

# Operations

# Manual

A/C INSPECTION

**Test A/C system**

AIR CONDITIONER PERFORMANCE INSPECTION.

THIS SERVICE INCLUDES:

- Test A/C duct temperature at center duct, on high at 2000 RPM. Temperature should be at least 55 degrees. TEMP. \_\_\_\_\_ P/F \*
- Inspect A/C belt for condition Pass/Fail
- Inspect engine cooling system and hoses Pass/Fail
- Engine antifreeze good to \_\_\_\_\_\*F Needs to be flushed?  
Y/N
- Install A/C pressure gauges, test A/C pressures
  - High Pressure \_\_\_\_\_ psi. Pass/Fail
  - LOW PRESSURE \_\_\_\_\_ psi. Pass/Fail
- Install fluorescent dye into system, run A/C for 15 minutes
- Inspect for leaks using ultra-violet light Pass/Fail
- If no leaks are evident, apply anti-bacterial spray into evaporator duct.

# A/C SERVICE R-134A     **A/C Service R-134a**

R134A AIR CONDITIONER SERVICE INCLUDES:

- Inspect hoses and fittings for obvious leaks. PASS/FAIL
- Test purity of refrigerant \_\_\_\_\_%R134A\_\_\_\_\_ %OTHER PASS/FAIL  
IF PURITY TEST FAILS DO NOT EVACUATE!!!!
- Inspect condition of fan belts PASS/FAIL
- Inspect condition of engine cooling system PASS/FAIL
- Verify operation of A/C compressor. PASS/FAIL
- Evacuate system, recycle Freon, recharge system, add oil and dye
- PLEASE NOTE TOTAL AMOUNT OF REFRIGERANT ADDED. \_\_\_\_\_ LBS.
- Verify operation of auxiliary cooling fan PASS/FAIL
- Duct temperature at 2000 RPM at center duct after service \_\_\_\_\_ DEGREES F. Pass/Fail
- Apply anti-bacterial spray to inlet duct..
- Test system for leaks. PASS/FAIL
- IF LEAKS ARE FOUND, EVACUATE REFRIGERANT AS PER STATE LAW.

# **A/C Retrofitting Procedure**

## **9 Step Retrofit Process**

The following procedure is a combination of SAE J1661 and OE procedures. To achieve the best performance and longest compressor life, follow the SAE J1661 standard on every vehicle. In addition to the SAE procedure, when the information is available, add any vehicle specific components or procedures that the OE manufacturer recommends.

### **Safety Precautions**

All of the standard safety procedures that should be followed when working with R12 should also be followed when working with any alternate refrigerant. The following are some additional precautions to follow when working with any of the new refrigerants or lubricants:

Always wear protective gloves when working with PAG or Ester lubricants. PAG lubricants can cause a skin reaction much like brake fluid does. If PAG or Ester lubricants do come in contact with your skin, wash it off with plenty of soap and water.

Never use compressed air to leak or pressure test systems with alternate refrigerants. Under certain conditions, these refrigerants when pressurized can become combustible.

Provide plenty of fresh air ventilation when working on any A/C system. Avoid breathing any refrigerant or lubricant vapor or mist.

PAG and Ester lubricants can damage painted surfaces much like brake fluid. Use fender covers or any additional protection that is required. Be especially careful when connecting and disconnecting service hoses. The refrigerant spray that occurs contains lubricant as well.

PAG and Ester lubricants are very hygroscopic, which means they will absorb moisture from the atmosphere. To prevent moisture from contaminating a system, lubricant bottles should be tightly capped when not in use.

Use mineral oil to lubricate seals and O-rings, even for R134a systems. This will prevent PAG or Ester lubricants from coming in contact with skin.

### **Step 1: System Inspection**

An important step in any retrofit is to assess the current system's condition. Any component failures or other repair issues must be addressed before a retrofit can be considered. A complete history of prior service, including cooling system service, will help to arrive at a proper diagnosis.

