CHEVROLET SERVICE NEWS

PROMPT DEPENDABLE QUALITY SUPER CHEVROLET SERVICE

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Engine Cold Starting

Analysis of American Automobile Association data has shown that there is a distinct temperature related increase in emergency service calls during the winter months. Further examination of data from a midwestern club, indicates clearly that this increase is largely due to the operator's inability to get the car started. The four leading causes for emergency service at this club were:

1. Failure to start
2. Tire trouble
3. Wreck service
4. Stuck in sand, snow, or mud

Further analysis of AAA records shows that approximately one-third of the failures to start were due to ignition or fuel system problems. The other two-thirds were associated in some manner with failure of the battery and starter (or cranking system) to adequately perform the necessary function.

Simple reflection on these facts leads to two possible conclusions:

1. The cranking system in use is not as durable or as powerful as the vehicle manufacturer had specified.
2. The cranking system is being asked to supply more power than originally intended by the vehicle manufacturer.

Actually, both conclusions are entirely correct because the service trade does not understand and follow two simple but extremely important maintenance recommendations.

The cranking system consists of two major components: The cranking motor and the battery. The cranking motor generally operates for the life of the passenger car, with no service maintenance. However, because of its chemical nature, the battery eventually deteriorates and replacement is required. The fact that the original equipment battery is designed to fit the exacting cranking requirements of a specific engine, is exemplified by the great number of models sold by service outlets. However, not all types in this great variety are the result of the performance requirements determined by the vehicle manufacturer. The retail battery market is highly competitive, and to obtain price advantage, many replacement batteries have a performance capability far below that of the original equipment batteries. Placing one of these low cost, low performance batteries under the hood of a passenger car and expecting satisfactory cold cranking is comparable to installing a small passenger car engine in a heavy duty truck and hoping the vehicle will still maintain schedule over a Rocky Mountain run.

The importance of battery performance is illustrated in Fig. 1, which shows the cranking speed of a typical engine with 10W motor oil. Chevrolet specifies that 10W or 10W-30 oil may be used at minimum temperatures down to 0°F. Below that temperature, 5W or 5W-20 oil is recommended. This engine requires a minimum cranking speed of 50 rpm to assure rapid, positive starting. The

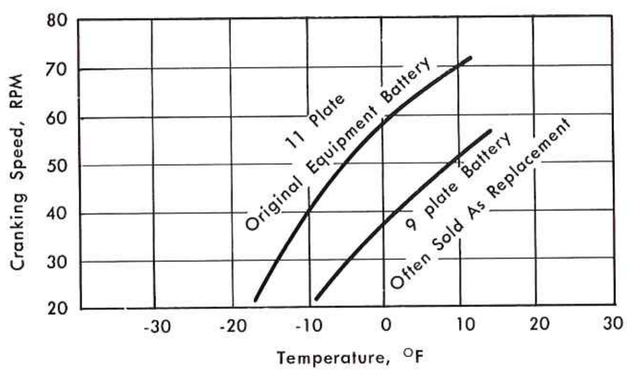

Fig. 1—Cranking speed of a typical engine with 10W oil.

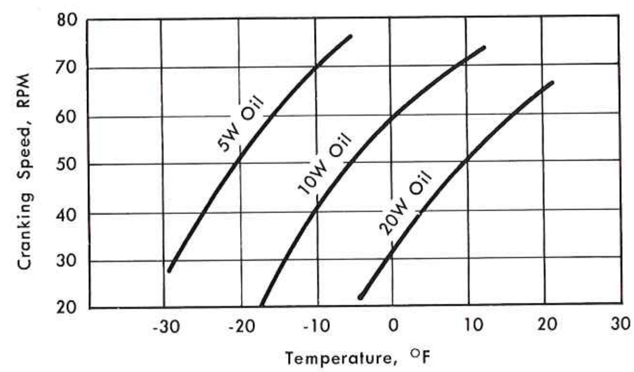

Fig. 2—Cranking speed of a typical engine with various viscosity oils.

original equipment battery with 11 plates per cell has some margin of safety in that it will supply this cranking speed down to —5°F, as shown by the curve on the left. The curve to the right indicates the cranking performance of a typical 9-plate battery that often is sold as a replacement model for this vehicle. In addition to the reduced number, the plates are also smaller than those in the original equipment battery. With the recommended 10W engine oil, this battery will supply the necessary cranking speed of 50 rpm down to only 10°F, while the original battery would assure satisfactory cranking at temperatures 15 deg. lower. The difference is even greater when the battery is only partially charged or higher viscosity engine oils are used.

