INNOVA
AUTOMOTIVE MADE EASY

GM CODE READER

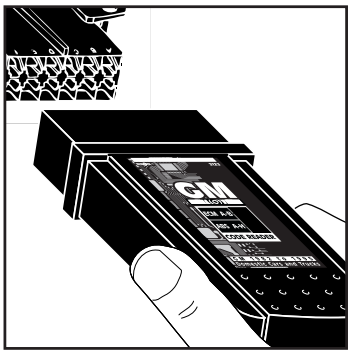
OWNER'S MANUAL

For General Motors and Saturn Vehicles from 1982 to 1995 (excluding Cadillac)

Table of Contents

1 Plug It In

- Test connector usually found under the left side of the dashboard.
- Set Selector switch to **ECM A-B** position.
- Make sure ignition is off. Plug Code Reader into test connector.

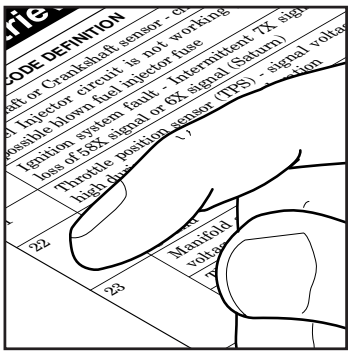


2 Read Fault Codes

- Turn on ignition. **DO NOT START ENGINE.**
- Read codes from flashing "Check Engine" or "Service Engine Soon" light.

3 Pinpoint Problems

- Locate fault code(s) in the appropriate Service Codes List.



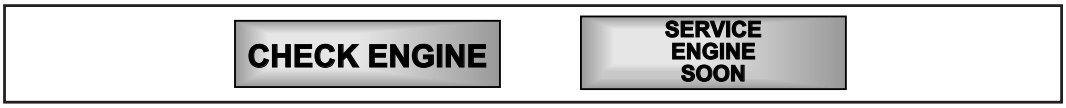
Read manual for a complete description of the Code Reader and it's proper use and operation.

1.1 YOUR VEHICLE'S COMPUTER SYSTEM

Today's vehicles are equipped with computer self-testing abilities that can locate problems in your vehicle and store them as service codes in the vehicle's onboard computer. The Code Reader allows you access to the computer's memory and recalls the service codes.

1.1.1 Instrument Panel Indicator Lights

Your vehicle's Instrument panel has several indicator lights, such as the "Check Engine", "Service Engine Soon", "ABS", "Shift to D2" and "Temperature" indicator lights. These lights do more than tell you to check for engine, brake, or other component malfunctions. They can also transmit the service codes in the computer memory by blinking on and off.



NOTE: *If your instrument panel indicator lights do not come on when you turn on the ignition, please refer to your vehicle's service manual. You may have problems in the car's circuitry. You must fix these problems before you can obtain service codes from the vehicle's onboard computer.*

1.1.2 Service Codes

The service codes are also called "fault codes", "diagnostic codes" or "trouble codes". These codes can be used to identify systems or components which are malfunctioning.

The computer records codes for two types of problems:

- **"Hard" Codes.** "Hard" codes are stored for problems which are happening now. The instrument panel indicator light will stay on when the engine is running.
- **"Intermittent" Codes or "Continuous Memory" Codes.** Intermittent service codes are stored in the computer's memory for problems which occur intermittently, or for problems which happened in the past but are not currently present. Intermittent problems may cause the panel indicator light to flicker or to turn on intermittently. Intermittent codes are stored in the computer's memory for a set period of time (usually 50 start cycles). If an intermittent problem does not recur within this time period, the computer automatically erases the related intermittent fault code from it's memory.

NOTE : *For Saturn vehicles, either the "Shift to D2" light or the "Temperature" indicator light is used to transmit Saturn Electronic Transmission codes.*

1.2 ABOUT YOUR CODE READER

The Code Reader is a device which connects to your vehicle's computer self-test connector. It allows the computer to output the service codes through the vehicle's instrument panel indicator lights. The Code Reader can be used to retrieve:

- Engine/Electronic Transmission codes (ECM/PCM)

  NOTE: *Unless otherwise indicated, any reference to ECM throughout this manual also applies to PCM.*

- Anti-Lock Brake System codes (ABS)

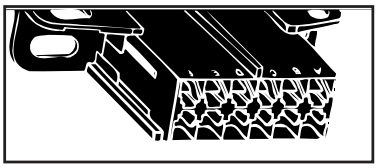
1.2.1 Controls and Indicators

Selector Switch – Selects operating mode for Code Reader:

- **ECM A-B** – Use to retrieve ECM codes
- **ABS A-H** – Use to retrieve ABS service codes

1.3 TEST CONNECTOR LOCATIONS

- The gateway to your vehicle's onboard computer.



Your vehicle test connector also known as the Assembly Line Data Link (ALDL) connector or Assembly Line Communication Link (ALCL) connector is usually black in color and is most likely found under the left side of the dashboard. Some connectors can be found on the right kick panel, under the center of the dashboard, on the side of the fuse block or under the ashtray in the center console. The connector might have a plastic cover on it labeled "Diagnostic Connector". If you have any questions about the connector's location, please refer to your vehicle's service manual for detailed information.

1.4 SAFETY PRECAUTIONS

- Always observe safety precautions whenever working on a vehicle.

a. Always wear safety eye protection.

b. Only work on your vehicle in a well-ventilated area.

c. Put transmission in “park” (for automatic) or “neutral” (for manual). Set parking brake.

d. Put blocks on drive wheels.

e. Avoid moving fan blades or any potentially moving parts.

f. Avoid hot engine parts.

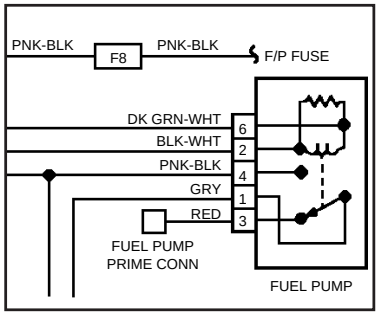
g. Turn off ignition before connecting (or disconnecting) any testing equipment.

h. Please read your vehicle’s service manual and follow it’s safety procedure.

1.5 VEHICLE SERVICE MANUALS

It is recommended that you consult the manufacturer’s instructions and specifications in these service manuals before any test or tune-up procedures are performed.

IMPORTANT: You **MUST** use the **wiring diagrams** in your vehicle's service manual to ensure proper connections during testing.



TYPICAL WIRING DIAGRAM

Contact your local car dealership, auto parts store, bookstore or public library for availability of these manuals. The following companies publish valuable repair manuals:

- General Motors Publications, Helm, Inc., 14310 Hamilton Ave., Highland Park, MI 48203, Phone: (800) 782-4356
- Haynes Publications, 861 Lawrence Drive, Newbury Park, California 91320, Phone: (805) 498-6703, Fax: (805) 498-2867
- Mitchell International, 14145 Danielson St., Poway, California 92064, Phone: (888) 724-6742
- Motor Publications, 5600 Crooks Road, Troy, Michigan 48098, Phone: (800) 426-6867, Fax: (313) 828-0215

1.6 PRELIMINARY VEHICLE DIAGNOSIS WORKSHEET

The purpose of this form is to help you gather preliminary information on your vehicle before you retrieve codes. By having a complete account of your vehicle's current problem(s), you will be able to systematically pinpoint the problem(s) by comparing your answers to the fault codes you retrieve. You can also provide this information to your mechanic to assist in diagnosis and help avoid costly and unnecessary repairs. It is important for you to complete this form to help you and/or your mechanic have a clear understanding of your vehicle's problems.

NAME:

DATE:

VIN*:

YEAR:

MAKE:

MODEL:

ENGINE SIZE:

VEHICLE MILEAGE:

*VIN: Vehicle Identification Number, found at the base of the windshield on a metallic plate, or at the driver door latch area (consult your vehicle owner's manual for location).

TRANSMISSION:

- ❑ Automatic
- ❑ Manual

Please check all applicable items in each category.

DESCRIBE THE PROBLEM:

WHEN DID YOU FIRST NOTICE THE PROBLEM:

- ❑ Just Started
- ❑ Started Last Week
- ❑ Started Last Month
- ❑ Other:

LIST ANY REPAIRS DONE IN THE PAST SIX MONTHS:

PROBLEMS STARTING

- ❑ No symptoms
- ❑ Will not crank
- ❑ Cranks, but will not start
- ❑ Starts, but takes a long time

ENGINE QUITS OR STALLS

- ❑ No symptoms
- ❑ Right after starting
- ❑ When shifting into gear
- ❑ During steady-speed driving
- ❑ Right after vehicle comes to a stop
- ❑ While idling
- ❑ During acceleration
- ❑ When parking

IDLING CONDITIONS

- ❑ No symptoms
- ❑ Is too slow at all times
- ❑ Is too fast
- ❑ Is sometimes too fast or too slow
- ❑ Is rough or uneven
- ❑ Fluctuates up and down

RUNNING CONDITIONS

- ❑ No symptoms
- ❑ Runs rough
- ❑ Lacks power
- ❑ Bucks and jerks
- ❑ Poor fuel economy
- ❑ Hesitates or stumbles on accelerations
- ❑ Backfires
- ❑ Misfires or cuts out
- ❑ Engine knocks, pings or rattles
- ❑ Surges
- ❑ Dieseling or run-on

AUTOMATIC TRANSMISSION PROBLEMS (if applicable)

- ❑ No symptoms
- ❑ Shifts too early or too late
- ❑ Changes gear incorrectly
- ❑ Vehicle does not move when in gear
- ❑ Jerks or bucks