To start the inspection, use a refrigerant identifier to make sure that there is nothing but R12 in the system. If one contaminated system is pulled into a recovery machine, the entire recovery tank is then contaminated. If this mixture is used to recharge other vehicles, every car serviced will be contaminated and will have performance and compressor life problems. There have been many cases of R22, R134a, R502, and flammable refrigerants found in R12 systems. Using an identifier will protect your shop, your equipment, and your customers. After you find out what is in the system check for evidence of a prior retrofit. If possible, check

gauge pressures and duct temperature. This information is used to "baseline" the retrofit job. When the retrofit is done, the before and after readings can be compared to determine the success of the retrofit.

### **Step 2: Refrigerant Recovery**

Use a recovery or recycling machine to remove as much R12 as possible. This step is critical to ensure that there is no R12 left to react with the new lubricant or refrigerant. Testing has shown that any more than 2% R12 in an R134a system (about 1/2 ounce in a 2 lb. system) will cause problems.

### **Step 3: Lubricant Removal and Flushing**

Leaving residual mineral oil in the system can trap R12 and take up space that is needed for refrigerant. If the system has never been serviced, replacing the compressor and drier will usually remove more than half of the mineral oil from the system. But if the system has been serviced before, and especially if the compressor has been replaced before, there may be excess oil in the evaporator and condenser. Since there is no way of knowing how much oil is left in a system, it is best to flush all of the old oil out and start with an empty system.

To do this, the complete system can be flushed with liquid R12 or each component can be flushed separately. By flushing with liquid R12 the residual mineral oil will combine with the liquid refrigerant and the resulting mixture can be removed with conventional recycling equipment. Remember, although some debris may be removed, the primary purpose of this procedure is to remove the mineral oil and any contaminants that it contains.

To flush the complete system, follow this procedure:

- A Remove the accumulator or drier.
- B On an orifice tube system, inspect the orifice tube. If the screen is clean, it can be reinstalled during the flush to trap any debris coming out of the condenser. If the screen is dirty, replace the tube with a new one. When flushing an expansion valve system, you may need to warm up the TXV sensing bulb to prevent the valve from closing and stopping the flow of refrigerant.
- C Connect flushing adaptors to the lines that were attached to the accumulator or drier. These fittings adapt the lines to standard refrigerant service hoses.
- D Attach R12 charging equipment to the adaptor that was installed in step 2 that will allow refrigerant to flow in the same direction that the refrigerant normally flows in the system.
- E Attach recycling equipment to the other adaptor that was installed in step 2.
- F Evacuate the system for at least 10 minutes to remove any air.
- G Using the charging equipment, add a double system charge of liquid R12. If the system normally holds 32 ounces, add 64 ounces. To add the entire charge, a tank heating blanket will probably have to be used.
- H After the full refrigerant charge is in the system and the charging equipment has turned off, start the recycling equipment. As the refrigerant is recovered, most of the oil will be recovered along with it. Remember to purge the oil collection system of the recycling machine.
- I The system is now ready for component replacement or repair. For orifice tube systems, don't forget to replace the orifice tube with a new one.

To flush the condenser or evaporator separately, the same procedures can be followed. Use 1 - 2 lbs of refrigerant for each component.

#### **Step 4: Add or Replace Components**

Now that the R12 has been recovered and the old lubricant has been removed it is time to add or replace components. Remember, some components have to be changed but many are optional. Component choices should be determined by how much performance the customer expects, how long the system is expected to last, and how much the customer wants to spend.

#### **Compressors**

For most retrofits, changing the compressor is not necessary unless it is damaged. Some compressor manufacturers have identified compressors that will not handle the higher pressures and temperatures of R134a. For example, Chrysler recommends replacing C171 and A590 compressors with Sanden units. GM does not recommend using some R4 and V5 compressors, or any DA6 compressors when retrofitting. Ford used the FX15 compressor for most of their R12 vehicles from 1988-1993, but switched to the FS10 for all of their R134a systems. In fact, Ford has stopped building the FX 15 and is using the FS 10 for all replacements, whether R 12 or R134a. For best results, FX15s should be replaced with FS10s when retrofitting. A complete list of compressors that should be replaced during a retrofit is in appendix E.

