

2017 GENERAL INFORMATION

General Information - Impala

INTRODUCTION

ARROWS AND SYMBOLS

This service manual uses various symbols in order to describe different service operations.

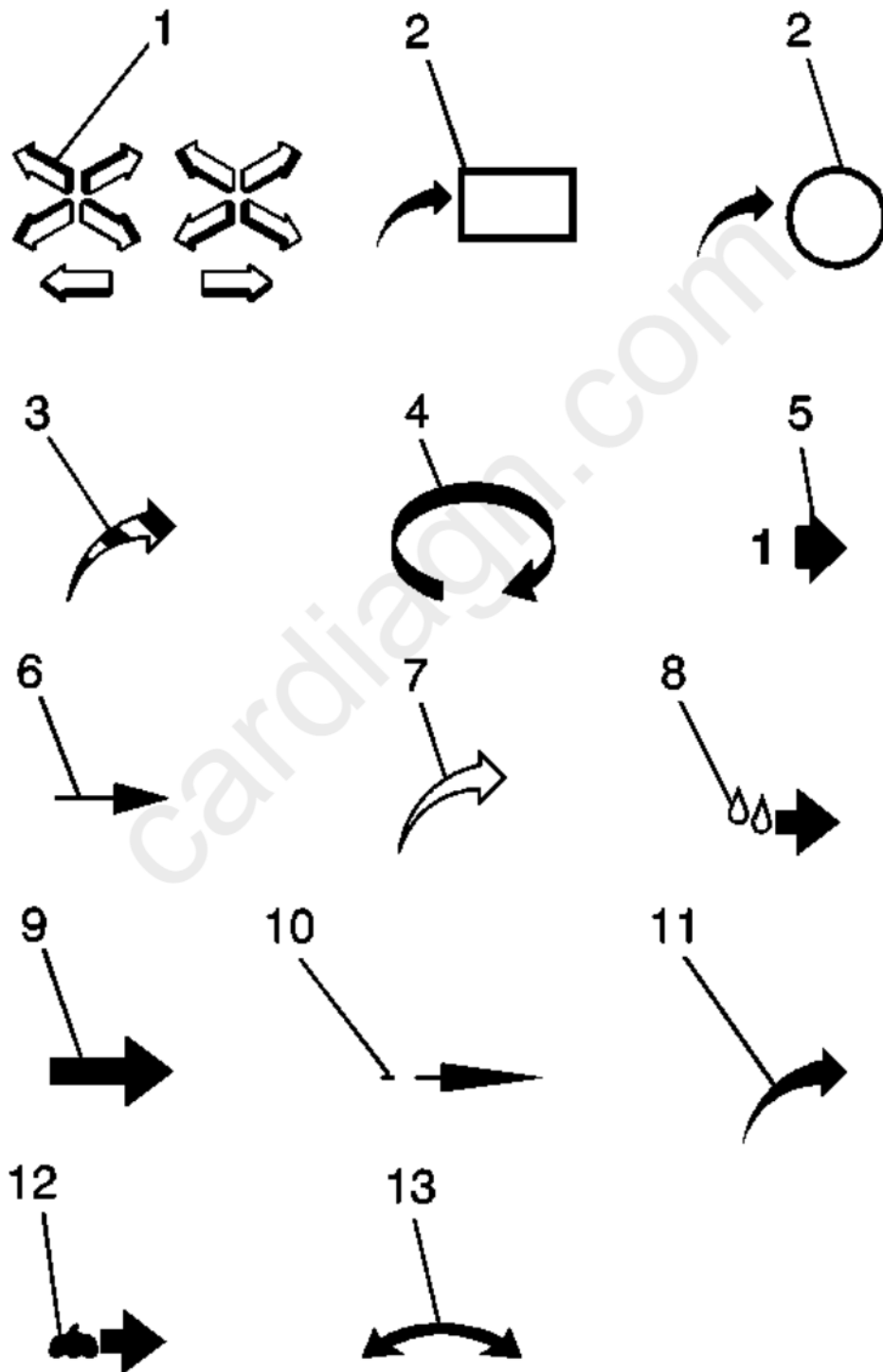


Fig. 1: Identifying Different Service Operations Symbols
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Front of Vehicle
2	View Detail
2	View Detail
3	Ambient Air Mixed with Another Gas or Indicate Temperature Change
4	Motion or Direction
5	View Angle
6	Dimension (1:2)
7	Ambient/Clean Air Flow or Cool Air Flow
8	Lubrication Point - Oil or Fluid
9	Task Related
10	Sectioning (1:3)
11	Gas Other Than Ambient Air or Hot Air Flow
12	Lubrication Point - Grease or Jelly
13	Multidirectional Arrow

ACRONYMS AND UNITS

Acronyms

Acronym	Meaning	Definition
2WD	Two-Wheel Drive	Indicates that a vehicle has 2 driven wheels OR that a 4WD vehicle uses only 2 wheels for propulsion. So it can be the description of a vehicle configuration OR the operational mode of the drivetrain.
4WD	Four-Wheel Drive	Four-wheeled vehicle with a drivetrain that allows all four wheels to receive power from the engine simultaneously which provides better control on various surfaces. Can be used to describe the configuration of the vehicle OR as the operational mode of the drivetrain. 4WD vehicles usually can turn 2 wheels off to be in a 2WD mode. See also AWD.
A/C	Air Conditioning	The cooling and dehumidification of indoor air for thermal comfort.
A/D	Analog to Digital	Used in context of converting electrical analog signals to digital signals.
ABS	Antilock Braking System	System on motor vehicles which prevents the wheels from locking while braking which helps the driver maintain control in heavy braking conditions.
AC	Alternating Current	An electrical current whose magnitude and direction vary cyclically.
AM	Amplitude Modulation	Method of impressing data onto an alternating-current (AC) carrier waveform.
APP	Accelerator Pedal Position	A pedal that controls the throttle valve.
AWD	All-Wheel Drive	All-wheel-drive systems are designed to function on all types of surfaces, both on- and off-road, and most of them cannot be switched off. This can also be called full-time four wheel drive. See also 4WD.
AWG	American Wire Gauge	American wire gauge is a standardized wire gauge system used since 1857 predominantly in the United States for the diameters of round, solid, nonferrous, electrically conducting wire. E.g. a wire of AWG10 has a diameter of 2.588mm, AWG20 corresponds to a diameter of 0.812mm.

Acronym	Meaning	Definition
B+	Battery Positive Voltage	The electrical potential on the positive terminal of the battery.
BARO	Barometric Pressure	Atmospheric pressure as measured by a barometer.
BCM	Body Control Module	This module supplies vehicle occupants with visual and audible information and controls various vehicle functions,
BECM	Battery Energy Control Module	Control module used to regulate the battery voltage.
BPP	Brake Pedal Position	Position of the foot pedal that moves a piston in the master brake cylinder.
CAN	Controller Area Network	Serial data connection between control modules by Bosch
CCM	Chassis Control Module	The module that controls various vehicle functions on the Chassis, like Engine/Trans Mount, Active Grille Air Shutter, Load Leveling, etc•••
CD	Compact Disc	A small optical disk on which data such as music, text, or graphic images is digitally encoded.
CNG	Compressed Natural Gas	This a substitute for gasoline or diesel fuel. It is made by compressing natural gas (which is mainly composed by methane (CH ₄), in a percentage range of 70% to 98%)
CO	Carbon Monoxide	This is a product of the incomplete combustion of carbon-containing compounds, at room temperature this is a gas. It consists of one carbon atom covalently bonded to one oxygen atom.
CO ₂	Carbon Dioxide	Chemical compound composed of two oxygen atoms covalently bonded to a single carbon atom.
CPA	Connector Position Assurance	Part of an electrical connector that prevents the connector from moving out of its socket. Usually needs to be pressed to unlock the connector when disconnecting it.
CPP	Clutch Pedal Position	A lever operated with the foot that controls the coupling that connects or disconnects driving and driven parts of a driving mechanism.
CV	Constant Velocity	Used in conjunction with CV joints, which connect two shafts at an angle while both shafts always have the same rotational speed without variations.
CVT	Continuously Variable Transmission	A transmission in which the ratio of the rotational speeds of two shafts, as the input shaft and output shaft of a vehicle or other machine, can be varied continuously within a given range, providing an infinite number of possible ratios which improves fuel economy.
D	Drive	D on the transmission gear selector lever.
DAB	Digital Audio Broadcast	Technology for broadcasting of audio using digital radio (carries information via digital signal) transmission.
DC	Direct Current	Continuous current, constant flow of electric charge.
DLC	Data Link Connector	This is an electronic connector typically located underneath the driver's side dashboard, just above the pedals. The connector has 16 pins.
DMM	Digital Multimeter	Electronic measuring instrument that combines several functions in one unit. The most basic instruments include an ammeter, voltmeter, and ohmmeter.

Acronym	Meaning	Definition
DOHC	Dual Overhead Camshaft	Dual overhead camshafts (DOHC) are higher performance engines, they produce more power, and can run at higher speeds because they allow an engine to have four valves per cylinder. Each camshaft operates two of the valves, one camshaft handles the intake valves, and one handles the exhaust valves
DPF	Diesel Particulate Filter	Device designed to remove diesel particulate matter or soot from the exhaust gas of a diesel engine.
DRL	Daytime Running Lamps	White lights mounted on the front of an automobile that automatically switch on when the key is turned and are intended for daytime use, to increase the visibility of the automobile.
DSCC	Distance Sensing Cruise Control	A type of cruise control that automatically maintains the distance between vehicles.
DSP	Digital Signal Processor	A specialized microprocessor designed specifically for digital signal processing, generally in real-time computing.
DTC	Diagnostic Trouble Code	An electronic signal stored in an automotive computer, indicating the presence of a fault detected by that computer.
DVD	DVD	A popular optical disc storage media format the size of a CD. Used mainly for movies but also for data. DVD has no spelled out version (officially it does not mean Digital Video Disc or Digital Versatile Disc, it just means DVD).
EBCM	Electronic Brake Control Module	This module contains a microprocessor and software for antilock braking system operation.
ECM	Engine Control Module	This electronic module works with a vehicle's sensors and engine control devices to insure that the engine operates at maximum efficiency and performance. It performs three vital functions. Receives electronic signals from engine sensors. Analyzes the data and makes an engine performance decision (based on the pre-set parameters within the unit). Sends an "output command" to an actuator that adjusts engine performance.
ECT	Engine Coolant Temperature	A measure of how hot or cold the fluid which flows through the engine in order to prevent its overheating, transferring the heat produced by the device to other devices that utilize or dissipate it.
EEPROM	Electrically Erasable Programmable Read-Only Memory	A non-volatile storage chip used in computers and other devices to store small amounts of volatile data, e.g. calibration tables or device configuration.
EGR	Exhaust Gas Recirculation	Is an NOx (nitrogen oxide and nitrogen dioxide) reduction technique used in most gasoline and diesel engines. EGR works by recirculating a portion of an engine's exhaust gas back to the engine cylinders.
EMI	Electromagnetic Interference	Electromagnetic interference (also called radio frequency interference) is a disturbance that affects an electrical circuit due to either electromagnetic conduction or electromagnetic radiation emitted from an external source.

Acronym	Meaning	Definition
ESD	Electrostatic Discharge	The sudden and momentary electric current that flows between two objects at different electrical potentials.
EV	Electric Vehicle	A category of vehicles that only have an electric drive system.
EVAP	Evaporative Emission	A system that controls the fuel fumes in the fuel tank.
FM	Frequency Modulation	In telecommunication this is a way to convey information over a carrier wave by varying its frequency.
FWD	Front-Wheel Drive	A form of engine/transmission layout used in motor vehicles, where the engine drives the front wheels only.
GMLAN	General Motors Local Area Network	A local-area network is a computer network covering a small geographic area, like a home or vehicle. This specific type of LAN connects several controllers inside the vehicle and was developed by General Motors.
GPS	Global Positioning System	Satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense.
GSM	Global System for Mobile Communications	Globally accepted standard for digital cellular communication.
GVW	Gross Vehicle Weight	Maximum total weight of a road vehicle or trailer that is loaded, including the weight of the vehicle itself plus fuel, passengers, cargo, and trailer tongue weight.
HD	Heavy Duty	Robust design to accommodate large work loads.
HID	High Intensity Discharge	A type of light that produces a bright light by using gas filled bulbs. (gas is usually mercury, metal halide, and high-pressure sodium) Uses very little battery power and is a very "cool" light.
HO2S	Heated Oxygen Sensor	Heated oxygen sensors have an internal heater circuit that brings the sensor up to operating temperature more quickly than an unheated sensor. An oxygen sensor must be hot (about 600 - 650Å°F) before it will generate a voltage signal. The hot exhaust from the engine will provide enough heat to bring an O2 sensor up to operating temperature.
HVAC	Heating Ventilation Air Conditioning	This system is sometimes referred to as climate control. Ventilation air ducts installed throughout a vehicle that supply conditioned air to a room through rectangular or round outlet vents.
I ² C	Inter-Integrated Circuit	Serial data connection between Integrated Circuits (microchips) inside a control module invented by Phillips
IAT	Intake Air Temperature	Temperature of the air entering intake air flow system of the engine.
ICE	Internal Combustion Engine	An engine in which the combustion of fuel and an oxidizer (typically air) occurs in a confined space called a combustion chamber.
ID	Identification	Number or Code that identifies a component or control module. Can be written on the part or be transmitted on a bus or via radio.
ISP	Internet Service Provider	A company that furnishes corporations and individual consumers with various services, mainly access to the Internet.

Acronym	Meaning	Definition
ISS	Input Shaft Speed	Rotational speed of the input shaft of a transmission.
LAN	Local Area Network	Standard network connection PC's.
LCD	Liquid Crystal Display	A thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector.
LED	Light Emitting Diode	Small light bulbs that fit easily into an electrical circuit they do not have a filament that will burn out, and they do not get especially hot. They are illuminated solely by the movement of electrons in a semiconductor material.
LIN	Local Interconnect Network	Computer networking bus system used within automotive network architectures. Similar to CAN, but cheaper and less powerful.
LPG	Liquefied Petroleum Gas	A mixture of mainly propane and butane, produced commercially and stored under pressure to keep it in a liquid state.
MAF	Mass Air Flow	The amount of air drawn into the engine
MAP	Manifold Absolute Pressure	Pressure in the engine intake system after the throttle valve referenced to a perfect vacuum.
MDI	Multiple Diagnostics Interface	A device used by GM dealers that enables a PC to communicate with the control modules in a vehicle.
MIL	Malfunction Indicator Lamp	An indicator of the internal status of a car engine.
MOST	Media Oriented Systems Transport	Serial communication bus to transmit audio and video information.
N	Neutral	A state of the transmission in which it is not engaged.
NiMH	Nickel Metal Hydride	A type of rechargeable battery that uses a hydrogen absorbing alloy for the negative electrode.
NOx	Nitrogen Oxides	Refers to any of the following oxygen compounds of nitrogen or a mixture of them. Nitric Oxide, Nitrogen dioxide, Nitrous Oxide, Dinitrogen trioxide, Dinitrogen tetroxide, Dinitrogen pentoxide.
O2	Oxygen	A colorless, odorless, tasteless, gaseous chemical element with the chemical symbol O and atomic number 8.
O2S	Oxygen Sensor	An electronic device that measures the proportion of oxygen (O2) in the gas or liquid being analyzed.
OBD	On-Board Diagnostic	A generic term referring to a vehicle's self-diagnostic and reporting capability.
OEM	Original Equipment Manufacturer	A producer that provides a product to its customers, who proceed to modify or bundle it before distributing it to their customers.
OSS	Output Shaft Speed	Rotational speed of the output shaft of a transmission.
P	Park	A state in which the transmission is set so one can leave the vehicle.
PCB	Printed Circuit Board	A thin plate on which chips and other electronic components are placed.
PCM	Powertrain Control Module	A control module that features the functions of both, the engine and the transmission control module.

Acronym	Meaning	Definition
PCMCIA	Personal Computer Memory Card Industry Association	An international standards body and trade association with over 100 member companies that was founded in 1989 to establish standards for Integrated Circuit cards and to promote interchangeability among mobile computers where ruggedness, low power, and small size were critical.
PIN	Personal Identification Number	A secret numeric password shared between a user and a system that can be used to authenticate the user to the system.
PPE	Personal Protective Equipment	Protective clothing, helmets, goggles, or other garment designed to protect the wearer's body from injury.
PRNDL	Park, Reverse, Neutral, Drive, Low	Park, Reverse, Neutral, Drive, Low (automatic transmission positions).
PTC	Positive Temperature Coefficient	Refers to materials that experience an increase in electrical resistance when their temperature is raised.
PTO	Power Take-Off	A splined driveshaft, usually on a tractor or truck that can be used to provide power to an attachment or separate machine. This mechanism allows implements to draw energy from the tractor's engine.
PVC	Polyvinyl Chloride	A thermoplastic copolymer.
PWM	Pulse Width Modulation	Square shaped type of signal that carries the information in the ratio between on and off times.
R	Reverse	Rearward: directed or moving toward the rear;
RAM	Random Access Memory	A type of computer data storage. It today takes the form of integrated circuits that allow the stored data to be accessed in any order.
RCT	Radiator Coolant Temperature	This is the heat intensity of the radiator coolant measured in degrees. The radiator is a part of the cooling system that removes the engine heat. Coolant is a mixture of water and antifreeze (ethylene glycol) which lowers the freezing point of the water in the coolant system, this fluid also picks up heat from the engine and transfers it to the air.
RDS	Radio Data System	A standard from the European Broadcasting Union for sending small amounts of digital information using conventional FM radio broadcasts.
RF	Radio Frequency	A frequency or rate of oscillation within the range of about 3 Hz and 300 GHz. This range corresponds to frequency of alternating current electrical signals used to produce and detect radio waves.
ROM	Read-Only Memory	A class of storage media used in computers and other electronic devices. Data stored in ROM cannot be modified.
RPO	Regular Production Option	A three digit/letter code given to parts, assemblies, and systems originally installed on the vehicle. These RPO codes designate options and are assigned by General Motors.
RSA	Rear Seat Audio	An auxiliary set of controls that operate the main audio system from the rear seat. Rear passengers can also operate a different media source than the front passengers.