PROBLEM OCCURS

- ❑ Morning
- ❑ Afternoon
- ❑ Anytime

ENGINE TEMPERATURE WHEN PROBLEM OCCURS

- ❑ Cold
- ❑ Warm
- ❑ Hot

DRIVING CONDITIONS WHEN PROBLEM OCCURS

- ❑ Short - less than 2 miles
- ❑ 2 ~ 10 miles
- ❑ Long - more than 10 miles
- ❑ Stop and go
- ❑ While turning
- ❑ While braking
- ❑ At gear engagement
- ❑ With A/C operating
- ❑ With headlights on
- ❑ During acceleration
- ❑ Mostly driving downhill
- ❑ Mostly driving uphill
- ❑ Mostly driving level
- ❑ Mostly driving curvy roads
- ❑ Mostly driving rough roads

DRIVING HABITS

- ❑ Mostly city driving
- ❑ Highway
- ❑ Park vehicle inside
- ❑ Park vehicle outside
- ❑ Drive less than 10 miles per day
- ❑ Drive 10 to 50 miles per day
- ❑ Drive more than 50 miles per day

GASOLINE USED

- ❑ 87 Octane
- ❑ 89 Octane
- ❑ 91 Octane
- ❑ More than 91 Octane

WEATHER CONDITIONS WHEN PROBLEM OCCURS

- ❑ 32 ~ 55° F (0 ~ 13° C)
- ❑ Below freezing (32° F / 0° C)
- ❑ Above 55° F (13° C)

CHECK ENGINE LIGHT / DASH WARNING LIGHT

- ❑ Sometimes ON
- ❑ Always ON
- ❑ Never ON

PECULIAR SMELLS

- ❑ "Hot"
- ❑ Sulfur ("rotten egg")
- ❑ Burning rubber
- ❑ Gasoline
- ❑ Burning oil
- ❑ Electrical

STRANGE NOISES

- ❑ Rattle
- ❑ Knock
- ❑ Squeak
- ❑ Other

2.1 VEHICLES COVERED

This Code Reader may be used to retrieve engine service codes from most General Motors (GM) and Saturn domestic cars and trucks (EXCEPT Geo, Nova, and Sprint). Includes all models EXCEPT Cadillacs and diesel vehicles. Specific makes and models are listed below.

Model Year	Make	Model
1982-93	Buick	Century, Electra, Electra Wagon, Estate Wagon, Le Sabre, Le Sabre Wagon, Park Avenue, Reatta*, Regal, Grand National, Riviera*, Roadmaster, Skyhawk, Skylark, Somerset
	Chevrolet	Berreta, Camaro, Caprice, Cavalier, Celebrity, Chevette, Citation, Corisca, Corvette, El Camino, Impala, Lumina, Monte Carlo
	Oldsmobile	Achieva, Calais, Custom Cruiser, Cutlass Calais, Ciera, Cutlass Cruiser, Cruiser Wagon, Cutlass Supreme, Supreme Classic, Delta 88, Eighty-eight, Firenze, Ninety-eight, Omega, Toronado*, Touring Sedan, Trofeo*
	Pontiac	6000, 6000 STE, Bonneville, Fiero, Firebird, Grand Am, Grand Prix, J 2000, Lemans, J Parisienne, Phoenix, Safari, Safari Wagon, Sunbird, T 1000
	Saturn	All models
	Trucks and Vans	All one ton capacity or less with gas engines
1994	Buick	Roadmaster 5.7 liter
	Chevrolet	Camaro 3.4 liter/5.7 liter, Caprice 5.7 liter, Caprice 5.7 liter, Cavalier 3.1 liter, Lumina 3.1 liter
	Pontiac	Firebird 3.4 liter/5.7 liter, Sunbird 2.0 liter/ 3.1 liter
	Saturn	All models
	Trucks and Vans	All one ton capacity or less with gas engines

Model Year	Make	Model
1995	Chevrolet	Caprice 4.3 liter
	Saturn	All models
	Trucks and Vans	All one ton capacity or less with gas engines (EXCEPT S/T Series vehicles)

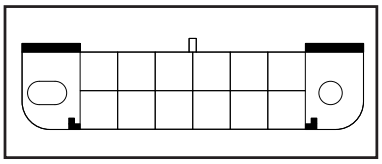
* Not applicable to models equipped with climate control computers

NOTE: *For 1994 and 1995 vehicles, only the models listed above are compatible with the Code Reader.*

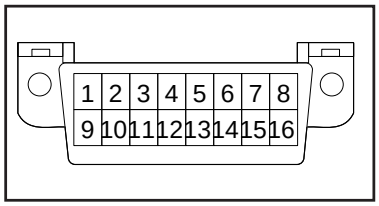
The Code Reader ***is not*** *compatible with 1996 and later model year vehicles.*

2.1.1 Vehicle Test Connector

GM and Saturn vehicles use one of two types of test connectors: 12-pin or 16-pin.



- **12-Pin Connector:** The 12-pin connector was phased out completely in 1996. Some 1994 and 1995 vehicles still use the 12-pin connector, but because of changes in the ECM, the Code Reader is not compatible with some of these systems (see paragraph 2.1).



- **16-Pin Connector:** The new 16-pin connector was introduced on some 1994 and 1995 models, and was made standard equipment on all 1996 and subsequent model year vehicles. **The Code Reader will not work on vehicles equipped with the 16-pin connector.**

2.2 BEFORE YOU BEGIN

- Fix any known mechanical problems before performing any test.

Make a thorough check before starting any test procedure. Loose or damaged hoses, wiring, or electrical connectors are often responsible for poor engine performance, and in some cases they may cause a “false” fault code.

Please read your vehicle's service manual for proper connection of vacuum hoses, electrical wiring, and wiring harness connectors. Check the following areas:

a. All fluid levels
b. Air cleaner and ducts
c. Belts
d. Mechanical linkage associated with sensor
e. Vacuum hoses
f. Spark plugs and wires
g. Electrical wiring
h. Electrical connectors
i. Proper battery voltage
j. Fuel system components

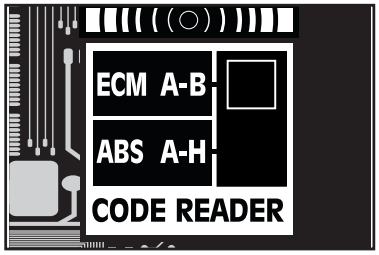
2.3 RETRIEVING SERVICE CODES

- Always observe safety precautions before and during the testing process.
- Fix any known mechanical problems before this test.
- Have pencil and paper handy.

1. Turn off ignition.

2. Connect the Code Reader to the vehicle test connector.

NOTE: *The Code Reader only fits into the connector one way.*



3. Set Selector Switch to **ECM A-B** position.

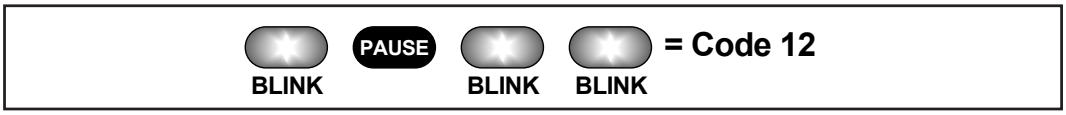
4. Turn on ignition. **DO NOT START THE ENGINE.**

5. Read codes from the "Check Engine" or "Service Engine Soon" light (from the "Shift to D2" light - 1991 and 1992 models or the "Temperature" indicator light - 1993 and subsequent - for Saturn Electronic Transmission codes) on your vehicle's instrument panel. Be sure to write the codes down.

NOTE: *If the light does not blink, refer to your vehicle's service manual for information on checking the circuitry.*

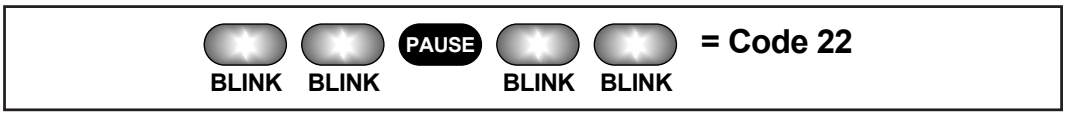
- All codes are two digits.

- Each code is transmitted three times before the next code is sent.
- Code sets will begin with Code 12 ("System Pass") even if fault codes are present.
- The codes will continue to be sent as long as the ignition is on and the Code Reader is connected.
- Count blinks to get the service codes:
- Code 12 looks like:



NOTE: *Code 12* ***is not*** *a fault code. Code 12 indicates the computer's self-diagnostic system is functioning properly (SYSTEM PASS). If code 12 is the only code which displays when you perform the diagnostic test, this means there are no fault codes stored in the vehicle's computer. Consult your vehicle's repair manual for "no codes" problems.*

- Code 22 looks like:



IMPORTANT: Any code that ends in zero ("0") is transmitted as follows:

- Code 30 looks like:

6. Next, erase service codes (see paragraph 2.4). This will help you determine which codes are "hard" faults and which codes are "intermittent" faults.
7. Turn on ignition, start engine, and observe "Service Engine Soon" light; light should turn off. Run engine for several minutes (to allow engine to reach normal operating temperature), then observe "Service Engine Soon" light:

■ If "Service Engine Soon" light turns on, turn off ignition and repeat steps 2 through 5. This reveals "hard" fault codes.

NOTE: *It may be necessary to test drive the vehicle to reset "hard" fault codes 13, 15, 24, 44, 45, and 55 after they have been erased.*

- If "Service Engine Soon" light does not turn on, the initial stored fault codes were all "intermittent" fault codes. (Refer to the "Diagnostic Procedures" section in the manufacturer's service manual for your vehicle.)

8. Follow the testing and repair procedures outlined in the manufacturer's service manual for your vehicle to correct "hard" faults. Codes should be addressed and eliminated in the order they were received, erasing and retesting after each repair is made to be sure the fault was eliminated. Code 12 will appear alone when no other fault codes are present.

