuum. Whenever a demand for greater power output is strong enough to decrease manifold vacuum to less than approximately 2-1/2 psi (5"Hg), the calibrated power spring pushes the piston downward; the piston rod opening the power valve to admit fuel from the float bowl. After it has been metered by the power jet, this extra fuel joins that being supplied by the main jet. As soon as the vacuum increases again to a point above 5" Hg, the power piston is drawn upward, closing the power valve, and the engine returns to operation on the more economical part throttle mixtures.

For 1950, frames for all models, except the Convertible, are made heavier to provide even greater rigidity. Furthermore, in the new Bel Air, a reinforcement is welded to the full length of each frame side member to gain the required strength without increasing weight excessively. These changes are described fully in the following text, along with the details of several minor changes in other chassis units.

CHASSIS FRAME. Late in 1949, each frame side member was made more rigid by increasing the bottom plate thickness from 3/32 to 1/8 of an inch.

Because the side door lock pillars in the new Bel Air body terminate at the window sills, additional rigidity must be provided by the frame side members. To accomplish this, a full-length reinforcement, 5/16 of an inch thick, and 1-7/8 inches wide, is welded to the inside of each side member. Each reinforcement is divided into three pieces, and is welded to the top of the side member.

BEL AIR FRAME SIDE MEMBERS ARE REINFORCED



The frame for the Convertible, with bottom plates already 1/8 of an inch thick, remains unchanged, except for the addition of a narrow cutout in the upper flange of the right forward leg in the VK structure. The cutout makes the optional torque converter transmission more accessible for servicing, in cars thus equipped. To compensate for the metal removed, a reinforcement is welded to the underside of the flange, between the edge of the cutout and the web.

FRONT SPRINGS. For manufacturing reasons, the front springs are reduced slightly in developed length, but not in working height. This is done by spreading the coils farther apart, so that each spring now contains approximately 9.12 active coils, compared with 9.45 in 1949. At the same time, it was necessary to reduce the diameter of the spring wire .008 inch to preserve the excellent performance characteristics of the 1949 spring.

FRONT SUSPENSION SADDLES are increased in thickness to make them even stronger and more rigid than before. These saddles are parts of the front suspension cross member, and serve as points of attachment to the frame.

THE VOLTAGE REGULATOR unit is moved from its previous location on the left front fender skirt to the wiring access door in the dash. Here it is less exposed, so that entry of water is unlikely.

FUEL GAUGE WIRING. To prevent the possibility of incorrect wiring in assembly, the connection between the wire from the tank and the wire leading to the gauge is made through a line connector. This leaves an open terminal on the instrument panel junction block for connection of accessories.

A FUEL TANK FILLER SIGNAL is a new convenience feature on all 1950 models except the Station Wagon. A whistle is installed in the lower end of the fuel tank vent pipe, which now extends into the tank itself. While the tank is being filled, the whistle is clearly audible, but when the rising fuel floods the lower end of the vent pipe, the whistling ceases. At this point, the tank is one gallon short of being full to capacity, a level which provides room for expansion in hot weather. Thus, the service station attendant is warned in plenty of time to avoid overflow.

A similar signal, but with a wider range, was an option for taxicabs in 1949, and will be continued as such in 1950.

A slight advantage is realized from another small revision, involving the fuel tank outlet pipe. The end of this pipe was redesigned during 1949 to place the opening 1/8 of an inch closer to the bottom of the tank. With the new construction, the car may be driven until less than a quart of gasoline remains in the tank. Previously, the minimum was approximately two quarts.

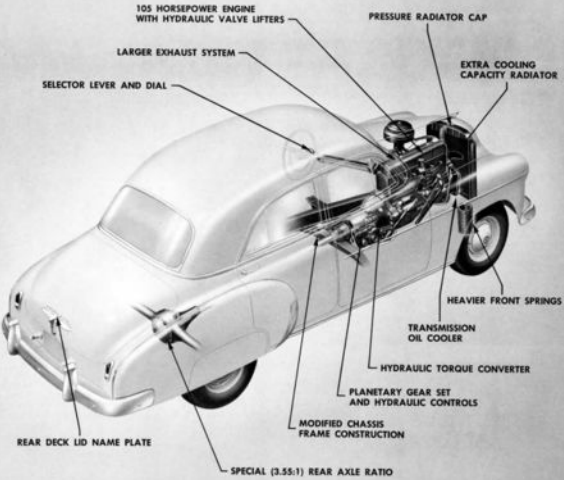
HEAVIER DUTY TIRES, size 6.70-15-6 pr, are furnished as regular equipment on the Station Wagon. Necessary because of the weight of the Station Wagon, these tires formerly were supplied at extra cost.

THE SHOCK ABSORBER BAFFLE TUBE, which formed a sheath over the piston tube, was removed, during 1949. Intended to provide an enclosed return path for bubbles that leaked past the piston rod guide, the baffle tube was open to the reservoir tube only at the bottom, below the level of the fluid. Since its value was found to be negligible, the removal of the baffle tube does not affect shock absorber performance in any way.

THE CHEVROLET AUTOMATIC TRANSMISSION

A hydraulic torque converter and related equipment installed at the factory on any De Luxe model at extra cost.

THE TORQUE CONVERTER TRANSMISSION OPTION



A NAME PLATE IDENTIFIES MODELS EQUIPPED WITH THE AUTOMATIC TRANSMISSION

COMPONENTS

With the introduction of an optional torque converter transmission, Chevrolet adds another to its long and distinguished list of "firsts" in the low price field. This new transmission, which vastly increases the pleasures of driving, is available at extra cost on any model in the De Luxe series.

In order to exploit the many advantages of the torque converter type of automatic transmission, Chevrolet engineers have developed other mechanical components especially for use with it. These are grouped with the transmission in a regular production option "package", so that the customer who orders it receives a car especially built for use with the torque converter.

On the highway, cars equipped with the optional drive are easily identified by the name, Powerglide, in chrome plated letters on the rear deck lid.

The only automatic transmission in the low price field, it is, in addition, one of the few hydraulic torque converters presently available in the entire industry. However, it is backed by a long program of development and thorough testing by Chevrolet, and by General Motors, as well.

THE TRANSMISSION is the heart of Chevrolet's automatic drive "package". It comprises a five-element, polyphase, hydraulic torque converter, a planetary gear set, and a system of controls. These replace the 3-speed transmission, the mechanical gearshift, and the conventional clutch and pedal, used in the regular production car.

Actually, the torque converter is the only part of the transmission needed to drive the car in normal forward motion. The planetary gear section is required to permit reversing the car, and is also used to provide a powerful, emergency low gear.

A selector lever is mounted on the steering column in place of the gearshift lever. The positions of the selector are indicated by letters molded in a quadrant-shaped, clear plastic dial.

Positions on the dial are marked, from left to right, PARK, N, D, L, and R, indicating respectively, the parking lock, NEUTRAL, DRIVE, LOW, and REVERSE. With the exception of the parking lock, which is engaged by a simple mechanical linkage, movement of the selector lever merely changes the position of a hydraulic slide valve in the transmission, and requires only fingertip pressure.

As a safety precaution, an electrical switch is incorporated in the control linkage, making it impossible to complete the circuit to the starting motor unless the control lever is at N or PARK.

THE ENGINE included in the "package" is second in importance only to the transmission. It is the most powerful engine ever to be used in a Chevrolet, and has been tailored especially for use with the torque converter. Compared with the one in conventional Chevrolets, this 105-horsepower, valve-in-head engine boasts larger piston displacement, higher compression ratio, and greater volumetric efficiency. Moreover, the valve-actuating mechanism is improved by the use of hydraulic valve tappets, a quality feature previously restricted to far more expensive cars.

Other variations from the conventional car are a larger exhaust system, and a radiator of greater cooling capacity. A radiator pressure cap is included, and an oil cooler for the transmission is added as well.

Complete details of the new engine will be found in a later section, following the description of the transmission.

OTHER DESIGN MODIFICATIONS included in the option are less dramatic than either the transmission or the engine, but no less important in achieving the well-rounded design sought by Chevrolet.

THE CLUTCH PEDAL IS ELIMINATED

A CONVENIENT SELECTOR LEVER IS PROVIDED

A special rear axle ratio of 3.55:1 is furnished in place of the regular 4.11:1 ratio. The purpose of this change in ratios is to provide a balanced combination of economy and performance.

In the chassis frame, the second cross member is 2-5/8 inches farther to the rear than it is in the conventional car. This relocation is necessary to provide proper support for the automatic transmission. The dimensions of the cross member, and the braces that extend from it to the frame side members, differ slightly from the production car parts, but their design is basically similar. Several minor differences also exist between the automatic transmission support and that for the 3-speed transmission.

The entire package adds approximately 130 pounds to the total weight of the car. Of this additional weight, about 90 pounds are supported by the front wheels, and the remaining 40 pounds are carried by the rear wheels. Therefore, heavy-duty front springs are included. Compared with the regular springs, these have 3/8 of an inch greater free height, and require 150 pounds more weight to compress them to the same working height. In other respects, the two springs have identical characteristics.

Larger tires, size 7.10-15-4 pr (ply rating), are necessary when the automatic transmission is specified on Convertible models. The weight on the front wheels of conventional Convertibles is greater than for other body styles, because of differences in body and frame construction. With the added weight of the automatic transmission package, larger tires are necessary to preserve the riding qualities made possible by extra-low inflation pressures. The 7.10-15-4 pr tires are inflated to 24 pounds all around, like the smaller 6.70-15-4 pr tires on other models. The extra cost of the larger tires is not included in the price of the optional transmission.

DRIVING TECHNIQUE

Only by driving the new Chevrolet with torque converter drive can its simplicity of operation and ready adaptability to every driving situation be fully appreciated. Essentially, its operation is automatic, requiring no attention-diverting movements on the part of the driver. Eighty per cent of the manipulation required with a conventional transmission is eliminated in the Chevrolet automatic transmission. And, for the little that remains, controls are designed to be safe, sure, and simple.

PARK

PARK. In this position of the selector lever, the transmission is in neutral, and a gear, connected indirectly to the propeller shaft, is locked by a pawl to the transmission case. The parking lock will hold the car on the steepest grades likely to be encountered, and may be used independently, or in addition to the regular parking brake. The engine can be started in PARK position, so that the car is ready to respond to the accelerator as soon as the lever is moved to one of the driving positions. Accidental application of the parking lock is nearly impossible, since the selector lever must be lifted slightly toward the steering wheel to pass over a stop before the lever can be moved to PARK.

NEUTRAL

NEUTRAL (N). In this position, the engine cannot transmit power to the rear wheels. Just as in PARK position, however, the starter switch circuit is operative, so that the engine can be started. For safety reasons, the starter switch is ineffective in all other positions. The only active difference between NEUTRAL and PARK positions is that, in NEUTRAL, the wheels are free to roll, and the car may be pushed, if necessary.

DRIVE

DRIVE (D). When the selector is moved to DRIVE, with the engine idling, the car remains standing, but is ready to respond instantly to the accelerator pedal. The engine is fluid-coupled to the rear wheels through the torque converter, which transmits smoothly and automatically varying power to meet all driving requirements normally encountered. Thus, the driver need only steer the car, and operate the brake and accelerator pedals, as required. Most drivers will use DRIVE position more than 98 per cent of the time.

LOW

LOW (L). Whenever exceptional performance is demanded, the fixed reduction of the planetary gear set may be added to the variable reduction of the torque converter by moving the selector to LOW. This position should be used for heavy going in mud, deep sand, or snow, and for climbing long, steep hills.

When a shift from DRIVE to LOW is made while ascending a hill, there will be no power interruption if the down-shift is made without releasing the accelerator.

LOW is also useful when descending steep hills, where 2nd gear would ordinarily be employed to increase the engine braking effect. Here, however, the down-shift from DRIVE should be made with the accelerator released to obtain the greatest braking effect.

From a standstill, unusually fast acceleration may be obtained by starting in LOW. The up-shift to DRIVE is then made without releasing the accelerator, so that acceleration is smooth and uninterrupted.

Shifts between LOW and DRIVE may be made without regard for accelerator position, but should not be made at speeds greater than 40 MPH.

REVERSE

REVERSE (R). The reduction of the planetary gear set is added to that of the torque converter in REVERSE, just as in LOW. Unintentional shifts into REVERSE are unlikely since the selector lever must be lifted over a stop before the shift can be completed. As in other ranges, pressure on the accelerator pedal places the car in motion.

DIFFICULT DRIVING CONDITIONS may be approached with greater assurance by the driver of a Chevrolet equipped with the automatic transmission. For example, the usually difficult job of getting a car into motion on glare ice is reduced to lightly pressing the accelerator with the selector in DRIVE position. Torque, or twisting force, on the rear wheels can be applied as gently as is necessary to avoid spinning the wheels.

The car may be rocked out of deep ruts by lifting the selector lever and moving it back and forth between LOW and REVERSE, with the engine running steadily at a low speed. Another method is to leave the selector lever in either LOW or REVERSE, alternately depressing and releasing the accelerator.

PUSH STARTS. If, for some reason, the starter is inoperative, as with a discharged battery, the engine may be started by pushing the car with the transmission engaged, just as in a conventional car. Push starts are accomplished at safe, low road speeds by pushing the car in NEUTRAL to a speed of approximately 15 MPH, then moving the selector lever to LOW. Towing the car to start the engine is not recommended, because of the danger of overtaking the towing car when the engine starts.

FEATURES

Whether it is compared with a car which has a conventional, manual shift transmission, or with cars having transmissions that are either fully or partially automatic, the Chevrolet equipped with the optional torque converter has many advantages. These range from increased comfort, better performance, and more convenience, to greater safety, durability, and economy--added features in nearly every category of the qualities by which motor cars are judged.

COMFORT . . .

SMOOTH, CONTINUOUS POWER FLOW. With the Chevrolet automatic transmission, there can be no sudden, jerky starts. From standstill to top speed, performance is smooth, powerful, and uninterrupted. There are no pauses for shifting; not even the slight hesitations that are required for the separate cycles of other types of automatic transmissions. Therefore, passengers are never subjected to the seesaw motions accompanying manual shifts, even though the car may be in the hands of an amateur.

ENGINE VIBRATIONS BLANKETED. Because the torque converter always provides the proper ratio between engine output and power required, it is virtually impossible to overload the engine. Consequently, the engine never labors for lack of the correct gear ratio, and the vibration that goes with a laboring engine is eliminated.

Periodic vibrations, torque reaction impulses, and even mild engine roughness are scarcely noticeable, because of the absence of a rigid connection between the engine and drive line. Instead, the oil cushion in the torque converter absorbs these tremors before they can reach the occupants of the car.

LOAD VARIATIONS ABSORBED. The transfer of road shocks through the drive line to the engine is prevented by the fluid coupling of the torque converter, resulting in quieter, smoother engine operation on any road surface, and longer engine life, as well. In conventional cars, the continuous mechanical connection provides a path through which varying loads are imposed on the engine whenever the rear wheels pass over a bump.

A more comfortable ride on washboard roads is a corollary advantage of the mechanical separation of the drive line from the engine. Freed from the jarring effects of spasmodic power impulses, the springs and shock absorbers can perform their functions with greater efficiency.

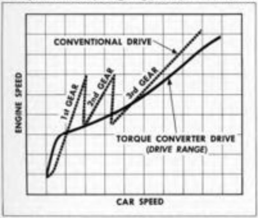
QUIET OPERATION. Because the torque converter is inherently quieter than a gear transmission, car occupants enjoy a comfortably low sound level. The work usually done by gears is performed by circulating oil, which is infinitely better than metal as a sound deadener, and has no sound-making tendencies of its own.

The engine is quieter, too, since self-adjusting hydraulic valve tappets do away with the necessity for providing large clearances in the valve mechanism to compensate for expansion.

At highway speeds, the lower axle ratio reduces the number of engine revolutions nearly ten per cent, with a corresponding reduction of noise and vibration. This feature alone makes high speed driving less tiring, especially on long trips.

PERFORMANCE . . .

105 HP, HIGH-OUTPUT ENGINE. In the new Chevrolet equipped with the automatic transmission, the greater power output of the special engine is efficiently utilized. The torque converter, by providing the correct ratio at all times, automatically places this power at the disposal of the driver whenever he wants it. The complete flexibility of the automatic transmission is demonstrated by the fact that car speed may be reduced to a point where it is difficult to perceive movement, while engine performance continues to be smooth and unlabored. These same performance qualities prevail at any speed, from the lowest to the highest. Moreover, the engine operates in its peak efficiency range a greater part of the time.



ENGINE SPEED VARIES SMOOTHLY WITH CAR SPEED

HIGH SPEED AND RAPID ACCELERATION. Because it is so smooth and quiet, acceleration with the automatic transmission-equipped Chevrolet is deceiving. Starting from a standstill, in DRIVE position, it is actually somewhat faster than in a conventional Chevrolet from a 2nd gear start. However, since the start is made in DRIVE position, no further manipulation is required, while the conventional Chevrolet must still be shifted into 3rd gear. If the converter-equipped model is started in LOW, then shifted to DRIVE without releasing pressure on the accelerator, the resulting acceleration will be faster than most drivers can obtain using all three gear changes in the conventional model.