#### **Accumulator/Drier**

Older R12 driers used a desiccant material known as XH5 that will not work with R134a when the desiccant is new. Most driers sold today **contain XH7 or XH9**, which are both compatible with R134a.

If an XH5 unit has been used with R12, tests have shown that it will work with R134a, though it is not recommended. It is still a good service practice to replace the drier whenever the system has been opened. Most retrofit candidates are older than 3-5 years, which is past the average useful life of a drier.

#### **Hoses and O-rings**

Since R134a is made up of smaller molecules than R12, it leaks out through fittings and hoses faster than R12. To keep the leakage rate to a minimum, hoses, gaskets, and o-rings should be inspected.

Generally, hoses do not need to be replaced unless they are leaking. If a hose does need to be replaced, it should be replaced with a barrier hose. Barrier hose has an inner liner which greatly reduces the ability of R134a to leak out. Most vehicles sold since the mid 80's are equipped with barrier hose, and all hose sold today is barrier hose.

Most OE manufacturers suggest that if a gasket or O-ring has not been disturbed (taken apart), it does not need to be replaced during a retrofit. Even though the OEs do not recommend it, it is still a good idea to replace all gaskets and O-rings whenever any A/C service is done, including retrofit. Gaskets should be replaced with an original type gasket, and O-rings should be replaced with one made of HNBR or neoprene. HNBR and neoprene can better handle the higher temperatures in an R134a system, and they are not affected by PAG or ester lubricants.

When replacing O-rings, lubricate them with mineral oil to help prevent PAG or Ester lubricants from coming in contact with your skin. Also, PAG or Ester lubricants on an O-ring can absorb moisture from the air and may cause corrosion at the fittings. You will also be less tempted to leave a bottle of PAG or Ester lubricant open to the atmosphere.

## **Expansion Devices**

Unless a manufacturer recommends otherwise, use the proper R12 expansion valve or orifice tube when retrofitting to R134a. Expansion valve sensing bulbs that used to be filled with R12 now contain R134a. Due to the pressure/temperature difference, these systems may not perform as well as expected. If available, use an expansion valve with a 2' higher superheat setting.

### **Pressure Cycling Switches**

To achieve the same evaporator temperature as R12, R134a needs to be 2 psi lower. If the system uses a temperature cycling switch, no adjustment is needed because the switch will still cycle the compressor to obtain the desired temperature. If the system uses a pressure cycling switch, the switch should be adjusted or replaced.

If there is a screw between the switch terminals it can be adjusted. Connect the switch using individual jumper leads so the screw is accessible. Install a gauge set and start the vehicle and turn the air conditioning on. To get the system to cycle, set the controls for max or recirculated air and low blower speed. Watch the low side gauge and note the pressure at which it cuts out. You may have to increase the engine speed to get the system to cycle. Adjust the screw in small increments until the new cut out point is 2 psi lower than it was originally. To finish, remove the gauges and jumper leads and reconnect the switch.

If the switch is not adjustable it can be replaced with a switch designed for an R134a system. GM, Ford, and Chrysler use a switch with a 12mm thread. An adapter is available that will convert a 3/8-20 service port to a 12mm port. To use the new switch, the electrical connector may have to be changed.

### **High Pressure Limit Switches**

Any retrofitted vehicle that is equipped with a pressure relief valve must also have a high pressure cut out switch. To prevent venting refrigerant, the switch should interrupt the clutch circuit before the pressure relief valve releases. The switch can be wired through a relay or in series with the clutch.