NOTE: *Whenever codes 51, 52, 54, or 55 are displayed with other codes, troubleshoot and eliminate the "50 Series" codes first, then proceed with the lower-numbered codes.*

9. Turn off ignition and remove the Code Reader.

2.3.1 Servicing Fault Codes

Diagnostic trouble codes indicate a problem in a circuit, not necessarily a faulty component. **DO NOT** replace components based only on trouble codes without first following the service procedures described in your vehicle's repair manual. Most faults (including those that set trouble codes) are caused by damaged, shorted or open wiring, damaged or corroded connections, improper voltages or grounds, or other mechanical problems.

Sometimes a fault in one circuit or system will cause the computer to set a fault code for a different circuit or system.

Example:

A defective spark plug wire can cause a "rich condition" fault code to be set on the oxygen sensor circuit. In this case, replacing any component in the oxygen sensor circuit will not correct the fault, because the problem is caused by the defective spark plug wire and not by the oxygen sensor circuit. This is called a "false" code.

For this reason, it is **IMPORTANT** that you make a thorough inspection of all systems: wiring, hoses, vacuum, engine mechanical, charging, ignition, power, ground, fuel, (some of these systems are not connected to the computer system, but

will still affect it) before retrieving trouble codes. Refer to your vehicle's service/repair manual for specifications and system testing procedures which apply to your particular vehicle.

2.4 ERASING SERVICE CODES

- Always observe safety precautions before and during testing process.

1. Turn off ignition.
2. Remove ECM fuse from the fuse block or disconnect the negative battery cable to disconnect power to the vehicle's computer.
3. Wait fifteen seconds for codes to be erased from the computer's memory.
4. Reconnect ECM fuse or reconnect negative battery cable.

NOTE: *Once the computer's memory has been erased your vehicle may run rough for up to 40 miles while new information is being saved in the vehicle's computer. If the battery cable is removed, you will have to reprogram your radio, clock and memory seat position.*

2.5 ECM SERVICE CODES

- Consult your vehicle's service manual for detailed meanings or definitions related to your vehicle.

Refer to the appropriate service codes table for your vehicle:

2.5.1 GM Engine/Electronic Transmission Service Codes; Saturn Engine Service Codes

2.5.2 Saturn Electronic Transmission Service Codes

Refer to the "Diagnostic Charts" and "Diagnostic Aids" in your vehicle's service manual to further assist in the fault isolation and elimination process.

2.5.1 GM Engine/Electronic Transmission Service Codes; Saturn Engine Service Codes

CODE	SERVICE CODE DEFINITION
11	*(Saturn vehicles ONLY):* Indicates transmission service codes will be displayed next on the "Shift to D2" light (1991-92 models) or "Temperature" indicator light (1993 and later models)
12	Diagnostic mode; no distributor signal to Electronic Control Module; System PASS
13	Oxygen sensor signal fault - signal too low / open left oxygen sensor circuit (Dual sensor models)
14	Coolant sensor or circuit fault - signal voltage low or shorted
15	Coolant temperature sensor or circuit fault - signal voltage high
16	Battery or alternator problem - voltage too high or low
	Direct ignition system (DIS) fault line open or shorted to ground
	Ignition system fault - loss of 2X or Low Resolution Pulse signal
	Transmission speed error
17	RPM signal problem
	Camshaft sensor - circuit problems
	Electronic Control Module (ECM) computer circuit problem - Pull-up resistor (Saturn)
18	Camshaft or Crankshaft sensor - circuit problems
	Fuel Injector circuit is not working properly - possible blown fuel injector fuse
19	Ignition system fault - Intermittent 7X signal or loss of 58X signal or 6X signal (Saturn)
21	Throttle position sensor (TPS) - signal voltage is high
22	Throttle position sensor (TPS) - signal voltage is low
	Fuel cutoff relay circuit - open or shorted to ground
23	Manifold air temperature (MAT) sensor - signal voltage is low or high
	Throttle position sensor (TPS) error
	Mixture Control (M/C) solenoid - open or short circuit problems
	Intake Air Temperature Sensor (IAT) low

CODE	SERVICE CODE DEFINITION
24	Vehicle speed sensor (VSS) - open or short circuit problems or park/neutral switch circuit problem
25	Manifold air temperature (MAT) sensor - signal voltage is low or high
	Vacuum switching valve circuit open or shorted to ground
	ATS sensor - signal voltage is high or low
26	Quad-Driver module or Quad-driver No. 1 error
27	2nd gear switch problem
	Quad-Driver module or Quad-driver No. 2 error
28	3rd gear switch
	Quad-Driver module or Quad-driver No. 3 error (Corvette)
	(Transmission) Fluid pressure switch assembly - open or short circuit problems
29	4th gear switch
	Quad-Driver module or Quad-driver No. 3 error
	Secondary air injection system - circuit problems
31	Manifold absolute pressure (MAP) sensor - signal voltage is low
	Fuel injector
	Park/Neutral switch - circuit problems
	CAM sensor - circuit problems
	Engine speed control governor malfunction (Van)
	Turbocharger wastegate overboost
	Wastegate electrical signal - open or shorted to ground
	Purge solenoid voltage high (carburetor engines)
32	Barometric pressure (BARO) sensor circuit failure
	Exhaust gas recirculation (EGR) valve diagnostic switch - closed during engine start-up or open when EGR flow requested by ECM
	Electronic vacuum regulator valve (EVRV) error (EVRV controls EGR vacuum)

CODE	SERVICE CODE DEFINITION
33	Mass air flow (MAF) sensor - signal voltage or frequency is high during engine idle
	Manifold absolute pressure (MAP) sensor - signal voltage is high during engine idle (Note: Engine misfire or unstable idle may cause this code)
34	Mass air flow (MAF) sensor - signal voltage or frequency is low during engine cruise
	Manifold absolute pressure (MAP) sensor - signal voltage is low during ignition on
	Pressure sensor circuit - signal voltage too high or low (carburetor engines)
35	Idle air control (IAC) system problem - can not set desired RPM or idle speed actuator (ISA) carbureted system problems
36	Mass air flow (MAF) sensor - burn-off circuit problem
	Transmission shift problem (electronically controlled transmissions only)
	Direct ignition system (DIS) fault - loss of 24X signal or extra or missing pulses in electronic spark timing (EST) signal
	Ignition system fault - loss of High Resolution Pulse signal
37	Brake switch stuck"on"
38	Brake switch circuit fault
	Knock sensor (KS) - open circuit problem
39	Torque converter clutch (TCC circuit fault)
	Clutch switch circuit problems
	Knock sensor (KS) - short circuit problem
41	Cam sensor (CAM) failure
	Cylinder select error
	Tach input error - no reference pulses during engine run
	Electronic spark timing (EST) circuit - open or shorted to ground during engine run
	Direct ignition system (DIS) fault - bypass circuit open or shorted to ground during engine run
	Ignition system fault - loss of 1X Reference Pulse signal

CODE	SERVICE CODE DEFINITION
42	Electronic spark timing (EST) circuit - open or shorted
	Direct ignition system (DIS) fault - bypass circuit open or shorted to ground during engine run
	Fuel cutoff relay circuit - open or shorted to ground
43	Electronic spark timing (EST) circuit - low voltage detected
	Electronic spark control (ESC) - circuit problems
44	Lean exhaust indicated (Left side on dual oxygen models)
45	Rich exhaust indicated (Left side on dual oxygen models)
46	Vehicle anti-theft system (VATS) failure
	Power steering pressure switch failure
47	Circuit or component problem in ECM/PCM (communication error)
	Knock sensor module error (inside computer)
48	Misfire symptom
	Mass air flow (MAF) sensor - circuit error
49	RPM is high at idle (possible vacuum leak)
50	System voltage is low
51	Computer problem; faulty, wrong or incorrectly installed PROM circuit; or ECM/PCM failure
52	Calibration Package Chip or ECM fault or oil temperature sensor fault/low engine temperature (Corvette); faulty or missing PROM/Calibration Package Chip; ECM problem
	System voltage high for a long period of time
53	System voltage too high (over 17.7 volts to ECM) or EGR system fault or alternator voltage not normal or Vehicle Anti-Theft System fault
54	Fuel pump circuit fault or Mixture Control (M/C) solenoid fault or Electronic Control Module (ECM) fault/EGR solenoid #2 failure (3.8L VIN1)
	Fuel pump relay
55	Electronic Control Module (ECM) fault or oxygen sensor circuit fault or EGR solenoid #3 failure (3.8L VIN1) or fuel lean monitor (Corvette)

CODE	SERVICE CODE DEFINITION
56	Vacuum sensor circuit fault or quad driver "B" fault (3.8L VIN1)
	Corrosivity/add coolant
57	Boost control problem (3.8L VIN1)
58	Vehicle Anti-Theft System fault (3.8L)
	Transmission Temperature Sensor (TTS) - short circuit
	Transmission fluid temp high
59	Transmission Temp Sensor (TTS) - open
	Transmission fluid temp low
60	Transmission not in drive
61	Oxygen sensor signal fault or port throttle system fault or on-board cruise control fault (vent solenoid circuit)
	Air Conditioner (A/C) system performance problems
62	Engine oil temperature sensor fault or gear switch signal circuit fault or on-board cruise control fault (vacuum solenoid circuit)
63	EGR flow problem or on-board cruise control problem Servo Position Sensor (SPS) circuit fault or Manifold Absolute Pressure (MAP) sensor fault or oxygen sensor fault
64	EGR flow problem or on-board cruise control problem or Manifold Absolute Pressure (MAP) sensor fault or oxygen sensor fault
65	EGR flow problem or on-board cruise control problem Servo Position Sensor (SPS) circuit fault or Manifold Absolute Pressure (MAP) sensor fault or oxygen sensor fault or fuel injector current low
66	Electronic Control Module (ECM) computer circuit fault or air conditioning pressure sensor circuit fault or low air conditioning refrigerant charge
	(Transmission) 3-2 shift control solenoid - circuit problems
67	Cruise control - switch circuit problems
	Air Conditioner (A/C) pressure sensor - circuit problems
	Torque Converter Clutch (TCC) solenoid - circuit problems
	Cruise control switches - circuit problems