Acronym	Meaning	Definition
RWD	Rear-Wheel Drive	A common engine/transmission layout in which the engine is in the front of the vehicle, but the front mid-engine, rear mid-engine and rear engine layouts are also used.
SCV	Speed Controlled Volume	The volume control is set for a desired sound level in the vehicle as the vehicle increases its speed, the sound level is adjusted.
SDM	Sensing and Diagnostic Module	The name given to air bag modules used in General Motors vehicles.
SIM	Subscriber Identity Module	Part of a removable smart card Integrated Circuit Card. This is used for mobile cellular telephone devices such as mobile computers and mobile phones. SIM cards securely store the service-subscriber key used to identify a subscriber. The SIM card allows users to change phones by simply removing the SIM card from one mobile phone and inserting it into another mobile phone or broadband telephony device.
SIR	Supplemental Inflatable Restraint	Technical term for the air bag. Air bag is a stretchable membrane, which inflates during an automobile accident to provide cushioning to the passenger's head and torso to prevent injury to the passengers.
SPI	Serial Peripheral Interface	This is an interface that enables the serial (one bit at a time) exchange of data between two devices. An SPI operates in full duplex mode. This means that data can be transferred in both directions at the same time. It is a standard bus technology like CAN or I2C.
SPS	Service Programming System	System that enables repair facilities to update the software in control modules.
SUV	Sport Utility Vehicle	A passenger vehicle which combines the towing capacity of a pickup truck with the passenger-carrying space of a minivan.
SVS	Service Vehicle Soon	Indicator lamp or symbol for a malfunction related to a vehicle component or system.
TA	Traffic Announcement	Message spoken on radio regarding the movement of vehicles or pedestrians through an area or along a route. The buttons on radios that enable this announcements are also often labeled TA.
TAC	Throttle Actuator Control	A motor which moves the engine throttle plate or valve, controlled by the engine control module. A throttle plate limits the amount of air entering a internal combustion gasoline engine.
TAP	Transmission Adaptive Pressure	The transmission control module learns each component's characteristics and adjusts fluid pressure accordingly.
TCC	Torque Converter Clutch	Resides in a torque converter to connect an engine to an automatic transmission. The clutch is applied when conditions are correct to achieve a 1:1 ratio of engine crankshaft to transmission input shaft.
TCM	Transmission Control Module	A module that controls electronic automatic transmissions. It uses sensors from the vehicle as well as data provided by the Engine Control Module to calculate how and when to change gears in the vehicle for optimum performance, fuel economy and shift quality.

Acronym	Meaning	Definition
TDC	Top Dead Center	The piston is in its highest position relative to the combustion chamber.
TIS	Techline Information System	The PC-based global dealership diagnostic software that provides the technician the ability to reference the most recent service information via the service department's computer.
TPA	Terminal Position Assurance	An additional locking mechanism inside an electric connector that holds the pins in place.
TV	Television	A telecommunication system for broadcasting and receiving moving pictures and sound over a distance.
USB	Universal Serial Bus	A type of communication bus connection between a computer and a peripheral device.
VCI	Vehicle Communications Interface	A diagnostic tool that communicates to modules of multiple communication protocols in a vehicle by converting vehicle serial data into PC serial data communication.
VIN	Vehicle Identification Number	Used by manufacturers to uniquely identify motor vehicles using 17 characters.
VSCM	Vehicle Stability Control Module	This module uses information from several sensors to detect a loss of vehicle traction, then works with the antilock brake system to apply individual brakes to help keep the vehicle on its intended path.
VSS	Vehicle Speed Sensor	Sends data regarding how fast the car is traveling at the moment of driving. It is designed to be able to record the rate at which the vehicle's crankshaft is spinning.
WOT	Wide Open Throttle	When the throttle blade or valve is at its maximum open position, allowing maximum air to enter an internal combustion gasoline engine.
WLAN	Wireless Local Area Network	Standard to transmit digital data via radio frequency.
XM	XM (Satellite Radio)	XM Satellite Radio Holdings (XM) is one of two satellite radio services in the United States and Canada. XM provides pay-for-service radio, analogous to cable television. Its service includes 73 different music channels, 39 news, sports, talk, and entertainment channels, 21 regional traffic and weather channels and 23 play-by-play sports channels (2008).
XML	Extensible Markup Language	A markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable.

Units

Unit	Meaning	Definition
m ²	Square Meter	Area
A	Ampere	Electrical
Ah	Ampere Hour	Electrical
C	Coulomb	Electrical
dBm	Decibel Meter	Electrical
dBmV	Decibel Millivolt	Electrical
mV/DIV	Millivolts per Division	Electrical
mV/s	Millivolts per Second	Electrical
Ω	Ohm	Electrical

Unit	Meaning	Definition
V	Volt	Electrical
V/DIV	Volts per Division	Electrical
V/ms	Volts per Millisecond	Electrical
W	Watt	Electrical
mm ³ /stroke	Cubic Millimeters per Stroke	Flow
gal/h	Gallons per Hour	Flow
g/s	grams per second	Flow
g/stroke	Grams per Stroke	Flow
kg/100km	Kilograms per 100 Kilometer	Flow
kg/h	Kilograms per Hour	Flow
km/L	kilometer/liter	Flow
L/100km	Liters per 100 Kilometers	Flow
L/h	Liters per Hour	Flow
L/min	Liters per Minute	Flow
MPG	Miles per Gallon	Flow
mg/s	Milligrams per Second	Flow
mg/stroke	Milligrams per stroke	Flow
ft	feet	Length
in	Inch	Length
m	Meter	Length
mi	Mile	Length
bar	Bar	Mechanical
bar/min	Bars per Minute	Mechanical
in. H2O	Inches of Water	Mechanical
in. H2O/s	Inches of Water per second	Mechanical
kPa/s	Kilopascals per Second	Mechanical
N	Newton	Mechanical
Å	Newton Meter	Mechanical
Pa	Pascal	Mechanical
Pa/s	Pascals per Second	Mechanical
lb ft	Pound Foot	Mechanical
PSI	Pound-Force per Square Inch	Mechanical
Counts	Counts	Misc.
Cycles	Cycles	Misc.
dB	Decibel	Misc.
Å°	Degree	Misc.
Å°C	Degree Centigrade	Misc.
Å°CA	Degree Crankshaft Angle	Misc.
Å°F	Degree Fahrenheit	Misc.
Å°/s	Degree per Second	Misc.
Hz	Hertz	Misc.
kbit/s	Kilobit per second	Misc.
lx	Lux	Misc.
ppm	Parts per Million	Misc.
%	Percent	Misc.
%/min	Percents per Minute	Misc.
%/sec	Percents per Second	Misc.
Pulses	Pulses	Misc.
:1	Ratio	Misc.
RPM	Revolutions per Minute	Misc.
Steps	Steps	Misc.
W/m ²	Watts per Square Meter	Misc.

Unit	Meaning	Definition
g	g (Acceleration)	Movement
km/h	Kilometers per Hour	Movement
m/s	Meters per Second	Movement
m/s ³	Meters per Second Cubed	Movement
m/s ²	Meters per Second Squared	Movement
MPH	Miles per Hour	Movement
mm/s	Millimeters per Second	Movement
d	Day	Time
h	Hour	Time
hh:mm:ss	Hour:Minute:Second	Time
ms/DIV	Milliseconds per Division	Time
min	Minute	Time
s	Second	Time
s/DIV	Seconds per Division	Time
yy-mm-dd	Year-Month-Day (2 digits)	Time
yyyy-mm-dd	Year-Month-Day (4 digits, preferred)	Time
m ³	Cubic Meter	Volume
gal	Gallon	Volume
L	Liter	Volume
mL	milliliters	Volume
US gal	US Gallon	Volume
US pt	US Pint	Volume
US qt	US Quart	Volume
kg	Kilogram	Weight

TEXT FORMATS AND SYMBOLS

These punctuation marks and symbols are used in the service information to separate information, values, data, and text.

NOTE: In the examples, the punctuation marks and symbols are bold only to highlight them; in the service information, they are not bold.

Punctuation/Symbol	Description
:	Colon separates the "what to do" statement from the "where to do it, how to do it, or which ones" Example: - Disconnect the electrical connector: X3 @ K20 Engine Control Module - Test for less than 10 Ω between the test points: Signal circuit terminal 1 & Ground - Install the following components: - Valve - Bolt [2x] - Nut [2x]

Punctuation/Symbol	Description
&	Ampersand separates two test points or two or more conditions Example: - Test for less than 10 Ω between the test points: Signal circuit terminal 1 & Ground - Throttle Angle = Greater than 0% & Engine Speed = Less than 1000 RPM
@	At sign separates location information relative to a component. Replaces "from the", "to the" or "at the". Example: - Signal circuit terminal 1 @ Control module harness - Instrument Panel Center Trim Plate Applique @ Instrument Panel - Remove
-	Chevron separates the action/condition/function/object from the object/task/value Example: - Perform the scan tool control function: EVAP Purge Solenoid Valve - 50% - Remove - Test Lamp - Test or replace - B34 Engine Coolant Temperature Sensor - Instrument Panel Center Trim Plate Applique @ Instrument Panel - Remove - If any of the DTCs are set - Repeat Step 5
=	Equal sign separates the observed object from the nominal value or when stating a value Example: - Verify the scan tool parameter: ECT Sensor = <i>Colder than -39.4°C (-38.4°F)</i> - Engine Run Time = Greater than 10 min 0.75 to 1.5 V - A/C Compressor = Off 1.3 to 2.5 V - A/C Compressor = On
-	Hyphen separates the component name from the location information relative to the vehicle (eg. Left, Right, Lower, Upper) Example: Cylinder Head - Left - Remove
-	Minus sign used for negative values Example: Engine Coolant Temperature= Between- 10 and - 5.4°C (14 and 23.4°F)
-	Ndash separates a consecutive numeric range Example: Cylinder 1- 8 Injector
-	Mdash separates additional information at the end of the subject matter Example: - Engine Controls Ignition Relay Feedback Circuit = Less than 5 V - For greater than 5 s - Switch @ Switch Bezel - Remove - Rotate counterclockwise

Punctuation/Symbol	Description
/	Forward slash separates conditions or alphanumeric terminals Example: - Screen - Misaligned / Missing / Restricted / Torn - Signal circuit terminal 1/ A @ Control module harness
()	Parenthesis identify a callout reference Example: Instrument Panel Center Trim Plate Applique (1)
[]	Brackets identify a quantity reference Example: Hood Hinge Bolt [2x]
{ }	Curly brackets identify decisional information at the beginning of a subject matter Example: { If equipped } Instrument Panel Center Trim Plate Applique (1) - Remove { 2.0L (LHU) } Low Reference circuit terminal 2 & Ground { 2.4L (LAF) } Low Reference circuit terminal 5 & Ground

GRAPHIC COLORS AND GRAPHIC SYMBOLS

Graphic Colors - General

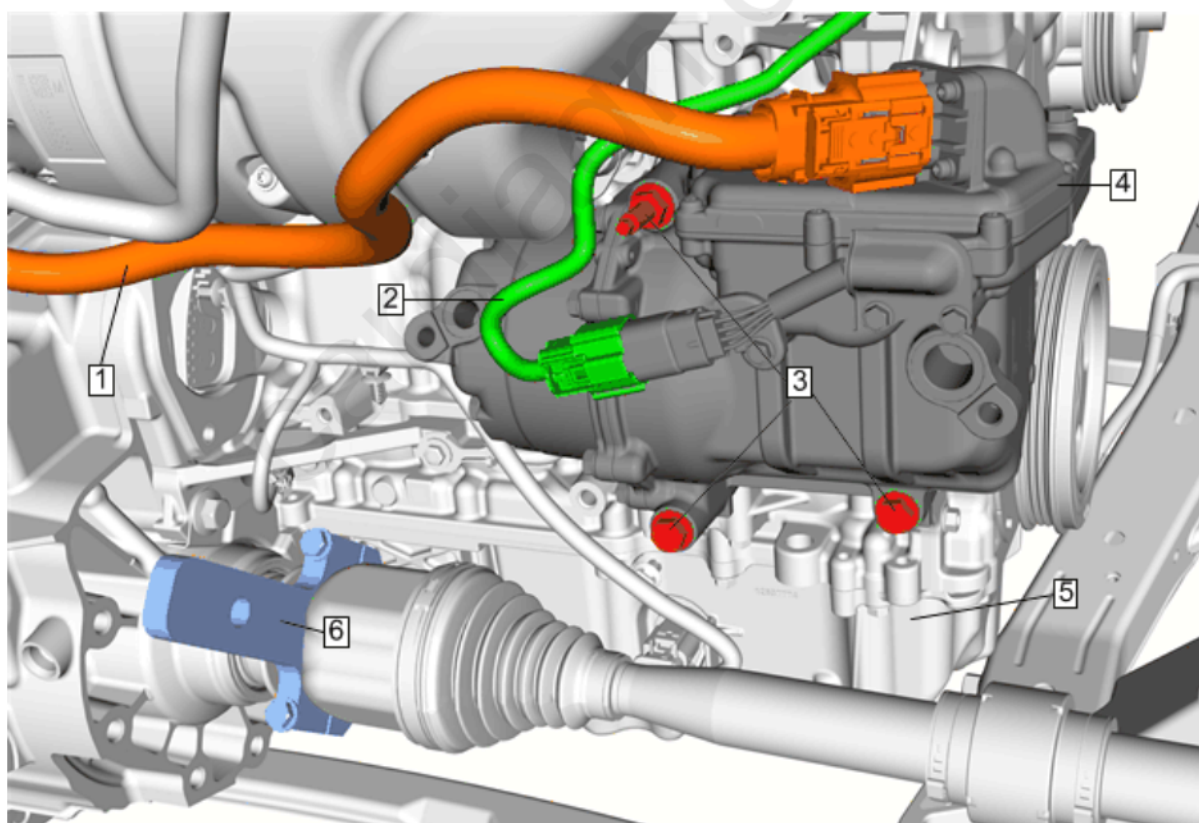


Fig. 2: Graphic Colors - General

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Orange - High voltage electrical connectors and harnesses being removed or installed.
2	Green - Electrical connectors and harnesses being removed or installed.
3	Red - Fasteners being removed or installed.

Callout	Component Name
4	Dark Gray - Standout color that shows the component being removed or installed.
5	Light Gray - Background detail to show component location.
6	Light Blue - Special tool being used.

Graphic Symbols - Collision Repair

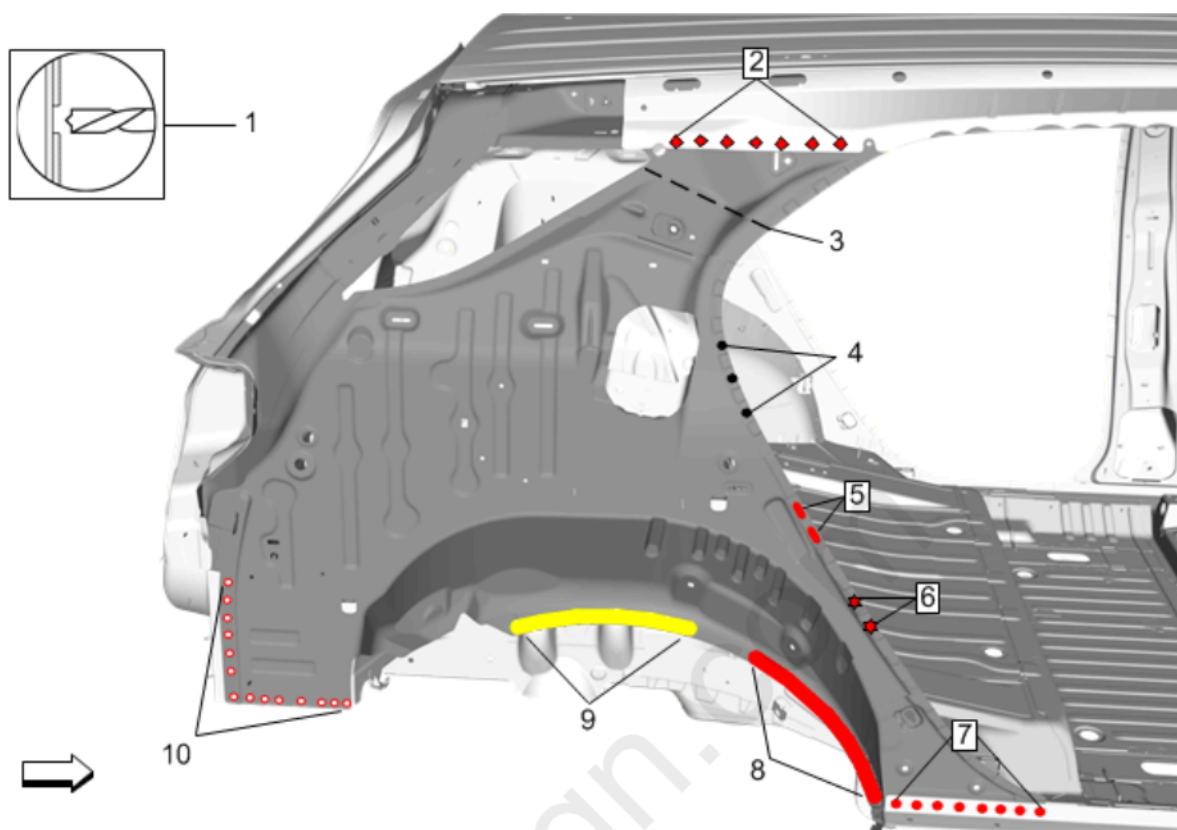


Fig. 3: Graphic Symbols - Collision Repair
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Drill through top layer of material only
2	Structural Rivet
3	Sectioning Location
4	Drill Hole
5	Mig Braze Slot
6	Self-Piercing Rivet
7	Mig/Mag Plug Weld
8	Adhesive
9	Apply Heat
10	Resistance Spot Weld

CUSTOMER CONCERN VERIFICATION SHEETS

The GM Customer Concern Verification Sheets have been designed to improve communications between the service customer and the technician. The more clearly the technician understands the concern and its symptoms, the more likely the concern will be fixed right the first time.