The preferred switch location is on the discharge line, but it can be installed on the liquid line if necessary. If a switch needs to be added to a system, saddle clamps are available to mount the switch on any straight section of tubing. An adaptor tee is also available to mount the switch to the high side service port. A typical high pressure cut out switch cuts out at 375 - 400 psi and cuts back in at 150 - 175 psi.

## **Condensers**

The cooling capacity of the condenser will be the determining factor in how well the retrofitted system will perform. If the condenser will be reused, the exterior should be thoroughly cleaned and the fins should be straightened to allow for maximum heat transfer between the air and the refrigerant. Most vehicles will benefit from foam strips placed between the condenser and radiator to force all of the incoming air through the condenser instead of around it. Sometimes a new, higher efficiency condenser will be required to handle the higher pressures and temperatures that will result from the retrofit.

## **Cooling Fans**

The cooling fan(s) for the vehicle must be working properly. Engine drive and electric cooling fans should be inspected for proper operation. Some retrofits may work better with an auxiliary cooling fan installed, but not

all vehicles can handle the added electrical load. The cooling system must be operating at peak performance if the air conditioning system is expected to operate at peak performance.

### **Step 5: Adding Lubricant**

The proper type and amount of lubricant is critical to the life of an A/C system. R12 systems used mineral oil for a lubricant, but R134a systems need to use either PAG or ester lubricants, which are both synthetic. The technician performing the retrofit needs to make two choices - which lubricant to use and how much of it to install. Polyalkylene Glycol (PAG) lubricants are used by every OE manufacturer for new R134a systems, and are recommended by almost every manufacturer for retrofit. Ester lubricants are recommended for retrofit by a few OE manufacturers like Volvo, Jaguar, and Rover. Ester lubricants have the added advantage of being miscible with mineral oil, which allows them to be used with R12 systems. Either lubricant will work, but OE test results indicate that PAGs work better. Both PAG and ester lubricants are available in different viscosities. No matter which lubricant is used, follow the lubricant manufacturer's recommendation for which viscosity to use.

When retrofitting, always add a full system charge of the new lubricant. Even though there may be mineral oil left in the system, it will not provide any lubrication. When using a new or rebuilt compressor, check to see which lubricant it contains. Compressors can be shipped with mineral oil, PAG, ester, or no lubricant (dry).

### **Step 6: Install Fittings and Labels**

When a vehicle has been retrofitted, section 612 of the Clean Air Act (the SNAP rule) requires that a label be attached that provides information about the retrofit. The label should be in plain view, preferably covering the original R12 information. If the R12 information is not covered, it must be made unreadable. After installing the label, cover it with a clear overlay so it remains readable. It is also a good idea to put a duplicate label in the glove compartment in case the under hood label gets damaged. Federal law also requires that each refrigerant used to replace R 12 must use a unique set of service ports, and all R12 ports must be disabled. The easiest way to do this is to install conversion adaptors on the old ports. All R12 ports must be converted or capped off so there is no chance of someone reintroducing R12 into the system after it has been retrofitted. The adaptors are supplied with a thread locking adhesive applied. In order for the adhesive to work, the fitting must be clean and dry. Once the fitting is installed, it should be difficult to remove.

Adaptors are supplied three ways: With a valve core, with a valve core extension, or without a valve core. If the adaptor is supplied with a valve core, the original valve core must be removed and discarded. If the adaptor is supplied with a valve core extension or without a valve core, the original valve core must be removed and replaced with an R134a compatible valve core. If the original R12 fitting is damaged or in a hard to reach spot, R134a fittings can be added with saddle clamp fittings. These fittings can be attached to any straight section of metal tubing. Both high and low side fittings are available, and each comes in 2 different tubing sizes.

For R134a, the low side fitting is smaller than the high side fitting. On older American cars and many imports, both R12 service ports were the same size. On these vehicles, care must be taken to ensure that the correct adaptor is installed on the correct side of the system.