High speed performance is also better than in the conventional car, with top speed six to eight miles per hour faster.

EXCEPTIONAL PERFORMANCE ON HILLS. All except the steepest hills are easily breasted in DRIVE range, with the extra power of LOW range instantly available, when needed. Momentum is never lost, because it is unnecessary to release the accelerator when shifting from DRIVE to LOW. There is no danger of stalling on hills, since the torque converter prevents overloading of the engine, and uphill starts may be made simply by depressing the accelerator.

On downgrades, it is sometimes expedient to shift to a lower range after the descent has begun. Here, again, this is only a matter of moving the selector lever from DRIVE to LOW, with no gain in momentum, such as would be experienced in declutching with a conventional car (unless it was brought to a complete stop for the shift).

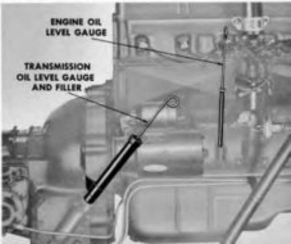
PRACTICAL SIMPLICITY . . .

EASY TO DRIVE. For the beginning driver, it will be gratifying to find that there is little that is new, and nothing that is difficult to master in the new Chevrolet, when it is equipped with the optional automatic transmission. Three motions replace the usual fifteen required to bring a conventional car to cruising speed from a parked position. The driver just starts the engine, places the selector at DRIVE, and presses the accelerator. Veteran drivers will feel at home with this convenient way of driving after a few minutes behind the wheel.

MANEUVERING FLEXIBILITY. Since the precise timing required for clutch operation and gear shifting is eliminated, it is much easier to maneuver the car out of difficult situations. With the engine running at a steady speed, for instance, it is possible to rock the car out of a rut merely by moving the selector lever back and forth between LOW and REVERSE. Footwork is reduced to pressing the brake and accelerator pedals, so that, if he wishes, the driver may use his left foot to apply the brakes.

CONVENIENT TO SERVICE. While it is only necessary to check the transmission oil level at 1000 mile intervals, the location of the oil level gauge and filler under the hood encourages such periodic inspection.

THE OIL FILLER IS EASILY REACHED



With some automatic transmissions, it is necessary to raise the floor mat and to remove a cover plate for inspection or service. Besides encouraging neglect, this introduces a more serious hazard; it increases the possibility of dirt entering the transmission.

SAFETY . .

FEWER DISTRACTIONS. With the automatic transmission, there is no clutch pedal to press, and both of the driver's hands are free for steering and signaling, since the selector lever normally is kept in DRIVE position--even in the heaviest traffic. Fewer physical motions to go through, and fewer to think about, means less fatigue, and less diversion of attention from the main task of driving, with a correspondingly greater measure of safety. The general reduction of noise and vibration also contributes to safety through freedom from aural fatigue.

NO FREE-WHEELING. Use of the engine as a brake is retained in the Chevrolet torque converter drive. With some automatic transmissions, as well as those with overdrive attachments, the car coasts whenever pressure on the accelerator is released at low speeds. The Chevrolet torque converter, however, maintains the fluid coupling between engine and rear wheels, regardless of the accelerator position, in all except PARK and NEUTRAL positions. Thus, the braking power of the engine is always available for controlled deceleration without the necessity for excessive use of the wheel brakes. Additional engine braking may be employed for controlled descent of steep hills, by shifting the selector lever to LOW.

Another advantage of the engine braking feature is that it permits push starts at safe, low speeds. In LOW, the engine can be started when the car has reached a speed of only 12 MPH. In DRIVE, slightly higher speeds, 18 to 20 MPH, are necessary.

PARKING SECURITY. Motorists who live in very hilly areas will especially appreciate the parking lock provision in the Chevrolet automatic transmission. When the selector lever is placed at PARK, the car will be held immovable, without requiring the use of the regular wheel brakes. An important advantage of this feature lies in the fact that the engine can be started without releasing the parking lock. With conventional transmissions, it is necessary to take the car out of gear, or to declutch, and to hold the car with the wheel brakes, when starting the engine while on a grade.

OTHER DESIGN PRECAUTIONS. To prevent accidental shifts into PARK or REVERSE, when the engine is running, the selector mechanism is designed so that the lever must be raised slightly to enter either position. And, because the starter is inoperative except in the two neutral positions, the engine cannot be started when the car is in gear.

ECONOMY . . .

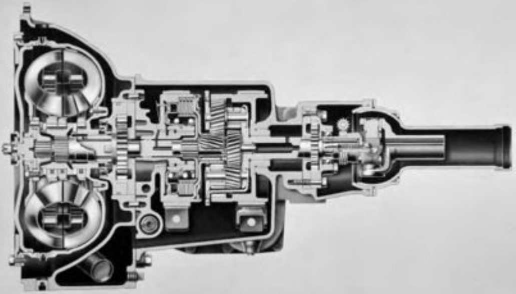
DURABILITY. Mechanical wear is reduced in the torque converter transmission to a point where it is of little consequence. All of the moving parts in the transmission operate in a bath of oil that is continuously circulated and temperature-regulated. Even the universal joint, instead of depending on "splash" oiling, is pressure-lubricated. In DRIVE range, where most driving is done, the planetary gears revolve as a unit, and cannot wear. Also, there are no mechanical shift cycles to go through with every stop and start--no continual engaging and disengaging of clutches and gears. The engine, too, gets less wear than in conventional models, because it makes fewer revolutions in cross-country driving, due to the lower axle ratio of 3.55:1.

LOW MAINTENANCE. The torque converter transmission is economical to maintain. Oil changes are recommended at intervals of 15000 miles, and oil additions between changes are few. Because high pressure oil is confined to the interior of the unit, oil leaks are unlikely. Only a few gaskets and bolt-on covers are used, and these confine oil at relatively low pressures.

Since the detents which determine selector lever positions are inside the transmission, and are adjusted at assembly, they do not require later adjustments for correct functioning, as they do in some automatic transmissions.

The bands that are used to engage LOW range and REVERSE are so seldom used, when compared with DRIVE range operation, that they will probably last as long as the transmission itself.

FUEL ECONOMY. Even with its more powerful engine, the converter-equipped Chevrolet equals the conventional model in fuel economy, if country and city driving are considered together. Gasoline consumption, although somewhat greater during operation confined entirely to stop-and-go driving, is very low when compared with that of other cars equipped with automatic transmissions.



A SECTIONAL VIEW OF THE TORQUE CONVERTER TRANSMISSION

CONVERTER DESIGN

Unlike many mechanical devices, the hydraulic torque converter is a comparatively recent invention, having been devised early in the twentieth century to provide a smooth drive for ships. Since then, many designs for torque converters have been conceived, but, until just recently, applications have been confined to heavier types of vehicles than passenger cars.

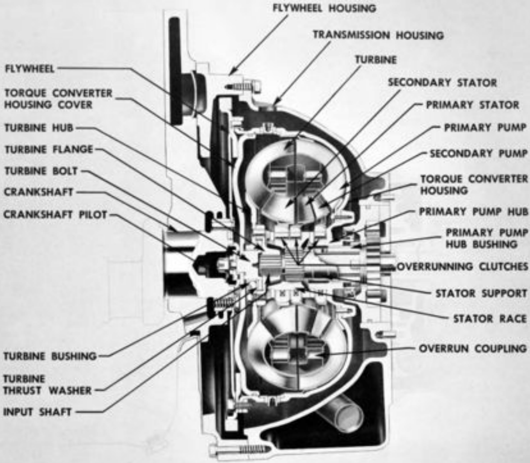
When Chevrolet decided, more than four years ago, to develop some kind of automatic drive, most cars being produced were regularly equipped with the conventional three-speed, geared transmission and dry-disk clutch. In the more expensive automobiles, the fluid coupling had made its appearance and, out of necessity, was being used with geared transmissions. These varied from the manually shifted type, to semi-automatic, and fully automatic shifting devices. In all of them, however, some form of gear changing was involved, and, with many, the conventional clutch pedal was still needed. In addition, most of these more or less automatic transmissions were offered only at extra cost to the customer.

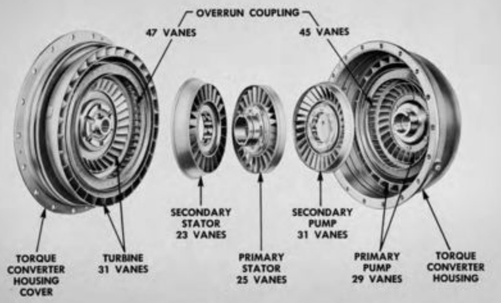
However, in spite of these shortcomings, a large and growing segment of the public seemed willing to pay extra for the comfort and convenience of automatic drives. Even overdrive units, added to conventional geared transmissions, found a ready market.

In choosing the type of automatic drive to be developed for use in its cars, Chevrolet was determined that for all normal driving, no shifting, either manual or automatic, should be required. Also, to be economically feasible for use in a low-priced car, the device had to be simple enough to permit large scale production. Since these virtues are inherent in the hydraulic torque converter, it was chosen as the basis for the Chevrolet automatic transmission.

As in other large undertakings in the past, Chevrolet benefited through the knowledge and resources of General Motors in the development of the torque converter transmission. Corporation experience with torque converters goes back more than twelve years, to the development of automatic hydraulic drives for buses. Progress since then has been continuous,

DETAILS OF THE TORQUE CONVERTER





ELEMENTS OF THE TORQUE CONVERTER

even during the recent war, when torque converters were built for military vehicles.

After more than four years of intensive design and test work, Chevrolet's version of the hydraulic torque converter transmission is now ready for the motoring public. Best of all, the original goals have been attained, since, with this transmission, the car can be driven for hours without touching the control lever—hours that are uninterrupted by gear functions, no matter how heavy the traffic. Most important, the unit is relatively uncomplicated, and Chevrolet engineers have found ways to simplify its manufacture, suiting it to large-scale production.

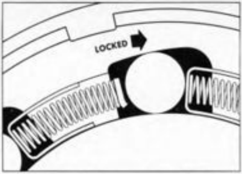
THE NEW TRANSMISSION includes two main units: the torque converter, and the planetary gear set. The torque converter is the device which couples the engine to the rear wheels, through the medium of oil, and automatically multiplies torque, as required. The planetary gear set provides added reduction, through gears, for operation in reverse, and for an extra-powerful forward speed. The section containing the planetary gears also includes the mechanisms for NEUTRAL and PARK, as well as the hydraulic control system for the entire transmission.

A HYDRAULIC TORQUE CONVERTER consists of three essential parts: a driving member, known as the pump; a driven member, called the turbine; and a reaction member, known as the stator. However, the highly efficient Chevrolet torque converter is a five-element, polyphase type. As suggested by the name, it is composed of five major elements:

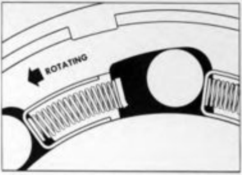
1. Primary pump
2. Secondary pump
3. Turbine
4. Primary stator
5. Secondary stator

Each element is a vaned wheel, made from many steel stampings, which are spot-welded and copper-brazed into an assembly of great strength. This method of producing the elements, rather than the customary but intricate casting process, is admirably suited to the high volume production requirements of Chevrolet.

When assembled to form the torque converter, the five elements nest closely together, but the vanes of the different wheels do not touch one another. A pressed steel housing encloses the entire converter, serving to contain the working fluid, a light mineral oil, with which the converter operates. The vanes of



Overrunning clutch prevents rotation in a reverse direction, because the roller is wedged in the small end of the cam.



Overrunning clutch permits rotation in a forward direction, because the roller moves to the large end of the cam.

OPERATION OF THE OVERRUNNING CLUTCHES

the various wheels provide the means for imparting motion and direction to this oil.

Through its mating cover, at the front of the transmission, the torque converter housing is bolted to the engine flywheel. The primary pump is spot-welded to the rear of the housing, so that it, too, is connected to the flywheel. Consequently, the torque converter housing and the primary pump revolve as one, whenever the engine is running.

The turbine is attached to the housing cover at the front of the converter by a special machined bolt. Through a bronze bushing and thrust washer, however, the turbine is permitted to turn independently of the housing. A flange, bolted to the back of the turbine hub, is splined to the input shaft, so that the shaft turns with the turbine. It is this shaft which connects the turbine, through the planetary gear set and propeller shaft, to the rear wheels.

To the rear of the turbine, the input shaft runs through a sleeve, called the stator support, which is a stationary part of the transmission housing. The primary and secondary stators are mounted on a cylindrical race that is splined to this sleeve. Thus, the stators are separated from the rotating elements, the pump and turbine, except through the circulation of oil in the torque converter.

The secondary pump is located just behind the stators, and is mounted on the hub of the primary pump.

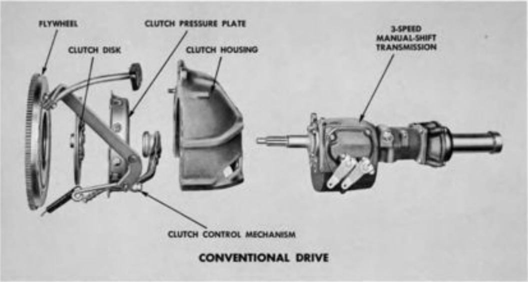
OVERRUNNING CLUTCH ON THE SECONDARY PUMP

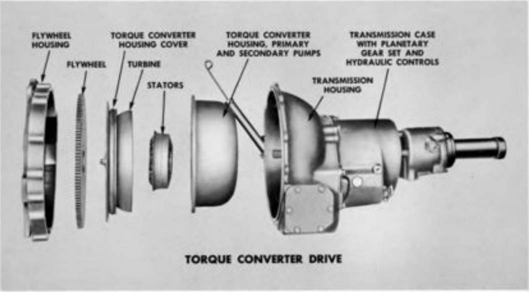
OVERRUNNING CLUTCHES. The secondary pump and the two stators are each equipped with an overrunning clutch at their points of attachment in the converter. These clutches are of the familiar cam and roller design, used by Chevrolet since 1938 in the starter motor drive.

The action of the overrunning clutches permits either stator to rotate, or free-wheel, in the same direction in which the pump and turbine turn. However, any force tending to turn the stators in the opposite direction causes the clutches to lock the stators securely to the stationary stator race. Similarly, the clutch on the secondary pump permits it to turn faster, but never more slowly than the primary pump.

THE OVERRUN COUPLING is a small fluid coupling, which operates inside of the torque converter. An exclusive Chevrolet feature, the overrun coupling provides additional engine braking, and makes possible the low-speed push starts, previously described.

Two vaned wheels are installed between the inner concave surfaces of the primary pump and the tur-

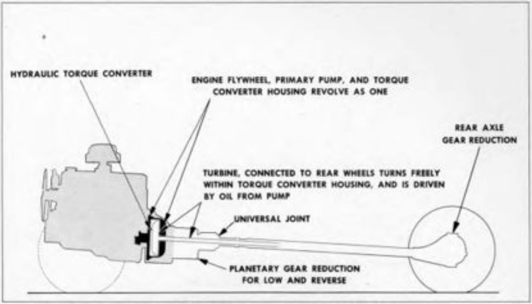




MAJOR UNITS OF TORQUE CONVERTER AND CONVENTIONAL DRIVES COMPARED

bine. One is attached to the pump, and the other is fastened to the turbine. While made from many steel stampings, the wheels are integrated with the pump and turbine, when these main converter elements are assembled, by spot-welding and copper brazing. When considered together, these auxiliary wheels form the overrun coupling.

THE OUTER ENCLOSURE for the torque converter section of the new transmission is a sturdy iron casting of modified conical shape. Called the transmission housing, it encloses the pressed steel converter housing, which revolves with the flywheel. Although the converter housing is filled with oil under pressure, seals prevent the escape of oil into the trans-



FUNDAMENTAL RELATIONSHIP OF TORQUE CONVERTER TO ENGINE AND REAR WHEELS

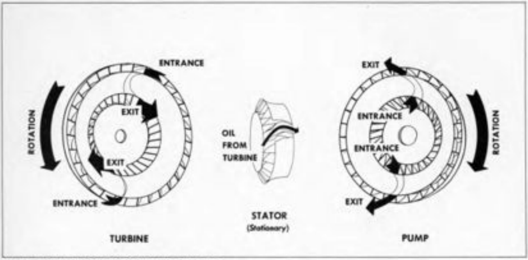
mission housing. Underneath, and to the rear of the converter compartment, the transmission housing contains an integral, box-like cavity which serves as the transmission oil sump.

The transmission housing is bolted to the flywheel housing at the front, and to the transmission case at the rear. The transmission case, which is closest to the propeller shaft, contains the planetary gear set. These three cast iron housings occupy the same length that the transmission and clutch housing occupy in the conventional car. Thus, the propeller shaft, torque tube, and other parts of the drive system to the rear of the transmission, are the same length in both regular production and torque converter models.

VIBRATION-FREE operation of the torque converter is assured, because the main rotating parts are dynamically balanced. The primary pump and torque converter housing are balanced as a unit while filled with oil, and the turbine is balanced separately. In each case, the parts must be within 1/4 inch-ounce of perfect balance before they are installed.