The GM-wide Customer Concern Verification Sheets are available in GM GlobalConnect. The Customer Concern Verification Sheets may be printed and reproduced locally.

TRAINING

Dealers

All U.S. GM Dealers participating in the Center of Learning / GM Service Technical College (STC) Programs can enroll through the Center of Learning website at <https://www.centerlearning.com>. Within the website, there are individual training paths that are designed to assist in planning the training needs for each individual and their job role. Dealers who have questions about Center of Learning Training should contact the Center of Learning help desk at 1-888-748-2687. The help desk is available Monday through Friday, 8:00 am - 9:00 pm Eastern Standard Time, excluding holidays. For GM Access support, contact the GM Access Help Desk at 1-888-337-1010.

Fleets

GM Fleet customers with GM Warranty In-Shop agreements are able to participate in service technical training through the Center of Learning/GM Service Technical College (STC).

Assistance for GM fleet registered customers using GM STC training is provided by the Center of Learning help desk at 1-888-748-2687. The help desk is available Monday through Friday, 8:00 am - 9:00 pm Eastern Standard Time, excluding holidays. For GM Access support, contact the GM Access Help Desk at 1-888-337-1010.

Most GM STC course materials have associated charges.

To purchase authentic GM STC Training Materials, contact the GM Training Materials Headquarters at 1-800-393-4831.

Non-GM Dealer Technicians

Technician training for non-GM dealers is available through ACDelco. This training is for ACDelco PSC and Fleet program members employed in the automotive or truck service industry.

ACDelco courses are available at approved GM STC Training Centers. Availability and schedules can be obtained by calling 1-800-825-5886 (prompt 1) or contact us via the web at www.acdelcotechconnect.com and select the Training tab. Seminars are also offered through the ACDelco Warehouse Distribution channel. Contact your Local ACDelco representative or distributor directly for more information.

VEHICLE, ENGINE AND TRANSMISSION ID AND VIN LOCATION, DERIVATIVE AND USAGE

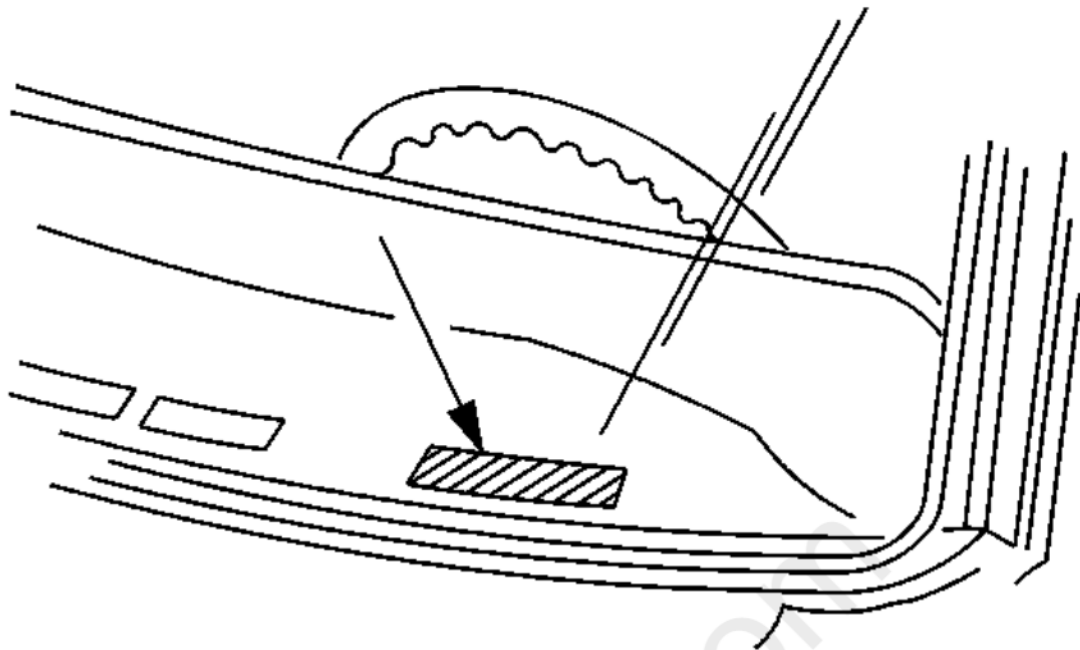


Fig. 4: Locating Vehicle Identification Number (VIN) Plate
 Courtesy of GENERAL MOTORS COMPANY

The VIN plate is the legal identifier of the vehicle. The VIN plate is located on the upper left corner of the instrument panel (I/P) and can be seen through the windshield from the outside of the vehicle:

Position	Definition	Character	Description
1	Region of Build	1	United States
		2	Canada
2	Manufacturer	G	General Motors
3	Vehicle Brand/Type	1	Chevrolet Passenger Car
4 - 5	Vehicle Line/Series	1/X	Chevrolet Impala LS (1FL)
		1/Z	Chevrolet Impala LS (1LS)
		1/0	Chevrolet Impala LT (1LT)
		1/1	Chevrolet Impala LT (2LT)
		1/3	Chevrolet Impala LTZ (1LZ)
		1/4	Chevrolet Impala LTZ (2LZ)
		1/5	Chevrolet Impala (Non-US, Non-Canada)
6	Body Style	5	69 - Sedan, 4 Door, 4 Window, Notchback
7	Restraint System	S	AYF - Active Manual Belts, Airbags - Driver and Passenger - Front (1st row), Front Seat Side (1st row) & Rear Seat Side (2nd row), Roof Side (all seating rows) & Knee (1st row)

Position	Definition	Character	Description
8	Engine Type	A	RPO LCV, Engine - Gas, 4 CYL, 2.5L, L4, SIDI, DOHC, DCVCP, VVT, E85 Max, Alum
		3	RPO LFX, Engine - Gas, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 Max, Alum
9	Check Digit	-	Check Digit
10	Model Year	H	2017
11	Plant Location	U	Detroit Hamtramck (DEH)
		9	Oshawa #1 (OSH)
12 - 17	Plant Sequence Number	-	Plant Sequence Number

2.5L LCV Engine ID and VIN Derivative Location

Refer to [Engine Identification](#) .

3.6L LFX Engine ID and VIN Derivative Location

Refer to [Engine Identification](#) .

6T40/6T45 Transmission ID and VIN Derivative Location

Refer to [Transmission Identification Information](#) .

6T70 Transmission ID and VIN Derivative Location

Refer to [Transmission Identification Information](#) .

VEHICLE CERTIFICATION, TIRE PLACARD, ANTI-THEFT, AND SERVICE PARTS ID LABEL

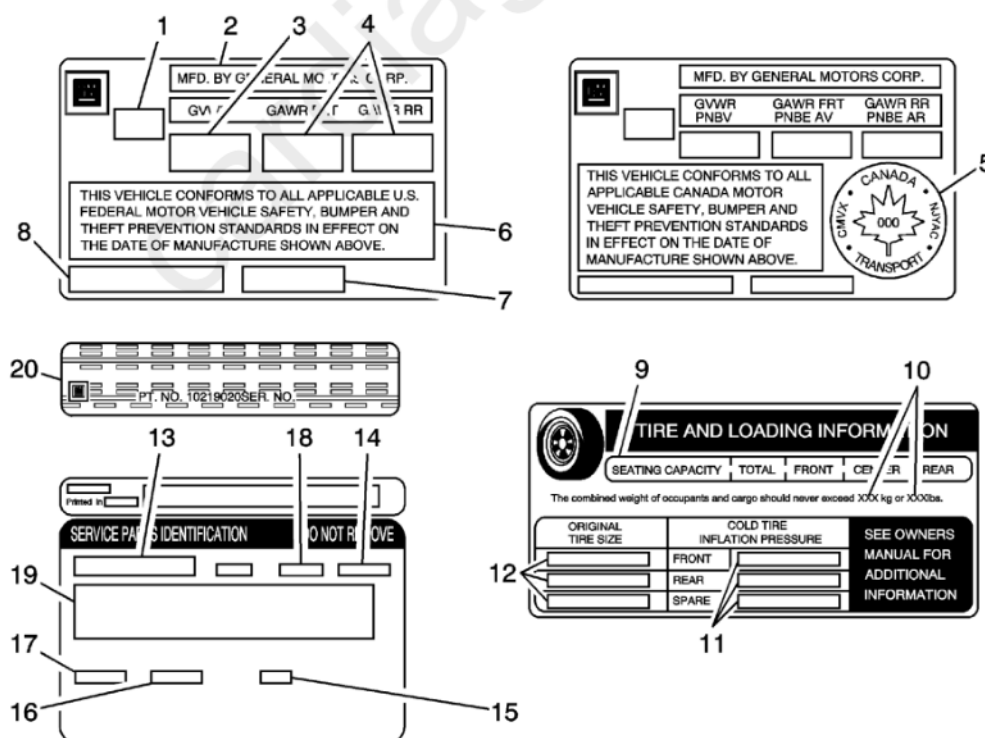


Fig. 5: Vehicle Certification, Tire Placard, Anti-Theft, and Service Parts ID Label
Courtesy of GENERAL MOTORS COMPANY

Callout	Description

Callout	Description
Vehicle Certification Label The vehicle certification label is located on the left hand side of the B pillar and displays the following assessments: - Gross Vehicle Weight Rating (GVWR) - Gross Axle Weight Rating (GAWR), front and rear - The gross vehicle weight (GVW) is the weight of the vehicle and everything it carries. The gross vehicle weight must not exceed the Gross Vehicle Weight Rating. Include the following items when figuring the GVW: - The base vehicle weight (factory weight) - The weight of all vehicles accessories - The weight of the driver and the passengers - The weight of the cargo	
1	Name of Manufacturer
2	Gross Vehicle Weight Rating
3	Gross Axle Weight Rating (Front, Rear)
4	Canadian Safety Mark (w/RPO Z49)
5	Certification Statement
6	Vehicle Class Type (Pass Car, etc.)
7	Vehicle Identification Number
8	Date of Manufacture (Mo/Yr)
Tire Placard The tire placard label is located on the forward portion of the center pillar and displays the following assessments:	
9	Specified Occupant Seating Positions
10	Maximum Vehicle Capacity Weight
11	Tire Pressure, Front, Rear, and Spare (Cold)
12	Original Equipment Tire Size
Service Parts ID Label The vehicle service parts identification label is located in the rear compartment attached to the left side of the spare tire well. The label is use to help identify the vehicle original parts and options.	
13	Vehicle Identification Number
14	Engineering Model Number (Vehicle Division, Line, and Body Style)
15	Interior Trim Level and Decor
16	Exterior (Paint Color) WA Number
17	Paint Technology
18	Special Order Paint Colors and Numbers
19	Vehicle Option Content
Anti-Theft Label	
20	The Federal law requires that General Motors label certain body parts on this vehicle with the VIN. The purpose of the law is to reduce the number of motor vehicle thefts by helping in the tracing and recovery of parts from stolen vehicles. Labels are permanently affixed to an interior surface of the part. The label on the replacement part contains the letter R, the manufacturer's logo, and the DOT symbol. The anti-theft label must be covered before any painting, rustproofing procedures, and uncovered after the procedures. Failure to follow the precautionary steps may result in liability for violation of the Federal Vehicle Theft Prevention Standard and possible suspicion to the owner that the part was stolen.

RPO CODE DESCRIPTION

The following table provides the description of the Regular Production Option (RPO) codes that are available on the vehicle. The vehicle's RPO list is printed on the Service Parts Identification Label.

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RPO	Description
4AA	INTERIOR TRIM-JET BLACK
4AJ	INTERIOR TRIM-JET BLACK/DK TITANIUM
4CZ	INTERIOR TRIM-JET BLACK/LT WHEAT
5XQ	ACCESSORY-WHEEL - 19 X 8.5 - J - ALUMINUM - DESIGN 3
8X1	VEHICLE-LABEL, FASTEN SEAT BELTS
9H8	LAMP SYSTEM-DAYTIME RUNNING, AUXILIARY
A45	MEMORY-SEAT ADJUSTER, MIRROR, POWER, DRIVER, PERSONALIZATION
A51	SEAT-FRT BKT, CUSTOM
A69	RESTRAINT-SEAT BELT TENSIONER, FRT, VAR. 2
A6C	ADJUSTER PASS ST-MANUAL, 4 WAY, PWR VERT
A70	RESTRAINT-SEAT BELT TENSIONER, FRT
A90	LOCK CONTROL RR CMPT-LID, REM CONT ELEC RELEASE
AB5	LOCK CONTROL-RR CMPT LID, REM CONT ELEC, TOUCH RELEASE
ACO	IDENTIFICATION-ACCESSORY CATALOG OFFERING
AE2	LATCH-RR COMPARTMENT, SAFETY, MANUAL RELEASE
AED	WINDOW REG PASS DR-POWER OPERATED, EXPRESS DOWN
AEQ	WINDOW REG REAR DR-POWER OPERATED, EXPRESS DOWN
AG1	ADJUSTER FRT ST-POWER, MULTI-DIRECTIONAL, DRIVER
AG2	ADJUSTER PASS ST-POWER, MULTI-DIRECTIONAL
AHR	RESTRAINT-HEAD, FRT SEAT, UP/DOWN, FORE/AFT ADJUSTMENT
AJC	RESTRAINT-HEAD, FRT SEAT, UP/DOWN ADJUSTMENT
AKK	WINDSHIELD STYLE-ACOUSTIC PVB
AKP	WINDOW TYPE-SOLAR ABSORBING
AKX	WINDSHIELD TYPE-SOLAR ABSORBING
AL0	SENSOR INDICATOR-INFLATABLE RESTRAINT, FRT PASS/CHILD PRESENCE DETECTOR
AP9	NET-CONVENIENCE
APG	CONTROL-SEAT, POWER LUMBAR, LH (DO NOT USE FOR NEXT NEW MAJOR)
APH	CONTROL-SEAT, POWER LUMBAR, RH (DO NOT USE FOR NEXT NEW MAJOR)
AQQ	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE (MY 09 AND FUTURE)
ASV	EQUIPMENT-SENSOR AIR MOISTURE & W/S TEMP
ATH	LOCK CONTROL, ENTRY-REMOTE ENTRY, EXTENDED RANGE, PASSIVE ENTRY, ALL DOORS
AXG	WINDOW REG DRVR DR-POWER OPERATED, EXPRESS UP/DOWN
AXJ	VEHICLE TYPE-PASSENGER CAR
AYF	RESTRAINT SYSTEM-SEAT, INFLATABLE, DRIVER & PASS FRT, FRT SEAT SIDE & RR SEAT SIDE, ROOF SIDE, KNEE
AYK	RESTRAINT HEAD RR ST-L-SHAPED, 2 WAY ADJUST
AYR	RESTRAINT HEAD RR ST-FOLDING, ADJUSTABLE
B1V	HANDLE O/S DOOR-CHROME, BODY COLOR STRIP
B34	COVERING FRT-FLOOR MATS, CARPETED INSERT
B35	COVERING REAR-FLOOR MATS, CARPETED INSERT
B36	COVERING-FLOOR MAT, LUGG COMPT
B58	COVERING-FLOOR MAT, FRT & RR, CARPETED INSERT
B7Y	PLATE-DOOR SILL COVER, CHROME
B85	MOLDING B/S-EXTERIOR, BRIGHT
BR6	FLEET INCENTIVE-LEHIGH HANSON, INC. (A/J/P/Z/0G/7L-TRK CK/RV)

RPO	Description
BTM	SWITCH-ENGINE START, KEYLESS
BTT	ALARM-REMOTE PANIC
BTV	REMOTE START-ENGINE
C3U	ROOF-SUN, GLASS, SLIDING, ELEC, TRANSPARENT GLASS FIXED
C4P	HVAC SYSTEM-AIR CONDITIONER FRT, SEMIAUTOMATIC, ELECTRONIC CONTROLS
C59	VENT-AIR, CONSOLE, RR
C67	HVAC SYSTEM-AIR CONDITIONER FRT, ELECTRONIC CONTROLS
C9B	LAMP-INTR, AMBIENT, DOOR
C9J	LAMP-INTR, AMBIENT, I/P
CJ2	HVAC SYSTEM-AIR CONDITIONER FRT, AUTO TEMP CONT, AUX TEMP CONT
D31	MIRROR I/S R/V-TILT
D49	MIRROR O/S-LH & RH, REMOTE CONTROL, ELECTRIC, MANUAL FOLD
D53	CONSOLE-FRT COMPT, FLOOR, W/LID
D54	CONSOLE-FRT COMPT, FLOOR, W/O LID
D70	RATIO-TRANSAXLE FINAL DRIVE 2.77
D75	HANDLE O/S DOOR-BODY COLOR
DA5	ARM REST-RR SEAT, CENTER
DCP	PROCESSING-DIRECTIONS & CONNECTIONS SERVICE PACKAGE
DD8	MIRROR I/S R/V-LT SENSITIVE
DEH	PLANT CODE-DETROIT/HAMTRAMCK, MI, USA
DH6	MIRROR I/S FRT VAN-LH & RH, SUNSHADE, ILLUM
DLG	MIRROR O/S-LH & RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, LT SENS, TURN SIG IND, PERM LIGHT
DLL	MIRROR O/S-LH & RH, RC, ELEC, HEAT, MAN FOLD, FLAT/DRVR, CNVX/PASS, TURN SIG IND, PERM LIGHT
DNS	EQUIPMENT-SUPPLIER INSTALLED
E3E	HANDLE, REAR CLOSURE-O/S, L/GATE, R/CMPT, CHROME
EA1	POCKET-FRONT SEAT BACK, LH
EA2	POCKET-FRONT SEAT BACK, RH
EF7	COUNTRY-UNITED STATES OF AMERICA (USA)
F82	RATIO-TRANSAXLE FINAL DRIVE 3.23
FE9	CERTIFICATION-EMISSION, FEDERAL
FHO	VEHICLE FUEL-GASOLINE E10
FHS	VEHICLE FUEL-GASOLINE E85
FHV	VEHICLE FUEL-BIFUEL & MONOVALENT PLUS CNG
FX3	RIDE AND HANDLING-AUTOMATIC ELECTRONIC CONTROLLED
G1E	PRIMARY COLOR-EXTERIOR, LIMITED ADDICTION RED TINT (405Y)
G1M	PRIMARY COLOR-EXTERIOR, OLD BLUE EYES MET(410Y)
G1W	PRIMARY COLOR-EXTERIOR, ABALONE WHITE TRICOAT(140X)
GA6	PRIMARY COLOR-EXTERIOR, YOU DRIVE ME GRAZY MET (380A)
GAN	PRIMARY COLOR-EXTERIOR, SWITCHBLADE SILVER MET (G) 636R
GAZ	PRIMARY COLOR-EXTERIOR, SUMMIT WHITE (G) 8624
GB8	PRIMARY COLOR-EXTERIOR, BLACK MEET KETTLE MET (384A)
GBA	PRIMARY COLOR-EXTERIOR, BLACK (G) 8555
GC8	PRIMARY COLOR-EXTERIOR, GREEN WITH ENVY MET (387A)
GGB	PRIMARY COLOR-BLUE PERSUASION MET(413B)
GMU	PRIMARY COLOR-EXTERIOR, PEPPERDUST MET-2 (441B)
GNA	CHASSIS EQUIP FRONT-STRUT ASM
GNC	CHASSIS EQUIP REAR-REAR AXLE, 4-LINK