CODE	SERVICE CODE DEFINITION
68	On-board cruise control switch circuit problems Servo Position Sensor (SPS) circuit fault or shorted A/C clutch relay circuit (Corvette) or overdrive ratio error
69	Air conditioning head pressure switch circuit fault or air conditioning pressure switch problem
	Torque converter clutch stuck "on"
70	Air conditioning refrigerant pressure sensor circuit fault (high pressure) or quad driver module error
71	Air conditioning evaporator temperature sensor circuit fault (low temp.)
72	Gear select switch circuit fault - Corvette only
	Vehicle Speed Sensor (VSS) - loss of signal
73	Air conditioning evaporator temperature sensor circuit fault (high temp.)
	(Transmission) Pressure control solenoid - circuit problems
74	Traction control circuit voltage low
75	Digital EGR fault - #1 solenoid or system voltage low (charging system problem)
	Transmission voltage low
76	Digital EGR fault - #2 solenoid
77	Digital EGR fault - #3 solenoid
	Primary cooling fan relay driver circuit - circuit problems
78	Secondary cooling fan relay driver circuit - circuit problems
79	Vehicle Speed Sensor (VSS) - signal voltage too high
	Transmission Temperature Sensor (TTS) - high temperature
80	Vehicle Speed Sensor (VSS) - signal voltage too low; transmission component fault
81	QDM Solenoid "B" monitored voltage differs from commanded
	Anti-Lock Brake System (ABS) message fault (Saturn)
	Brake switch circuit problems

CODE	SERVICE CODE DEFINITION
82	Internal PCM communication fault (Saturn) or QDM Solenoid "A" monitored voltage differs from commanded
	Ignition system fault - 3X signal problem
83	Torque Converter Clutch (TCC) solenoid - circuit problems
	Reverse Inhibit - open or short circuit in reverse inhibit solenoid
84	3-2 Control solenoid - open or short circuit problems
	Skip shift solenoid - open or short circuit problems
85	Programmable Read Only Memory error or undefined gear ratio (input or output sensor failure)
	Torque converter clutch (TCC) - TCC is mechanically stuck on
86	Analogue/Digital Electronic Control Module (ECM) error or shift Solenoid "B" stuck on
87	Electrically Erasable Programmable Read Only Memory (EEPROM) error or shift Solenoid "B" stuck off or high gear ratio error
88	Electronic Control Module (ECM) computer circuit fault
89	Power Management fault
90	TCC error
91	Skip shift light - open or short circuit problems in skip shift light circuit
93	Pressure control solenoid - transmission line pressure not at desired level
95	Change oil light - wrong voltage is present in light circuit for more than 26 seconds
96	Transmission voltage low - low system voltage possibly caused by generator voltage supply circuit or power train control module
	Low oil light - wrong voltage is present in light circuit for more than 26 seconds
97	Vehicle speed sensor (VSS) - output circuit problems
99	Tachometer output circuit problems

2.5.2 Saturn Electronic Transmission Service Codes

- Transmission codes will be transmitted (if present) after all engine codes are transmitted and code 11 has been sent. Code 11 indicates that transmission codes are present and will be transmitted on the "Shift to D2" light (1991-92 models) or the "Temperature" indicator light (1993 and later models).

CODE	SERVICE CODE DEFINITION
13	Line pressure high
14	Line pressure low
15	Hot light
16	No 1st gear
	Electrical variable orifice (EVO) fault
17, 18	No gears available
21	2nd gear stuck "on"
22	No 2nd gear
23	No 3rd gear
24	No 4th gear
25	No torque converter clutch
26	Torque converter clutch stuck "on"
27	Quick quad-driver output fault
31	Transaxle temperature circuit open
32	Transaxle temperature circuit grounded
34	Powertrain Control Module (PCM) - communication failure
35	No turbine speed signal
36	Turbine speed signal noise
41	Vehicle Speed Sensor (VSS) circuit - no signal
42	Vehicle Speed Sensor (VSS) circuit - signal noise
43	Master relay - open or grounded
44	Master relay - shorted
45	Gear selector switch circuit problem - no signal
46	Gear selector switch circuit problem - invalid signal
47	Powertrain Control Module (PCM) computer circuit problem - communication interrupt failure

CODE	SERVICE CODE DEFINITION
48	Hold mode voltage is too low
	Reference input intermittent
49	Gear selector error signal
51	Powertrain Control Module (PCM) computer circuit problem
52	Hold mode stuck "on"
	Battery voltage out of range
53	Hold mode stuck "off"
	ESC (Knock present)
54	Powertrain Control Module (PCM) computer circuit problem
	5-volt reference ground
55	Transaxle temperature sensor failure
56	Generic Field-Effect Transistor (FET) driver failure
57	Powertrain Control Module (PCM)
58	Battery voltage unstable
61	Possible open or intermittent in DIS module harness 6X Signal fault
	Powertrain Control Module (PCM)
62	Powertrain Control Module (PCM)
63	Powertrain Control Module (PCM)
	Option check sum error (set if tire size and options do not compare with those stored)
64	Powertrain Control Module (PCM)
65	Ignition voltage problem
66	Clamp shorted
67	Clamp open
	Handwheel sensor circuit fault
68	Line circuit grounded or open
69	Line circuit shorted
71	2nd line circuit - grounded or open
	Cooling system high temperature
72	2nd line circuit - shorted
	Cooling system low temperature

CODE	SERVICE CODE DEFINITION
73	3rd line circuit - grounded or open
	Coolant sensor signal unstable
74	Coolant/Transmission temperature sensor ratio error
	3rd line circuit - shorted
75	3rd gear stuck "on"
	Air temperature sensor signal
76	4th line circuit - grounded or open
	Throttle position sensor (TPS) to manifold absolute pressure (MAP) sensor voltage out of range
77	4th line circuit - shorted
78	4th gear stuck "on"
79	Torque Converter Clutch (TCC) circuit - grounded or open
81	Torque Converter Clutch (TCC) circuit - shorted
82	Transaxle temperature unstable
83	Transaxle temperature low
	Low coolant
84	Brake switch stuck open
85	Brake switch stuck closed
86	Engine speed invalid
87	Torque Converter Clutch (TCC) hold circuit - grounded or open
88	Torque Converter Clutch (TCC) hold circuit - shorted
89	Master relay stuck "on"
91	Assembly Line Diagnostic Link (ALDL)
92	Clamp circuit - intermittent fault
93	Torque Converter Clutch (TCC) hold circuit - intermittent fault
94	Master enable relay circuit intermittent fault
95	Line circuit - intermittent fault
96	Torque Converter Clutch (TCC) circuit - intermittent fault
97	2nd gear circuit - intermittent fault
98	3rd gear circuit - intermittent fault
99	4th gear circuit - intermittent fault

3.1 ANTILOCK BRAKE SYSTEMS (ABS)

3.1.1 What is ABS?

The ABS system utilizes several mechanical, hydraulic, and electric/electronic components to automatically control hydraulic brake pressure to the rear, or front and rear wheels (depending on the brake system) to prevent wheel lock-up during hard braking.

3.1.2 What are the benefits of ABS?

By preventing wheel lock-up during hard braking, ABS helps maintain vehicle directional stability, as well as driver control, ensuring a safer and more controlled stop in the shortest distance.

3.1.3 How does the ABS system work?

The ABS system utilizes a computer called an Electronic Brake Control Module (EBCM). The system also employs several sensors and switches which monitor and control wheel speed and hydraulic brake pressure when hard braking is applied. When the wheel speed sensor(s) detect a potential lock-up condition, a signal is sent to the EBCM. The EBCM, in turn, sends a signal to the hydraulic system to relieve brake pressure at the affected wheels, preventing the lock-up condition.

3.1.4 What is the purpose of the Code Reader?

Most ABS systems generate diagnostic service codes when a fault in the system is detected. These service codes are stored in the EBCM. The Code Reader allows you to access the EBCM's memory and recalls the service codes. The EBCM outputs the service codes through the "Anti-Lock" light on the vehicle's instrument panel.

3.2 APPLICATIONS

GM vehicles use a variety of Anti-Lock Brake Systems. This Code Reader may be used to retrieve ABS service codes from the following vehicle models:

Year	Model	ABS Type
1989-93	Astro, "G" Series Van, "R" and "V" Series Trucks, Safari, Suburban	Kelsey-Hayes RWAL
1987-94	Blazer, "C" and "K" Series Pickup, Sierra, "S" and "T" Series Pickup (EXCEPT 93-94 4.3L M/T)	Kelsey-Hayes RWAL
1989-90	Eldorado, Reatta, Riviera, Seville, Toronado, Delta 88, Bonneville, DeVille, Electra, Le Sabre, Ninety-Eight, Fleetwood, Park Avenue, Touring Sedan (EXCEPT 1988 Eldorado, Reatta, Riviera, Seville, Toronado)	Teves II
1990-91	Corvette	Bosch 2S
1990-92	Brougham	Bosch 2U
1990-94	Astro, Bravada, Jimmy, Safari, Sierra, Sonoma, Suburban, Cyclone, Typhoon, Yukon, "C" and "K" Series Blazer and Pickup, "S" and "T" Series Blazer and Pickup, "G" Series Van	Kelsey-Hayes 4WAL
1995	Astro, "C" and "K" Series Pickup, "G" Series Van, Safari, Sierra, Suburban, Tahoe, Yukon	Kelsey-Hayes 4WAL
1991-92	Custom Cruiser, Eldorado, Seville, Reatta, Toronado, Trofeo	Bosch 2U
1991-93	Riviera, Roadmaster, Caprice	Bosch 2U
1993	Eldorado, Seville	Bosch 2U ABS/TCS

3.3 RETRIEVING SERVICE CODES

- Always observe safety precautions before and during testing process.
- Fix any known mechanical problems before this test.
- Have pencil and paper handy.