The basic design of the five main elements in the Chevrolet converter also contributes to smooth, quiet operation. Adjacent wheels differ slightly in number of vanes, averting any disturbance which might occur if the same number of vanes were used in each member. If this were the case, resonant vibrations might easily be set up, causing objectionable noises at certain speeds of converter operation.

THE COMPACT DESIGN of the Chevrolet torque converter is the result of the concerted efforts of the engineers to utilize each part of the converter in the best interests of economy, simplicity, and durability. For the same reasons, the unit was arranged to require as few oil seals as possible. As a consequence, the turbine was placed at the front of the converter, near the engine, with the pump at the rear. An understanding of this basic arrangement is important, because the illustrations which appear in this presentation show the torque converter elements in their proper positions, even though those positions may seem at first to be reversed.



OIL PATHS IN TORQUE CONVERTER ELEMENTS

CONVERTER OPERATION

To gain a clear understanding of the manner in which the torque converter multiplies engine torque, it is necessary to observe the actions of the converter elements, and the circulation of oil in the converter, under typical driving conditions. The following discussion will, at first, be limited to basic principles, and the torque converter will be presumed to have only the three essential elements: pump, turbine, and stator. Later, the function of the stator will be further explained, to show the purpose of splitting it into primary and secondary parts. Similarly, the reason for primary and secondary pumps will be explained.

To begin with, it is assumed that the car to be observed is parked at the curb, and is to be accelerated rapidly to cruising speed. It is also assumed that, for the present, the turbine is connected directly to the propeller shaft, disregarding the planetary gears.

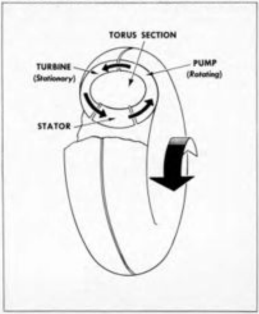
WHEN THE ENGINE IS STARTED, the flywheel immediately begins to turn, and, as previously explained, the pump in the torque converter rotates at the same speed. As it turns, it develops centrifugal force, which throws oil out of the openings near its rim.

Since these openings face similar openings in the turbine, the oil that is being discharged from the pump flows through the turbine, then the stator, and then re-enters the pump.

Because the car is at a standstill, the turbine is also stationary, since it is considered to be connected directly to the drive line. With the engine idling, oil emerging from the pump has comparatively little speed, and circulates gently around the outside of the torus section, or inner core, of the converter without imparting motion to the turbine.

RAPID ACCELERATION is now desired, so the driver presses the accelerator to the floor. The engine and pump speed up rapidly to a point where a high torque, or twisting force, is being produced by the engine. (The maximum engine speed that can be at-

OIL FLOW AROUND TORUS SECTION, ENGINE IDLING



1 First oil entering turbine is projected from pump with a velocity imparted to it by engine speed alone.

2 Numerals in arrows represent oil velocity. Pump capacity (due to engine alone) to accelerate flow is taken as unity.

3 Oil flow is reversed by turbine, emerging in a direction opposite to rotation of pump with no loss in velocity.

4 Stator redirects oil stream into pump in direction of rotation with but little loss in velocity.

tained while the turbine remains stationary is known as the stall point. It is determined by the characteristics of the engine and torque converter, and is designed to occur within the range of engine speeds at which maximum torque is produced).

The high torque output of the engine is now reflected in the torque converter in the form of greatly increased pump speed. The rapidly spinning pump is hurling a veritable torrent of oil from its outer exits into the turbine.

IN THE TURBINE, this continuous, whirling ring of oil rushes through the twisting passages between the vanes, emerging in a direction opposite to that in which the pump is rotating.

Like all other vanes in the torque converter, the turbine vanes are designed to provide entrance and exit angles which offer the least resistance to the flow of oil. However, the central portions of the turbine vanes are shaped to effect a maximum redirection of the oil stream, so that a direct force is brought to bear on the turbine. This is why the direction in which the oil leaves the turbine is opposite to that of pump rotation.

While the turbine remains stationary, it cannot extract work from the oil that is being diverted by its blades. If no work is extracted from it, the oil loses none of its energy in the process of reversal, except for small friction losses. However, when it leaves the turbine, the oil stream has a greater velocity than when it was discharged from the pump. This is because the passages in the turbine, like funnels, become smaller near their exits at the hub, so that the oil must squeeze through them at greater speed, if its volume is to equal that entering the turbine.

THE STATOR VANES are designed to receive the oil stream as it emerges from the turbine, and to turn it once more into the direction of pump rotation. The stator is held stationary against the force of the im-

5 Velocity of oil entering pump is added to that developed by pump alone. Velocity at pump exit becomes the sum of the two.

6 Turning force (torque) on turbine is multiplied with repetition of the cycle, since torque increases with the mass of oil projected into the turbine.

7 Regenerative process continues until maximum is reached, when effective velocity at pump inlet is 1.2 times pump capacity.

8 The sum of the two velocities is 2.2 times engine torque, or maximum multiplication. At this point, the turbine starts to turn.

pinging oil stream by the locking action of its over-running clutch.

Like the turbine, which still is presumed to be stationary, the stator can extract no work, and very little energy, from the stream of oil. But, since there must be an equal and opposite reaction for every action, the stator exerts a great force upon the oil stream, returning it to the direction of pump rotation, with little loss in velocity.

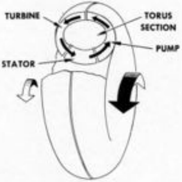
TORQUE MULTIPLICATION. Because it is moving in the same direction, the high-velocity oil stream leaving the stator vanes enters the pump smoothly. Its velocity is added to that developed in the pump, so that the total velocity at the pump exits is correspondingly greater. This regenerative action is the key to the torque multiplication process in the hydraulic torque converter.

Because the torque applied to the turbine increases with the amount of oil projected into it, the greater the pump output velocity, the greater will be the torque, or twisting force, on the turbine. The engine torque applied to the pump is capable of accelerating the oil in the converter from rest to a certain velocity. Then, if oil, already flowing in the same direction with considerable velocity, is supplied to the pump input, the pump output velocity becomes the sum of the velocity due to engine-torque, and the regenerative, or additional, input velocity.

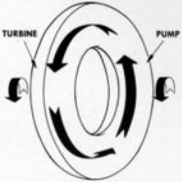
At the stall point, the regenerative energy in the oil returned to the pump from the stators is 1.2 times the pump capacity due to engine torque alone. Therefore, if the initial pump capacity is considered as unity, the maximum torque applied to the turbine is equal to 1 plus 1.2, or 2.2 times the engine torque.

The rate of oil circulation through the converter at the stall point is almost unbelievable. The oil leaves the pump exits at a rate of 55 gallons per second, or, in more familiar terms, a speed of 41 miles per hour.

OIL FLOW

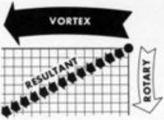


VORTEX FLOW

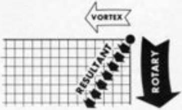


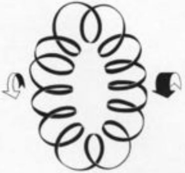
ROTARY FLOW

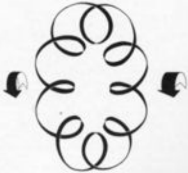
RESULTANT FLOW WHEN PUMP IS ROTATING MUCH FASTER THAN TURBINE



RESULTANT FLOW WHEN TURBINE SPEED APPROACHES SPEED OF PUMP







TURBINE ACTIVITY. To clarify the explanation of torque multiplication, it has been expedient, until now, to assume that the turbine remains stationary when engine torque is applied to it through the pump. This, however, is not the case, since the turbine is connected to the rear wheels, and is held stationary only until the torque applied to it is sufficient to overcome the inertia of the car.

Now that the means is established for applying engine torque to the turbine, the car, last observed at a standstill, will start to move. Since rapid acceleration is desired, the driver keeps the throttle open. Both pump and turbine begin to pick up speed, but the pump is still rotating much faster than the turbine. The oil continues to circulate through the converter at tremendous velocity, producing continuous torque multiplication. As the car accelerates, however, the need for torque multiplication diminishes.

OIL FLOW thus far described has all been around the inner core (torus section) of the converter. This circulation, from pump to turbine to stator, and back to the pump, is called vortex flow, and varies from a maximum at the stall point to a minimum at cruising speeds. As the turbine begins to rotate, it can be seen that the oil in the converter will also be carried around the periphery of the unit. Called rotary flow, this motion of the oil becomes greater, and vortex flow diminishes as the speed of the turbine approaches that of the pump. However, both vortex and rotary flows are always present in the torque converter when the engine is driving the car, because turbine speed never quite attains pump speed. It is vortex flow which provides both torque multiplication and fluid coupling within the torque converter.

The direction actually taken by the oil when it leaves one element to enter another is influenced by both vortex and rotary forces, and is called the resultant flow. It is for this resultant direction that the entrance angles of the vanes in the converter are so carefully worked out.

REDUCTION IN TORQUE MULTIPLICATION takes place automatically as the need for torque diminishes. It is such a gradual process, taking place in such infinitely small steps, that it is continuous in effect.

As the car accelerates, the turbine speed increases, causing vortex flow in the converter to lessen, and rotary flow to become greater. The more rapid rotation of the turbine creates centrifugal forces like those in the pump. As these develop with speed, they resist the oil flow being projected into the turbine from the pump.

The faster moving turbine is now "running away" from the stationary stator, reducing the effective velocity of the oil discharged against the stator vanes. This, of course, reduces the velocity of the oil stream when it is redirected into the pump by the stators.

The increase in engine speed, as the car accelerates, similarly causes the pump to "run away" from the stator more rapidly. This further reduces the effectiveness of the oil input velocity from the stator, even though the basic pump output rate is increased with faster pump rotation.

The overall effect of these changes is to reduce the vortex oil flow and regenerative effect from the stators. Velocity of the oil stream entering the pump is gradually decreased, reducing, in turn, both the oil velocity at the pump exit, and the force on the turbine. The process continues until all torque multiplication ceases, and only engine torque is delivered to the turbine. The rate at which this torque reduction takes place depends upon how rapidly the turbine speed approaches that of the pump. Therefore, it can be seen that the proper amount of torque multiplication is supplied, whenever it is needed, without any attention from the driver.

EFFICIENCY. As the changes in oil flow take place, during acceleration, the angles at which the oil enters the various converter elements undergo considerable change. The effectiveness of the torque converter blading, and the efficiency of the entire unit, for that matter, depend on maintaining the correct entrance angles throughout the operating range. In the Chevrolet converter, this is done by providing two stator wheels and two pump wheels. The operating flexibility required of these additional elements is accomplished by mounting them on overrunning clutches.

THE SECONDARY PUMP is mounted on the hub of the primary pump, through an overrunning clutch, so that it can rotate faster than (overrun) the primary pump, or be driven by the primary pump hub, but cannot turn in the opposite direction.

Under starting conditions, when the turbine has not yet started to rotate, a stream of oil is being deflected into the pump with tremendous velocity from the stators. The resultant flow is such that the oil strikes the backs of the secondary pump blades, and would cause a serious shock loss, if it were not for the overrunning clutch. Instead, the force of the oil on the backs of the blades merely causes the secondary pump to spin faster, overrunning the primary pump. In effect, the secondary pump blades are pushed aside, so that the stream of oil can enter the primary pump. The entrance angle of the primary pump vanes is correct at this time to receive the high-velocity oil, which illustrates how an ingenious design has prevented a serious drop in efficiency.

Oil approaches the pump entrance with declining velocity, as the regenerative action through the stators diminishes with greater turbine speed. The resultant flow of the oil entering the pump from the stators gradually changes direction with the decrease in vortex flow, until the oil stream begins to strike the front faces of the secondary pump vanes. When this occurs, the secondary pump slows down, and is carried forward by the primary pump hub, forming a single pump unit, whose entrance angle is designed for efficient operation at the higher vehicle speeds. Under full-throttle acceleration on a level road, the secondary pump stops overrunning the primary at approximately 30 MPH.

When torque multiplication is maximum, rotary flow is minimum, but vortex flow is high, causing secondary pump to overrun primary pump. With secondary pump vanes pushed aside, oil enters primary pump smoothly.

SECONDARY PUMP OVERRUNNING

BOTH STATORS are effective whenever large multiplication of torque is required. The strongly reversed oil flow from the turbine serves to lock the stators tightly to the stationary stator support through the action of the overrunning clutches.

A point is reached, however, when the rotary flow has increased so much that the resultant flow is against the backs of the secondary stator vanes. Again, this could cause a serious disturbance in the oil flow, if the vanes remained stationary. Instead, the force of the oil causes the secondary stator to free-wheel in the direction of pump and turbine rotation. The secondary stator no longer takes part in the process of torque multiplication, nor does it impede the remaining oil circulation.

The primary stator is still functioning as a stationary member, directing oil flow into the pump. With continued reduction in vortex flow, as less and less torque multiplication is needed, the turbine speed approaches the speed of the pump. Oil flow is now nearly all rotary, and the resultant flow developed causes the oil to strike the backs of the primary stator vanes. This makes the primary stator free-wheel, just as the secondary stator, and torque multiplication is ended.

A slight vortex flow remains, coupling the pump and turbine, which are the only working elements still in use. Just like an ordinary fluid coupling, the converter now transmits engine torque to the drive line at a ratio that is practically 1:1.

During full-throttle acceleration, the secondary stator is removed from action at approximately 40 MPH, and the primary stator free-wheels at 50 MPH, above which further acceleration is effected by engine output alone.

Adjustment of exit and entry angles between the pump and turbine is not necessary. Here, vortex flow is high when a large speed differential exists between the pump and turbine, and low when the differential is small. Thus, the entrance angle, or resultant flow, of the oil entering the turbine is nearly constant throughout the operating range of the torque converter.

PART-THROTTLE ACCELERATION results in torque converter action similar to that for full-throttle ac-

PUMPS LOCKED TOGETHER

When torque multiplication begins to diminish, vortex flow also decreases, so that the free-wheeling secondary pump slows down until it is picked up by the primary pump, forming a single pumping unit.

As torque multiplication begins to decrease with greater turbine speed, rotary flow increases, and vortex flow diminishes, causing the secondary stator to free-wheel. Oil flow to the primary stator is not impeded, however, and torque multiplication continues.

SECONDARY STATOR FREE-WHEELING

celeration, except that the various changes take place at lower speeds. Torque multiplication requirements are satisfied sooner, and, therefore, the fluid coupling stage is reached at slower car speeds.

Having considered the details of torque converter operation at some length, it can be seen that the unit is very flexible. Its adjustment to varying torque requirements takes place automatically and continuously, without requiring complicated mechanical governors, or attention from the driver. Whenever a large speed differential exists between the pump and turbine, such as when climbing a hill, the converter multiplies torque exactly according to the need, and ceases multiplication when the requirement is satisfied. It cannot be emphasized too strongly, however, that these changes in torque converter action take place smoothly and continuously. Because they are so imperceptible, the changes might better be described as variations.

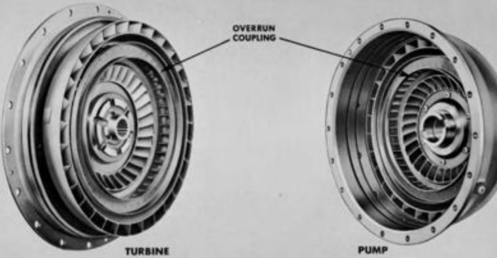
OVERRUN COUPLING. One important phase of torque converter operation that has not been considered in detail, is the means by which coasting is prevented when the accelerator is released. Chevrolet has provided a small fluid coupling inside the torus section of the torque converter for more effective engine-braking under these circumstances.

The added members are called the overrun coupling, and they occupy the space which, in other designs, is filled with an unused body of oil. Two opposing wheels, made up of crescent-shaped vanes, are located on the inner sides of the turbine and pump. The vanes on the turbine side are mounted with the cupped surfaces facing the direction of rotation. Those on the pump form a wheel of slightly smaller diameter, and are arranged with the convex surfaces facing the direction of rotation. A U-shaped rim on the inner side of each wheel forms a tiny inner core for the coupling.

When the car is being driven by the engine, the pump speed always exceeds the turbine speed. In the overrun coupling, this means that the vanes on the pump are rotating faster than those on the turbine. In a small way, they attempt to set up a vortex flow, which is canceled by the vanes on the turbine side. These have a greater pumping capacity, even though

BOTH STATORS FREE-WHEELING

The primary stator begins to free-wheel when the turbine approaches pump speed. With both stators out of action, torque multiplication is ended, although a little vortex flow remains, transmitting engine torque as in an ordinary fluid coupling.

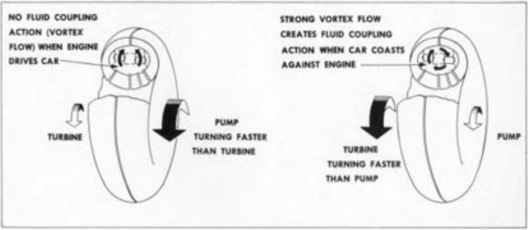


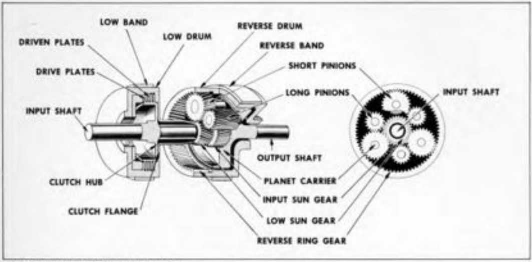
THE INGENIOUS OVERRUN COUPLING

traveling more slowly, because they are mounted on a larger radius. Consequently, vortex flow within the overrun coupling is canceled, and the unit has little effect.