RPO	Description
H0U	INTERIOR TRIM CONFIG-CLOTH, LEVEL 2, JET BLACK
H0V	INTERIOR TRIM CONFIG-SUEDE, LEVEL 1, JET BLACK/DK TITANIUM
H0X	INTERIOR TRIM CONFIG-CLOTH, LEVEL 2, JET BLACK/DK TITANIUM
H0Y	INTERIOR TRIM CONFIG-LEATHER, LEVEL 1, JET BLACK
H0Z	INTERIOR TRIM CONFIG-CLOTH, LEVEL 1, JET BLACK/DK TITANIUM
H1Q	INTERIOR TRIM CONFIG-LEATHER, LEVEL 1, JET BLACK/DK TITANIUM
H1Y	INTERIOR TRIM CONFIG-LEATHER, LEVEL 2, JET BLACK
HCR	MERCHANDISED PKG-SPORT SPECIAL EDITION
HG0	INTERIOR TRIM CONFIG-LEATHER, LEVEL 1, JET BLACK/LT WHEAT
HV9	INTERIOR TRIM CONFIG-LEATHER, LEVEL 2, JET BLACK/LT WHEAT
I17	ENGINEERING YEAR-2017
IO3	RADIO-INFOTAINMENT SYSTEM - BASE HMI
IO5	RADIO-INFOTAINMENT SYSTEM - UPLEVEL HMI, ENHANCED CONNECTIVITY
IO6	RADIO-INFOTAINMENT SYSTEM - UPLEVEL HMI, ENHANCED CONNECTIVITY, EMBEDDED NAVIGATION
J61	BRAKE SYSTEM-POWER, FRT & RR DISC, ABS, 17"
J71	BRAKE PARKING-POWER OPERATED
JJ2	BRAKE LINING-BRAKE NOISE AND DUST PERFORMANCE
K05	HEATER ENG-BLOCK
K34	CRUISE CONTROL-AUTOMATIC, ELECTRONIC
K4C	CHARGER-INDUCTIVE PORTABLE WIRELESS DEVICE
K4F	BATTERY-LN4, AGM, 12V, 80AH, 800 ENCCA
KA1	HEATER SEAT FRT-DRVR & PASS
KD4	RECEPTACLE-ELECTRICAL, FRT CONSOLE
KG4	GENERATOR-150 AMP
KI6	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR 110 VOLT
KL9	ENG CONTROL-STOP/START SYS, CONVENTIONAL AT, CONVENTIONAL MT OR BRAKE RELEASE LATE RESTART
KPA	RECEPTACLE-ELECTRICAL, FRT CONSOLE RR
KSG	CRUISE CONTROL-AUTOMATIC, ADAPTIVE, WITH STOP/GO
KU1	VENTILATED SEAT DRVR-FRONT
KU3	VENTILATED SEAT PASS-FRONT
LCV	ENGINE-GAS, 4 CYL, 2.5L, I4, SIDI, DOHC, DCVCP, VVT, E85 MAX, E0-E100, ALUM
LFX	ENGINE-GAS, 6 CYL, 3.6L, SIDI, DOHC, VVT, E85 MAX, ALUM, GM
LHD	VEHICLE DRIVE-LEFTHAND DRIVE
M7W	TRANSMISSION-AUTO 6 SPD, 6T70, FWD, GEN 2
MCR	RECEPTACLE-MEMORY CARD
MCY	PORT, ELEK DEVICE-USB ONLY
MDE	MOLDING B/S UPPER-BRIGHT, WINDOW ALL AROUND
MHG	TRANSMISSION-AUTO 6 SPD, HMD, GM, BAS+, 6T45, HYBRID, FWD
MWN	TAILPIPE-DUAL, INTEGRATED IN FASCIA
N37	STEERING COLUMN-TILT, TELESOPING
N38	STEERING COLUMN-TILT, TELESOPING, POWER
N46	STEERING WHEEL-4 SPOKES
NCG	LOCK-ELECTRICAL CHILD LOCK SYSTEM (REAR DOOR LATCH)

RPO	Description
NE1	CERTIFICATION-EMISSION, GEOGRAPHICALLY RESTRICTED REGISTRATION FOR VEHICLES UP TO 14, 000 LBS GVW (USE 2003 MDL YR
NE8	EVAPORATIVE SYSTEM-LEVEL 3 EMISSIONS
NJ1	STEERING-POWER, NON-VARIABLE RATIO, ELECTRIC
NJ2	STEERING-ELECTRIC, BELT DRIVE
NKC	NOISE CONTROL-SYSTEM, ACTIVE NOISE CANCELLATION
NR0	STEERING WHEEL-LEATHER, 4 SPOKES
NT7	EMISSION SYSTEM-FEDERAL, TIER 2
NU5	EMISSION SYSTEM-CALIFORNIA, BIN 4
NU6	EMISSION SYSTEM-CALIFORNIA, PZEV
NWN	TAILPIPE-SINGLE, TURNED DOWN, HIDDEN
NWT	TAILPIPE-DUAL, TURNED DOWN. HIDDEN
OSH	PLANT CODE-OSHAWA 1, ONT, CANADA
Q2B	TIRE ALL-P245/45R19 SL 98V BW AL3
Q6M	WHEEL-19 X 8.5, J, ALUMINUM, DESIGN 2
Q7P	WHEEL-19 X 8.5, J, ALUMINUM, DESIGN 11
QCL	TIRE SPARE-T125/70R17 SL 98M BW SPR
QGK	TIRE ALL-P235/50R18 SL 97H BW AL3
RAL	TIRE ALL-P245/40R20 SL 95V BW AL3
RQ9	WHEEL-20 X 8.5, J, ALUMINUM, DESIGN 1
RT3	WHEEL-18 X 8.0, J, STEEL, DESIGN 1
RT4	WHEEL-18 X 8.0, J, ALUMINUM, DESIGN 1
RT9	WHEEL-19 X 8.5, J, ALUMINUM, DESIGN 1
RV9	WHEEL SPARE-17 X 4.0, T, STEEL, DESIGN 1
RVW	ACCESSORY-BAG - TRUNK/CARGO AREA ORGANIZER
RWS	ACCESSORY-FLOOR MATS - CARPET
RYT	ACCESSORY-FIRST AID KIT
S47	ACCESSORY-LUG NUTS
S5W	ACCESSORY-ORGANIZER - PANEL - SEAT BACK
S6P	ACCESSORY-REMOTE START KIT
SAI	ACCESSORY-SILL PLATES - STAINLESS
SAO	ACCESSORY-SMOKERS PACKAGE
SB2	ACCESSORY-SPOILER - DECKLID - FLUSH MOUNT
SE4	ACCESSORY-WHEEL - 18" - ALUMINUM - DESIGN 1
SE7	ACCESSORY-WHEEL - 18" - ALUMINUM - DESIGN 4
SFE	ACCESSORY-WHEEL LOCKS
SFZ	ACCESSORY-EMBLEM - EXTERIOR - DESIGN 1
T43	SPOILER-RR
T4A	HEADLAMPS-HALOGEN
T4F	HEADLAMPS-HIGH INTENSITY DISCHARGE
T67	BATTERY-LN3, FLA, 12V, 70AH, 512 ENCCA
T83	CONTROL, HEADLAMPS-AUTOMATIC ON-OFF
TG5	PLAYER-COMPACT DISC AND MP3
TU2	LAMP-MARKER, SIDE
U19	SPEEDOMETER-INST, KILO & MILES, KILO ODOMETER
U2J	DIGITAL AUDIO SYSTEM-S-BAND - NONE
U2K	DIGITAL AUDIO SYSTEM-S-BAND
U77	ANTENNA-RR WINDOW, RADIO
U80	DISPLAY-COMPASS
UD7	PARK ASSIST-REAR

RPO	Description
UDD	DISPLAY INSTRUMENT-DRIVER INFO ENHANCED (MULTI COLOR STANDARD GRAPHIC)
UDT	INFOTAINMENT DISPLAY-COLOR INFO DISPLAY (CID) 8", WVGA, TOUCH SCREEN
UE0	COMMUNICATION SYSTEM-VEHICLE - NONE
UE1	COMMUNICATION SYSTEM-VEHICLE, ONSTAR
UEU	SENSOR INDICATOR-FORWARD COLLISION ALERT
UFG	SENSOR INDICATOR-REAR CROSS TRAFFIC ALERT
UFL	LANE ACTIVE SAFETY-DEPARTURE WARNING
UG1	OPENER-GARAGE DOOR, UNIVERSAL
UGN	COLL IMMINENT BRK-ALL SPEED, VEH FWD MOVEMENT, BRAKE PREFILL, INTEGRATED BRAKE ASSIST
UH1	INDICATOR-SEAT BELT WARNING, RH
UHI	INFOTAINMENT DISPLAY-COLOR INFO DISPLAY (CID) 4.2"
UJM	TIRE PRESS INDICATOR-MANUAL LEARN
UKC	SIDE ACTIVE SAFETY-OBSTACLE DETECTION ENHANCED
UMN	SPEEDOMETER-INST, MILES & KILO, MILES ODOMETER
UPF	WIRELESS INTERFACE-SHORT RANGE, VOICE REC
UQG	SPEAKER SYSTEM-ENHANCED AUDIO WITH AMPLIFIER
UQS	SPEAKER SYSTEM-PREMIUM AUDIO BRANDED WITH SURROUND AMPLIFIER
USR	RECEPTACLE-USB
UTJ	THEFT DETERENT-ELECTRICAL, UNAUTHORIZED ENTRY
UVC	VISION-REAR VIEW, MONO, ANALOG
UVD	STEERING WHEEL HEAT-MANUAL
V33	TOOL KIT-ROAD, EMERGENCY
V8D	VEHICLE STATEMENT-US
V8E	VEHICLE STATEMENT-CANADA
VAT	ACCESSORY-GRILLE / GRILLE INSERTS - ALTERNATE FINISH - CHROME
VAV	ACCESSORY-FLOOR MATS - ALL WEATHER
VEB	ACCESSORY-PEDAL COVER SET
VK3	LICENSE PLATE FRONT-FRT MOUNTING PKG
VKU	ACCESSORY-MIRROR CAPS - CHROME
VLI	ACCESSORY-MAT - TRUNK / CARGO AREA
VQK	ACCESSORY-SPLASH GUARDS - CUSTOM MOLDED
VRI	SHUTTERS-FRONT GRILLE, ACTIVE, LWR
VV4	COMMUNICATION EQUIP-MOBILE INTERNET CONNECTIVITY
VY7	KNOB-TRANS CONT LEVER, LEATHER
VZ3	LABEL-MERCURY DISPOSAL NOTIFICATION
W1Y	CONTROL-STEERING WHEEL, RADIO, REDUNDANT CONTROLS
W2D	ACCESSORY-CARGO NET
WMH	VIN MODEL YEAR-2017
XAT	ACCESSORY-TIRE ALL-P245/45R19 SL 98V BW AL3 VAR1
XFE	FUEL ECONOMY-EXTRA FUEL ECONOMY
XL7	FREQUENCIES RATING-315 MHZ, LONG DISTANCE
YF5	CERTIFICATION-EMISSION, CALIFORNIA
YM8	IDENTIFICATION-LIMITED PERSONALIZATION OPTION (LPO)
Z49	COUNTRY-CANADA

FASTENERS

Metric Fasteners

This vehicle provides fastener dimensions using the metric system. Most metric fasteners are approximate in diameter to equivalent English fasteners. Make replacements using fasteners of the same nominal diameter, thread pitch, and strength.

A number marking identifies the OE metric fasteners except cross-recess head screws. The number also indicates the strength of the fastener material. A Posidrive® or Type 1A cross-recess identifies a metric cross-recess screw. For best results, use a Type 1A cross-recess screwdriver, or equivalent, in Posidrive® recess head screws.

GM Engineering Standards and North American Industries have adopted a portion of the ISO-defined standard metric fastener sizes. The purpose was to reduce the number of fastener sizes used while retaining the best thread qualities in each thread size. For example, the metric M6.0 X 1 screw, with nearly the same diameter and 25.4 threads per inch replaced the English 1/4 - 20 and 1/4 - 28 screws. The thread pitch is midway between the English coarse and fine thread pitches.

Fastener Strength Identification

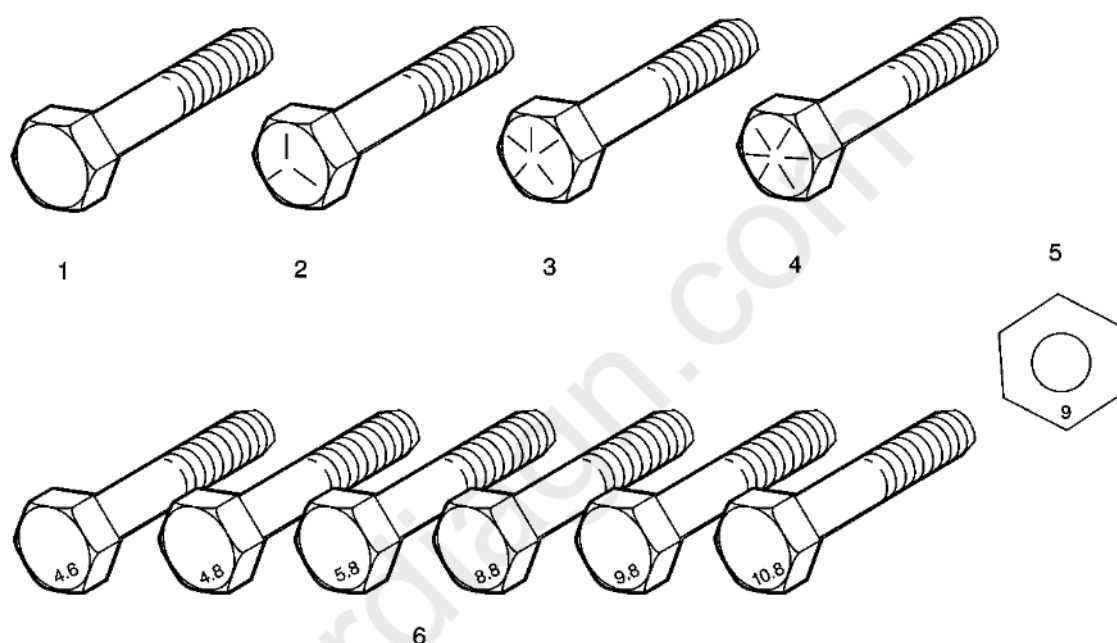


Fig. 6: Identifying Fastener Strength Marks
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	English Bolt, Grade 2 (Strength Class)
2	English Bolt, Grade 5 (Strength Class)
3	English Bolt, Grade 7 (Strength Class)
4	English Bolt, Grade 8 (Strength Class)
5	Metric Nut, Strength Class 9
6	Metric Bolts, Strength Class Increases as Numbers Increase

The most commonly used metric fastener strength property classes are 9.8 and 10.9. The class identification is embossed on the head of each bolt. The English, inch strength classes range from grade 2 to grade 8. Radial lines are embossed on the head of each bolt in order to identify the strength class. The number of lines on the head of the bolt is 2 lines less than the actual grade. For example, a grade 8 bolt will have 6 radial lines on the bolt head. Some metric nuts are marked with a single digit strength identification number on the nut face.

The correct fasteners are available through GM SPO. Many metric fasteners available in the aftermarket parts channels are designed to metric standards of countries other than the United States, and may exhibit the following:

- Lower strength
- No numbered head marking system
- Wrong thread pitch

The metric fasteners on GM products are designed to new, international standards. The following are the common sizes and pitches, except for special applications:

- M6.0 X 1
- M8 X 1.25
- M10 X 1.5
- M12 X 1.75
- M14 X 2.00
- M16 X 2.00

Prevailing Torque Fasteners

Prevailing torque fasteners create a thread interface between the fastener and the fastener counterpart in order to prevent the fastener from loosening.

All Metal Prevailing Torque Fasteners

These fasteners accomplish the thread interface by a designed distortion or deformation in the fastener.

Nylon Interface Prevailing Torque Fasteners

These fasteners accomplish the thread interface by the presence of a nylon material on the fastener threads.

Adhesive Coated Fasteners

These fasteners accomplish the thread interface by the presence of a thread-locking compound on the fastener threads. Refer to the appropriate repair procedure in order to determine if the fastener may be reused and the applicable thread-locking compound to apply to the fastener.