Statistics show that about two-thirds of the replacement batteries that have been sold in the aftermarket had a cranking performance that is substantially lower than that of the original equipment battery supplied by the vehicle manufacturer. The motorist can observe little about the replacement battery on the shelf except its physical size and price tag. He must rely upon the service dealer to guide him in selecting the necessary performance. If the dealer fails to sell him a battery with a total plate area equal to that of his original equipment battery, he is likely to encounter starting failure in cold weather.

A second maintenance recommendation that is frequently ignored by the service trade is the use of lower viscosity engine oils during cold weather. The manner in which this overburdens the cranking system is shown by Fig. 2. With the original equipment battery and 20W oil, this typical engine will not obtain its necessary cranking speed of 50 rpm at temperatures below 10°F. A 10W oil will permit satisfactory cranking down to approximately —5°F, while 5W oil will assure adequate cranking speed at —20°F.

Each reduction in engine oil viscosity level lowers the minimum starting temperature by approximately 15°F. This is why Chevrolet specifies the use of lighter weight oils in cold weather. Suppose that during subzero weather the owner of this vehicle had 20W oil in the crankcase and had purchased a low performance replacement battery. Instead of satisfactory cranking down to —20°F, as intended and provided by Chevrolet's service recommendations, he likely would have difficulty in starting at any temperature below 25°F. It is little wonder that "can't start" service calls increase sharply in the winter months.

The following table lists the engine oil recommendations for all Chevrolet passenger car engines as shown in the Owner Guides. If this chart is not followed, the motorist cannot expect sure, positive starting at all times and temperatures.

Lowest Anticipated Temperature During Time Oil Will be in the Crankcase	Single Viscosity Oils	Multi Viscosity Oils
32° F.	*SAE 20 or 20W	SAE 10W-30
0° F.	SAE 10W	SAE 10W-30
Below 0° F.	SAE 5W	SAE 5W-20

*Corvair requires SAE 30.

NOTE 1: SAE 30 or 10W-30 is recommended when most of the driving is at high speeds and/or at temperatures above 90° F.

NOTE 2: SAE 5W-30 oils may be used during periods when temperatures of 32° and below are to be expected.

Conclusion

Records indicate conclusively that there is a cold starting problem and that it is not confined to the extreme northern areas. In fact, it becomes apparent any time the temperature nears the freezing point, and it is experienced to some extent by motorists in almost all states. A major portion of the trouble can be eliminated by encouraging the service trade to follow two simple maintenance recommendations:

1. Sell replacement batteries with performance at least equal to that of the original equipment model.
2. Follow the engine oil viscosity recommendations as shown in Chevrolet Owners Guide.

Engines Like to Run Warm

There has been some misunderstanding about the correct operating temperatures of automobile and truck engines, and we have conducted many types of tests to determine the best temperatures for engine operation.

Operating an engine too cold presents a number of problems, including:

1. Decreased fuel economy.
2. Increased oil dilution.
3. Increased tendency to form sludge.
4. Increased tendency to form rust.
5. Increased piston ring and bore wear.

On the other hand, engines should not be operated at too high a temperature. To run an engine too hot will:

1. Increase oil oxidation and varnish.
2. Increase piston ring and hydraulic lifter plunger sticking.
3. Increase oil consumption.
4. Result in loss of engine power.
5. Increase tendency toward detonation, abnormal combustion, and preignition, with possible engine damage.

One of the primary considerations of many vehicle owners or operators, is fuel economy which is significantly affected by engine temperature, with economy increasing as much as 3% at 30 mph when jacket temperature is increased from 120° to 190°F.

There are two reasons for this gain. Increased jacket temperature raises the oil temperature which, in turn, decreases viscosity of the oil, thus reducing engine friction. Also, the engine operating temperature has a marked influence on the temperature of the incoming air-fuel mixture, which determines the degree of fuel vaporization and mixture-conditioning for efficient combustion.

Low engine temperature likewise has an important influence on dilution of lubricating oil by raw fuel and in the formation of sludge. At idling speed, high rates of raw fuel appear in blowby gases when jacket temperatures are below 120°F. This fuel blowby does not evaporate, but accumulates in the lubricating oil until the oil reaches a temperature sufficient to cause evaporation of the fuel.