The opposite is true, however, when the car is coasting against the engine. This is the only time when the turbine is spinning faster than the pump. A rapid vortex flow is set up in the overrun coupling, because the turbine side, with greater pumping capacity, is rotating faster than the pump member. The resulting vortex flow creates a fluid coupling between the turbine and the pump, so that the rear wheels receive a braking action similar to that which takes place in a car with conventional drive. This is the same action which permits push starts at unusually low speeds.

OPERATION OF THE OVERRUN COUPLING





PARTS OF THE PLANETARY GEAR SET

PLANETARY GEAR SET

Thus far, the output of the torque converter has been considered as being transmitted directly from the turbine to the propeller shaft. In reality, this is not the case. The input shaft connects the turbine to the planetary gear set, located just back of the converter, and the output shaft from the planetary set is joined to the propeller shaft.

A PLANETARY SET, in its simplest form, consists of three parts. There is a sun gear in the center, two or more planet gears (pinions) meshing with it, and an internal ring gear surrounding all of them. A planet carrier, composed of pins and a connecting link, supports and joins the pinions. The planet carrier fixes the relative positions of the pinions, but allows them to rotate on the pins.

Suppose the sun gear is now connected to the input shaft, and the planet carrier to the output shaft. A brake band is put around the outside of the ring gear, holding it tight, so that it cannot move. Then, if the engine drives the sun gear, the pinions must turn around. But they cannot stand still and rotate on their pins, because that would mean the ring gear must move, and it is being held with the brake. So the pinions must move around the ring gear, and the planet carrier moves with them. The resulting motion is much the same as that of the earth and other planets about the sun. Each rotates on its own axis, and together they circle around the sun.

The planet carrier, connected to the driven shaft, is turning much more slowly than the engine-driven sun gear, but in the same direction. The resultant gear reduction depends on the ratio between the sun gear and the pinions. To eliminate the gear reduction, it is only necessary to release the brake band, which frees the ring gear, so that the entire planetary set revolves with the sun gear, and the pinions no longer turn on their axes.

Although these same principles are used in the Chevrolet planetary set, they are applied in a different manner to a more complex mechanism. Here, a multiple-disk wet clutch is combined with a planetary set having two sun gears and six pinions. Two brake bands are used, one around the LOW drum, and the other around the planetary ring gear.

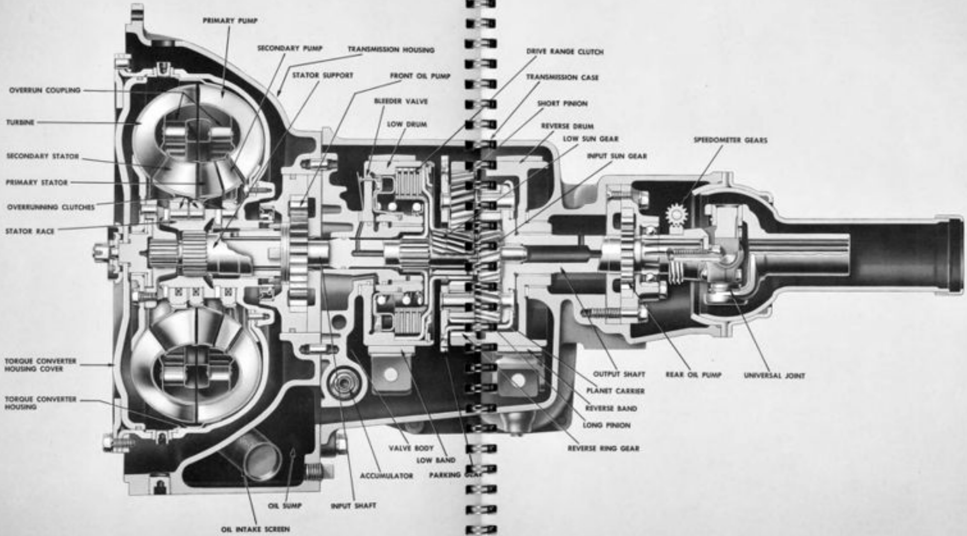
With the selector in DRIVE position, the clutch is engaged, providing a direct drive from the turbine to the rear axle without gear reduction. The planetary gear set, in conjunction with the two brake bands, supplies the gear reduction for LOW and REVERSE. NEUTRAL is obtained when the clutch, as well as the LOW and REVERSE brake bands, are released.

The output of the torque converter turbine is transmitted to the planetary gear set by the input shaft. The front end of this shaft is splined to the hub of the turbine, and, at the rear, it is supported by a bronze bearing in the center of the planet carrier. The input sun gear is splined to the input shaft, just ahead of the rear bearing.

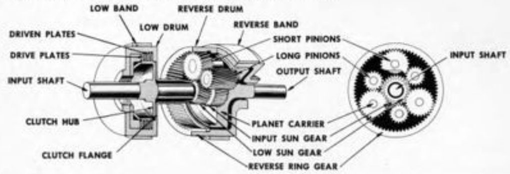
PLANETARY GEARS. In the planetary set itself, there are three long pinions which mesh with the input sun gear, as well as with three short pinions. The three short pinions, in turn, mesh with both the LOW sun gear and the REVERSE internal ring gear.

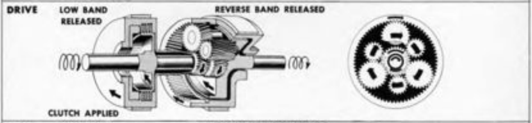
The pinions turn on needle roller bearings around pins fixed in the planet carrier. The body of the planet carrier is pressed steel, with three slots in its sides, through which the short pinions extend to mesh with the ring gear. The body of the carrier is riveted to the output shaft at the rear, and to the front plate, which contains the parking lock teeth.

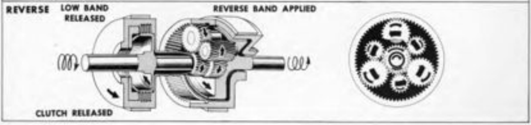
THE TORQUE CONVERTER TRANSMISSION

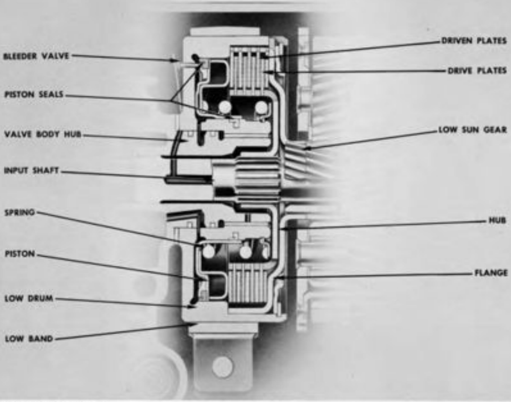


PLANETARY GEAR SET OPERATION









THE DRIVE RANGE CLUTCH

THE CLUTCH, used for DRIVE range and NEUTRAL, is actuated by a steel piston, and operates inside of the LOW range drum. A flange at the rear of the clutch is splined to both the drum and the LOW sun gear. The clutch hub is splined to the input shaft. Slots in the hub and flange hold the four driving and five driven clutch plates, respectively. A molded, metallic friction material is bonded to both faces of each drive plate. The steel driven plates are slightly dished to assure separation when the clutch is disengaged. A spring bears against the inside of the piston to hold it in the disengaged position. When in this position, the piston also holds a small drain valve open, allowing oil to escape slowly. This valve is located in the front face of the LOW drum, and is closed by a leaf spring when the clutch is engaged.

THE LOW AND REVERSE bands are malleable iron castings, with linings of the same material used on the clutch drive plates. Both bands are anchored to the transmission case, and are applied by hydraulic pressure on servo pistons. Clearances between the bands and drums are properly adjusted when the transmission is assembled, and should require no further attention.

IN PARK AND NEUTRAL, the clutch is not engaged, and neither brake band is applied. Since the car is stationary, the planet carrier is also stationary, and the pinions turn idly around their own axes.

WHEN DRIVE RANGE is selected, oil pressure is applied to the clutch piston, but the LOW and REVERSE bands are not applied. The clutch plates are compressed together, locking the input shaft to the LOW sun gear. Thus, torque applied to the input shaft by the turbine is transmitted through the clutch hub and plates to the LOW sun gear, so that it turns with the input shaft.

The LOW and input sun gears are intermeshed through the pinions, and since both sun gears are turning together, they carry the entire planetary set around with them. Thus, with input shaft, both sun gears, planet carrier, ring gear, and output shaft turning as a unit, the turbine drives the propeller shaft directly, without gear reduction.

IN LOW RANGE, oil pressure is applied to the LOW servo piston, applying the LOW brake band. The clutch is not engaged, and the REVERSE band is not applied. Pressure of the LOW band prevents rotation of the LOW drum, and the LOW sun gear, attached to the drum.

Torque from the turbine turns the input sun gear, which turns the long pinions, which turn the short pinions. However, the short pinions cannot turn the stationary LOW sun gear, with which they mesh. Therefore, they walk around the outside of the LOW sun gear, causing the planet carrier and output shaft to revolve in the same direction, but more slowly than the input shaft. In this way, a fixed gear ratio of 1.82:1 is obtained. To this ratio is added the torque multiplication of the converter, whose maximum ratio is 2.2:1. Thus, in LOW range, if torque multiplication in the converter is at the maximum, the total reduction supplied by the transmission is at a ratio of 4:1.

FOR REVERSE, the ring gear is held stationary by the application of the REVERSE brake band to the REVERSE drum. The clutch is not engaged, and the LOW band is not applied.

Torque from the turbine turns the input sun gear, which turns the long pinions, which turn the short pinions. Because the short pinions cannot turn the stationary ring gear, they walk around it, turning the planet carrier and output shaft in the opposite direction. In this case, the LOW sun gear acts only as an idler for the short pinions, since it does no work when the clutch and LOW band are disengaged. The gear ratio in REVERSE is the same as in LOW.

HYDRAULIC CONTROLS

With the single exception of the parking lock, all of the operations in the Chevrolet automatic transmission are performed hydraulically. The DRIVE range clutch and the LOW and REVERSE brake bands are applied by means of oil pressure against spring-loaded pistons. To develop, to regulate, and to maintain the oil pressures required for these operations, the following units are included:

UNITS	WHAT THEY DO
Front and rear oil pumps	Develop hydraulic pressure Supply oil to converter Provide pressure lubrication Produce oil circulation
Valve body	Provides oil distribution passages Houses control valves
Manual valve	Selects hydraulic operations
Dual check valve	Co-ordinates output of pumps
Pressure regulator valve	Adjusts main line pressures
Modulator	Adjusts pressures to engine torque
Accumulator	Cushions LOW band application
Thermostat	Controls oil temperature
Pressure relief valve	Prevents excessive oil pressures

TWO OIL PUMPS are built into the transmission to supply oil to the converter, to develop the pressure required for operation of the hydraulic controls, and to lubricate the moving parts of the transmission. Both pumps are of the internal-external gear type.

The front pump is located just behind the torque converter, and is driven by the engine through the torque converter housing hub. The smaller rear pump is situated behind the planetary gear set, and is driven by the rear wheels through the transmission output shaft. The two pumps are interconnected by oil channels, and operate together, or independently, according to the action of a pressure regulator valve and a check valve.

For all normal driving, one pump would be sufficient. However, provision must be made to produce an adequate supply of oil under pressure when it is necessary to start the engine by pushing the car. Therefore, the rear pump, driven by the car wheels, is mandatory.

The oil supply for the transmission is contained in a sump in the lower part of the transmission housing. The suction line, extending into it, is equipped with a screened inlet. It is located at the center of the sump to assure an adequate oil level, even when the car is making fast turns.

At low speeds, the front pump provides the entire oil supply. At higher speeds (above approximately 15 MPH in DRIVE range, for example), the greater speed of the rear pump compensates for its smaller capacity, and it satisfies the entire oil volume and pressure requirements. At the same time, the output of the front pump has dropped to practically nothing, since a by-pass in the pressure regulator is returning its outflow to the suction line.

DRIVING CONTROLS. Selection of any of the operating phases in the new Chevrolet automatic transmission is made by movement of the selector lever on the steering column. Motion of this lever is carried to the transmission through a mechanical linkage, which includes the safety switch for the starting motor circuit.

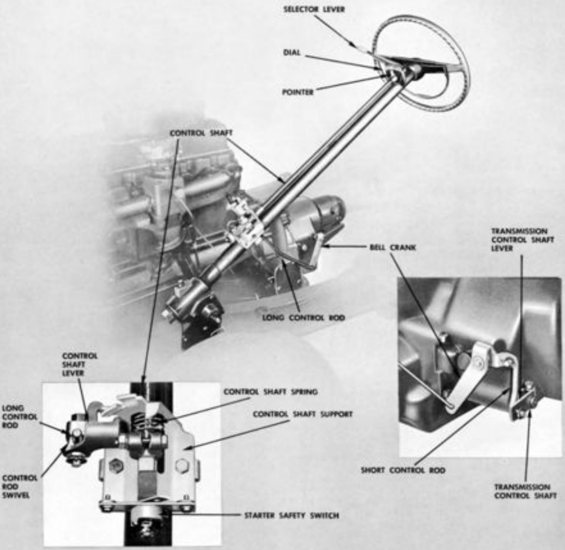
At the back of the transmission case, the control linkage is attached to the transmission control shaft lever. Just inside the case, the detent lever and roller assembly is loosely mounted on the control shaft. The manual valve lever is securely fastened to the front end of the same shaft. A stiff coil spring on the control shaft is the medium through which the detent lever is actuated.

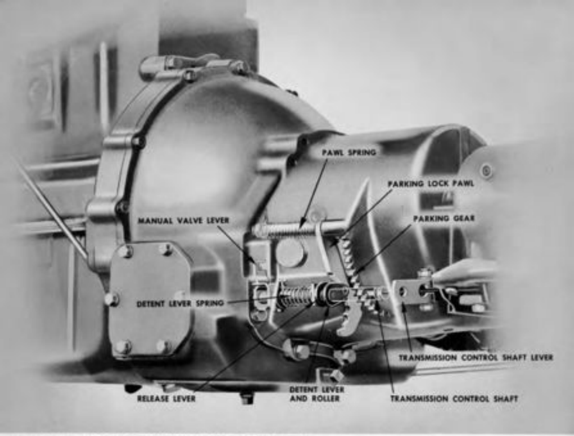
The roller on the detent lever rides on the outer face of the parking lock pawl, in which five notches are cut. These notches provide a detent, or stop, for each position of the selector lever. The pressure exerted by a heavy coil spring on the pawl shaft causes the pawl to bear firmly against the detent roller at all times.

Putting the detent mechanism inside the transmission, rather than including it in the external control linkage, eliminates the necessity for a means of adjustment between the detents and related transmission parts.

THE TRANSMISSION FRONT OIL PUMP

SELECTOR LINKAGE





PHANTOM VIEW OF THE TRANSMISSION CONTROL MECHANISM

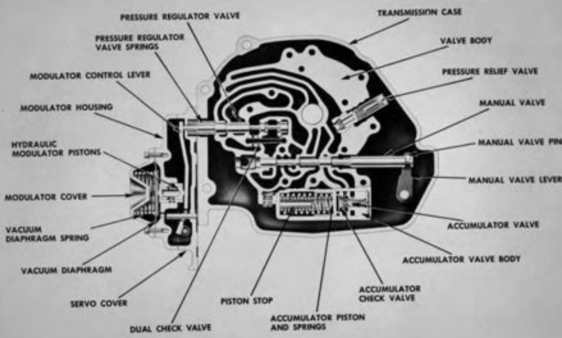
Moving the selector lever to PARK position shifts the detent lever into the uppermost notch on the parking lock pawl. This notch is longer than the others, and is cam-shaped, so that the detent roller, as it rises, exerts increasing force upon the pawl, moving it into engagement with the parking lock gear on the front of the planet carrier. The inner edge of the pawl contains three teeth, which mesh simultaneously with those on the gear, preventing movement of the planet carrier, hence the output shaft and the rear wheels.

The pawl teeth, as well as those on the gear, have rounded tops to facilitate engagement, and to prevent damage, if they should come into contact when the car is moving. The parking lock cannot be completely engaged, however, if the car is moving faster than a few miles per hour. This is because the spring that actuates the detent lever is not powerful enough to force the pawl into engagement with the moving parking lock gear.

Spring force is not used to disengage the parking lock, however. Instead, when the selector lever is moved away from PARK position, a release lever, fixed to the control shaft in front of the detent lever, encounters a projecting pin on the detent lever. As the control shaft is rotated, the release lever moves downward, carrying the detent lever with it, and forcibly disengaging the parking lock.

The manual valve lever, at the front end of the transmission control shaft, has a projecting pin at its top. The pin fits into an annular groove on the outer end of the manual valve. Thus, as the lever moves with the shaft, the manual valve is moved back and forth in the valve body.