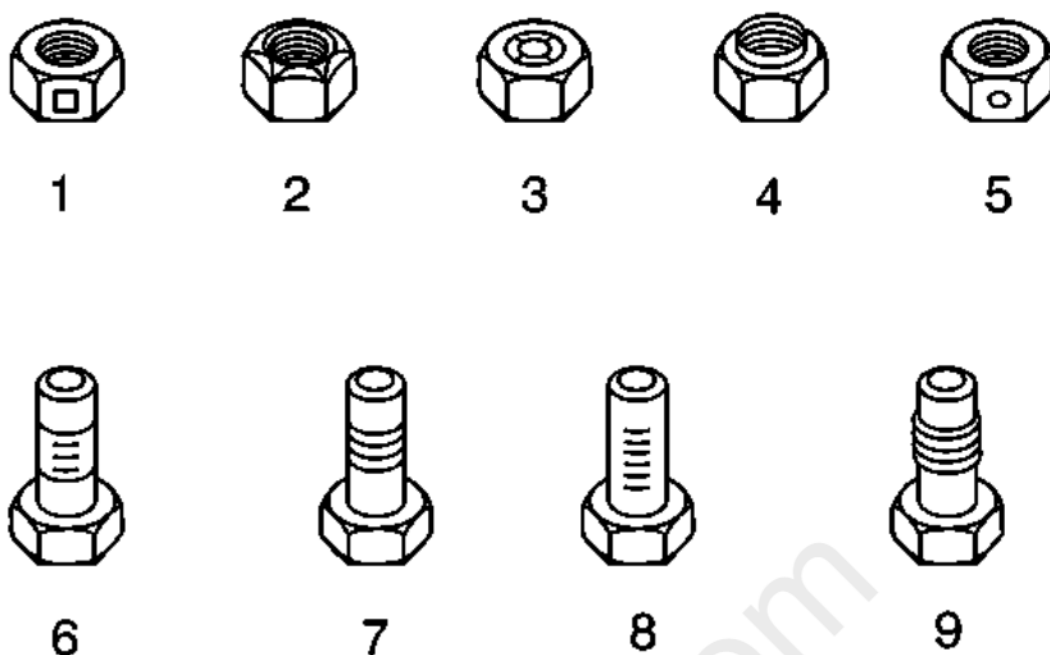


Fig. 7: Identifying Adhesive Coated Fasteners
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Prevailing Torque Nut, Center Lock Type
2	Prevailing Torque Nut, Top Lock Type
3	Prevailing Torque Nut, Nylon Patch Type
4	Prevailing Torque Nut, Nylon Washer Insert Type
5	Prevailing Torque Nut, Nylon Insert Type
6	Prevailing Torque Bolt, Dry Adhesive Coating Type
7	Prevailing Torque Bolt, Thread Profile Deformed Type
8	Prevailing Torque Bolt, Nylon Strip Type
9	Prevailing Torque Bolt, Out-of-Round Thread Area Type

A prevailing torque fastener may be reused ONLY if:

- The fastener and the fastener counterpart are clean and not damaged
- There is no rust on the fastener
- The fastener develops the specified minimum torque against its counterpart prior to the fastener seating

Metric Prevailing Torque Fastener Minimum Torque Development

Application	Specification	
	Metric	English
All Metal Prevailing Torque Fasteners		

Application	Specification	
	Metric	English
• 6 mm	0.4 N.m	4 lb in
• 8 mm	0.8 N.m	7 lb in
• 10 mm	1.4 N.m	12 lb in
• 12 mm	2.1 N.m	19 lb in
• 14 mm	3 N.m	27 lb in
• 16 mm	4.2 N.m	37 lb in
• 20 mm	7 N.m	62 lb in
• 24 mm	10.5 N.m	93 lb in
Nylon Interface Prevailing Torque Fasteners		
• 6 mm	0.3 N.m	3 lb in
• 8 mm	0.6 N.m	5 lb in
• 10 mm	1.1 N.m	10 lb in
• 12 mm	1.5 N.m	13 lb in
• 14 mm	2.3 N.m	20 lb in
• 16 mm	3.4 N.m	30 lb in
• 20 mm	5.5 N.m	49 lb in
• 24 mm	8.5 N.m	75 lb in

English Prevailing Torque Fastener Minimum Torque Development

Application	Specification	
	Metric	English
All Metal Prevailing Torque Fasteners		
• 1/4 in	0.5 N.m	4.5 lb in
• 5/16 in	0.8 N.m	7.5 lb in

Application	Specification	
	Metric	English
• 3/8 in	1.3 N.m	11.5 lb in
• 7/16 in	1.8 N.m	16 lb in
• 1/2 in	2.3 N.m	20 lb in
• 9/16 in	3.2 N.m	28 lb in
• 5/8 in	4 N.m	36 lb in
• 3/4 in	7 N.m	62 lb in
Nylon Interface Prevailing Torque Fasteners		
• 1/4 in	0.3 N.m	3 lb in
• 5/16 in	0.6 N.m	5 lb in
• 3/8 in	1	9 lb in
• 7/16 in	1.3 N.m	12 lb in
• 1/2 in	1.8 N.m	16 lb in
• 9/16 in	2.5 N.m	22 lb in
• 5/8 in	3.4 N.m	30 lb in
• 3/4 in	5 N.m	45 lb in

THREAD INSERTS

General Purpose Thread Repair Kits.

These kits are available commercially.

Repair Procedure

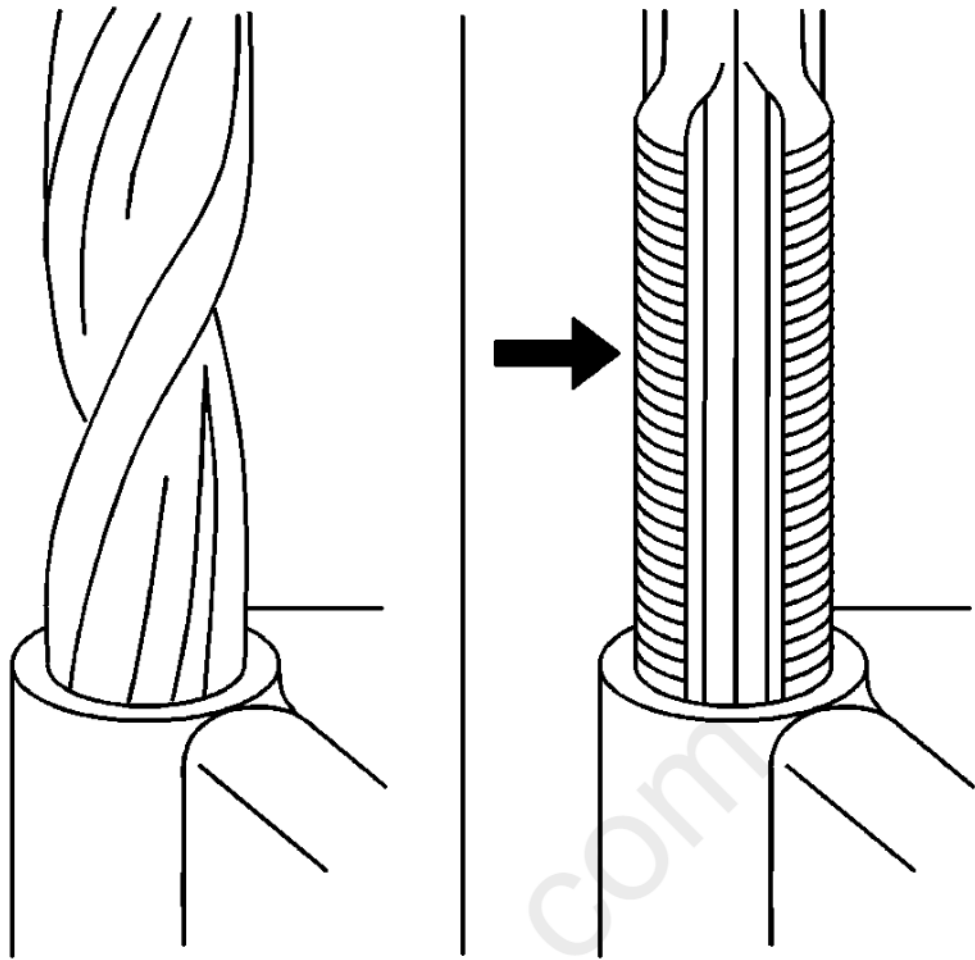


Fig. 8: Drilling & Tapping Damaged Threads
Courtesy of GENERAL MOTORS COMPANY

WARNING: Refer to [Safety Glasses Warning](#) .

NOTE: Refer to the thread repair kit manufacturer's instructions regarding the size of the drill and tap to use.

Avoid any buildup of chips. Back out the tap every few turns and remove the chips.

1. Determine the size, the pitch, and the depth of the damaged thread. If necessary, adjust the stop collars on the cutting tool and tap to the required depth.
2. Drill out the damaged threads. Clean out any chips.
3. Lubricate the tap with light engine oil. Tap the hole. Clean the threads.

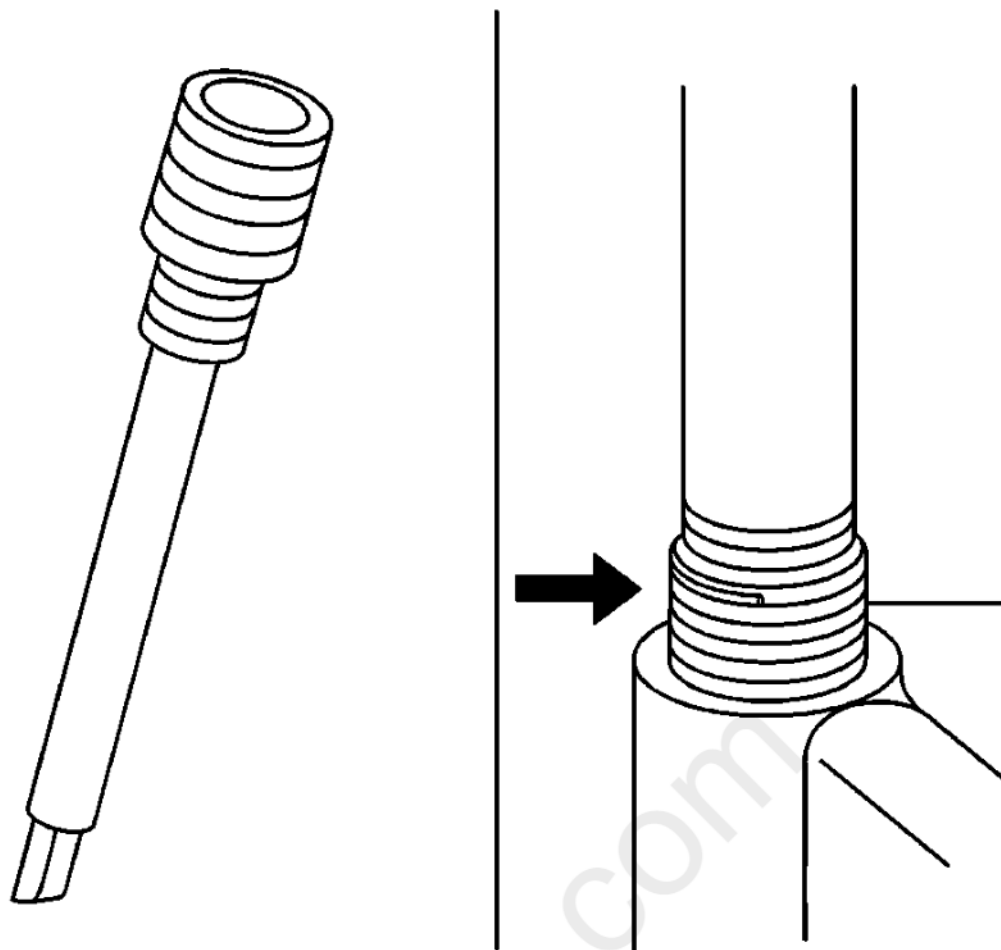


Fig. 9: View Of Thread Insert
 Courtesy of GENERAL MOTORS COMPANY

4. Thread the thread insert onto the mandrel of the installer. Engage the tang of the insert onto the end of the mandrel.

NOTE: The insert should be flush to one turn below the surface.

5. Lubricate the insert with light engine oil, except when installing in aluminum and install the insert.
6. If the tang of the insert does not break off when backing out the installer, break the tang off with a drift.

REGISTERED AND NON-REGISTERED TRADEMARKS

Listed below are Registered Trademarks (®) or Non-Registered Trademarks (™) which may appear in this service manual.

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ACA®
ACCUTURN®
ACDelco®
Active Fuel Management™
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Micropack®
Minifuse®
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N
Northstar®
O
OnStar®
Optikleen®
P
PASS-KEY®
PASS-KEYII®
PASSLOCK™
PK3®
Pozidriv®
Pro®
Q
Quad 4®
R
RAINSENSE™
Rapid Fire®
S
ScotchBrite™
Scotchguard™
Signals®
Sikkens™
Soft-Ray®
Solar-Ray®
Stabilitrak®
Sunrayce®
Superlube®
Syclone®
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Tech 2®
Techline®
Teflon®
Tefzel®
Theft-IA®
Theftlock®
Tiltmaster®
TORX®
Transjel®

Transguide®	
Twilight Sentinel®	
	U
Ultralite®	
	V
Velcro®	
	W
Weatherpack™	

DOOR LOCK AND IGNITION LOCK FOLDING AND NON-FOLDING KEY CUTTING

High Security keys are available from the service parts system.

Obtain the key code from the security card or from the GM Dealer World, Parts, Key Code Look Up system.

If you have the key code and access to a Triax-E., BD Laser or other code key cutting machine from the GM Dealer Equipment Catalog, you may cut a new key.

If you have the original key and access to a Matrix S, BD Laser or other key duplicating machine, you may duplicate the key.

If you do not have a high security key cutting machine, order the side cut key from the service parts system. Include the key code in the NOTE field. Indicate the timing and the method of the shipment.

Inspect the new key operation in the lock cylinder. Ensure the new key operates effectively.

DOOR LOCK AND IGNITION LOCK FOLDING KEY BLADE REMOVAL AND INSTALLATION

Special Tools

BO-51098 Flip Key Blade Fixture

For equivalent region tools, refer to [Special Tools](#).

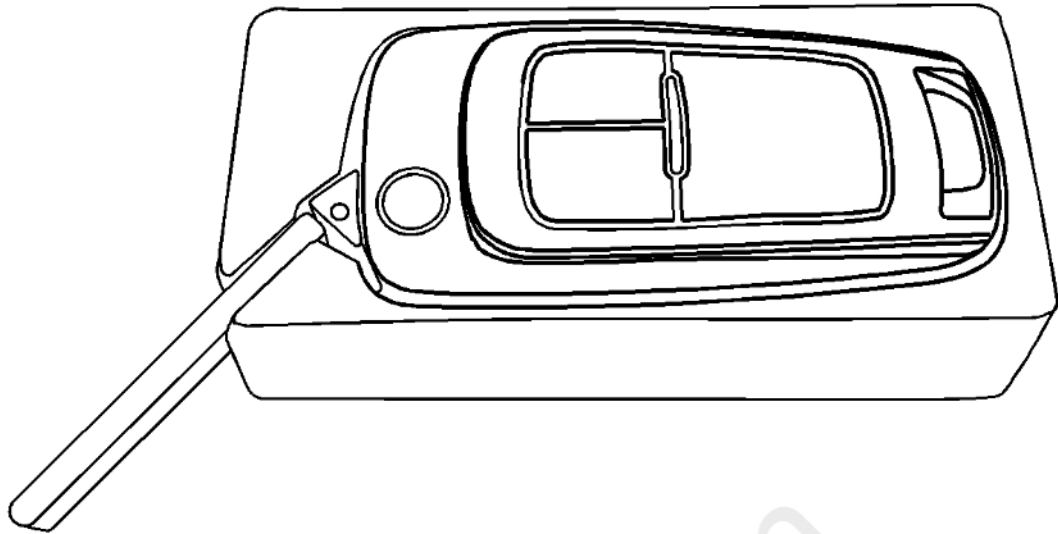


Fig. 10: Remote Keyless Entry (RKE) Transmitter Assembly

Courtesy of GENERAL MOTORS COMPANY

CAUTION: Failure to properly support the Remote Keyless Entry (RKE) transmitter assembly while replacing the key blade may cause internal damage to the transmitter assembly.

1. Insert the RKE transmitter in the fixture as shown.

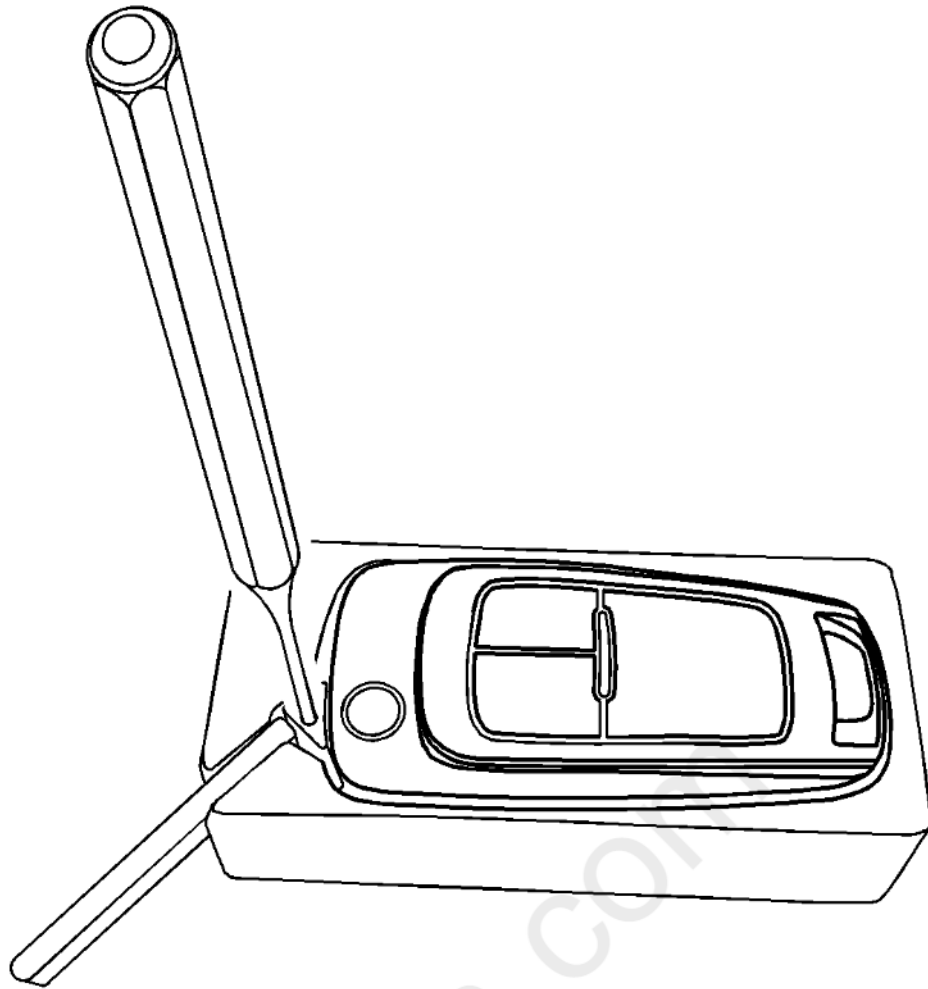


Fig. 11: Flip Key Blade Fixture & Transmitter Assembly

Courtesy of GENERAL MOTORS COMPANY

NOTE: It may be necessary to dress the pin drift on a grinder to maintain the diameter in order to drive the pin through the housing.