The type of driving most conducive to the formation of sludge is short trip driving when the engine does not have enough running time to warm up.

Low engine operating temperatures also have a very significant effect on the formation of rust on engine parts. Data obtained on the effect of coolant temperatures shows that the lower the temperature, the greater the amount of water condensed in the oil, and the greater the amount of rust formed.

This water dilution, plus the corrosive contaminants in the combustion gases, are the causes of rust formation on engine parts.

The relation of cylinder wall temperature to wear of the cylinder bore and top piston ring is also of extreme importance. Wear of both the rings and bore is greatly accelerated at low temperatures, but at higher operating temperatures wear is practically nil.

Wear of engine components may result from three basic causes:

1. Corrosion, which is the chemical attack of metal surfaces by corrosive constituents and moisture originating from the combustion processes.
2. Abrasion, which is wear caused by dust, dirt, and solid particles introduced into the engine in the intake air through the induction and ventilation systems.
3. Metal to metal contact because of inadequate lubrication.

To adequately control engine operating temperatures, control devices such as the thermostat, the radiator pressure cap, radiator bypasses, and a relatively recent advancement in the thermomodulated fan have been developed. These devices are all designed to work together to maintain proper engine temperatures demanded by varying speed, load, and atmospheric conditions.

The thermostat in its housing has an extruded pellet of wax-base plastic material compressed into a copper cup, which is assembled in the cylinder of a power element.

Expansion and contraction of the pellet results in the desired opening and closing cycles within the preselected temperature range.

The pellet type thermostat is not affected by the pressure in a modern cooling system, and has replaced the old bellows type thermostat. The bellows type was used throughout the industry for years, but had the disadvantage of its calibration being affected by pressure.

When the thermostat is closed and the coolant flow blocked off from the radiator, it is necessary to keep the coolant circulating in the engine. There are three reasons for this:

1. Provide a uniform rate of warmup throughout the engine.
2. Prevent excessive cooling system pressures from building up when the engine is operated at high speed.
3. Eliminate hot spots, steam pockets, or thermal stresses which would tend to form if the coolant were to remain inert under heavy load conditions during warmup or during cyclic load, cold weather operation.

Service Tips

THE CHEVROLET L-6 OIL PAN REMOVAL PROCEDURE (outlined in the 1965 Chassis Service Manual Page 6-18) is revised to omit steps 2 and 3—distributor cap and fuel pump removal. Due to a late engine mount change the wood block (in step 12) should be 5½″ long to gain pan to mount clearance.

CORVETTE DISC BRAKE CALIPERS—The piston insulator is attached to the piston with a self-tapping screw and is serviced as part of the piston assembly. Revise the Corvette Shop Manual procedure page 5-3 (disassembly step 5 and assembly step 3) so insulator and screw are not removed from the piston. The replacement dust boot is installed by sliding the inner lip over the insulator and onto the piston.

THE CORVAIR CORSA BODY PAINT STRIPE is $\frac{1}{10}$″ wide. Repainting of the stripe is made easier by applying a $\frac{1}{10}$″ wide strip of chart tape (available locally) where the stripe should go. Mask to the chart tape with a thin tape (such as Scotch Magic Tape) to keep paint thickness to a minimum, then remove the chart tape and spray the stripe color. The chart tape acts as a guide for straight accurate masking and can be moved as needed (before masking) without leaving marks.

IN-LINE ENGINE CYLINDER HEADS use a composition steel asbestos gasket in 1965 production which is also used in service for 194, 230 and 292 engines of all years. When a replacement gasket is installed the head bolts should be torqued, the engine normalized and then the bolts retorqued to 90-95 ft. lbs. This procedure increases gasket durability and requires a temporary valve lash adjustment for warmup and resetting the valve lifters after final torque operation.

THE ACCESSORY REAR DOOR SAFETY LOCK is installed into the existing ferrule on the trim panel. Some ferrules are undersize and it is necessary to elongate the hole at the outboard edge. Using a sharp knife, remove approximately $\frac{1}{16}$″ of material.