THE VALVE BODY is the control center of the hydraulic system. It is cast iron, rather than die cast aluminum, and contains hardened steel valves. Making the body and valves of metals which have similar expansion coefficients assures proper valve fits over a wide range of temperatures. The valve body is mounted directly behind the front oil pump, a position which greatly simplifies oil distribution, and shortens lines, reducing fluid friction losses. The rear portion of the valve body forms a sleeve, which supports the DRIVE range clutch and the LOW drum. Passages for the oil which operates the clutch are provided in the sleeve.



THE VALVE BODY—CONTROL CENTER OF THE TRANSMISSION

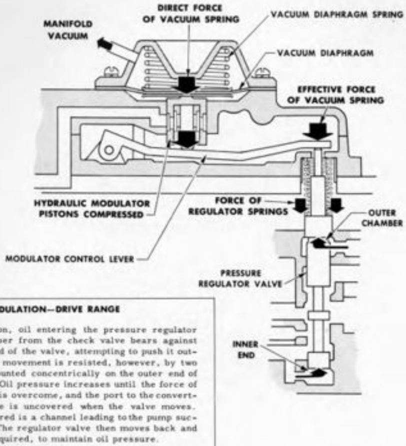
The valve body contains a maze of passageways and ports, which, in conjunction with valves mounted in the body, are used to distribute oil to all parts of the transmission.

MANUAL VALVE. As previously pointed out, movement of the selector lever changes the position of the manual valve in the valve body, and, like the selector, the valve has five positions. By means of annular grooves and lands on the valve, different combinations of ports are uncovered for each valve setting.

A DUAL CHECK VALVE of ingenious design is installed in the valve body at the juncture of the pressure lines from the two oil pumps. It is a wide, hairpin-shaped steel spring, and is fitted into a narrow slot in the valve body. At one end of this slot, two inlet holes are opposed. The hole in one side is connected to the pressure line from the front oil pump, while the opposite hole is connected to the rear pump. The outer sides of the check valve blades are held against the inlet holes by spring tension, closing them effectively.

When one of the pumps is in operation, the oil pressure it develops is sufficient to push the valve blade on that side away from its inlet hole. This allows the oil to flow through the check valve outlet, which supplies both the manual valve and the pressure regulator valve. With only one pump operating, the inlet from the other pump is closed by its valve blade. But, if both pumps are supplying oil, the two blades are squeezed together, opening both inlets.

THE PRESSURE REGULATOR VALVE is located in the right side of the valve body. In appearance, it is somewhat similar to the manual valve, since it also has a series of annular lands and grooves. Its function is to control oil pressures in the hydraulic system, varying them to meet the requirements of every situation. The pressure regulator valve also adjusts the pressure of oil fed to the torque converter. It keeps the converter filled while the car is in operation, and closes the feed line inlet when the engine is not running, to prevent converter oil from draining into the sump. A check valve closes the outlet side of the feed circuit for this purpose.



VACUUM MODULATION—DRIVE RANGE

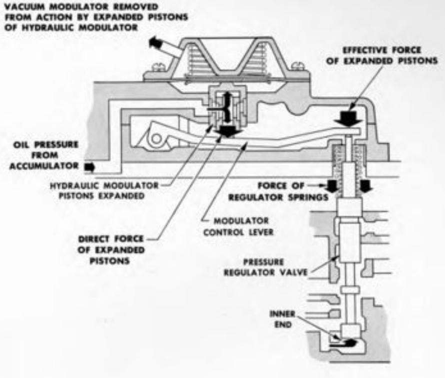
In operation, oil entering the pressure regulator valve chamber from the check valve bears against the inner end of the valve, attempting to push it outward. This movement is resisted, however, by two springs, mounted concentrically on the outer end of the valve. Oil pressure increases until the force of the springs is overcome, and the port to the converter feed line is uncovered when the valve moves. Also uncovered is a channel leading to the pump suction line. The regulator valve then moves back and forth, as required, to maintain oil pressure.

In DRIVE range, additional outward oil pressure is applied from the outermost chamber in the pressure regulator valve. This increases the area upon which oil acts to push the valve, so that less pressure need be developed to move it. By this means, lower pressures are provided for DRIVE range.

THE MODULATOR is another unit of the oil pressure control system. It is located in the servo cover on the right side of the transmission. The outer end of the pressure regulator valve extends into the modulator, contacting the modulator control lever.

The modulator is made in two sections, one of which is actuated by vacuum, and the other by hydraulic pressure. The purpose of the vacuum modulator is to impose additional resistive force on the pressure regulator valve to increase oil pressures when high torque is being transmitted. Also, it removes this force, reducing oil pressures when less torque is handled. The hydraulic modulator, on the other hand, adds resistance to pressure regulator valve movement, to increase oil pressures without regard for variations in the amount of torque being handled by the transmission. The vacuum modulator is provided principally for DRIVE range, while the hydraulic modulator is used only for LOW and REVERSE.

The vacuum modulator is a coil spring, confined between the modulator cover and a diaphragm. The chamber housing the spring is connected to the engine manifold. Engine vacuum, acting on the diaphragm, adjusts effective force applied to the regulator valve. When power requirements are high and engine vacuum is low, the entire spring load is transmitted to the regulator valve. Greater engine vacuum, as at part-throttle, removes some or all of the spring load.



HYDRAULIC MODULATION—LOW AND REVERSE

The force of the spring on the diaphragm is transmitted to the modulator control lever by the hydraulic modulator, which comprises two pistons, one sliding inside the other. The larger one is fitted into the modulator housing, and contacts the diaphragm of the vacuum modulator. The smaller piston rides on the modulator control lever. Openings in the piston walls admit oil under pressure, which expands the assembly in LOW and REVERSE. When expanded, the hydraulic modulator pushes the diaphragm of the vacuum modulator outward, until it strikes the modulator cover. The force of the expanded hydraulic unit acts on the end of the pressure regulator valve through the modulator control lever, causing oil pressures to be raised.

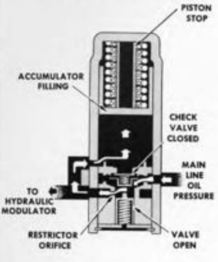
During vacuum modulation, as in DRIVE range, there is no oil pressure in the hydraulic modulator. The two pistons slide together, and function as a solid link between the diaphragm and the control lever.

THE ACCUMULATOR is situated in the lower part of the valve body. It is used only in LOW and REVERSE to supply oil to the hydraulic modulator. When a shift is made from DRIVE to LOW, the accumulator acts as a surge chamber, retarding the sudden rise in oil pressure, and cushioning the application of the LOW band.

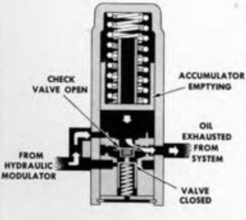
Oil pressure must rise to 55 psi to open the accumulator valve. When the valve is open, it uncovers an orifice which admits oil to the accumulator piston, as well as to the line that supplies oil to the hydraulic modulator. As its pressure quickly rises, the oil fills the accumulator until the piston hits a stop. At this time, the "door-check" action is completed, and the higher pressure in the line is fully applied to the hydraulic modulator.

When shifting from LOW or REVERSE into PARK, NEUTRAL, or DRIVE, oil is quickly exhausted from the hydraulic modulator and accumulator. As pressure is removed from the accumulator entrance, oil

ACCUMULATOR ACTION



SHIFTING INTO LOW OR REVERSE



SHIFTING FROM LOW OR REVERSE

flows rapidly out of the system through the accumulator check valve.

A PRESSURE RELIEF VALVE for the hydraulic system is mounted on the valve body. A ball-and-spring type, this valve discharges oil to the sump if the pressure in the system exceeds 200 psi.

CONVERTER OIL SUPPLY. The front and rear oil pumps maintain constant circulation of oil through the torque converter during all its operating phases. To insure optimum efficiency, the volume of oil in the converter is also kept constant, regardless of pressure variations. When the engine is not running, or when the selector lever is in PARK position, oil cannot drain from the converter into the sump because the converter feed circuit is closed; on one side by the pressure regulator valve; on the other, by the lubrication check valve. The important advantage of this feature is that, because the torque converter is always full of oil, the car is invariably ready for a quick start, even after prolonged inactivity.

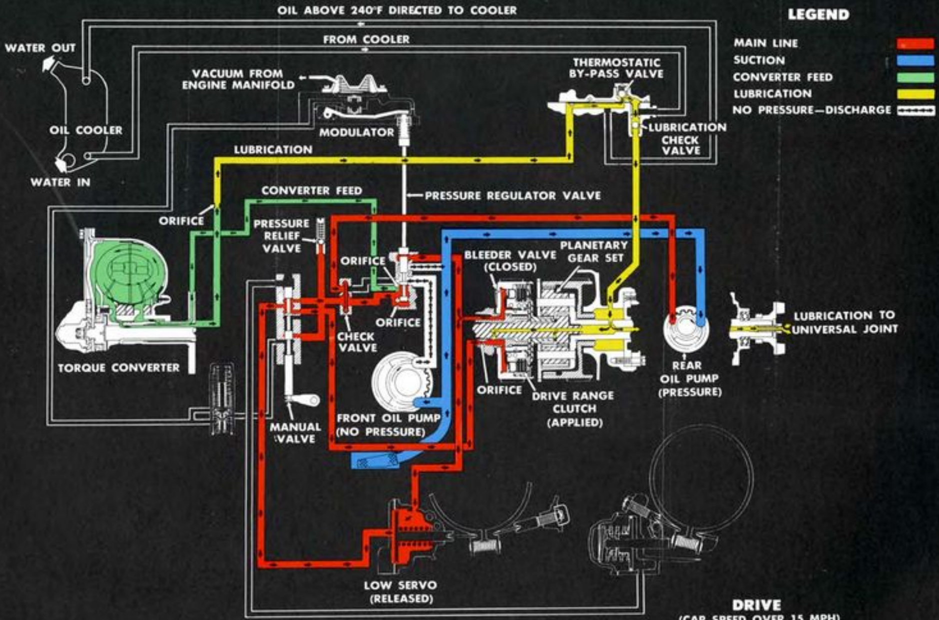
A port in the pressure regulator valve supplies oil to the converter feed circuit at main line pressures. These pressures are too high for converter operation, however, and to reduce them, a restrictor is provided at the pressure regulator port. An additional restrictor with a larger orifice is used in the outlet side of the converter feed line.

The orifices of the two restrictors are calibrated to provide just sufficient pressure to keep the converter filled with oil. Between them, they also prevent the oil from flowing out of the converter faster than it can enter. Since the pressure regulator valve controls main line pressures, and the restrictors can only reduce them, converter pressures are always lower than, but directly proportional to, main line pressures.

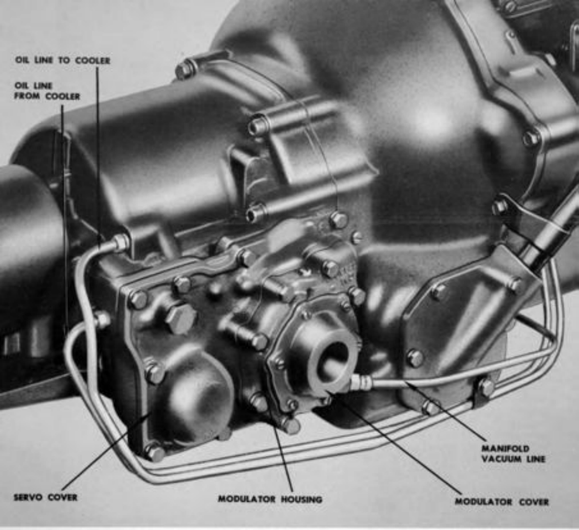
LUBRICATION, OIL COOLING. After it has passed through the orifice of the second restrictor, the oil leaving the converter has a still lower pressure, and becomes the lubricating oil for all of the moving parts in the transmission. The oil is directed to these parts through passages in the output and input shafts, returning to the sump after completing its circuit.

Excess heat, developed in the torque converter during ordinary operation, is rapidly dissipated. Under extended and severe driving conditions, however, the oil temperature may rise above the most desirable operating level. For such instances, an oil cooler of the water-jacket type is provided. It is interposed in the engine cooling system between the radiator outlet and the suction side of the water pump.

Whenever the oil temperature exceeds 240 degrees, Fahrenheit, a thermostat in the lubrication oil line closes a by-pass valve, conducting oil through the baffle plate in the cooler. After being cooled, the oil returns to its regular circuit, lubricates the transmission, and flows back to the sump. Since oil temperature seldom rises above 240 degrees, how-



DRIVE
(CAR SPEED OVER 15 MPH)



ALL LINES ENTER THE TRANSMISSION CASE ON THE RIGHT SIDE

ever, the by-pass valve stays open most of the time, cutting the oil cooler out of the lubrication line. Further details of the oil cooler will be found on page 96.

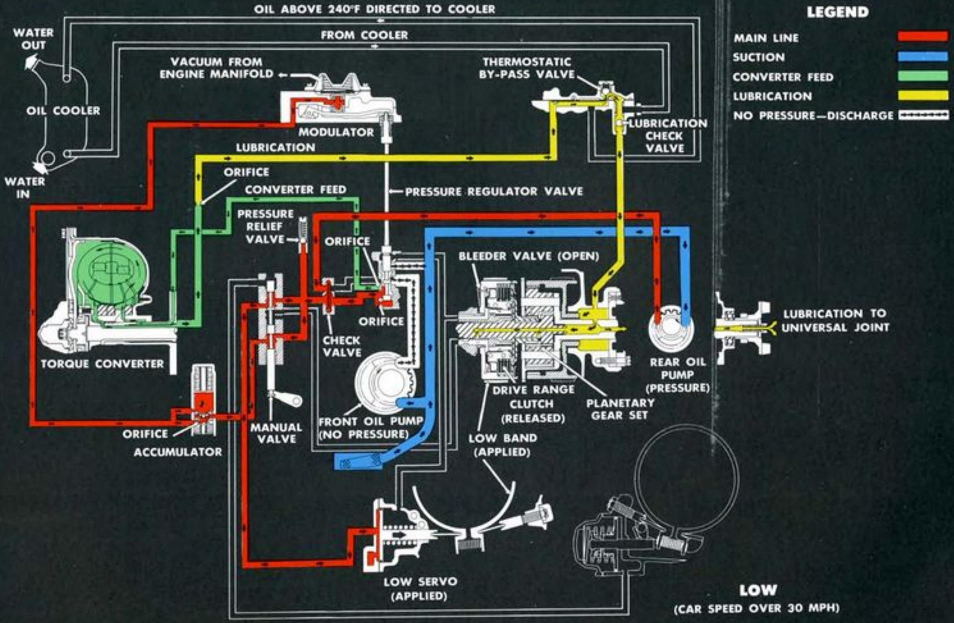
The charts on these pages, in conjunction with the following text, illustrate the operation of the various hydraulic units of the Chevrolet automatic transmission in each of the five selector lever positions.

IN DRIVE RANGE, either the front or rear oil pump may be in operation, depending on the speed of the car. The rear pump assumes the entire burden of oil supply above approximately 15 MPH. Since the greater part of driving is done at these higher speeds, this explanation and the accompanying diagram depict the rear pump in operation.

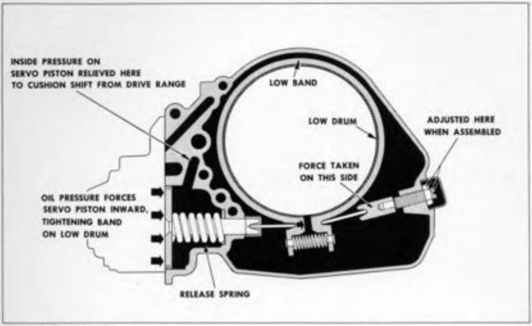
The output of the pump is applied to the piston of the DRIVE range clutch, to both sides of the LOW band servo piston, to the inner side of the pressure regulator valve, and to its outer chamber, as well.

The oil is directed to both sides of the LOW servo piston to insure co-ordination between DRIVE clutch release and LOW band application when shifting from DRIVE to LOW. The explanation of the LOW range hydraulic system covers this aspect fully.

Oil flowing to the clutch piston passes through a restricting orifice, reducing its pressure, so that clutch application will be gradual and smooth. As the piston compresses the clutch plates together, the bleeder valve in the LOW drum is closed by a leaf spring, preventing escape of the oil applied to the clutch piston.



LOW
(CAR SPEED OVER 30 MPH)



LOW BAND SERVO MECHANISM

A pressure of 43 psi is developed by the pressure regulator valve. It will be recalled that the outer end of the pressure regulator valve is linked to the modulator. Therefore, movement of the valve is also influenced by the modulator.

In DRIVE, only the vacuum section of the modulator is in use. If, because of a heavy load on the engine, vacuum is low, the vacuum diaphragm spring is fully applied. This, in addition to the pressure regulator spring load, creates a total pressure of 90 psi, which is the maximum.

A manifold vacuum of 18 inches removes the effect of the vacuum diaphragm spring, while lower values allow this spring to be partially applied. Thus, the pressure which holds the clutch in engagement varies from 43 to 90 psi, with the load on the engine.