2. Using the **BO-51098** fixture, drive the retention pin from the transmitter assembly as shown.

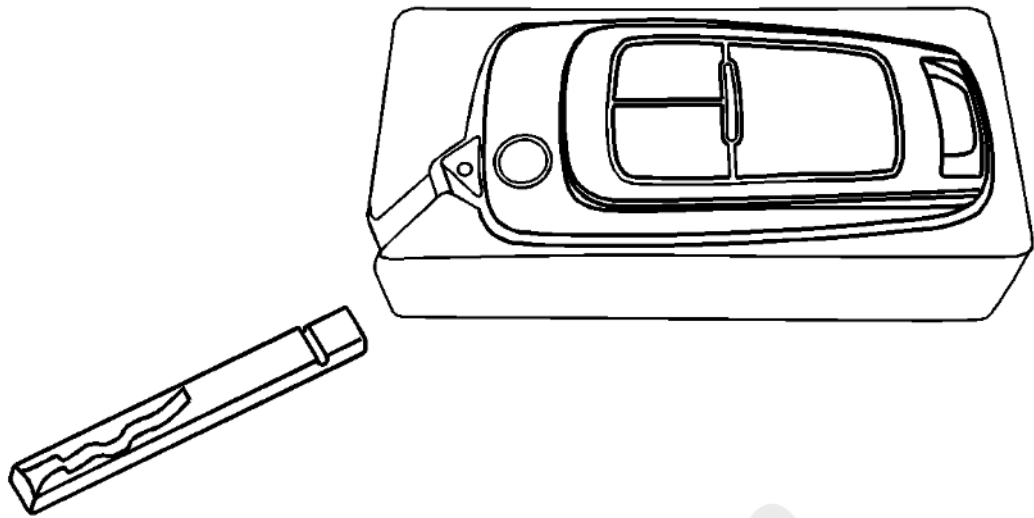


Fig. 12: Transmitter Assembly & Key Blade
Courtesy of GENERAL MOTORS COMPANY

3. Remove the key blade from the transmitter assembly.
4. Install the coded blank into the transmitter assembly, insure the indentation on the key blade faces the retention pin.

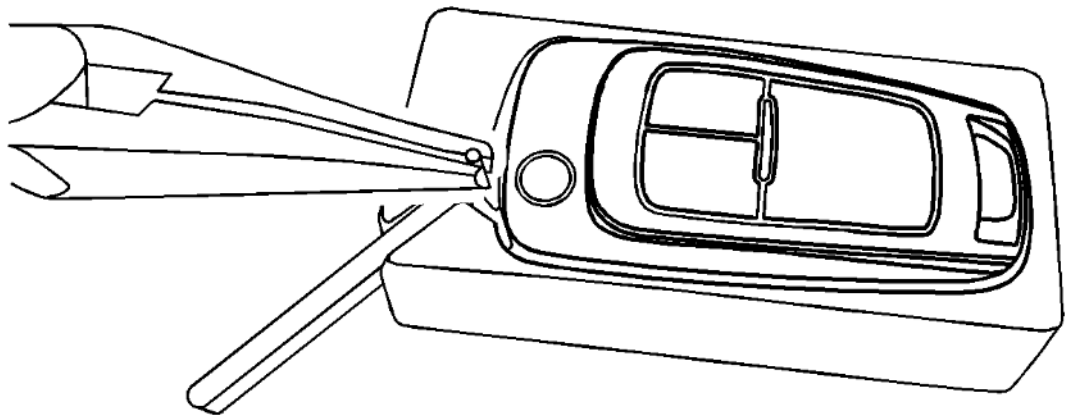


Fig. 13: Inserting Transmitter Pin

Courtesy of GENERAL MOTORS COMPANY

NOTE: Use caution not to damage the surface, chrome plating, in the following steps.

5. Using needle nose pliers, insert the pin half way into the transmitter assembly.

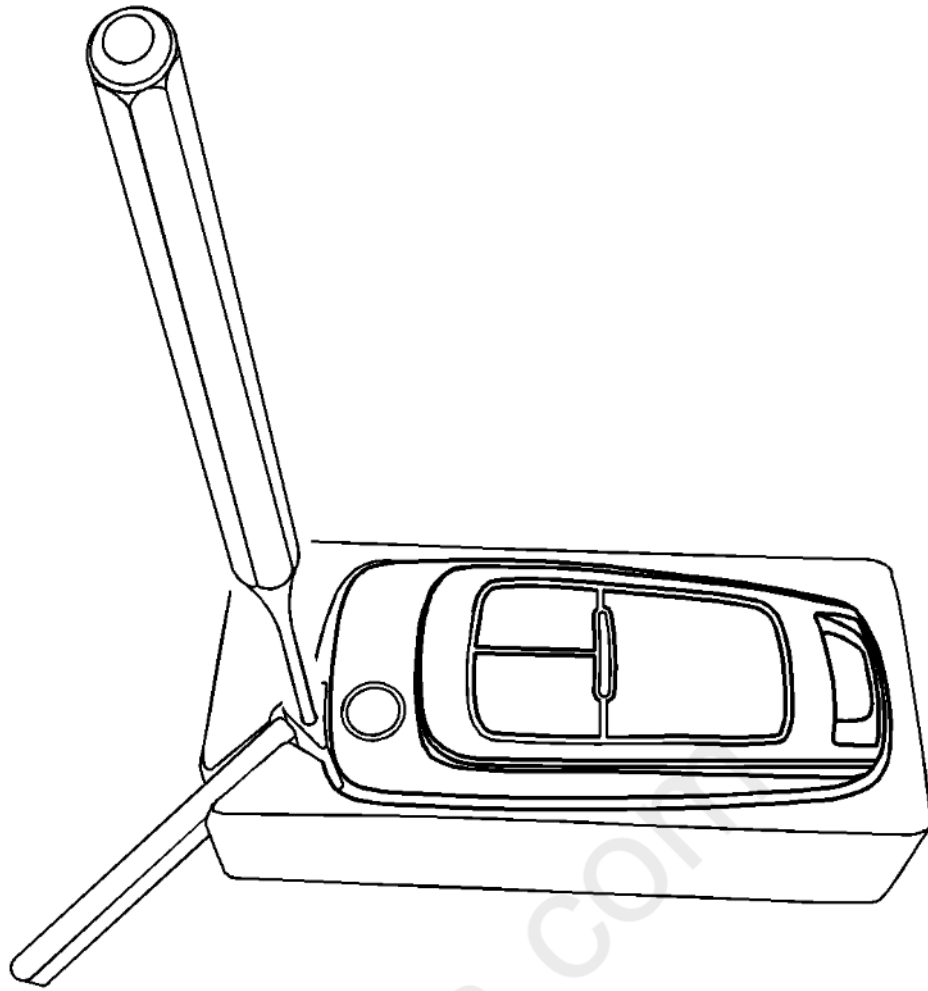


Fig. 14: Flip Key Blade Fixture

Courtesy of GENERAL MOTORS COMPANY

6. Using the **BO-51098** fixture, drive the roll pin flush to the surface.

INSTRUMENT PANEL COMPARTMENT DOOR LOCK CYLINDER CODING

The internal lock cylinder only uses 4 of the 8 cut positions, 5 - 8. The tumbler positions are on both sides, are not self-retaining, and are not snap in.

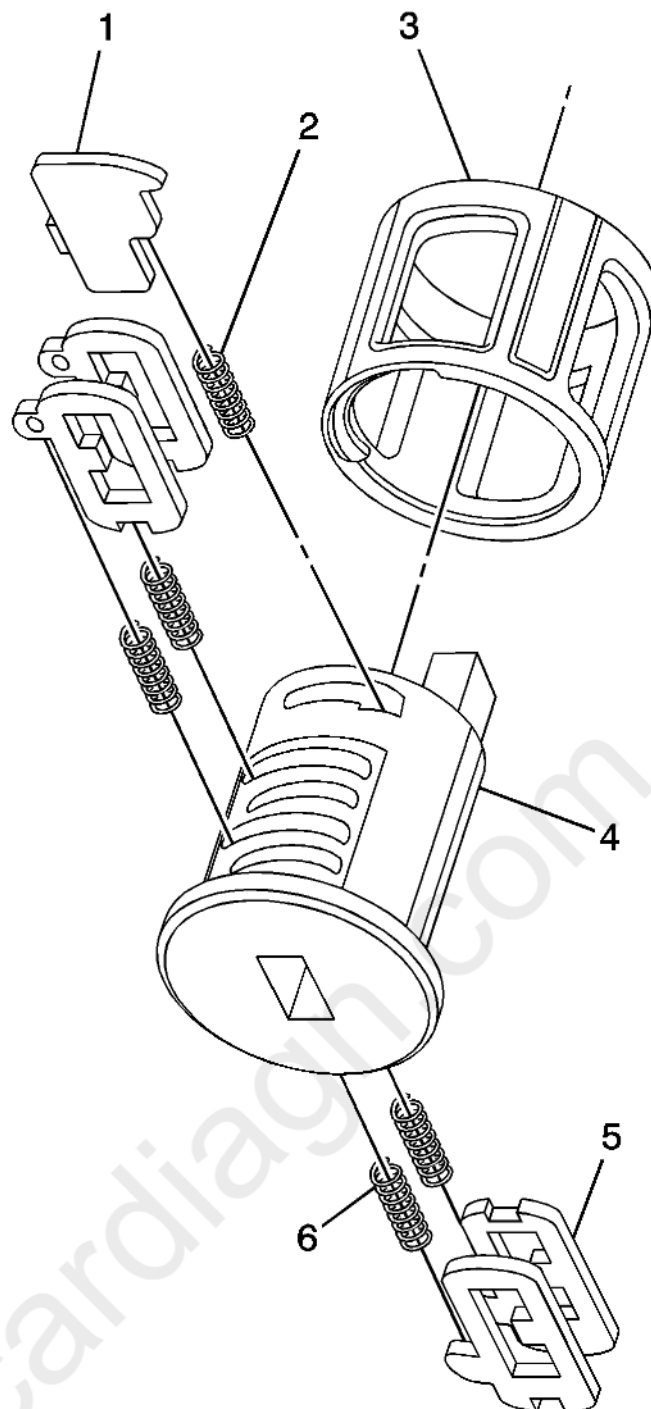


Fig. 15: Instrument Panel Compartment Door Lock Cylinder Components

Courtesy of GENERAL MOTORS COMPANY

NOTE: All lock cylinders for side milled keys have right and left tumblers. The location of the tooth of the tumbler determines whether it is right or left. Illustrations in this procedure show the right tumblers on the top and the left tumblers on the bottom. All tumblers are marked 1R, 1L, 2R, or 2L. The number being cut depth and the letter meaning right or left.

1. Hold the instrument panel (I/P) cylinder assembly (4) so the side with the tumbler spring pocket located closest to the head of the cylinder is facing up. This side of the cylinder uses left tumbler.
2. Insert the tumbler spring (6) into each of the 2 spring pockets of the cylinder assembly. This side uses left tumblers.
3. The first tumbler (5) to be loaded (closest to the head of the cylinder) will be the fifth key cut position, which is the fifth number in the key code. Install the tumbler in the slot over the spring.

Install the remaining tumblers following the key code and same process, pressing the tumblers in place until they are secure.

4. Rotate the cylinder assembly. Insert the tumbler spring (6) into each of the spring pockets of the cylinder assembly. This side uses right tumblers.
5. The first tumbler (5) to be loaded will be the sixth key cut position, the sixth number in the key code. Install the first tumbler in the slot over the spring. Install the remaining tumblers following the key code and same process, pressing the tumblers in place until they are secure.
6. Inspect for correct loading of the tumblers by inserting the key into the cylinder. All tumblers should drop flush with the lock cylinder body diameter.
7. Insert the sleeve (3) into the cylinder, the inner sleeve slot must be oriented to the head cylinder side. Rotate the sleeve until the slot match with the tab.
8. Insert the retainer spring (2) into the pocket and the tumbler retainer (1) over the spring. Make sure the tumbler retainer is properly seated and cannot pull out.
9. Lightly lubricate the outside surface in the tumbler area of the lock body and down the key slot using the provided grease. Insert and extract the key 5 times to lubricate the keyway.
10. When the key is removed, the lock should stay together.
11. Insert the key and function the lock 3 times to distribute the grease inside the sleeve.
12. Verify the key position for inserting the lock into the I/P compartment door.

FRONT SIDE DOOR LOCK CYLINDER CODING (FREE WHEELING)

Special Tools

BO-49753 Assembly Tool

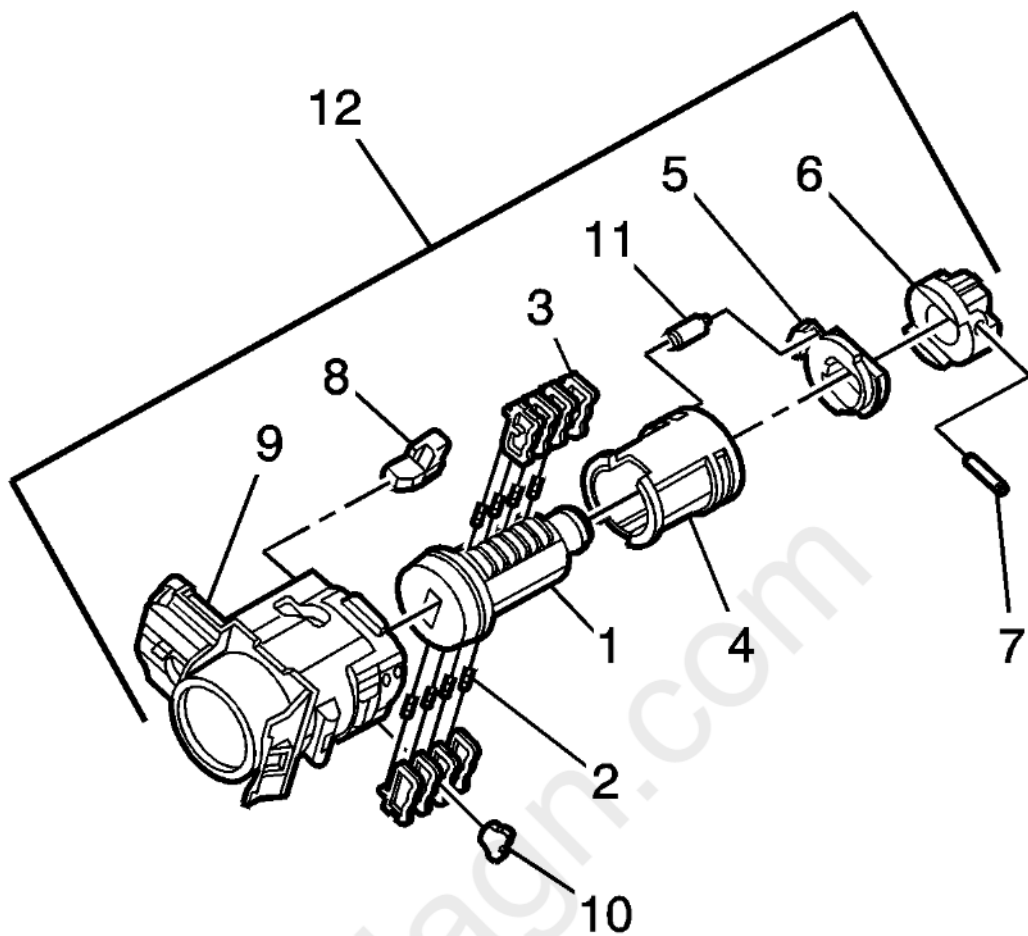


Fig. 16: Identifying Lock Components

Courtesy of GENERAL MOTORS COMPANY

The door lock cylinder uses 8 of the 8 cut positions. The tumbler positions are staggered from side to side, 4 on one side and 4 on the other, are not self-retaining, and are not snap in.

NOTE: All lock cylinders for side milled keys have right and left tumblers. The location of the tooth of the tumbler determines whether it is right or left. Illustrations in this procedure show the right tumblers on the top and the left tumblers on the bottom. All tumblers are marked 1R, 1L, 2R, or 2L. The number being cut depth and the letter meaning right or left.

1. Hold the door lock cylinder (1) so the side with the 4 tumbler spring pockets faces up, pocket nearest to the cylinder head.
2. Insert the tumbler springs (2) into the 4 spring pockets. This side uses left tumblers.

3. Install the tumbler (3) for key cut position one in the slot nearest to the front of the lock cylinder. Install the remaining tumblers, key cut positions 3, 5, and 7, following the key code and same process. Press the tumblers in place until they are secure.
4. Check the correct loading of the tumblers by inserting the key into the cylinder. All tumblers should be flush with the lock cylinder body.
5. Turn the cylinder so the side with the 4 tumbler spring wells faces up. This side uses right tumblers.
6. Insert the tumbler springs into the 4 spring pockets.
7. The first tumbler closest to the front of the lock cylinder to be loaded will be the second key cut position, the second number in the key code. Install the remaining tumblers for the key cut positions 4, 6, and 8. Press the tumblers in place until they are secure.
8. Check the correct loading of the tumblers by inserting the key into the cylinder. All tumblers should be flush with the lock cylinder body.
9. Insert the key and lightly lubricate the cylinder body diameter and tumbler surfaces and a small amount in the head of the cylinder using the supplied grease.
10. Insert the sleeve (4) onto the cylinder assembly.
11. Insert the clutch (5) and driver (6) onto the cylinder (1).