3-SPEED TRANSMISSION BEARING NOISE—To reduce bearing noise and increase bearing durability on 3-Speed transmissions (used in 1963-64 Passenger Cars except Corvair), two changes entered production in June, 1964. The changes include addition of a magnetic chip collector in the bottom of the case and the use of a new clutch gear and mainshaft bearing that incorporates a slinger ring on the inner race. Service Kit #3869240 has been released for field installation of the chip collector on 1963 and 1964 3-speed transmissions built prior to the above dates. The kit includes the magnet, cement, and instruction sheet. *It is recommended that when a 1963 or 1964 3-speed transmission is disassembled for any reason, the magnet be installed following the procedure outlined on the instruction sheet.*

MANY CORVAIR CARBURETOR SERVICE OPERATIONS may be done without removing the carburetor from the engine. Involved are float, float needle and seat, metering jet, accelerator pump, and venturi cluster replacement or adjustment procedures.

INSTALLATION OF THE HARMONIC BALANCER ON HIGH PERFORMANCE V-8 AND CORVAIR ENGINES is a pull-on operation using a bolt in the threaded crankshaft. If the existing short bolt is used for this operation it would have to be removed 2 or 3 times to install more spacers and threads may be damaged if the added spacer was too thick. A tool arrangement with a long bolt and nut (assembled as shown in Figs. 6 and 7) eliminates this problem and also provides a method of preventing the crankshaft from turning during the installation procedure.

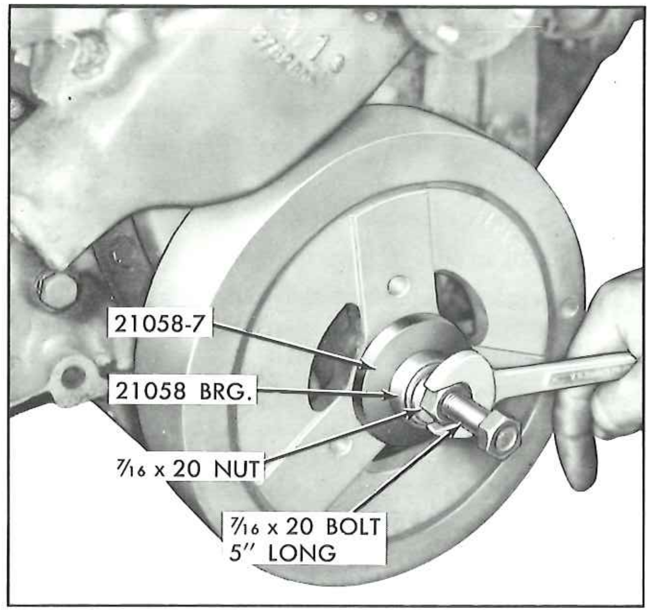

Fig. 6—Balancer installation—V-8.

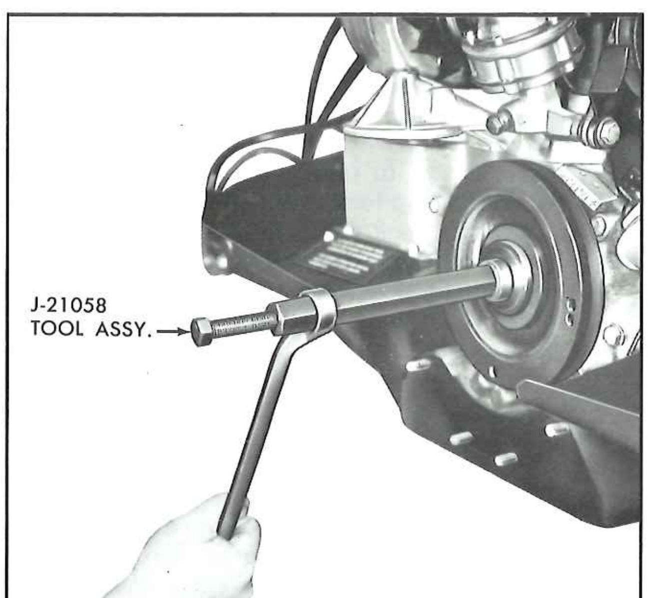

Fig. 7—Balancer installation—Corvair.

Bypasses around the thermostat and radiator are provided to keep the coolant circulating under these conditions. The internal bypass system, is the type used on all L-4, L-6 and V-8 283 and 327 passenger car and light duty truck engines. An external fixed bypass is used on V-8 409 passenger car and heavy duty truck engines. A double external fixed coolant bypass system is used on some heavy duty truck engines where high coolant bypass flow is required. This ensures adequate flow through the engine under all driving conditions.

One of the most important components of pressure cooling systems is the radiator pressure cap (Fig. 3). The cap combines several important functions in one simple device. It provides an easily removable closure on the radiator filler neck, a pressure relief valve, and a vacuum relief valve.