1. Determine your vehicle's ABS Type (paragraph 3.1) and retrieve codes using the appropriate procedures:

Teves II	Paragraph 3.3.1
Kelsey-Hayes RWAL	Paragraph 3.3.2
Kelsey-Hayes 4WAL	Paragraph 3.3.3
Bosch 2S	Paragraph 3.3.4
Bosch 2U	Paragraph 3.3.4

Be sure to write codes down.

2. After retrieving ABS fault codes, erase codes using the appropriate procedures for your vehicle and ABS system (paragraph 3.4).
3. Repeat the procedure to retrieve ABS fault codes (step 1, above).

NOTE: *It may be necessary to perform a thorough test drive to reset some fault codes.*

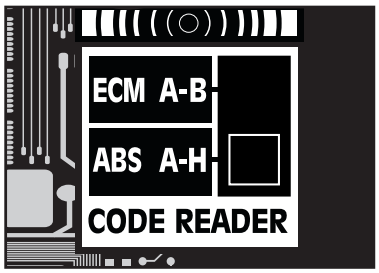
4. In most cases, codes which reappear indicate "hard" faults. Codes which DO NOT reappear are usually "intermittent" faults.
5. Follow the testing and repair procedures outlined in the manufacturer's service manual for your vehicle to correct "hard" faults. Codes should be addressed and eliminated in the order they were received, erasing and retesting after each repair is made to be sure the fault was eliminated.

3.3.1 Retrieving Service Codes for Teves II Systems

1. Turn on ignition. **DO NOT START THE ENGINE.** Observe "Anti-Lock" light:
   - If "Anti-Lock" light turns off within 30 seconds, no ABS service codes have been stored.
   - If "Anti-Lock" light remains on longer than 30 seconds, continue to step 2 to retrieve ABS service codes.
2. Turn off ignition.
3. Connect the Code Reader to the vehicle test connector.

NOTE: *The Code Reader only fits into the connector one way.*

4. Set Selector Switch to **ABS A-H** position.
5. Turn on ignition. **DO NOT START THE ENGINE.**



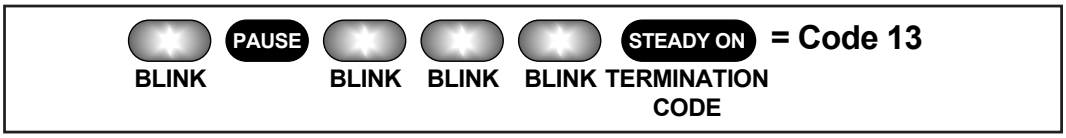
6. Read codes from the "Anti-Lock"light on your vehicle's instrument panel. Be sure to write the codes down.

NOTE: *If the light does not blink, refer to your vehicle's service manual for information on checking the circuitry.*

- All codes are two digits.
- Count blinks to get the service codes:
- First and second digits of code are separated by a 3 second pause.
- Second digit of service code is followed by a termination code ("Anti-Lock" light remains steady on).

NOTE: *DO NOT count termination code as part of second digit.*

- Code 13 looks like:



7. Up to seven codes can be stored by the EBCM. To check for additional codes: with ignition still on, disconnect and then reconnect Code Reader. Repeat this procedure until all codes have been retrieved.

NOTE: *Service codes cannot be erased until all stored service codes have been retrieved.*

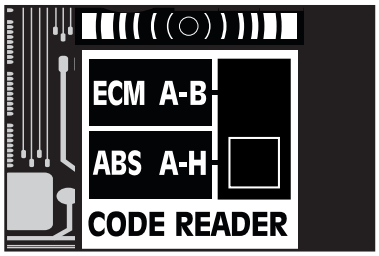
8. Turn off ignition and remove the Code Reader.

3.3.2 Retrieving Service Codes for Kelsey-Hayes RWAL Systems

1. Turn off ignition.
2. Connect the Code Reader to the vehicle test connector.

NOTE: *The Code Reader only fits into the connector one way.*

3. Set Selector Switch to **ABS A-H** position.
4. Turn on ignition. **DO NOT START THE ENGINE.**

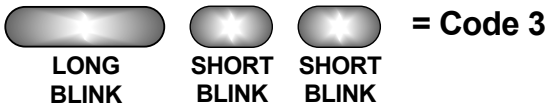


NOTE: *There is a 20 second pause before service codes begin to display.*

5. Read codes from the "Brake" light on your vehicle's instrument panel. Be sure to write the codes down.

NOTE: *If the light does not blink, refer to your vehicle's service manual for information on checking the circuitry.*

- Count blinks to get the service codes.
- Codes may be one or two digits.
- Codes are displayed as a pattern of one long blink followed by one or more short blinks. Count **ALL** blinks to get code.
- Code 3 looks like:



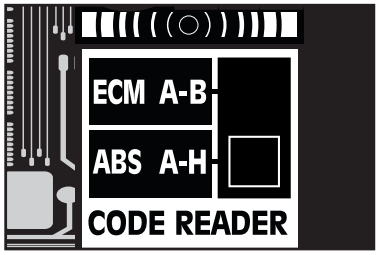
- The EBCM stores **only one** service code at a a time, even though it may detect more than one fault condition. The first fault detected results in a stored service code. The detected fault must be corrected, and the service code must be erased from the computer's memory before additional codes can be stored.
- After the first fault is corrected and the service code is erased, drive the vehicle at a speed greater than 35 mph to set any additional service codes.

3.3.3 Retrieving Service Codes for Kelsey-Hayes 4WAL Systems

1. Turn off ignition.
2. Connect the Code Reader to the vehicle test connector.

NOTE: *The Code Reader only fits into the connector one way.*

3. Set Selector Switch to **ABS A-H** position.
4. Turn on ignition. **DO NOT START THE ENGINE.**

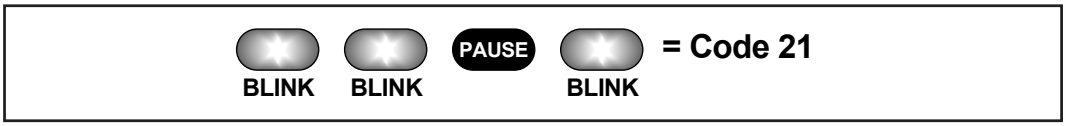


5. Read codes from the "Anti-Lock" light on your vehicle's instrument panel. Be sure to write the codes down.

NOTE: *If the light does not blink, refer to your vehicle's service manual for information on checking the circuitry.*

- All codes are two digits.
- Count blinks to get the service codes:
- First and second digits of code are separated by a pause.

- Code 21 looks like:



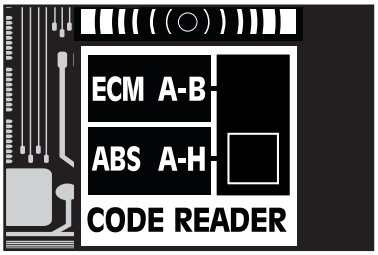
NOTE: *Service codes will repeat as long as Code Reader is connected.*

6. Turn off ignition and remove the Code Reader.

3.3.4 Retrieving Service Codes for Bosch 2S and 2U Systems

1. Turn off ignition.
2. Connect the Code Reader to the vehicle test connector.

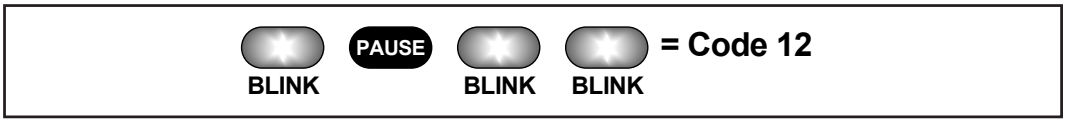
NOTE: *The Code Reader only fits into the connector one way.*



3. Set Selector Switch to **ABS A-H** position.
4. Turn on ignition. **DO NOT START THE ENGINE.**
5. Read codes from the "Service ABS" or "Anti-Lock" light on your vehicle's instrument panel. Be sure to write the codes down.

NOTE: *If the light does not blink, refer to your vehicle's service manual for information on checking the circuitry.*

- All codes are two digits.
- Count blinks to get the service codes:
- First and second digits of code are separated by a pause.
- Code sequence will start with Code 12:



NOTE: Code 12 is not a fault code. Code 12 indicates the self-diagnostic system is functioning properly (system pass).

- Each code is repeated three times. After all codes have been displayed, the entire code sequence is repeated.

NOTE: *Service codes will repeat as long as Code Reader is connected.*

6. Turn off ignition and remove the Code Reader.

3.4 ERASING SERVICE CODES

- Always observe safety precautions before and during testing process.
- Erase codes only when all repairs have been completed.

Determine your vehicle's ABS Type (paragraph 3.2) and erase codes using the appropriate procedures:

3.4.1 Teves II
3.4.2 Kelsey-Hayes RWAL
3.4.3 Kelsey-Hayes 4WAL
3.4.4 Bosch 2S
3.4.5 Bosch 2U

3.4.1 Erasing Service Codes for Teves II Systems

1. Drive vehicle at a speed greater than 20 MPH. Service codes will automatically be cleared.
2. Repeat procedure for retrieving service codes (paragraph 3.3.1) to make sure codes have been erased and no new codes have been recorded.