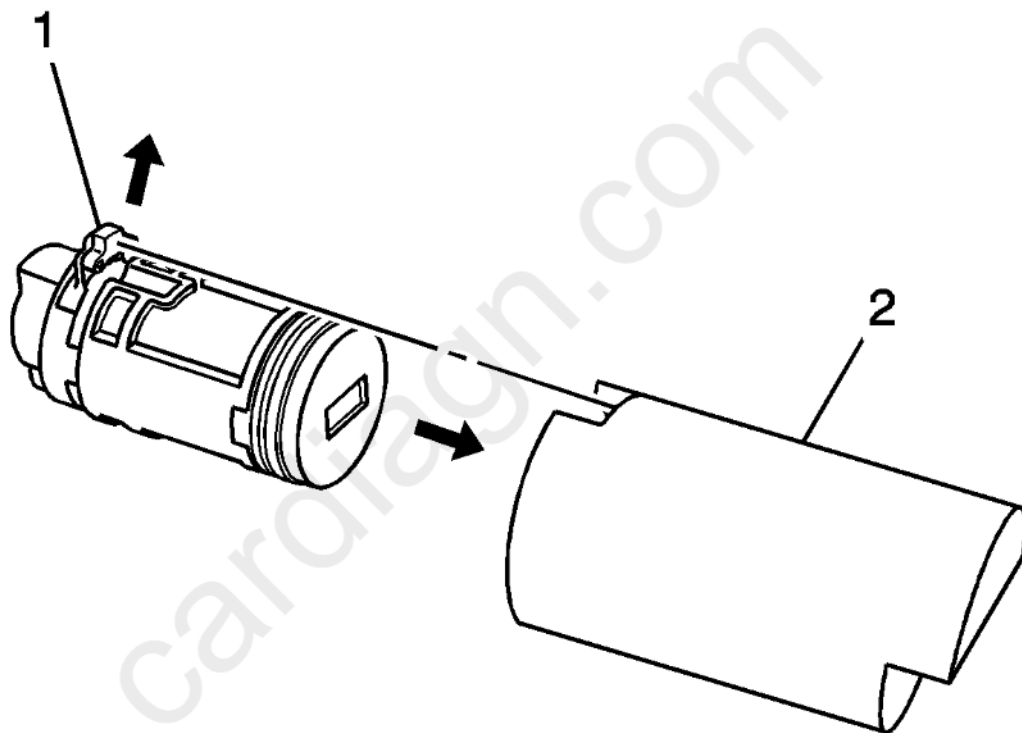


Fig. 17: Loading Cylinder Into Special Tool

Courtesy of GENERAL MOTORS COMPANY

12. Load the cylinder into the **BO-49753** assembly tool so that the clutch (1) indexes with the notch in the opening of the tool (2).

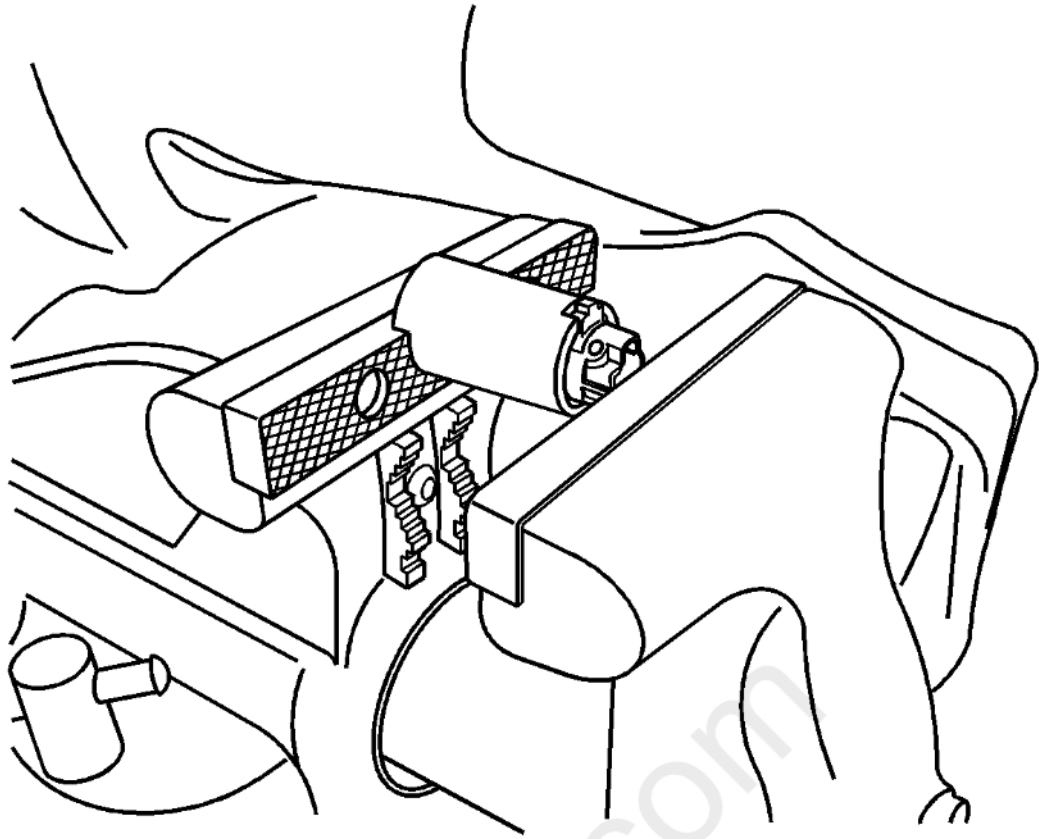


Fig. 18: Loading Assembly Tool Into Vice
Courtesy of GENERAL MOTORS COMPANY

13. Load the assembly tool with the lock cylinder into a vice and tighten the vice ONLY enough to hold the tool and lock the cylinder in place.

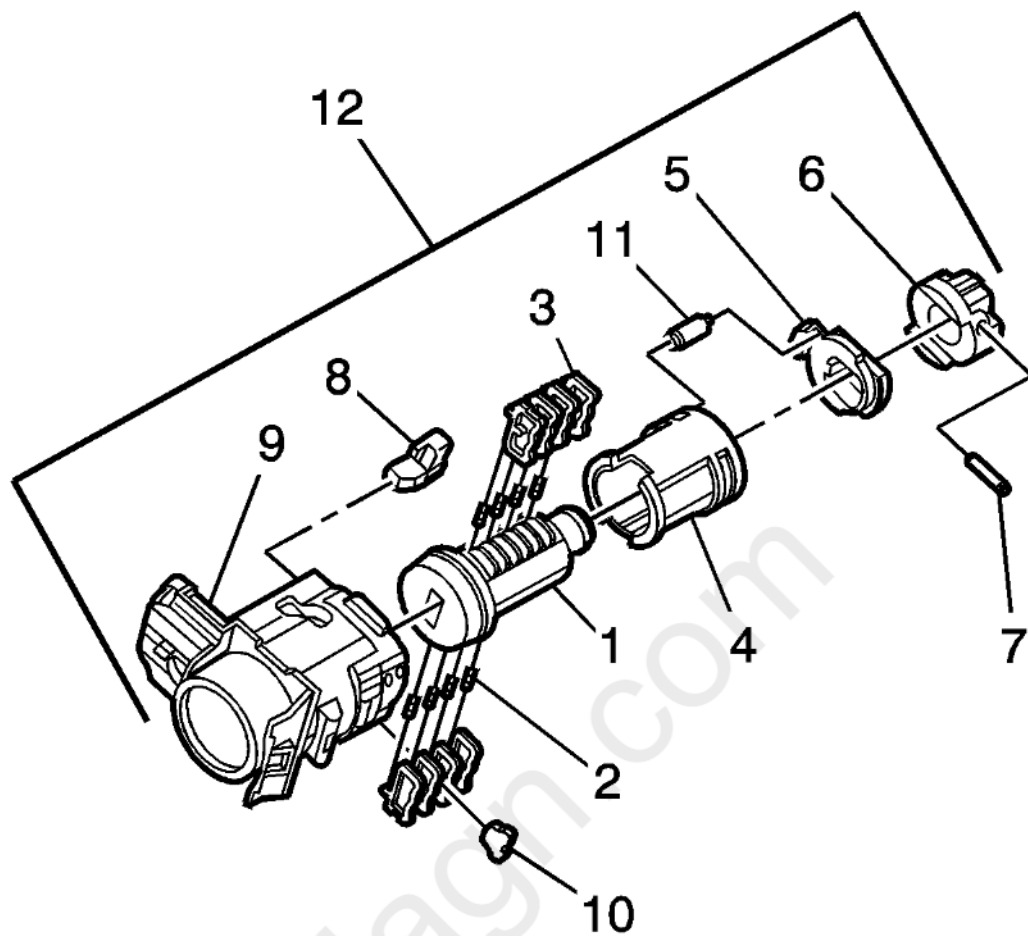


Fig. 19: Identifying Lock Components

Courtesy of GENERAL MOTORS COMPANY

14. Insert the roll pin (7) into the driver (6) and install it using a 1/16 inch pin punch.
15. Insert the buffer (8) in the case (9), verify the buffer is properly seated.
16. Install the free wheel pin (11) in the sleeve (4) and clutch (5) and insert the assembly into the case (9).
17. With the lock cylinder assembly installed in the case (9), install the retainer (10) and stake the retainer in place using a small punch and hammer to peen the case material onto the exposed ends of the installed retainer (10).
18. Insert the key into the lock and function the lock to check for proper assembly and smooth operation.

FRONT SIDE DOOR LOCK CYLINDER CODING (NON FREE WHEELING)

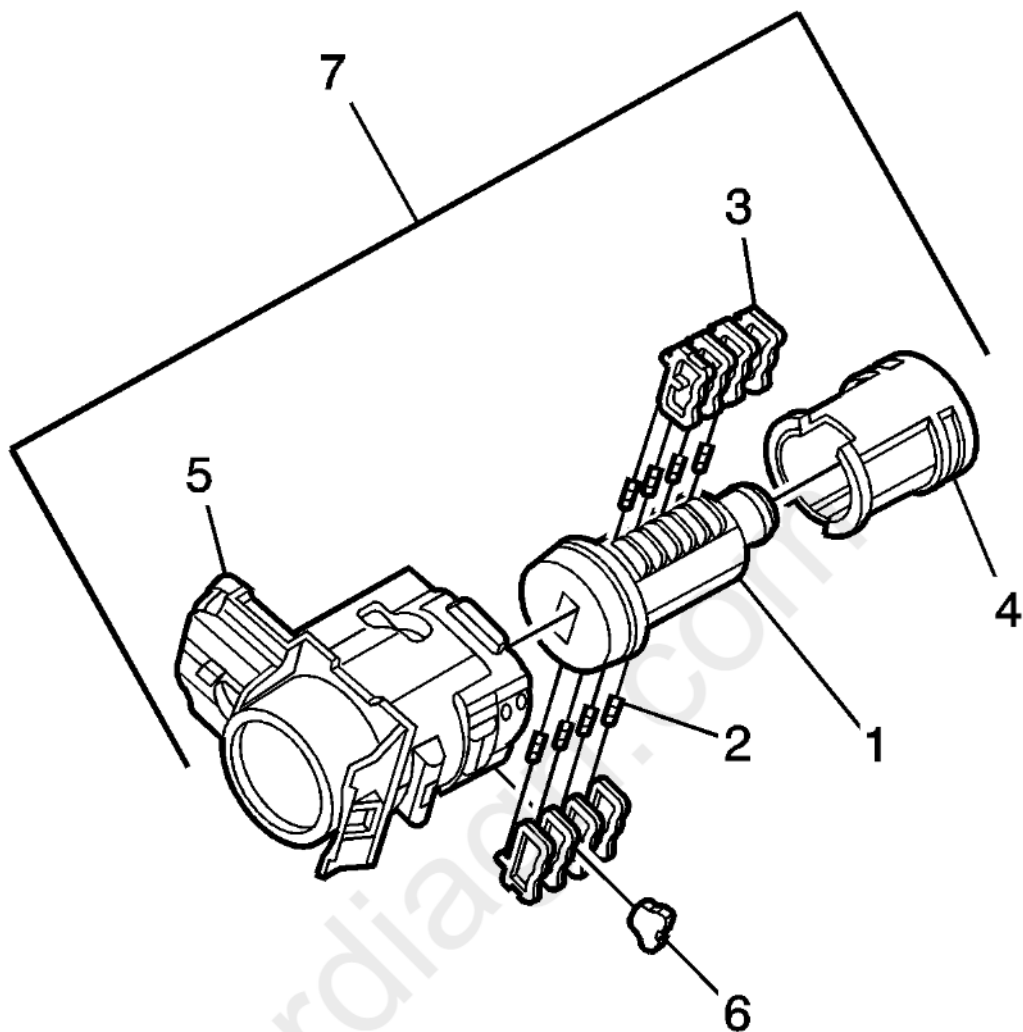


Fig. 20: Door Lock Cylinder Components (Non Free Wheeling)

Courtesy of GENERAL MOTORS COMPANY

The door lock cylinder uses 8 of the 8 cut positions. The tumbler positions are staggered from side to side, 4 on one side and 4 on the other, are not self-retaining, and are not snap in.

NOTE: All lock cylinders for side milled keys have right and left tumblers. The location of the tooth of the tumbler determines whether it is right or left. Illustrations in this procedure show the right tumblers on the top and the left tumblers on the bottom. All tumblers are marked 1R, 1L, 2R, or 2L. The number being cut depth and the letter meaning right or left.

1. Hold the door lock cylinder (1) so the side with the 4 tumbler spring pockets faces up, pocket nearest to the cylinder head.
2. Insert the tumbler springs (2) into the 4 spring pockets. This side uses left tumblers.

3. Install the tumbler (3) for key cut position one in the slot nearest to the front of the lock cylinder. Install the remaining tumblers, key cut positions 3, 5, and 7, following the key code and same process. Press the tumblers in place until they are secure.
4. Check the correct loading of the tumblers by inserting the key into the cylinder. All tumblers should be flush with the lock cylinder body.
5. Turn the cylinder so the side with the 4 tumbler spring wells faces up. This side uses right tumblers.
6. Insert the tumbler springs into the 4 spring pockets.
7. The first tumbler closest to the front of the lock cylinder to be loaded will be the second key cut position, the second number in the key code. Install the remaining tumblers for the key cut positions 4, 6, and 8. Press the tumblers in place until they are secure.
8. Check the correct loading of the tumblers by inserting the key into the cylinder. All tumblers should be flush with the lock cylinder body.
9. Insert the key and lightly lubricate the cylinder body diameter and tumbler surfaces and a small amount in the head of the cylinder using the supplied grease.
10. Insert the sleeve (4) onto the cylinder assembly.
11. Insert the assembly into the case (5).
12. With the lock cylinder assembly installed in the case (5), install the retainer (6) and stake the retainer in place using a small punch and hammer to peen the case material onto the exposed ends of the installed retainer (6).
13. Insert the key into the lock and function the lock to check for proper assembly and smooth operation.

LOCK CYLINDER CODING - IGNITION

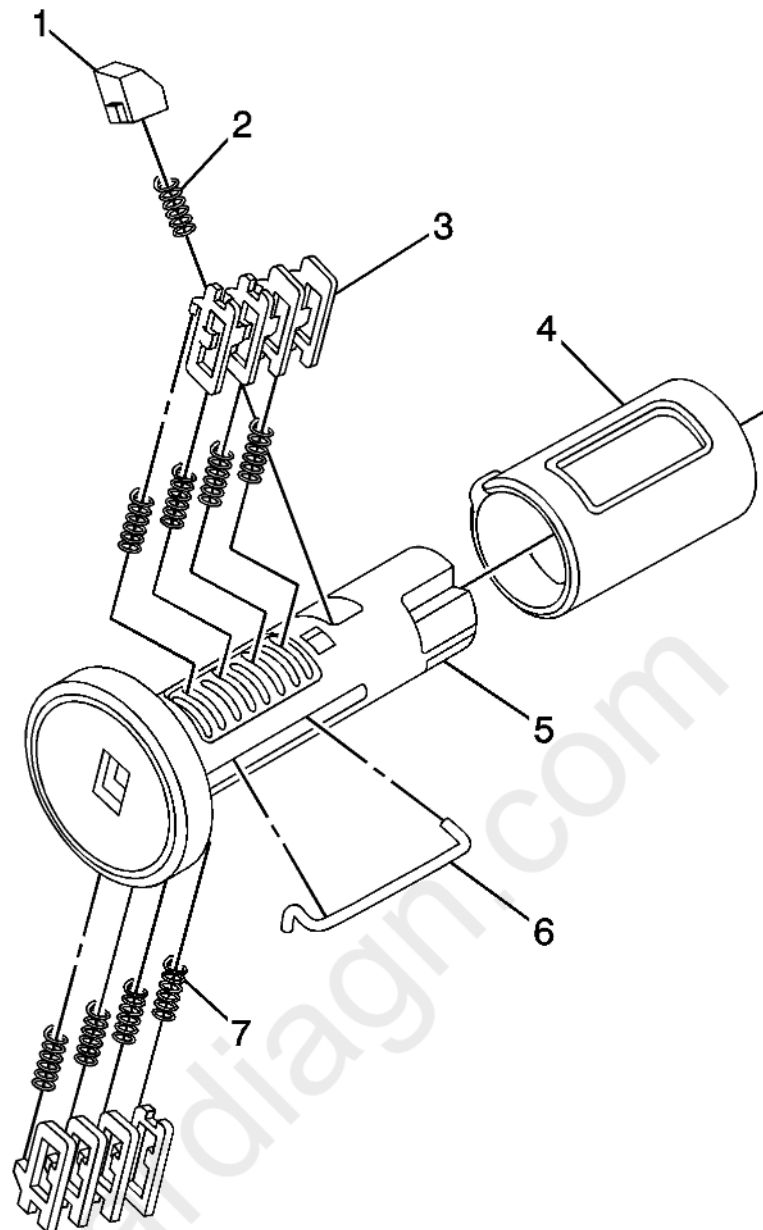


Fig. 21: Lock Cylinder Coding - Ignition

Courtesy of GENERAL MOTORS COMPANY

The ignition lock cylinder uses 8 key cut positions, 1 - 8. The ignition cylinder tumblers (3) are located on alternate sides of the cylinder (5). They are not snap-in and are not self-retaining. It follows the key code with the first tumbler being the first depth of the key code, closest to the head of the key.