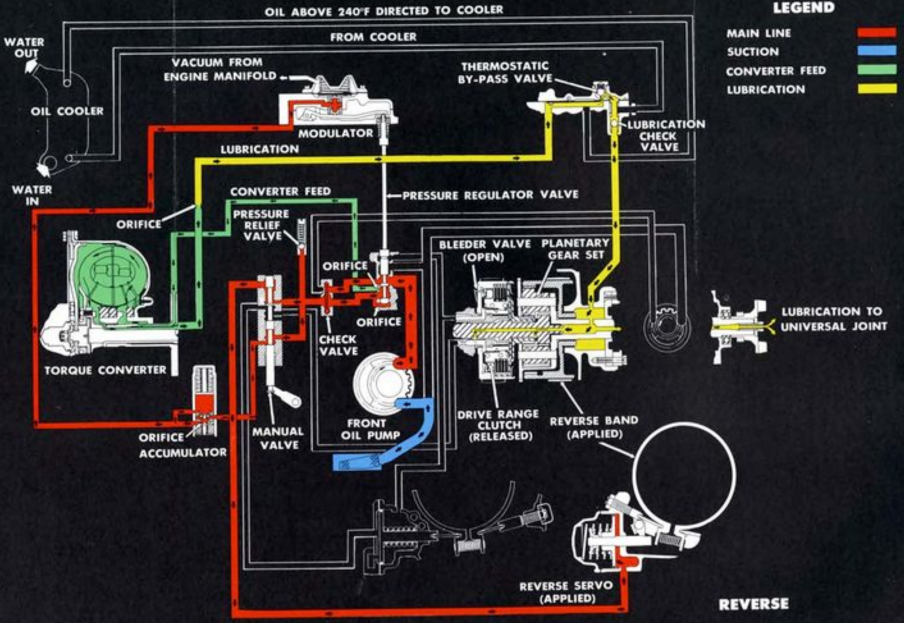
LOW. Again, either oil pump may furnish oil for the hydraulic system. The condition at higher speeds (over 30 MPH) is shown in the diagram for LOW range, in which the rear pump supplies all of the oil.

When the shift is made from DRIVE to LOW, oil is shut off from the clutch, the inside of the LOW servo, and the outer chamber of the pressure regulator valve. Oil pressure is still applied to the outer side of the LOW servo piston and the inner end of the pressure regulator valve. In addition, oil is directed to the hydraulic section of the modulator through the accumulator. Because the LOW band must be applied tightly to transmit greater torque, oil pressures in LOW are higher than they are in DRIVE.

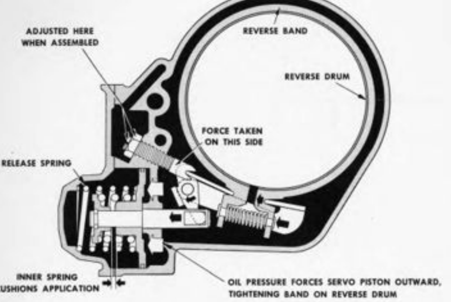
The oil pressure that applied the clutch in DRIVE range, and that on the inner side of the LOW servo, must be removed before the LOW band can be fully applied. Oil pressure in both of these units is removed through the same circuit in which it was applied. The restrictor which cushioned the clutch application now acts in reverse to ease the application of the LOW band. Thus, the shift to LOW is fast, but smooth, since it cannot be completed until the clutch is fully released. Complete evacuation of oil from the DRIVE clutch is assured, because the bleeder valve in the LOW drum is forced open as the clutch piston is released.

Oil pressure rises gradually as the shift is made. This is because it is removed from the outer chamber of the pressure regulator valve through the clutch circuit. As this occurs, the inner end of the pressure regulator valve becomes the only valve surface used for pressure control. Because of the reduction in affected valve area, an oil pressure of 78 psi is developed by the pressure regulator springs alone. This is immediately supplemented by the hydraulic modulator, which builds up the oil pressure to the maximum of 180 psi.

IN REVERSE, conditions in the hydraulic system are similar to those in LOW, although the front pump alone supplies the system with oil, because the rear pump turns backwards with the output shaft. Oil pressure is applied to the REVERSE servo piston, rather than to the LOW piston.


LEGEND
MAIN LINE
SUCTION
CONVERTER FEED
LUBRICATION
OIL ABOVE 240°F DIRECTED TO COOLER
FROM COOLER
WATER OUT
OIL COOLER
WATER IN
VACUUM FROM ENGINE MANIFOLD
MODULATOR
THERMOSTATIC BY-PASS VALVE
LUBRICATION CHECK VALVE
LUBRICATION
CONVERTER FEED
PRESSURE REGULATOR VALVE
ORIFICE
PRESSURE RELIEF VALVE
ORIFICE
ORIFICE
CHECK VALVE
BLEEDER VALVE (OPEN)
PLANETARY GEAR SET
LUBRICATION TO UNIVERSAL JOINT
TORQUE CONVERTER
ORIFICE
ACCUMULATOR
MANUAL VALVE
FRONT OIL PUMP
DRIVE RANGE CLUTCH (RELEASED)
REVERSE BAND (APPLIED)
REVERSE SERVO (APPLIED)

REVERSE



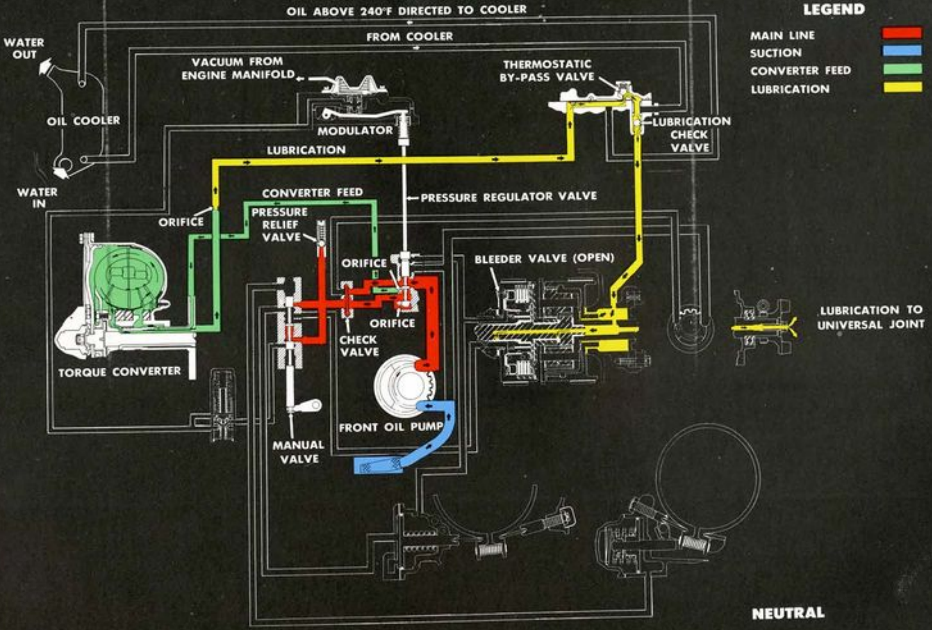
REVERSE BAND SERVO MECHANISM

Pressure control is the same as in LOW, and therefore the maximum is also 180 psi. Accumulator action may not be effective, since the selector lever must be moved past LOW (initiating the action) to reach REVERSE. The accumulator, then, is filled, and the hydraulic modulator is already effective before REVERSE is engaged. Nevertheless, smooth band application is assured by the design of the REVERSE servo linkage, in which the first 1/8 of an inch of piston travel is applied to the band through a high-rate coil spring.

Actuation of the REVERSE band differs somewhat from that of the LOW band. In LOW band application, the force exerted on the servo piston is opposed by the other side of the transmission case. The REVERSE band, on the contrary, is applied by an opposite movement of its piston, through a linkage anchored on the same side. Although the two pistons are the same size, the greater force required for REVERSE band application is gained through the linkage, which contains mechanical advantage. In addition, the linkage relieves the transmission of the extra stresses involved.

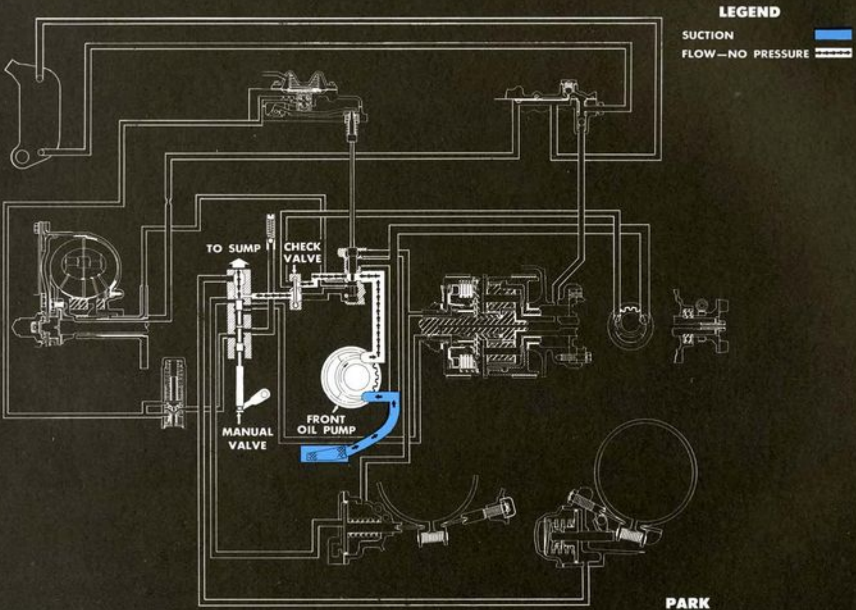
IN NEUTRAL, no oil pressure is applied to the DRIVE range clutch nor to either of the servo pistons. Since the car is not moving, the front oil pump supplies all of the oil for the system. Oil pressure in NEUTRAL is normally 78 psi, but higher pressures may be developed momentarily by vacuum modulator action, if the throttle is suddenly opened. The hydraulic modulator, however, is not used in NEUTRAL.

IN PARK POSITION, the front oil pump is the only operating component of the hydraulic system. Because of the position of the manual valve, the output of the pump is returned directly to the sump.

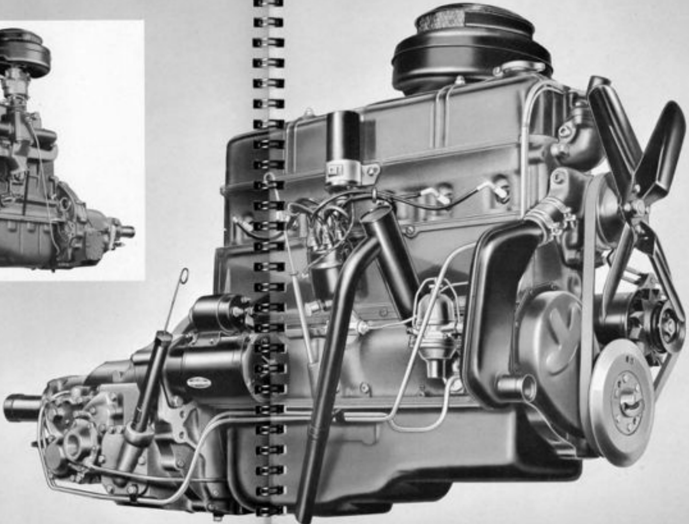


OIL ABOVE 240°F DIRECTED TO COOLER
FROM COOLER
WATER OUT
VACUUM FROM ENGINE MANIFOLD
THERMOSTATIC BY-PASS VALVE
LEGEND
MAIN LINE
SUCTION
CONVERTER FEED
LUBRICATION
OIL COOLER
MODULATOR
LUBRICATION CHECK VALVE
LUBRICATION
WATER IN
CONVERTER FEED
PRESSURE REGULATOR VALVE
ORIFICE
PRESSURE RELIEF VALVE
ORIFICE
BLEEDER VALVE (OPEN)
ORIFICE
CHECK VALVE
LUBRICATION TO UNIVERSAL JOINT
TORQUE CONVERTER
FRONT OIL PUMP
MANUAL VALVE

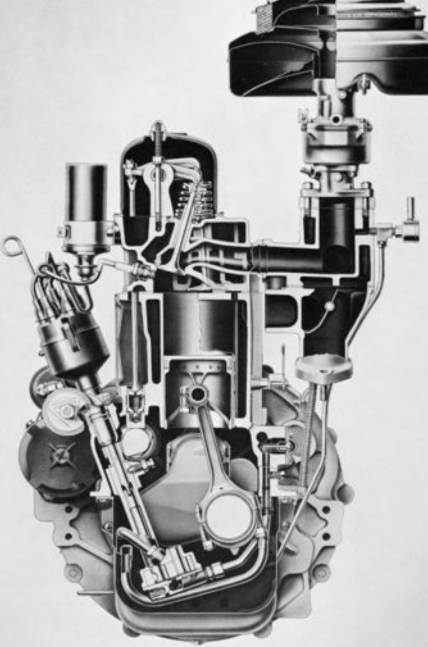
NEUTRAL


LEGEND
SUCTION
FLOW—NO PRESSURE
TO SUMP
CHECK VALVE
MANUAL VALVE
FRONT OIL PUMP
PARK

THE SPECIAL 105 HP ENGINE
FURNISHED WITH THE AUTOMATIC TRANSMISSION



A SECTIONAL VIEW OF THE NEW ENGINE



SPECIAL 105 HP ENGINE

The 105 horsepower engine, that is used with the automatic transmission, embodies all the fundamentals of design that have proved to be so successful in the regular passenger car engine. For this reason, it, too, operates with economy, durability, and smoothness that are outstanding. Moreover, its full throttle maximum torque and horsepower, unequalled by any other engine in the low-priced field, provide the Chevrolet with spirited acceleration and extraordinary hill-climbing ability. In addition, hydraulic valve lifters, an exclusive "first" in the low-priced field, help to make its operation noticeably quiet, while numerous noteworthy refinements improve its design.

THE MAJOR DIFFERENCES between this new engine and the regular engine are in its size, as follows:

	REGULAR ENGINE	105 HP ENGINE
Bore	3-1/2 in	3-9/16 in
Stroke	3-3/4 in	3-15/16 in
Displacement	216.5 cu in	235.5 cu in
Compression ratio	6.6:1	6.7:1

--which results in the following differences in the maximum power that is developed:

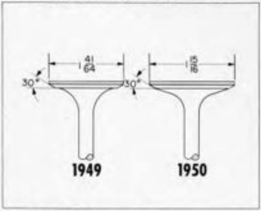
	REGULAR ENGINE	105 HP ENGINE
Gross horsepower	92 at 3400 rpm	105 at 3600 rpm
Net horsepower	85 at 3300 rpm	98 at 3500 rpm
Gross torque	176 ft lb at 1000 to 2000 rpm	193 ft lb at 1100 to 2200 rpm
Net torque	170 ft lb at 1000 to 2000 rpm	189 ft lb at 1200 to 1800 rpm

VOLUMETRIC EFFICIENCY. Since the 105 HP engine is larger than the regular engine, it must inhale more fuel-and-air mixture and exhale greater quantities of gases.

This greater volumetric efficiency, or breathing ability, is obtained mainly by making the valves, valve ports, and manifold passages larger than those of the regular engine.

Beginning at the air cleaner, the inner tube diameter is 1/8 of an inch larger. At the carburetor, the throttle body throat diameter is 1/16 of an inch more. The cross section of the intake manifold's main passage is 5/16 of a square inch greater in area. And the inlet passages in the cylinder head are 1/8 of an inch larger in diameter. More important, however, is the enlargement of the inlet valves, as shown in the accompanying illustration.

The larger inlet valve diameter (5/16 of an inch more), coupled with an increase in valve lift, permits the fuel mixture to flow easily past the valves. Considering the size of the inlet valve openings, there is more than one third more space through which the mixture sweeps into the combustion chambers.



INLET VALVES ARE LARGER

The exhaust system of the 105 HP engine, like its intake system, is larger than that of the regular engine, except for the valves.

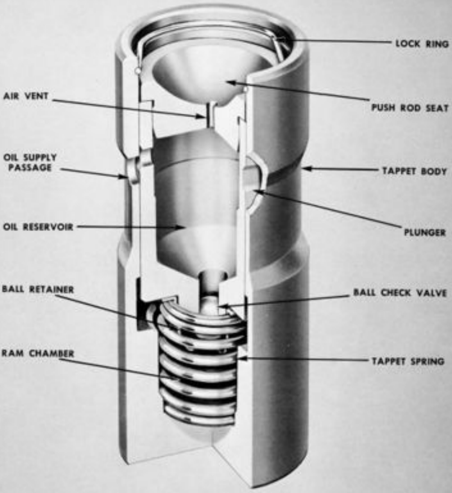
The enlargement of the exhaust valves in the regular engine resulted in more than four per cent increase in valve head area, making the expulsion of gases through the exhaust openings of the cylinder head easier. Because the paths they provide are fully large enough, these same larger, stronger, and more durable valves are used in the more powerful engine.

The rectangular exhaust passages in the cylinder head, leading from the exhaust valves, are 1/8 of an inch taller than in the regular engine at the point where the gases enter the exhaust manifold. Flow through the manifold also is freer, particularly where the gases leave to enter the enlarged exhaust pipe, the diameter of which is 2.024 inches, 1/8 of an inch more. Like the exhaust pipe, the muffler tail pipe is 1/8 of an inch larger, with an outside diameter of 1-7/8 inches. Construction modifications of the muffler, itself, are confined to those necessary to accommodate the larger pipes and to increase its capacity to that required for the more powerful engine.