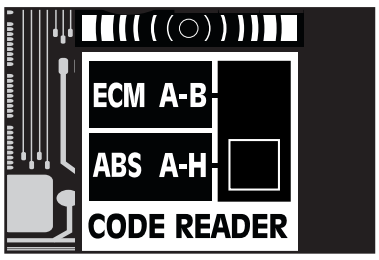
3.4.2 Erasing Service Codes for Kelsey-Hayes RWAL Systems

A. For all vehicle models EXCEPT "C" and "K" 3500 Series Heavy Duty (HD) (1992-93):

1. Turn off ignition.
2. Remove STOP/HAZARD fuse from fuse block.
3. Wait 20 seconds, then reinstall STOP/HAZARD fuse.
4. Repeat steps 2 and 3 for each code stored. For example: if four codes were retrieved, remove and install STOP/HAZARD fuse four times.
5. Repeat procedure for retrieving service codes (paragraph 3.3.2) to make sure codes have been erased.

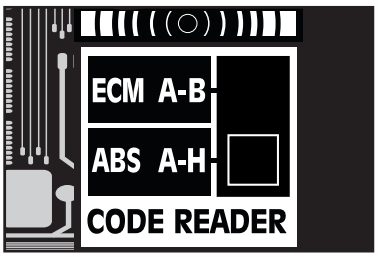
B. For "C" and "K" 3500 Series Heavy Duty (HD) (1992-93) vehicles ONLY:

1. Turn off ignition.
2. Remove STOP/HAZARD fuse from fuse block.
3. Turn on ignition and observe "Brake" light. If "Brake" light is on, a code(s) is stored.
4. Set Selector Switch to **ABS A-H** position.



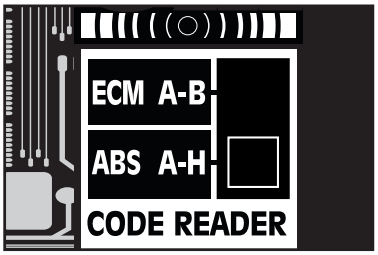
5. Connect the Code Reader to the vehicle test connector for one second, remove the Code Reader for one second, reconnect the Code Reader for one second, then remove the Code Reader.
6. Turn off ignition.
7. Reinstall STOP/HAZARD fuse in fuse block.
8. Repeat procedure for retrieving service codes (paragraph 3.3.2) to make sure codes have been erased.

3.4.3 Erasing Service Codes for Kelsey-Hayes 4WAL Systems



1. Turn on ignition.
2. Set Selector Switch to **ABS A-H** position.
3. Connect the Code Reader to the vehicle test connector for two seconds, remove the Code Reader for one second, reconnect the Code Reader for two seconds, then remove the Code Reader.
4. The "Anti-Lock" and "Brake" light should BOTH light, then turn off. This indicates service codes have been erased.
5. Turn off ignition.
6. Repeat procedure for retrieving service codes (paragraph 3.3.3) to make sure codes have been erased.

3.4.4 Erasing Service Codes for Bosch 2S Systems



1. Turn off ignition.
2. Set Selector Switch to **ABS A-H** position.
3. Connect the Code Reader to the vehicle test connector.
4. Turn on ignition. "Service ABS" light will begin displaying service codes.
5. Remove the Code Reader for one second, then reconnect the Code Reader for at least one second.
6. Repeat step 5 three more times (a total of four times) within a ten second period. **LEAVE THE CODE READER CONNECTED AFTER THE FOURTH TIME.**

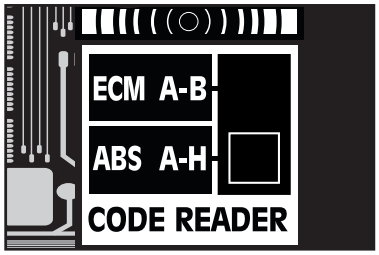
7. The ""Service ABS" light should display code 12 continuously. If any other codes are displayed, repeat steps 1 through 6.
8. Turn off ignition.

3.4.5 Erasing Service Codes for Bosch 2U Systems

1. Turn on ignition and observe "Anti-Lock" light. "Anti-Lock" light should turn off within 3 to 4 seconds. If "Anti-Lock" light remains on, a fault is still present.

NOTE: *Service codes cannot be erased until all stored service codes have been retrieved.*

2. Set Selector Switch to **ABS A-H** position.
3. Connect the Code Reader to the vehicle test connector and observe "Anti-Lock" light.



4. When "Anti-Lock" light turns on, disconnect Code Reader.
5. When "Anti-Lock" light turns off, reconnect Code Reader and observe "Anti-Lock" light. When "Anti-Lock" light turns on, disconnect Code Reader.
6. Repeat step 5.
7. When "Anti-Lock" light turns off, reconnect Code Reader. "Anti-Lock" light will turn on. Disconnect Code Reader. All service codes are now cleared.
8. Turn off ignition.
9. Repeat procedure for retrieving service codes (paragraph 3.3.4) to make sure codes have been erased.

3.5 ABS SERVICE CODES

- Consult your vehicle's service manual for detailed meaning related to your vehicle.

Determine your vehicle's ABS Type (paragraph 3.2) and refer to the appropriate service codes table:

Teves II	Paragraph 3.5.1
Kelsey-Hayes RWAL	Paragraph 3.5.2
Kelsey-Hayes 4WAL	Paragraph 3.5.3
Bosch 2S	Paragraph 3.5.4
Bosch 2U	Paragraph 3.5.5

3.5.1 Teves II System Service Codes

Code	Service Code Definition
11	Electronic Brake Control Module (EBCM) fault
12	Electronic Brake Control Module (EBCM) fault
21	Main valve fault
22	Left front inlet valve fault
23	Left front outlet valve fault
24	Right front inlet valve
25	Right front outlet valve
26	Rear inlet valve
27	Rear outlet valve
31	Left front Wheel Speed Sensor (WSS)
32	Right front Wheel Speed Sensor
33	Right rear Wheel Speed Sensor
34	Left rear Wheel Speed Sensor
35	Left front Wheel Speed Sensor
36	Right front Wheel Speed Sensor
37	Right rear Wheel Speed Sensor
38	Left rear Wheel Speed Sensor
41	Left front Wheel Speed Sensor
42	Right front Wheel Speed Sensor
43	Right rear Wheel Speed Sensor
44	Left rear Wheel Speed Sensor
45	Left front sensors (2)
46	Right front sensors (2)
47	Rear sensors (2)
48	sensors (3)
51	Left front outlet valve
52	Right front outlet valve
53	Rear outlet valve
54	Rear outlet valve
55	Left front Wheel Speed Sensor
56	Right front Wheel Speed Sensor
57	Right rear Wheel Speed Sensor
58	Left rear Wheel Speed Sensor

Code	Service Code Definition
61	Electronic Brake Control Module loop circuit
71	Left front outlet valve
72	Right front outlet valve
73	Rear outlet valve
74	Rear outlet valve
75	Left front Wheel Speed Sensor
76	Right front Wheel Speed Sensor
77	Right rear Wheel Speed Sensor
78	Left rear Wheel Speed Sensor

3.5.2 Kelsey-Hayes RWAL System Service Codes

Code	Service Code Definition
1	Rear Wheel Anti-Lock (RWAL) Electronic Control Unit (ECU) malfunction or improper voltage
2	Open isolation valve or faulty ECU
3	Open dump valve or faulty ECU
4	Grounded anti-lock valve reset switch circuit
5	Excessive actuation of the dump valve during an anti-lock stop
6	Erratic speed signal
7	Shorted isolation valve circuit or faulty ECU
8	Shorted dump valve circuit or faulty ECU
9	Open or grounded circuit to the vehicle speed sensor
10	Brake lamp switch circuit fault
11	Rear Wheel Anti-Lock (RWAL) Electronic Control Unit (ECU) malfunction or improper voltage
12	Rear Wheel Anti-Lock (RWAL) Electronic Control Unit (ECU) malfunction or improper voltage
13	Rear Wheel Anti-Lock (RWAL) Electronic Control Unit (ECU) malfunction
14	Rear Wheel Anti-Lock (RWAL) Electronic Control Unit (ECU) malfunction
15	Rear Wheel Anti-Lock (RWAL) Electronic Control Unit (ECU) malfunction

3.5.3 Kelsey-Hayes 4WAL System Service Codes

Code	Service Code Definition
12	System Normal
13	System Normal (2WD)
14	System Normal (4WD/AWD)
15	System Normal (4WD/AWD)
21	Right front wheel sensor fault
22	Missing right front wheel sensor signal
23	Erratic right front speed sensor
25	Left front speed sensor fault
26	Missing left front speed signal
27	Erratic left front speed sensor
28	Simultaneous loss of both front sensor signals
29	Simultaneous drop out of all 4 sensors
31	Right rear speed sensor fault
32	Missing right rear speed signal
33	Erratic right rear speed sensor
35	Left rear speed sensor fault or VSS circuit open (1993)
36	Missing left rear speed signal or VSS signal missing (1993)
37	Erratic left rear speed signal or erratic VSS signal (1993)
38	Wheel speed error
41	4 Wheel Anti-Lock (4WAL) control unit fault
42	4 Wheel Anti-Lock (4WAL) control unit fault
43	4 Wheel Anti-Lock (4WAL) control unit fault
44	4 Wheel Anti-Lock (4WAL) control unit fault
45	4 Wheel Anti-Lock (4WAL) control unit fault
46	4 Wheel Anti-Lock (4WAL) control unit fault
47	4 Wheel Anti-Lock (4WAL) control unit fault
48	4 Wheel Anti-Lock (4WAL) control unit fault
49	4 Wheel Anti-Lock (4WAL) control unit fault
50	4 Wheel Anti-Lock (4WAL) control unit fault
51	4 Wheel Anti-Lock (4WAL) control unit fault
52	4 Wheel Anti-Lock (4WAL) control unit fault
53	4 Wheel Anti-Lock (4WAL) control unit fault
54	4 Wheel Anti-Lock (4WAL) control unit fault