NOTE: All lock cylinders for side milled keys have right and left tumblers. The location of the tooth of the tumbler determines whether it is right of left. Illustrations in this procedure show the right tumblers on the top and the left tumblers on the bottom. All tumblers are marked 1R, 1L, 2R, or 2L. The number being cut depth and the letter meaning right or left.

1. Hold the ignition cylinder assembly (5) so the side with the tumbler spring pocket located closest to the head of the cylinder is facing up.

2. Insert the tumbler spring (7) into each of the 4 spring pockets of the cylinder assembly. This side of the cylinder used left tumblers.
3. The first tumbler (3) to be loaded will be the first key cut position, which is the first number in the key code. Install the tumbler in the slot over the spring. Install the remaining right tumblers following the key code and same process, pressing the tumblers in place until they are secure.
4. Rotate the cylinder assembly. Insert the tumbler spring into each of the spring pockets of the cylinder assembly. This side of the cylinder used right tumblers.
5. The first tumbler (3) to be loaded will be the second key cut position, the second number in the key code. Install the first tumbler in the slot over the spring. Install the remaining left tumblers following the key code and same process, pressing the tumblers in place until they are secure.
6. Inspect for correct loading of the tumblers by inserting the key into the cylinder. All tumblers should drop flush with the lock cylinder body diameter.
7. With the key in the cylinder assembly insert the round connector (6), insert the retainer spring (2) in the retainer slot located in the cylinder assembly. Insert the retainer (1) lining it up in the slot over the spring. Depress the retainer and hold.
8. Insert the cylinder into the sleeve (4) as shown in the print. Make sure the actuator stays located properly in the cylinder.
9. When the key is removed, the lock should stay together.
10. Lightly lubricate the outside surface in the tumbler area of in the lock body and down the key slot using the provided grease. Insert and extract the key 5 times to lubricate the keyway.
11. Insert the key and function the lock 3 times to distribute the grease inside the sleeve.
12. Verify the key position for inserting the lock into the column.

REAR COMPARTMENT LID LOCK CYLINDER CODING

The door lock cylinder uses 8 of the 8 cut positions, 1 - 8. The tumbler positions are staggered from side to side, 4 on one side and 4 on the other, are not self-retaining, and are not snap in.

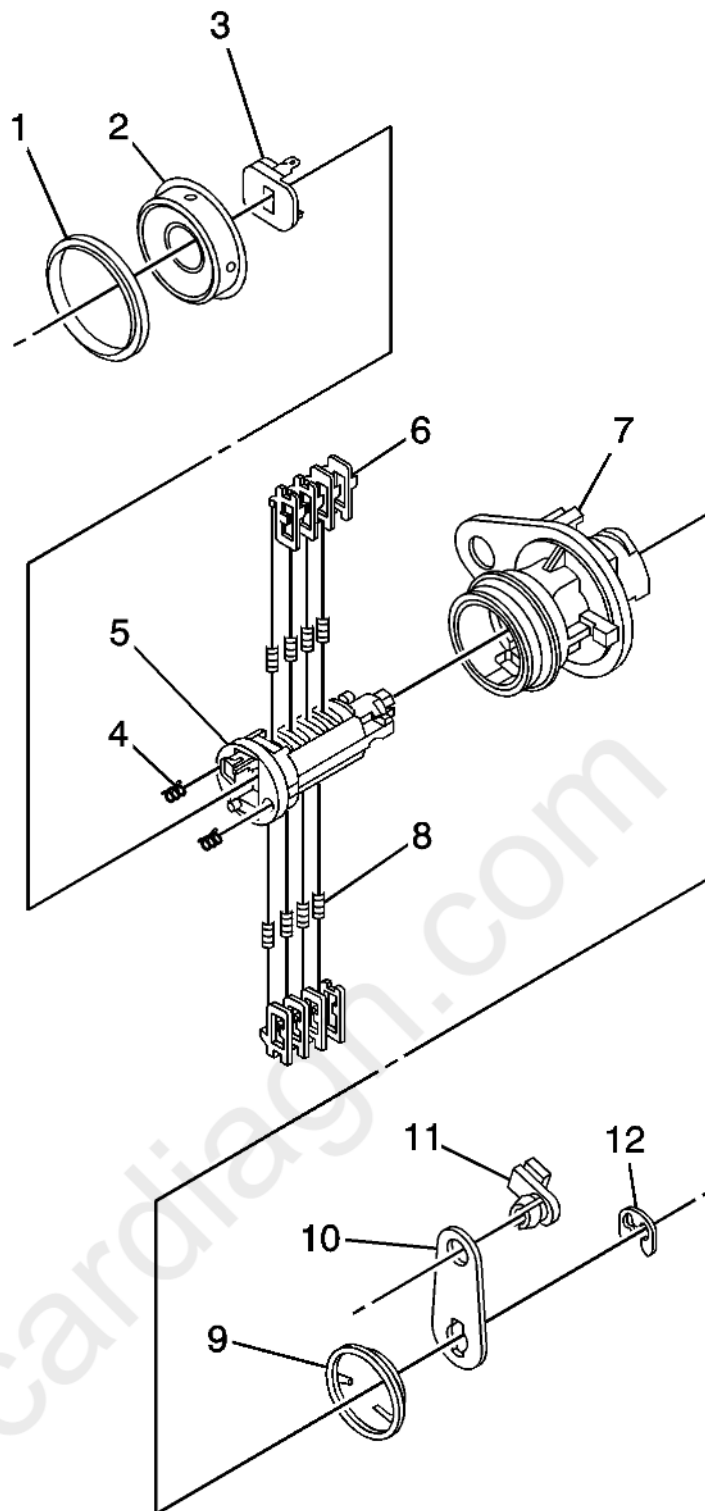


Fig. 22: Rear Compartment Lid Lock Cylinder Components

Courtesy of GENERAL MOTORS COMPANY

NOTE: All lock cylinders for side milled keys have right and left tumblers. The location of the tooth of the tumbler determines whether it is right or left. Illustrations in this procedure show the right tumblers on the top and the left tumblers on the bottom. All tumblers are marked 1R, 1L, 2R, or 2L. The number being cut depth and the letter meaning right or left.

1. Hold the cylinder (5) so the side with the 4 tumbler spring pockets nearest the cylinder head faces up. This side uses left tumblers.
2. Insert the tumbler springs (8) into the 4 spring pockets.
3. Install the tumbler (6) for key cut position one in the slot nearest to the front of the lock cylinder. Install the remaining tumblers, key cut positions 3, 5, and 7, following the key code and same process. Press the tumblers in place until they are secure.

4. Check the correct loading of the tumblers by inserting the key into the cylinder. All tumblers should be flush with the lock cylinder body.
5. Turn the cylinder so the opposite side spring pockets faces up. This side uses the right tumbler.
6. Insert the tumbler springs into the 4 spring pockets.
7. The first tumbler closest to the front of the lock cylinder to be loaded will be the second key cut position, the second number in the key code. Install the remaining tumblers for the key cut positions 4, 6, and 8. Press the tumblers in place until they are secure.
8. Check the correct loading of the tumblers by inserting the key into the cylinder. All tumblers should be flush with the lock cylinder body.
9. Insert the key and lightly lubricate the cylinder body diameter and tumbler surfaces and a small amount in the head of the cylinder using the supplied grease.
10. Install 2 springs (4) into the 2 spring pockets in the head of the lock cylinder.
11. Holding the tumblers snap the shutter assembly (3) onto the cylinder.
12. Insert the cylinder into the case assembly (7) and install the cap (2) and the gasket double (1) around the cap.
13. Add the torsion spring (9).
14. Insert the rod clip (11) in the lever (10) and place it in the cylinder assembly.
15. Insert the E-clip (12) to securely hold the lever to the cylinder.
16. Insert the key into the lock and rotate it to check for proper assembly and smooth operation.

LIFTING AND JACKING THE VEHICLE

NOTE:

- Make sure the vehicle is powered 'OFF' before lifting or jacking the vehicle.
- The use of a LOW PROFILE LIFT ARMS SYSTEM may be required to avoid unwanted contact with the vehicle's body and structure depending on lifting equipment used. Refer to the manufacture's recommendation for their applications of low profile lift arms system for their lifting equipment.

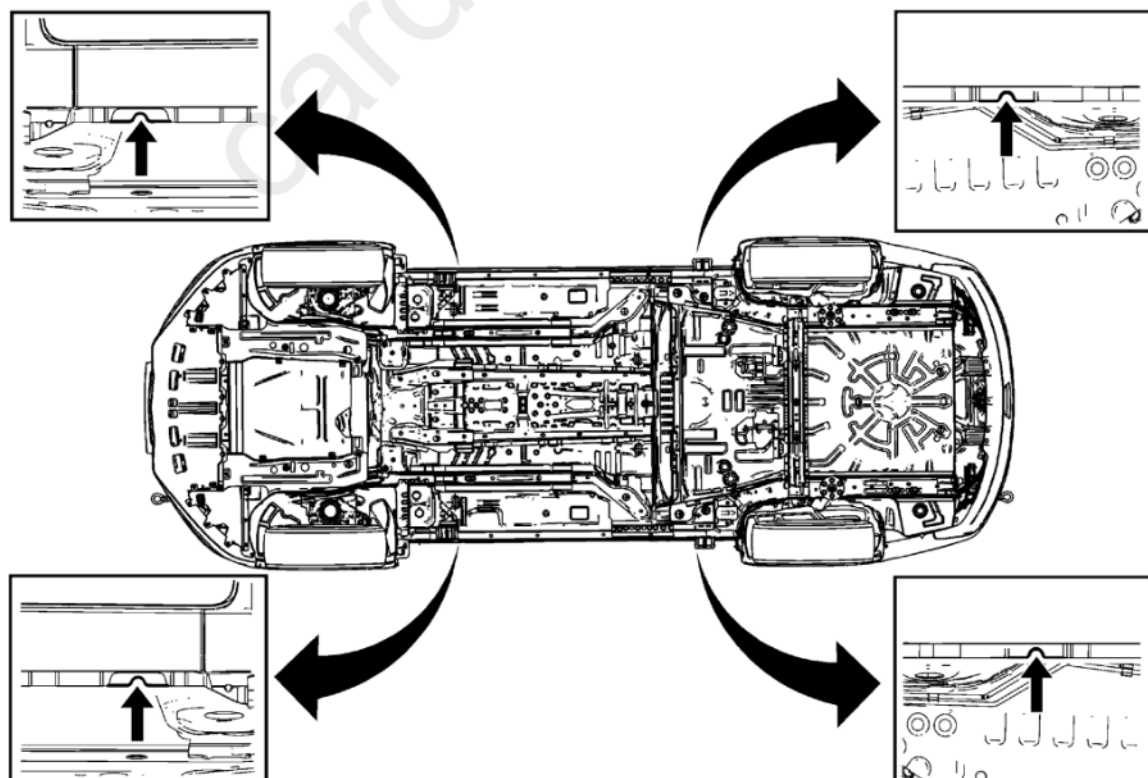


Fig. 23: Vehicle Hoisting Points

Courtesy of GENERAL MOTORS COMPANY

WARNING:

To avoid any vehicle damage, serious personal injury or death:

- When major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.
- When performing work in the engine compartment or under the vehicle, ensure that the hood is fully open, or opened to its secondary latch. When the hood is opened to the secondary latch, the vehicle will disable the remote start features from the key fob and OnStar mobile app. Failure to open the hood, or open the hood to the secondary latch while doing a repair in the engine compartment or under the vehicle can result in inadvertent vehicle starting which could result in personal injury or damage to a vehicle.

WARNING:

To avoid any vehicle damage, serious personal injury or death, always use the jackstands to support the vehicle when lifting the vehicle with a jack.

CAUTION:

Perform the following steps before beginning any vehicle lifting or jacking procedure:

- Remove or secure all of the vehicle contents in order to avoid any shifting or any movement that may occur during the vehicle lifting or jacking procedure.
- The lifting equipment or the jacking equipment weight rating must meet or exceed the weight of the vehicle and any vehicle contents.
- The lifting equipment or the jacking equipment must meet the operational standards of the lifting equipment or jacking equipment manufacturer.
- Perform the vehicle lifting or jacking procedure on a clean, hard, dry, level surface.
- Perform the vehicle lifting or jacking procedure only at the identified lift points. DO NOT allow the lifting equipment or jacking equipment to contact any other vehicle components.

Failure to perform the previous steps could result in damage to the lifting equipment or the jacking equipment, the vehicle, and/or the vehicle contents.

Vehicle Lifting - Frame Contact Lift

Front Lift Pads

When lifting the vehicle with a frame-contact lift, place the front lift pads on the rocker outer panel weld flange, as shown

Rear Lift Pads

When lifting the vehicle with a frame-contact lift, place the rear lift pads on the rocker outer panel weld flange, as shown.

Vehicle Jacking

CAUTION:

When you are jacking the vehicle at the front locations, be certain that the jack or the jack lift pad does not contact the front fascia, front fascia air dam, or the front fenders. If such contact occurs, vehicle damage may result. When jacking at selected front locations additional clearance may be required for the jacking points.

NOTE:

When you are lifting a vehicle with a service jack, block the wheels at the

opposite end from which you are lifting. Use jack stands to provide additional support.

Front of Vehicle

When using a service jack under the front of the vehicle use one of the following locations:

Place the service jack pad in the same location as shown for the front lift pads.

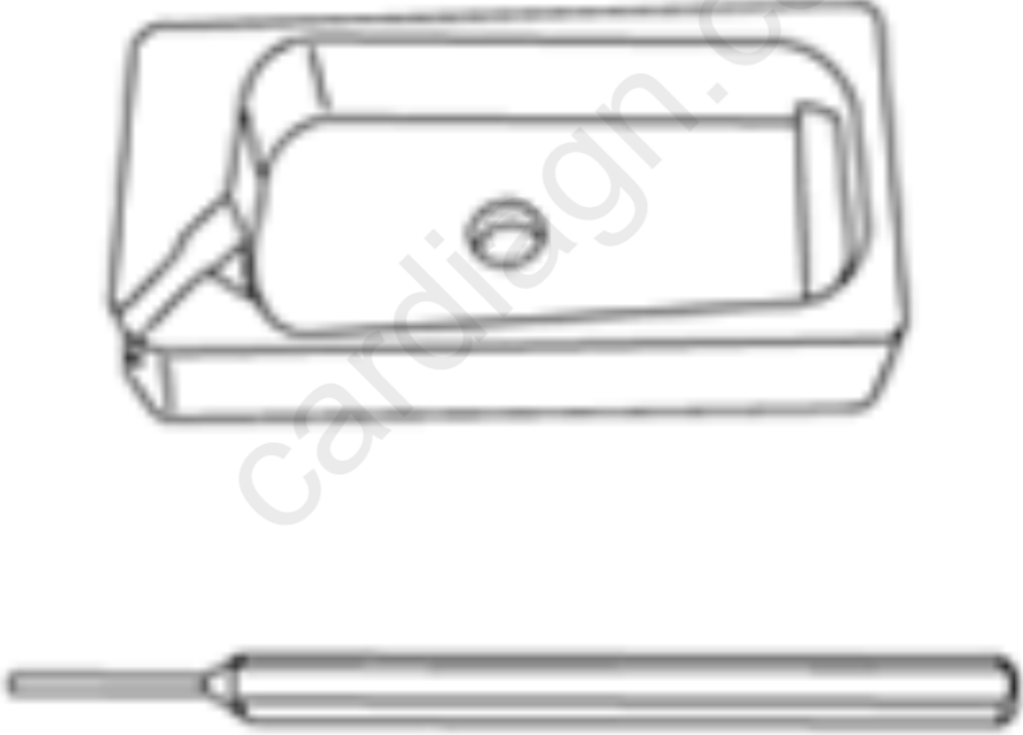
Rear of Vehicle

NOTE: Place jackstands **ONLY** under strong and stable vehicle structures.

Place the service jack pad in the same location as shown for the rear lift pads.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/ Description
	BO-51098 Flip Key Blade Fixture

SPECIAL TOOLS ORDERING INFORMATION

Special Tools

The special service tools shown in this service manual that have product numbers beginning with J, BO, GE, CH, DT, EN, EL, SA, OR KM are available for worldwide distribution.

US, Canada and Caribbean only:

NOTE: For Special Service tools only - see different location below for diagnostic tools & equipment.

Bosch Automotive Service Solutions

28635 Mound Road

Warren

MI

48092-3499

U.S.A

Phone: 1-800-GM-TOOLS

Monday through Friday

8:00 am - 7:00 pm Eastern Standard Time

Fax: 1-800-578-7375 or 586-578-7321

gmspecialservicetools.service-solutions.com

Mexico, Including Central America:

Bosch Automotive Service Solutions

Mitla No. 442 Col. Vertiz Narvarte

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Phone: +5255 2595 1630

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689-17 Geumjeong-dong, Gunpo-si, Gyeonggi-do, 435-862

Korea

Phone: 82-31-457-9520

sales.korea@servicesolutions.com

Fax: 82-31-427-9522

Greater China, SGM, SGMW, FAW-GM, GM OPEL China:

Bosch Automotive Service Solutions China

333 Fuquan Road North IBP, Changning District

Shanghai 200335 P.R.

Phone: 86-21-22182668

sales.cn@service-solutions.com

Fax: 0086 21 2218 2677

Australia:

Bosch Automotive Service Solutions Australia

1555 Centre Road,

Clayton

Vic. 3168

Phone: 1300 783 031

Fax: (3) 9541 6138

Inquiries can be sent to: customerservice.au@service-solutions.com

Iberica S.A.

Dealers based in Spain, Portugal and Canary Islands:

Bosch Automotive Service Solutions Europe

Nave 72 (Nudo Oeste), 19004 Guadalajara,

Spain

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