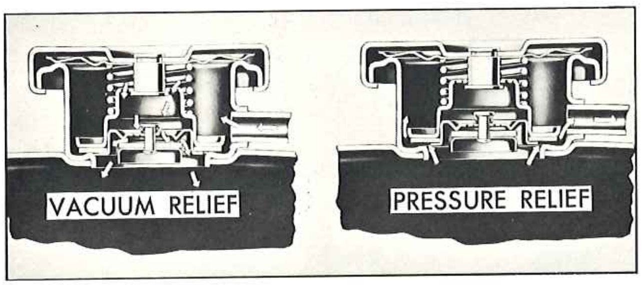

Fig. 3—Pressure Radiator Cap.

The pressure relief valve is held against its seat by a spring of predetermined strength, and serves to protect the radiator by relieving the pressure whenever it exceeds that for which the cooling system was designed. The vacuum or atmospheric valve is held against its seat by a light spring, and opens to admit air as the radiator cools and vapor condensation reduces pressure in the system to slightly below atmospheric. This prevents damage to the radiator by limiting the magnitude of reverse pressure.

The principle that the boiling point of a fluid is increased as the pressure over that fluid is increased is illustrated by the fact that water which will boil at 212° at sea level, will boil at about 200° in Denver which is about a mile above sea level.

A 1 lb. pressure increase in a cooling system increases the boiling point of the coolant by approximately 3°F. Current Chevrolet passenger vehicles are equipped with 13 psi caps for standard operation and 15 psi caps when the air conditioning option is used. Using a 13 lb. pressure cap, the coolant would have to reach about 243°F before it would boil at sea level.

With smaller radiators and reduced airflow, as brought about by styling trends, came a need for larger engine cooling fans under certain conditions of idling and low speed because of little or no ram airflow through radiators. The requirement for additional cooling was further increased in cars with air conditioners where the condenser, located in front of the radiator, raised the air inlet temperature to the radiator by 10-15 deg.

It was soon apparent that a fan of proper size for meeting idle cooling need, increased the noise level and horsepower requirements to an unacceptable level at higher speeds.

To help minimize the problem of noise and fan horsepower, thermomodulating fan clutches were developed.

The discovery that radiator discharge air is proportional to and a direct function of the radiator top tank temperature led to the development of the present bi-metal sensing devices in the radiator air stream.

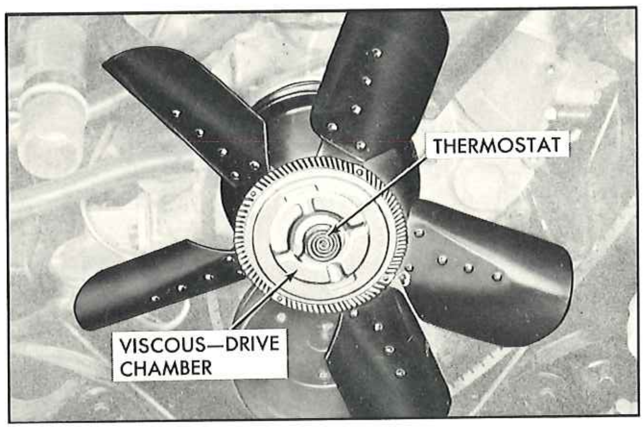

Fig. 4—Thermomodulating Fan Clutch.

Fig. 4 illustrates a typical thermomodulating fan clutch and fan. The assembly mounts directly to the existing water pump flange without changes to the pump. In this design the clutch is comprised of a body and clutch plate, each having annular grooves machined to mate one another. They are labeled "fluid drive chamber."

The principle of operation is based on the shear of the viscous fluid between the two members. Torque is transmitted from the shaft to the clutch plate through the silicone fluid into the body, to which the fan is attached. Speedy adjustment is accomplished through filling and evacuating the fluid drive chamber by means of a slide valve actuated by the bi-metal sensor, or thermostat. As the chamber fills, the fan speed increases until the cutoff limit is reached.

Characteristics of the clutch, such as maximum torque or speed at idle, are varied for specific applications by changing the viscosity of the fluid and/or the shear area.

Conclusion

The maintaining of adequate cooling temperatures will minimize oil dilution, wear due to corrosion, sludge formation, and rusting of components; will result in improved fuel economy, better engine performance and longer engine life.