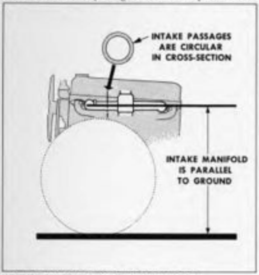
Altogether, the enlargements throughout the exhaust system provide for efficient dissipation of the gases, which are discharged with a pleasant low tone that indicates the engine's great ability, as in much larger cars.

EXCELLENT FUEL MIXTURE DISTRIBUTION is accomplished by an intake manifold that was developed especially for the 105 HP engine. This manifold is parallel to the ground, so there is no tendency for fuel to collect at one end and no cylinder is starved while others are fed an excess of fuel. Also, its

DETAILS OF THE HYDRAULIC VALVE LIFTER



main passage is cylindrical, so the volume of fuel that can collect on its floor during choking for cold starting, is limited. At cranking speeds during cold weather starting, there is insufficient air flow to keep the fuel suspended in air. The main passage, therefore, must be filled to the level of the intake valve openings in order to deliver a combustible mixture to the combustion chambers. This pool of fuel which forms in the main passage now has a depth which is



MIXTURE DISTRIBUTION IS MORE UNIFORM

the segment of a circle--a section of smaller area than those of other shapes. This permits quicker starts, since less fuel is required to flood the main passage, and to reach a level that will flow into the cylinders. Also, after the engine starts, there is less fuel to be swept from the passage. Therefore, choke operation is less critical and the engine is less likely to be stalled by improper manipulation of the choke control.

As in the regular engine, prompt warm-up is assured by a thermostatically controlled manifold heat chamber valve. This directs the hot exhaust gases around the intake manifold riser to assist in vaporizing the liquid fuel. The only difference in this device is in the control valve seat on the casting. Reshaping improves its sealing ability in the "heat-on" position.

THE CARBURETOR for the high output engine is the same in basic design and construction as the new carburetor for the regular engine (Described in the previous section). In many respects, however, it is larger: The float valve seat, the accelerator pump jet, and the main jet are larger to meet the greater fuel demand of the higher output engine. The idle port and the throttle valve and throat, too, are larger.

The size of the power jet is approximately the same in both carburetors, but the accelerator pump stroke and idle tube diameter are somewhat smaller in that for the 105 HP engine. Also, to meet the performance requirements of the higher output engine under idle conditions, its carburetor has one idle port instead of three.

HYDRAULIC VALVE LIFTERS, instead of plain tappets, are used in the 105 HP engine to eliminate periodic valve train adjustments and to maintain smooth and quiet valve train operation. Their introduction adds another exclusive feature to Chevrolet's long list of "firsts" in the low-priced field.

The torque converter amazingly reduces the amount of vibration and resultant sounds in the body. This undoubtedly will make owners far more critical of engine sounds. Of these, the sound caused by looseness in a valve train is probably the most noticeable. For this reason, hydraulic valve lifters, which keep the valve trains always under compression, are valuable as sound eliminators in the new Chevrolets with automatic transmissions.

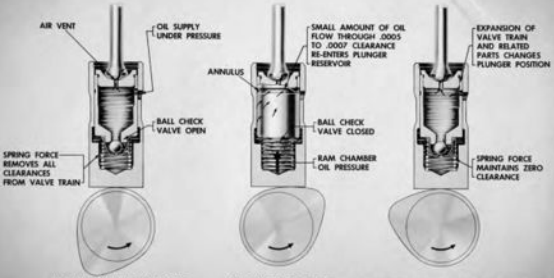
Through a combination spring-and-oil action, these devices co-operate with the valve springs to keep the push rods, valve rocker arms, and valves under just the right amount of compression to remove all clearance in the valve trains under all operating conditions. Without them, because of wear, it would be necessary to adjust the valve train adjusting screws periodically to obtain a prescribed clearance that allowed for the varying expansion and contraction of the different metals in the valve trains, cylinder case, and cylinder head. But, since the hydraulic valve lifters automatically compensate for all such variations, the adjusting screws are used only for the initial adjustment and whenever it becomes necessary to service the valve trains subsequently, as when removing the valves for grinding.

As illustrated, each hydraulic valve lifter consists of a tappet body; a plunger (which separates the oil into an upper reservoir and a lower ram chamber); a ball check valve and its retainer; and a spring. The plunger and the body are precision ground and selectively fitted together to obtain a free movement with minimum clearance to control passage of oil from the ram chamber to the reservoir.

Operation of a hydraulic valve lifter is depicted in the illustration on the following page. In this operation, the plunger reservoir and the ram chamber are kept filled with oil which enters, under two to three pounds pressure when hot, through passages in the body and the plunger.

When the valve is closed and the hydraulic valve lifter is riding on the base circle of its cam on the camshaft, the spring exerts approximately ten pounds of force against the plunger, thereby eliminating all clearances between the parts of the valve train. At this time, oil will flow through the ball check valve, if the ram chamber is not completely filled.

When the valve begins to open and the hydraulic valve lifter is riding on the ramp of its cam, the ball check valve is closed by oil pressure in the ram



WHEN THE ENGINE IS STARTED AND THE VALVE (INLET OR EXHAUST) CLOSED, OIL ENTERS PLUNGER RESERVOIR AND PASSES THROUGH THE OPEN BALL CHECK VALVE IF RAM CHAMBER IS NOT FILLED.

VALVE CLOSED ENGINE COLD

AS THE VALVE SPRING IS COMPRESSED, PRESSURE IN RAM CHAMBER INCREASES, CLOSING THE CHECK VALVE AND FORMING A HYDRAULIC RAM OF OIL TO SUPPORT THE PLUNGER.

VALVE OPEN ENGINE COLD

THROUGHOUT THE RANGE OF OPERATING TEMPERATURES, THE VOLUME OF OIL IS AUTOMATICALLY ADJUSTED BY FLOW THROUGH THE BALL CHECK VALVE, COMPENSATING FOR ANY CHANGE IN PLUNGER POSITION AND MAINTAINING ZERO CLEARANCE.

VALVE CLOSED ENGINE HOT

HYDRAULIC VALVE LIFTERS AUTOMATICALLY COMPENSATE FOR WEAR

chamber. Then, the cam action is transferred through the valve train with the hydraulic valve lifter acting as a hydraulic ram for the train.

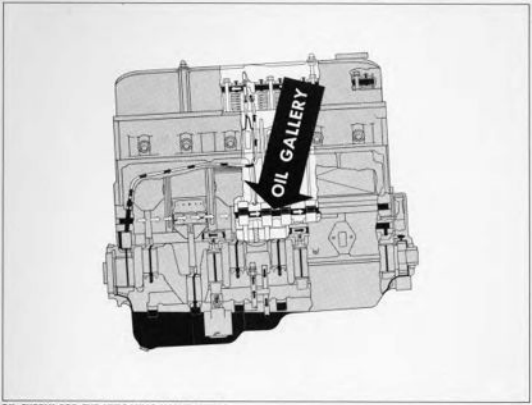
During the operation, the small amount of oil that passes from the ram chamber through the minute clearance space between the plunger and the tappet body, enters the plunger reservoir by way of an oil-return annulus. The same amount of oil is returned to the ram chamber when the ball check valve is allowed to open after the valve has closed.

Similarly, if there is wear, expansion, or contraction in the metal parts of the valve train and related parts, the volume of oil in the ram chamber is automatically adjusted through the ball check valve to compensate for any change in plunger position.

Air is capable of being compressed and is always present in some amount in engine lubrication systems. If any air were to be trapped with the oil in the ram chamber, a noisy valve train would result. To prevent this possibility, a hole in the center of the push rod seat allows the air to escape. A slot in the end of the push rod coincides with this hole to complete the passageway for expulsion of the air.

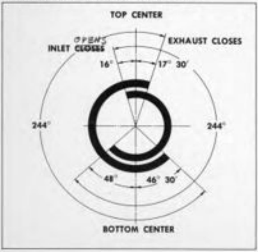
With hydraulic valve lifters, the initial adjustment of each valve train is made with the valve closed (lifter on cam base circle) and the engine cold and not running, instead of hot and running. In this operation, the adjusting screw on the rocker arm is turned until all clearance in the valve train is removed. Then the adjusting screw is turned one-and-a-half turns farther and locked.

IN THE CAMSHAFT of the 105 HP engine, both the inlet and exhaust valve cams have an identical contour that was developed especially for use with the hydraulic valve lifters. Included on each cam is a quieting ramp, the rise of which is slower and smoother than that of similar ramps in the regular engine. Hydraulic valve lifters, like conventional tappets, need this cam shape in order to start the valve trains in motion smoothly. No special ramp, however, is required to absorb valve lash clearance, as in the regular engine. This camshaft also differs from that of the regular engine in the following respects: The cam, or valve, lift is greater (.22 inch instead of .20, inlet, and .21, exhaust). The theoretical valve timing is different (both inlet and exhaust valves open earlier and stay open longer).



OIL SUPPLY FOR THE HYDRAULIC VALVE LIFTERS

DIAGRAM OF THEORETICAL VALVE TIMING



THE LUBRICATION SYSTEM of the 105 HP engine is the same as that of the regular engine, except for the hydraulic valve lifter and valve rocker arm bearing lubrication.

As in the regular engine, oil for each of the four camshaft bearings is supplied from an oil gallery on the left side of the engine through a drilled passage. Each passage extends from the gallery to the groove of the adjacent main bearing and from there to the groove in the camshaft bearing. To supply oil to the hydraulic valve lifters, the drilled passage for the rearmost camshaft bearing is continued upward to intersect a second oil gallery, on the right side of the engine, that extends through each of the hydraulic valve lifter bores.

This same drilled passage serves also in supplying oil to the valve rocker arm bearings. Instead of starting at a metering hole in the oil distributor valve, the tubing that carries oil to the valve rocker shaft is connected to the end of this passage and extended upward, through the push rod compartment. Its upper end, as in the regular engine, is joined to the middle of the hollow rocker arm shaft, through which oil is directed to the valve rocker arm bearings. Because the spring force of the hydraulic valve lifters places a continuous load on these bearings, a flat is machined on the bottom of the hollow shaft to supply them with more oil than in the regular engine.

ALL VALVE TRAIN PARTS of the 105 HP engine were developed to accommodate the larger valves and the hydraulic valve lifters of that engine. Consequently, they differ somewhat in design, size, and weight from like parts in the regular engine.

Notably, the rocker arms are heavier in construction, with thicker and deeper ribs and larger fillets. In this design, the upper rib extends the full length of the arm, crossing the bearing boss and adding strength to this and other highly stressed areas. The result is stiffer arms that operate with a minimum of deflection and loss of valve lift.

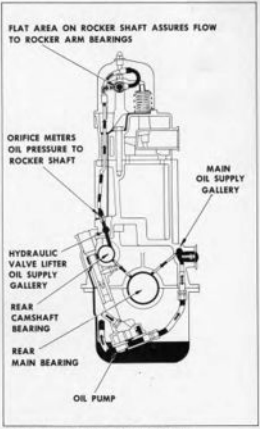
Because the various valve train parts are different from those of the regular engine, their vibration characteristics, too, are different. To prevent a surging condition from developing as a result, stiffer valve springs of higher frequency are used. These springs are seated in counterbores in the cylinder head, eliminating any need for separate spring seats.

SPECIAL COOLING PROVISIONS are required for the automatic transmission and 105 HP engine option.

Not only does the more powerful engine require greater heat dissipation but also an oil cooler is introduced into its cooling system to cool the oil for the transmission. Since this unit is located between the radiator outlet and the water pump, the engine's coolant passes through it before it enters the cylinder block. Therefore, without special provisions, the coolant's temperature would be affected by that of the hot transmission oil. To reduce the coolant's temperature to that which is best for the most efficient engine performance, a radiator of larger heat dissipating capacity than that for the regular engine, and a radiator cap of the pressure type are provided.

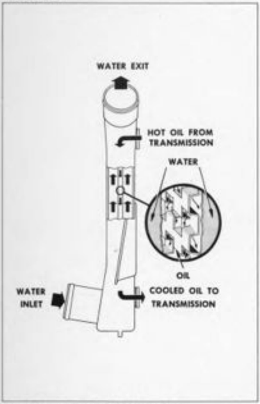
The transmission oil, when hot, passes from the transmission toward the cooler through a by-pass valve. This is located in the servo piston cover of the transmission and is connected to the cooler by "hot" and "cold" pipe lines on the right side of the power plant. The by-pass valve is a spring-loaded ball check type which is opened and closed by a bimetal thermostat. So the oil will heat up quickly to the temperature and consistency that is best for transmission operation, the thermostat keeps the by-pass valve open, thereby confining the oil to the transmission, until the oil's temperature is approximately 240°F. Then the thermostat closes the by-pass valve.

THE TRANSMISSION OIL COOLER



THE LUBRICATION SYSTEM IS MODIFIED

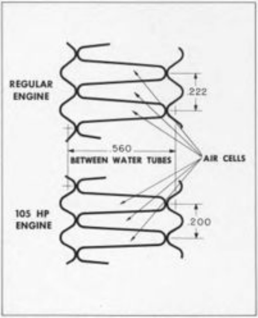
The oil enters the cooler at its top, follows the natural course of gravity, and leaves at its bottom. The cooler, itself, consists of an oil passage core that is surrounded by coolant contained in a sheet metal jacket. The core, a broad but thin unit, consists of two walls and a center plate that is shaped to form a series of baffles, as illustrated, that retards the oil flow. Brazing this center plate to the walls makes the unit sufficiently strong to withstand the oil pressure.



SECTIONAL VIEW OF THE OIL COOLER

Within the 105 HP engine, there is no basic difference from the regular engine as far as cooling is concerned, except where different construction results in changes in the location or size of a passage. In this respect, the water passages of the cylinder head are larger, so the head contains ten per cent more coolant. This greater capacity makes nozzle jets, for directing the coolant toward the valve seats, unnecessary.

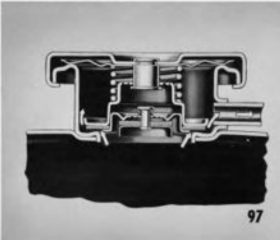
The radiator used with the 105 HP engine is like that used with the regular engine, except that its air cells, in effect, are squeezed together, as illustrated. This adds more than eight per cent heat radiating surface to the copper core. Consequently, it dissipates more heat. In tests, the air temperature at which water in the cooling system boiled was three degrees higher with this radiator than with the regular radiator.



FRONT VIEWS OF RADIATOR CELLS COMPARED

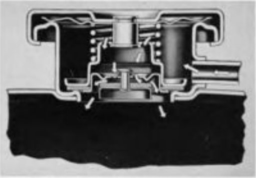
With the use of a pressure-type radiator cap, this cooling system is sealed so it operates under pressure. The cap is designed to hold pressures up to approximately four pounds per square inch above atmospheric pressure. Above that, the pressure is relieved by a valve within the cap that opens the system to the radiator overflow. As the pressure is

RADIATOR PRESSURE RELIEF



reduced to that of the atmosphere upon cooling, a "reverse" valve in the cap allows air to re-enter the radiator, preventing the formation of a vacuum.

With the pressure in the cooling system raised four pounds, the boiling point of the coolant is raised ten degrees. The loss of coolant, thereby, is reduced considerably.



RADIATOR VACUUM RELIEF

When removing the radiator cap from a hot engine, it is important to rotate the cap to the left to the first stop, which is a vented position. This relieves the pressure in the system. For removal, the cap is again rotated to the left, or counterclockwise. For installation, the cap is turned all the way to the right.

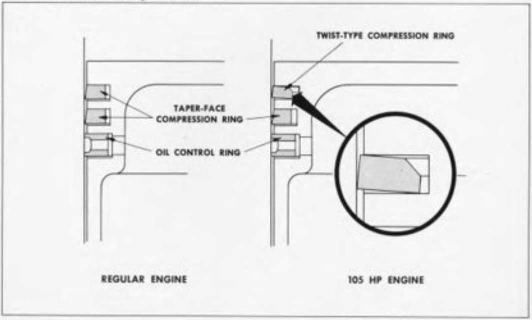
The larger passages of the cylinder head and the coolant added for the oil cooler, despite somewhat less capacity in the radiator, make the cooling system capacity of the 105 HP engine 16 quarts, one quart more than that of the regular engine.

Cooling tests, in the desert, on mountainous runs, and in stop-and-go driving in hilly cities, indicate that this cooling system more than meets the requirements of the 105 HP engine and the automatic transmission, under all normal driving conditions.

THE CYLINDER HEAD is larger than that of the regular engine and somewhat different in design. Its Blue Flame combustion chambers provide for the 6.7 to 1 compression ratio and for different valve positions. As previously mentioned, its inlet and exhaust valve ports and passages are larger, permitting freer intake of fuel mixture and expulsion of exhaust gases. Likewise, its water passages are larger, providing more coolant capacity and eliminating the need for nozzle jets. In addition, it is shaped to enclose the upper ends of the push rods so a shorter push rod cover, that covers just the opening in the cylinder case and is fastened to the case alone, may be used. This permits removal of the cylinder head without the need to remove the push rod cover. Furthermore, because the cover terminates below the spark plugs, they do not extend through the cover, eliminating any necessity for oil seals around them.