Code	Service Code Definition
55	4 Wheel Anti-Lock (4WAL) control unit fault
56	4 Wheel Anti-Lock (4WAL) control unit fault
57	4 Wheel Anti-Lock (4WAL) control unit fault
58	4 Wheel Anti-Lock (4WAL) control unit fault
59	4 Wheel Anti-Lock (4WAL) control unit fault
60	4 Wheel Anti-Lock (4WAL) control unit fault
61	4 Wheel Anti-Lock (4WAL) control unit fault
62	4 Wheel Anti-Lock (4WAL) control unit fault
63	4 Wheel Anti-Lock (4WAL) control unit fault
64	4 Wheel Anti-Lock (4WAL) control unit fault
65	4 Wheel Anti-Lock (4WAL) control unit fault
66	4 Wheel Anti-Lock (4WAL) control unit fault
67	Open motor circuit or shorted ECU output
68	Locked motor or shorted motor circuit
71	4 Wheel Anti-Lock (4WAL) control unit fault
72	4 Wheel Anti-Lock (4WAL) control unit fault
73	4 Wheel Anti-Lock (4WAL) control unit fault
74	4 Wheel Anti-Lock (4WAL) control unit fault
81	Brake switch circuit shorted or open
85	Open anti-lock warning lamp
86	Shorted anti-lock warning lamp
88	Shorted brake warning lamp

3.5.4 Bosch 2S System Service Codes

Code	Service Code Definition
12	Diagnostic system operational
21	Right front speed sensor fault
22	Right front toothed wheel frequency error
25	Left front speed sensor fault
26	Left front toothed wheel frequency error
31	Right rear speed sensor fault
32	Right rear toothed wheel frequency error
35	Left rear speed sensor fault
36	Left rear toothed wheel frequency error

Code	Service Code Definition
41	Right front solenoid valve fault
45	Left front solenoid valve fault
55	Rear solenoid valve fault
61	Pump motor or motor relay fault
63	Solenoid valve relay fault
71	Electronic Brake Control Module (EBCM) fault
72	Serial data link fault
75	Lateral accelerometer fault; short to battery, ground or open circuit
76	Lateral accelerometer fault, signal out of range or incorrect

3.5.5 Bosch 2U System Service Codes

Code	Service Code Definition
12	Normal
21	Right front wheel sensor fault
22	Right front toothed wheel frequency error
25	Left front wheel sensor fault
26	Left front toothed wheel frequency error
35	Rear axle speed sensor fault
36	Rear axle toothed wheel frequency error
41	Right front solenoid valve fault
45	Left front solenoid valve fault
55	Rear wheels solenoid valve fault
61	Pump motor or motor relay fault
63	Solenoid valve relay fault
71	Electronic brake control module fault
72	Serial data line fault

4.1 INTRODUCTION

The Society of Automotive Engineers has issued a Standard (SAE J1930) for Electrical/Electronic Systems Diagnostic Terms, Definitions, Abbreviations, and Acronyms. However, at the present time, this Standard is not in wide use by vehicle manufacturers.

This Glossary contains definitions for abbreviations and terms you may find in this manual or in your vehicle service manual. These definitions **may not** agree with those contained in SAE J1930.

4.2 GLOSSARY OF TERMS AND ABBREVIATIONS

A/C – Air Conditioning.

AAC – Auxiliary Air Control Valve.

ABS – Anti-Lock Brake System.

ACC – Air Conditioning Clutch compressor signal input to computer relating status of air conditioning clutch.

ACCS – Air Conditioning Cycling Switch.

ACD – Air Conditioner Demand switch.

ACT – Air Charge Temperature sensor or signal circuit.

ACV – Thermactor Air Control Valve.

AIR – Air Injector Reaction system, airflow from pump is directed into engine reduce exhaust emissions.

AIR BPV – Thermactor Air Bypass Valve.

AIS – Automatic Idle Speed circuit and/or motor.

ALDL – Assembly Line Data Link. Diagnostic connector under dash. Same as ALCL.

AM1 – Thermactor Air Management (TAB).

AM2 – Thermactor Air Management (TAD).

AMBIENT TEMPERATURE – Temperature of air surrounding vehicle being serviced.

ANTI-BFV – Anti-Backfire Valve.

AOD – Automatic Over Drive transmission.

ATDC – After Top Dead Center.

AVOM – Analog Volt/Ohm Meter.

AWD – All Wheel Drive.

AXOD – Automatic Overdrive transaxle.

AXOD-E – Electronic Automatic Overdrive transaxle.

BAC – Bypass Air Control valve.

BARO – Barometric Pressure.

BASE IDLE – Idle rpm determined by throttle switch with idle speed control fully retracted.

BCM – Body Computer Module.

BOO – Brake On-Off input to the computer.

BOOST – Turbo charger boost solenoid or its control circuit.

BP – Barometric Pressure sensor. Used to compensate for altitude variations.

BPMV – Brake Pressure Modulator Valve.

BTDC – Before Top Dead Center.

BVT – Back-pressure Variable Transducer.

CALPAC – A device used with fuel injection to allow fuel delivery in the event of a PROM or PCM malfunction.

CANISTER – A container, in an evaporative emission system, that contains charcoal to trap fuel vapors from the fuel system.

CANISTER PURGE SOLENOID – Electrical solenoid or its control line. Solenoid opens a valve from fuel vapor canister line to intake manifold when energized. Controls flow of vapors between carburetor bowl vent and carbon canister.

CANP – Canister Purge solenoid.

CATALYTIC CONVERTER – Muffler like assembly placed in exhaust system that contains a catalyst to change hydrocarbons and carbon monoxide into water vapor and carbon dioxide.

CCC – Climate Control Center.

CCC – Computer Command Control.

CCC – Converter Clutch Control solenoid or its circuit.

CCDIC – Climate Control/Driver Information Center.

CCO – Converter Clutch Override output from the computer processor to the transmission.

CCS – Coast Clutch Solenoid or its circuit.

CEC – Computerized Emission Control.

CER – Cold Enrichment Rod.

CES – Clutch Engage Switch.

CFI – Central Fuel Injection.

CHECK ENGINE LIGHT – Dash panel light used either to aid in identification and diagnosis of a system problems or to indicate that maintenance is required.

CHECK VALVE – Valve that operates like a one-way gate.

CID – Cylinder Identification sensor or its circuit.

CKT – Circuit.

CL – Closed Loop.

CLC – Converter Lock-up Clutch.

CO – Carbon Monoxide.

COC – Conventional Oxidation Catalyst.

COMPUTER TIMING –Total spark advance in degrees before top dead center.

CPS – Crankshaft Position Sensor. Provides the ECU with engine speed and crankshaft angle (position).

CRT – Cathode Ray Tube. A device for displaying video signals, similar to a television picture tube. Similar devices used on General Motors vehicles are referred to as DID or VIC.

CTS – Coolant Temperature Sensor.

CURB IDLE – Computer controlled idle rpm.

CVR – Control Vacuum Regulator.

CWM – Cold Weather Modulator.

CYLINDER IDENTIFICATION SIGNAL (CID) – A signal generated by crankshaft timing sensor, used to synchronize ignition coils, due to the fact that some models use a 2 ignition coil pack DIS system.

C^3I – Computer Controlled Coil Ignition. Produces ignition spark without aid of an ignition distributor.

DCL – Data Communications Link.

DERM – Diagnostic Energy Reserve Module and air bag (SIR) controller.

DFS – Decel Fuel Shut-off.

DIC – Driver Information Center.

DID – Driver Information Display.

DIS – Direct Ignition System. Produces ignition spark without aid of an ignition distributor. (Similar to C^3I).

DLC – Data Link Connector.

DRA – Digital Ratio Adapter.

DRAB – Digital Ratio Adapter Buffer.

DRAC – Digital Ratio Adapter Calibrator.

DTC – Diagnostic Trouble Code.

DUAL CATALYTIC CONVERTER – Combines 2 converters in one shell. Controls NOx, HC and CO. Also called TWC.

DV TW – Delay Valve, 2 Way.

DVM (10 MEG) – Digital voltmeter with a minimum of 10 million ohms resistance. Allows measurement in circuit without affecting the circuit operation.

DWELL – Amount of time (recorded on a dwell meter in degrees) that current passes through a closed switch.

EAS – Electronic Air Switching, directs airflow to catalytic converter or exhaust ports of the engine.

EBCM – Electronic Brake Control Module.

ECM – Engine Control Module properly call a Powertrain Control Module.

ECT – Engine Coolant Temperature sensor or circuit.

ECU – Electronic Control Unit. To process input information to trigger ignition control module.

EDF – Electro-Drive Fan relay or its circuit.

EECS – Evaporative Emission Control System.

EEGR – Electronic Exhaust Gas Recirculation valve (Sonic).

EEPROM – Electronically Erasable Programmable Read Only Memory.

EET – Electronic Exhaust Gas Recirculation Transducer.

EFC – Electronic Feedback Carburetor. Utilizes an electronic signal, generated by an exhaust gas oxygen sensor to precisely control air/fuel mixture ratio in the carburetor.

EFI – Electronic Fuel Injection. Computer controlled fuel injection system.

EGO – Exhaust Gas Oxygen sensor.

EGR – Exhaust Gas Recirculation system is designed to allow flow of inert exhaust gases into combustion chamber to cool combustion and reduce nitrous oxides in exhaust.

EHC – Exhaust Heat Control vacuum solenoid or its circuit.

EHCU - Electro-Hydraulic Control Unit.

EIC – Electronic Instrument Cluster.

ELECTRONIC SPARK CONTROL – Used to retard spark advance if detonation occurs.

ELECTRONIC SPARK TIMING – PCM controlled timing of the ignition spark.

EMI - Electro-Magnetic Interference.

EMR – Electronic Module Retard, controls spark retard.