Radio Receiver and Speaker Removal—Chevrolet

Radio receiver and speaker operations are not outlined in the 1965 Chassis Service Manual. In the event service is necessary use the following procedure.

1. Disconnect battery ground as a general precaution.
2. Remove ash tray and retainer (both trays on A/C models).
3. On air conditioned models only:
   a. Remove 3 screws, disconnect hoses and remove air distributor duct assembly.
   b. Remove 2 attaching screws and lower A/C control assembly from panel opening.
   c. Remove 2 attaching nuts and remove A/C center outlet nozzle and duct.
4. Remove radio control knobs, bezels, and retaining nuts using tool J21932 (if slotted nut is used).
5. Disconnect all wiring and antenna lead, remove support bracket attaching nut, and remove receiver from console.
6. Remove speaker bracket attaching bolt, bracket and speaker from console.
7. Reverse above procedure for installation.

4-Speed Transmission Shift Lever Reverse Blocker Cable

The 4-speed transmission shift lever reverse blocker cable replacement procedure (for Chevrolet, Chevelle, and Chevy II) is not outlined in the shop manuals. In the event replacement is necessary, use the following procedure:

1. Remove seat separator (console) assembly.
2. Remove shift lever seal retainer and slide seal up on lever.
3. Remove shift lever knob, and the 2 lever to bracket retaining nuts and remove the lever assembly.
4. Replace blocker cable—thread new cable up through lever and "T" handle and install cable retainer through access slot. Adjust retainer to hold blocker end .010/.020″ above lever bracket surface, then lock and cut off excess cable.
5. Reverse steps 1, 2 and 3 to install.

Accelerator Pedal Studs

The 1965 Chevrolet uses accelerator pedal mounting studs of two different lengths. A short stud is used on Biscayne and Bel-Air and a long stud is used on Impala and Impala S.S. where thicker carpeting and pad are used. The service part (#3748971) is used for replacement of either stud in the event of breakage or to replace studs of incorrect length. The service part has a longer thread area and is used without spacer washers for short stud replacement and with spacer washers for long stud replacement.

When installing the pedal onto the studs be certain that both studs are the same length and that each is engaged in the pedal opening.

Corvair Window Glass

Corvair vehicles use bolt-on glass to sash attachment on the rear door and the rear quarter panel

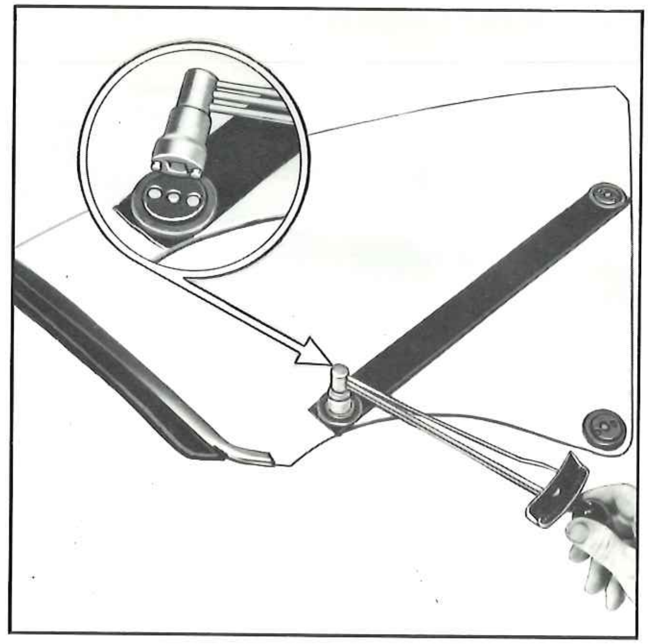

Fig. 5—Bolt-on Glass special tool usage.

windows. The rear door glass retaining nut is hex type, but the quarter panel has a special nut (Fig. 5) that requires a spanner adapter wrench for service. Since the 50 in. lbs. torque is critical, use Kent-Moore tool J-22055 with a 3/8″ drive (in. lb.) torque wrench.

Corvair Instrument Cluster Assembly Removal

This procedure is revised to change step 2 (Page 12-10) of the Corvair Chassis Shop Manual. It is not necessary to remove the steering column for cluster removal on any 1965 Corvair. Instead, apply masking tape on the mast jacket (between the dash panel and wheel) to prevent possible paint damage as the instrument cluster is removed. On Powerglide equipped models it is necessary to remove the upper mast jacket support clamp to provide free movement of the steering column.