Except for the four corner bolts, all the bolts that hold the cylinder head to the cylinder case are short-

PISTON RING COMBINATIONS COMPARED



er, making them more rigid. Because these bolts are located in different positions, and because of the larger cylinder bores, a special gasket is used to seal the head of the 105 HP engine to the case.

THE CYLINDER CASE is like that of the regular engine, except for its larger bores, but is made stronger by thicker walls and an added rib. The outer walls are 7/32 of an inch thick, in contrast to the 3/16-inch thick walls of the regular engine. The added rib, on the right exterior of the case, extends horizontally between the second and third vertical ribs and between the sixth and seventh vertical ribs

THE TOP COMPRESSION RING of each piston in the 105 HP engine is a deep-section twist type, 3/32 of an inch wide, instead of the 1/8-inch wide taper-face type used in the regular engine. Otherwise, the rings are the same except for diameter, as in the regular engine, as illustrated.

The top ring takes its name, twist type, from its installed position which is cocked, or twisted. It assumes and maintains this position for life, because the upper edge of its inside diameter is chamfered, making the ring unbalanced in cross section.

Tests have shown that this ring, in combination with the taper-face second compression ring and the wide-slot oil control ring, provides effective blow-by control throughout the speed range of the high output engine. In fact, blow-by actually is slightly less in the high range of speed.

Blow-by is undesirable because it burns the lubricant on the cylinder walls, resulting in scuffing of the rings, especially the top ring.

Tests also have indicated that blow-by control is improved to the extent that longer top ring life is expected. This is based on data which shows that the top ring wear is only slightly more than that of the second compression ring.

THE PISTON PIN BUSHING LUBRICATION is modified from that of the regular engine to assure proper distribution of oil to these bearings in the 105 HP engine. An oil groove in the side of each bushing is used instead of a hole and groove in its top. After splash oil enters the end of the bushing, the oil groove distributes it in an area that is not heavily loaded. The piston pin then wipes the oil into the bearing area.

THE CRANKSHAFT of the 105 HP engine is identical with that of the regular engine, except for its longer stroke, and for revisions in the counterweights. The revisions in the counterweights and adjustments in the harmonic balancer compensate for the longer stroke to provide dynamic balance in the crankshaft. The bearings used with the crankshaft are the same as those of the regular engine because they are fully capable of withstanding the heavier bearing loads of the high output engine.

COUPLING OF THE TORQUE CONVERTER of the automatic transmission to the 105 HP engine is accomplished by means of six bolts at the outer rims of the converter and flywheel.

Because of the size and weight of the pump unit and the volume of oil carried, it is in effect a large flywheel. For that reason, there is no need for a heavy flywheel. Instead, a sturdy but light steel stamping is the connection between the converter and the crankshaft. This thin flat disk really serves as a flexible driving coupling, thus minimizing engine disturbances and the effect of misalignment between the engine and transmission. The starter ring gear is welded on this stamped flywheel, whereas in the regular engine it is shrunk on the cast flywheel.

As in the regular engine, the transmission is piloted in the rear of the crankshaft. However, the construction differs in that a combined pilot and bearing is not necessary. Since the pump unit turns with the flywheel, a bearing is not required.

A cast iron flywheel housing, bolted to the rear of the engine, is used instead of a clutch housing. It is the structural member to which the transmission housing is mounted. Openings are cast in it for the starter pinion and the timing pointer. Also two holes are included to provide access to the six flywheel-to-converter attaching bolts.

SPARK ADVANCE. Laboratory testing proves that optimum performance in the 105 HP engine requires less spark advance at high speed than in the regular engine. Therefore, the amount of distributor advance was reduced by making the centrifugal weight return spring stiffer. The initial five degrees of spark advance and the twenty degrees of vacuum-operated advance are the same as in the regular engine, but the centrifugal weight full-advance is 31 degrees instead of 36.

OTHER EXTRA-COST EQUIPMENT

Aside from the addition of the torque converter transmission, the line of regular production options remains nearly the same.

On the Convertible, 7.10-15-4 pr tires with black side walls are now available. This RPO must be purchased if the Convertible is ordered with a torque converter transmission.

The economy rear axle ratio (3.73:1), and the optional, pile fabric upholstery for the De Luxe sedans and Sport Coupe, as well, are discontinued.

ACCESSORIES are changed mainly in colors and materials to preserve harmony when they are installed in the 1950 models. However, there are several units of new design, as follow, which are worthy of mention.

The direction signal control on the steering column incorporates a new self-cancelling device. Signal lights are automatically turned off as the steering wheel returns to the straight ahead position.

The windshield washer is now actuated by pressing a button in the center of the wiper knob. This makes it possible to use the washer while the windshield wipers are operating.

A junction block, which makes a more orderly wiring of accessories possible, is mounted above the steering column under the instrument panel. A total of twelve terminals are provided. Six of these are wired through the ignition switch for those units which the customer wishes to use only when the engine is running. The remaining terminals on the accessory junction block provide current at all times, regardless of the ignition switch position.

The accessory steering wheel now has two spokes, which are below the wheel center, and a horn blowing ring that is practically a full circle, with only a V-shaped cutout at the top to permit easy reading of the instruments.

Dual back-up lights replace the one that was mounted on the gravel deflector at the left side of the car. Installed in the body panel below the deck lid opening, they provide a pleasing symmetrical appearance as well as more illumination.

Massive fender guards cover the bumper ends and extend approximately the bumper height above them. Because the regular production bumper guards are taller, there is no demand for accessory bumper guards and they are discontinued.

The sealed beam spot light now includes an adjustable rear view mirror as an added convenience.

Wheel trim disks are of the ring or "donut" type which encircle the hub caps. In 1949, a solid disk was used that covered the wheel and replaced the regular hub cap.

A gasoline tank filler door guard is added. Approximately one foot long, it is attached with two screws to the fender below the lower edge of the filler door. The filler door opening and the fender paint are thus protected from dents and scratches during filling.

GENERAL SPECIFICATIONS

ENGINE: Six-cylinder, valve-in-head, 216.5 cubic inches displacement. Bore, 3-1/2 inches; stroke, 3-3/4 inches. Compression ratio, 6.6:1. Horsepower, 92. Maximum torque, 176 foot pounds.

PISTONS: Lightweight, cast alloy iron, with slipper skirt. Surfaces treated to resist wear. Three rings, all above pin: Two taper-face compression rings, and one wide-slot oil control ring.

CRANKSHAFT: Drop forged steel, heat treated. Weight, 70 pounds. Four main bearings. Rubber-floated harmonic balancer.

MAIN BEARINGS: Thin-wall babbitt, precision interchangeable.

ENGINE LUBRICATION: Pressure streams of oil to connecting rod bearings; full pressure to crankshaft bearings, camshaft bearings, and timing gear; calibrated pressure to valve rocker arms; splash-lubricated cylinder walls. Gear-type pump, with screened inlet. Crankcase ventilator. Crankcase refill capacity, 5 quarts.

FUEL SYSTEM: Single throat, balanced down-draft carburetor, with concentric float bowl and vacuum fuel enrichment valve. Fully enclosed accelerator pump, with fuel-lubricated piston. Fast-idle mechanism. Air cleaner and silencer, with flame-arrester. Thermostatic manifold heat control. Octane Selector. Sixteen-gallon gasoline tank, with overflow-alarm.

COOLING SYSTEM: Centrifugal water pump, with self - adjusting seal, and permanently - lubricated, sealed ball bearings. Thermostatic water temperature control. Nozzle-jet valve seat cooling. Capacity of system, 15 quarts.

ELECTRICAL SYSTEM: Centrifugal and vacuum spark - advance control. Oil - filled, hermetically sealed ignition coil. High-output, ventilated generator, with cutout. Voltage and current regulators. Fifteen-plate, 100 ampere-hour battery. Solenoid-operated, push-button starter, with positive shift. Thermal circuit-breaker-protected lighting system. Three-position ignition lock switch.

ENGINE MOUNTING: Rubber-cushioned, three point support, with torque reaction dampers.

CLUTCH: Ventilated, diaphragm spring-type, with permanently lubricated ball throwout bearing.

TRANSMISSION: Three-speed, Synchro-mesh, with helical gears. Mechanically operated, manual gearshift control. Gear ratios: Reverse and low, 2.94:1; intermediate, 1.68:1; high, 1:1.

FRAME: Full-length, box-girder construction, comprising deep, flanged channels, reinforced with flange-width bottom plates.

FRONT SUSPENSION: Unitized Knee-Action, with life-sealed, direct, double-acting shock absorbers.

REAR SUSPENSION: Semi-elliptic springs, with tapered leaf-ends and metal covers. Rubber-cushioned attachment and rubber bushings. Tension-type shackle mounting. Life-sealed, direct, double-acting shock absorbers, mounted diagonally to resist sway.

REAR AXLE: Hypoid, semi-floating, with six ball and roller bearings. Ratio, 4.11:1.

DRIVE: Torque tube, with enclosed universal joint and tubular propeller shaft.

BRAKES: Hydraulic, with double-articulated shoes and bonded linings. Composite, 11-inch drums, with cast alloy iron braking surfaces and cooling ribs. Mechanical parking brakes on rear wheels.

STEERING: Centerpoint, with semi-reversible worm and sector gear. Sector mounted on double-row ball bearing; worm mounted in tapered roller bearings. Gear ratio, 17.4:1

WHEELS: Five, short-spoke, steel disk, with 15 x 5K, wide-base rims.

TIRES: Five 6.70-15-4 pr (6.70-15-6 pr on Station Wagon) extra-low pressure. Recommended pressure, 24 pounds (24 front, 30 rear, on Station Wagon).

DIMENSIONS: Wheelbase, 115 inches. Overall length (over bumper guards), 197-1/2 inches; Station Wagon, 198-1/4 inches. Overall width, 74 inches.

VARIATIONS IN SPECIFICATIONS FOR MODELS EQUIPPED WITH THE OPTIONAL TRANSMISSION

ENGINE: Six-cylinder, valve-in-head, 235.5 cubic inches displacement. Bore, 3-9/16 inches; stroke, 3-15/16 inches. Compression ratio, 6.7:1. Horsepower, 105. Maximum torque, 193 foot pounds.

PISTONS: Lightweight, cast alloy iron, with slipper skirt. Surfaces treated to resist wear. Three rings, all above pin: One twist-type compression ring, one taper-face compression ring, and one wide-slot oil control ring.

VALVE MECHANISM: Self-adjusting, hydraulic valve lifters.

COOLING SYSTEM: Pressure cooling system, with four-pound cap. Centrifugal water pump, with self-adjusting seal, and permanently-lubricated, sealed ball bearings. Thermostatic water temperature control. Transmission oil cooler. Capacity of system, 16 quarts.

TRANSMISSION: Automatic, hydraulic torque converter, with planetary gears for reverse and emergency low. Manual selector mechanism for hydraulic control of transmission, and mechanical control of parking lock. Safety switch in starter circuit. Maximum torque converter ratio, 2.2:1. Planetary gear ratio, 1.82:1. Total ratios: DRIVE, 2.2:1; LOW and REVERSE, 4:1. Refill capacity, 9 quarts.

REAR AXLE: Hypoid, semi-floating, with six ball and roller bearings. Ratio, 3.55:1.

REGULAR EQUIPMENT - SERIES 1500

EXTERIOR:

Front and rear bumpers.
Bumper guards, front and rear.
License guard on front bumper.
Gravel deflectors, front and rear.
Chrome plated headlight rims.
Dual parking, tail and stop, and license plate lights.
Dual horns.
Dual windshield wipers.
Ventipane drip shields on front doors.
Stainless steel body belt, and windshield center moldings.
Black rubber rear fender shields.
Concealed gasoline filler.
Key locks in both front doors.
Counterbalanced, automatic-locking deck lid.

INTERIOR:

Seats upholstered with gray, striped, modern weave, flat cloth.
Upper sidewalls, center pillar, and front seat backs and side panels covered with dark gray broadcloth. Dark gray leather fabric on seat back and and rear compartment sidewalls in Business Coupe.
Lower sidewalls and headlining are light gray broadcloth.
Scuff pads of dark gray leather fabric on all doors.
Gray carpet on rear compartment floors of sedans and Sport Coupe.
Black rubber floor mats in front and luggage compartments of all models, and in rear compartment in Business Coupe.
Metallic dark gray instrument panel, with stainless steel horizontal molding; chrome plated radio grille and script nameplate above; locking glove compartment; and provisions for accessory installations.
Circular instrument cluster, containing speedometer, with glass figure ring; fuel, water temperature, and oil pressure gauges; and ammeter.
Metallic dark gray garnish moldings, with light gray stripe on lower edges.
Light gray plastic control knobs.
Friction-type ventipanes, with chrome plated frames, in front doors.
Fixed ventipanes in rear doors of four-door sedans.
Fixed quarter windows in coupes.
Sunshade for driver.
Inside rear view mirror.
Two coat hooks.
Dome light, with integral switch.
Painted step plates in door openings.
Illuminated luggage compartment, from windows in tail lights.
Bumper jack, and combination jack handle and wheel wrench.

REGULAR EQUIPMENT - SERIES 2100

The following equipment is included in place of, or in addition to, that furnished with Series 1500 models. Except for listed variations, Convertible, Bel Air, and Station Wagon equipment is identical with that of other De Luxe models.

EXTERIOR

Stainless steel reveals on windshield, door windows, quarter windows, and rear windows.
Stainless steel moldings on front fenders and doors.
Chrome plated series (De Luxe) nameplates above fender moldings.
Stainless steel rear fender shields.
Rear wheel cover panels.

Convertible

No ventipane drip shields.
Chrome plated door and quarter window frames.
Fabric folding top, hydraulically operated.
Outside rear view mirror, on left front door, in place of inside mirror.
Lowering rear curtain, with safety glass window and slide fastener.

Bel Air

Chrome plated door and quarter window frames.
Stainless steel drip molding.
No ventipane drip shields.

Station Wagon

Simulated wood body panels, without window reveals.
Body belt molding only around base of windshield and front corners.
Exposed gasoline filler.
Single tail, stop, and license light, automatically positioned with tail gate.

INTERIOR:

Foam rubber seat cushion pads.
Seats upholstered with gray, striped broadcloth.
Upper sidewalls, center pillar, and front seat back, shoulder area, and side panels covered with dark gray broadcloth.
Lower sidewalls and headlining are light gray broadcloth.
Parallel stainless steel moldings border darker sidewall areas.
Scuff pads on quarter panels of Sport Coupe and two-door sedans, as well as on all doors.
Stainless steel molding on upper edges of scuff pads.
Dark gray rubber floor mat, with simulated carpet inserts, in front compartment.
Tan rubber floor mat in luggage compartment.
Deep pile gray carpet in rear compartment.
Sunshades for driver and passenger.
Two-tone instrument panel: metallic dark gray upper, and light gray lower, with Lucite speedometer figure ring. Includes automatic glove compartment light, ash tray, cigarette lighter, and 39-hour clock.
Stainless steel molding on lower edge of garnish moldings.
Dark gray plastic control knobs, with stainless steel inserts, for lights, choke, throttle, windshield wiper, and window regulators.
Light gray plastic control knobs on ventilator handle and gearshift lever.
Friction-type ventipanes, with chrome plated frames, in rear doors of four-door sedans.
Sliding quarter windows in Sport Coupe.
Robe cords in sedans.
Automatic dome light switches in front doors.
Arm rests, front and rear.
Assist straps in two-door sedans and Sport Coupe.
Rear compartment ash tray in four-door sedans; two in all other models.
Extra roof insulation.
Package shelf molding.
Etched aluminum step plates in door openings.

Convertible and Bel Air

Seats upholstered in a combination of genuine leather and gray, striped pile-cord fabric.
Sidewalls upholstered in a combination of leather fabric and gray, striped pile-cord fabric.
Neutral gray fabric headlining, with exposed, bright metal roof bows in Bel Air.
Sunshades and backs of front seats are covered with leather fabric.
Genuine carpet inserts in front floor mat.
Garnish moldings and upper part of instrument panel painted to match leather trim.
Steering wheel rim, outer ends of spokes, and hub around medallion painted black; other parts light gray.
Black plastic gearshift control knob.
Manual dome light switch in left rear quarter panel.
Two interior lights, with manual switch in left quarter panel in Bel Air.
No coat hooks, robe cords, or extra roof insulation.

Station Wagon

Seats, sunshades, and scuff pads of tan leather fabric.
Foam rubber pad in front seat only.
Simulated wood, leather fabric headlining.
Wood paneling on sidewalls.
Simulated wood window garnish moldings.
Tan rubber floor mat between front and intermediate seats.
Tan linoleum on floor below and behind intermediate seat.
Sliding quarter windows.
No coat hooks, rear compartment arm rests, assist straps, or extra roof insulation.

Chevrolet Motor Division of General Motors Corporation reserves the right to make changes at any time, without notice, in prices, colors, materials, equipment, specifications and models, and also to discontinue models.

INDEX

INDEX

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