ENGINE CONTROL MODULE – A microprocessor based device which contains electronic circuitry to control and monitor air/fuel and emission systems, and aid in diagnostics.

EPC – Electronic Pressure Control solenoid.

EPROM – Erasable Programmable Read Only Memory.

ERS – Engine RPM Sensor.

ESA – Electronic Spark Advance.

ESC – Electronic Spark Control.

EST – Electronic Spark Timing.

EVP – EGR Valve Position sensor or its circuit.

EVR – EGR Vacuum Regulator or its circuit.

EVRV – Electronic Vacuum Regulator Valve. Controls EGR vacuum.

EXHAUST GAS OXYGEN SENSOR – Sensor that changes its voltage output as exhaust gas oxygen content changes as compared to oxygen content of the atmosphere. The constantly changing electrical signal is used to control fuel mixture.

EXHAUST GAS RECIRCULATION – Procedure where a small amount of exhaust gas is re-admitted to combustion chamber to reduce peak combustion temperatures, thus reducing NOx.

FAIL SAFE – or Fail Soft: any attempt by a computer to compensate for a fault or lost signal, usually by substituting fixed replacement valves.

FEEDBACK CARBURETOR (FBC) – System of fuel control employing a computer controlled solenoid that varies the carburetors air/fuel mixture.

FMEM – Failure Mode Effects Management. Sometimes referred to limp-in mode.

GND, GRD or GRND – Ground. Common line leading to the negative side of the battery.

HALL EFFECT – Process where current is passed through a small slice of semi-conductor material at the same time as a magnetic field to produce a small voltage in the semiconductor.

HARD FAULT – Fault present during current engine operating cycle. Opposite of an intermittent fault which does not stay present.

HEDF – High-speed Electro-Drive Fan relay or its circuit.

HEGO – Heated Oxygen Sensor or its circuit.

HIC – Hot Idle Compensator.

HPA - High Pressure Accumulator.

IAC – Idle Air Control.

IAS – Inlet Air Solenoid valve or its circuit.

IAT – Intake air temperature sensor, performs same function as MAT sensor.

ICM – Integrated Control Module.

IDLE TRACKING SWITCH – An input device that sends a signal to the computer to indicate a closed throttle condition.

IGN – Ignition.

INTERMITTENT FAULT – Fault which occurred during a previous engine operating cycle. Intermittent fault may have set a fault code which is still present in PCM memory.

ISA – Idle Speed Actuator. Extends or retracts to control engine idle speed and to set throttle stop angle during deceleration.

ISC – Idle Speed Control, either computer control motor, air bypass valve, or any device used to control idle rpm.

ISO VALVE - Isolation Valve.

ITS – Idle Tracking Switch.

KAM – Keep Alive Memory. Battery power memory locations in computer used to store failure codes and some diagnostic parameters.

KAPWR – Keep Alive Power, used to power KAM circuit of the processor.

KNOCK SENSOR (KS) – Input device that responds to spark knock, caused by over advanced ignition timing.

LEAN MIXTURE – Air/fuel mixture that has excessive oxygen left after all fuel in combustion chamber has burned, 1 part fuel to 15 or more parts air.

LED – Light Emitting Diode.

LOCK UP TORQUE CONVERTER – Converter with internal mechanism that locks turbine to impeller when engaged.

LPA - Low Pressure Accumulator.

LUS – Lock-Up Solenoid.

M/C – Mixture control or mixture control solenoid.

MAF – Mass Air Flow sensor, used to measure amount of airflow through the throttle body.

MAP – Manifold Absolute Pressure sensor or its circuit.

MAT – Manifold Air Temperature.

MFI – Multi-port Fuel Injection.

MIL – Malfunction Indicator Light. Check engine light.

MIXTURE CONTROL SOLENOID – Device installed on carburetor, that regulates the air/fuel ratio.

MLP – Manual (shift) Lever Position sensor or its circuit.

MPFI – Multi-Port Fuel Injection.

MULTI-PORT FUEL INJECTION – Individual injectors for each cylinder mounted in intake manifold. Injectors are pulsed in groups rather than individually.

NDS – Neutral Drive Switch.

NGS – Neutral Gear Switch or its circuit.

NON-VOLATILE MEMORY – Memory retained in block learn cells (not affected by turning the ignition ON or OFF).

NOx – Nitrous Oxides.

NPS – Neutral Pressure Switch or its circuit.

OCT ADJ – Octane Adjust device which modifies ignition spark.

OXYGEN SENSOR – Sensor that changes its voltage output as exhaust gas oxygen content changes as compared to the oxygen content of the atmosphere. The constantly changing electrical signal is used to control fuel mixture.

PCM – Powertrain Control Module. Computer that controls engine fuel, ignition and emission related functions.

PCV – Positive Crankcase Ventilation. System that controls flow of crankshaft vapors into engine intake manifold where they are burned in combustion rather then being discharged into the atmosphere.

PFE – Pressure Feedback EGR sensor or its circuit.

PFI – Port Fuel Injection.

PORTED VACUUM SWITCH – Temperature actuated switch that changes vacuum connections when the coolant temperature changes.

POT – Potentiometer.

POWERTRAIN CONTROL MODULE – Same as ECM, but also controls electronically controlled automatic transmission.

PROM – Programmable Read Only Memory.

PSPS – Power Steering Pressure Switch. Signal is used by computer to compensate for power steering loads.

PVS – Ported Vacuum Switch.

PWM - Pulse Width Modulation.

QUAD-DRIVER (QDM) – Computer chip, in the PCM, capable of operating four separate outputs. Some have digital and some have pulse width modulated outputs.

RAP – Retained Accessory Power.

RELAY – Switching device operated by a low current circuit, which controls opening and closing of another higher current circuit.

RELIEF VALVE – Pressure limiting valve located in exhaust chamber of thermactor air pump. Relieves part of exhaust airflow if pressure exceeds a calibrated value.

RICH MIXTURE – Air/fuel mixture that has more fuel than can burn completely, 1 part fuel to 14 or less parts air.

SAW – Spark Advance Word, and also Spark Angle Word.

SCC – Spark Control Computer.

SES – Service Engine Soon light.

SEFI, SFI – Sequential Fuel Injection, type of MFI with injectors pulsed individually based on engine firing order.

SIG RTN – Signal Return circuit for all sensors except HEGO.

SIL – Shift Indicator Light. Indicates to driver optimum time to shift gears.

SIR – Supplemental Inflatable Restraint (SIR) system; air bag.

SIS – Solenoid Idle Stop.

SOLENOID – Wire coil with a movable core which changes position by means of electromagnetism when current flows through the coil.

SPARK RETARD SOLENOID – Output device that receives an output signal to bleed distributor's vacuum advance when spark knock occurs.

SSI – Solid State Ignition system.

T.V. – Throttle Valve.

TAB – Thermactor Air Bypass solenoid.

TACH INPUT – Engine rpm signal sent to computer from ignition coil primary circuit.

TAD – Thermactor Air Diverter solenoid.

TBI – Throttle Body Injection (Fuel).

TCC – Torque Converter Clutch.

TCP – Temperature Compensating Pump.

TDC – Top Dead Center.

THERMACTOR AIR CONTROL VALVE – Combines function of a normally closed air bypass valve and an air diverter valve in one integral valve.

THERMACTOR AIR SYSTEM – Efficiency of catalytic converter is dependent upon temperature and chemical makeup of exhaust gases. These requirements are met by the thermactor air supply system.

THREE-WAY CATALYST – Combines 2 converters in 1 shell. Controls NOx, HC and CO. Also called dual catalytic converter.

TIMING – Relationship between spark plug firing and piston position.

TKS – Throttle Kicker Solenoid, when energized, supplies manifold vacuum to throttle kicker actuator as directed by computer to compensate for engine loads. Also called idle-up system.

TOT – Transmission Oil Temperature sensor.

TP or TPS – Throttle Position Sensor or its circuit. Used to signal computer the position of the throttle plates.

TPI – Tuned Port Injection, a type of MFI with intake tubes designed to be tuned for performance. Most TPI engines are also SFI.

TTS – Transmission Temperature Switch.

TVS – Temperature Vacuum Switch.

TVV – Thermal Vent Valve.

TWC – Three-Way Catalyst.

VACUUM – A term to describe a pressure that is less than atmospheric pressure.

VACUUM ADVANCE – Advances ignition timing with relation to engine load or computer signals.

VAF – Vane Air-Flow sensor or its circuit.

VAT – Vane Air-Flow Temperature sensor.

VATS – Vehicle Anti-theft System.

VCM - Vehicle Control Module.

VM – Vane Meter or air flow meter.

VSS – Vehicle Speed Sensor.

WOT – Wide Open Throttle or Wide Open Throttle switch.

WSS - Wheel Speed Sensor.

5.1 LIMITED ONE YEAR WARRANTY

The Manufacturer warrants to the original purchaser that this unit is free of defects in materials and workmanship under normal use and maintenance for a period of one (1) year from the date of original purchase.

If the unit fails within the one (1) year period, it will be repaired or replaced, at the Manufacturer's option, at no charge, when returned prepaid to the Service Center with Proof of Purchase. The sales receipt may be used for this purpose. All replacement parts, whether new or re-manufactured, assume as their warranty period only the remaining time of this warranty.

This warranty does not apply to damage caused by improper use, accident, abuse, improper voltage, service, fire, flood, lightning, or other acts of God, or if the product was altered or repaired by anyone other than the Manufacturer's Service.

The Manufacturer, under no circumstances shall be liable for any consequential damages for breach of any written warranty of this unit.

This warranty gives you specific legal rights, and you may also have rights which vary from state to state.

 THIS WARRANTY IS NOT TRANSFERABLE.

For service, send via U.P.S. (if possible) prepaid to manufacturer.

Allow 3-4 weeks service time