### **Step 7: Evacuation**

If any R12 remains in the system, it can contaminate the PAG lubricant and cause a loss of system performance and life. To prevent this, a thorough evacuation must be done. If the system is not evacuated for at least 30 (preferably 45) minutes, residual R12 can remain trapped in any old mineral oil



and cause future problems.

### **Step 8: Recharge with R134a**

After the system has been evacuated, it is time to recharge with R134a. A typical refrigerant charge for a retrofitted system will be 80-90% of the R12 charge. When following an OE procedure, use the charge level recommended by the manufacturer. If there is no OE procedure available, start with 80% of the R12 charge and add refrigerant up to 90% if necessary. If the vehicle is equipped with a sight glass, do not use the sight glass to determine charge level.

### **Step 9: Leak/Performance Test**

The final step to a successful retrofit is to leak check and performance test the system. R134a is a smaller molecule than R12, so it will leak at a higher rate than R12. If a leak is found, recover the refrigerant, repair the leak, and evacuate and recharge the system.

In the shop, check the duct temperature, system pressures, and cooling fan(s) for proper operation. Then road test the vehicle, noting duct temperature and cooling fan operation, if possible. If a performance test was done before the retrofit, compare the before and after figures. Most retrofits will result in a slightly higher duct temperature, but only the customer can decide what is acceptable.

## A/C Compressor Replacement.

Failure to follow these 12 steps when installing the compressor will void your warranty.

1. MUST clean A/C system with an approved flush, using an approved flushing method (R141b and Dura Flush are approved). If an approved flush is not available, an in line filter MUST be installed per the installation instructions included with the compressor.
2. MUST replace filter drier or accumulator.
3. MUST replace orifice tube or liquid line that contains orifice tube (if applicable).
4. Inspect/replace thermostatic expansion valve & clean inlet screen (if applicable).
5. Check for proper air flow through cooling fins of condenser & radiator (condenser may need to be replaced, see additional information in the instructions included with the compressor).
6. Check for proper fan clutch or electric fan operation.
7. Check compressor clutch air gap before installation (refer to OEM or compressor manufacturer's specifications).
8. MUST add correct type & amount of refrigerant oil (refer to OEM or compressor manufacturer's specifications).
9. After hose assemblies are attached, turn compressor shaft (not just the clutch pulley) a minimum of 10 times to clear oil from compressor (a spanner wrench may be required).
10. Check compressor clutch electrical circuit for proper voltage (use either OEM or compressor manufacturer's specifications).
11. Use ONLY R12 or R134a refrigerant.
12. Evacuate entire A/C system for a minimum of 45 minutes if the temperature is above 80 degrees (60 minutes for dual air system or if temperature is below 80 degrees).

**MOST REMANUFACTURED COMPRESSORS DO NOT CONTAIN OIL. SOME NEW UNITS DO CONTAIN OIL.**

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**PREALIGNMENT INSPECT**      *Inspect for alignment*

ALIGNMENT INSPECTION INCLUDES THE FOLLOWING:

- Road test and note steering wheel off-set and tire pull
- Raise vehicle, inspect the following:
- Front and rear tires for good tread, even wear P/F
- Inner tie rod ends for excessive play P/F
- Outer tie rod ends for excessive play P/F
- Upper ball joints for excessive play P/F
- Lower ball joints for excessive play P/F
- Strut rod & control arm bushings for wear P/F/NA
- Track bar and bushings for excessive play P/F/NA
- Shocks / struts, pivot bearing P/F
- Inflate tires to correct pressure.

○ Tires inflated to \_\_\_\_\_ psi.

THIS VEHICLE NEEDS THE FOLLOWING STEERING / SUSPENSION PARTS REPLACED BEFORE A PROPER ALIGNMENT CAN BE PERFORMED:

**ALIGNMENT 4 WHEEL**                      **Four wheel alignment**

**FRONT SUSPENSION THRUST ALIGNMENT INCLUDES THE FOLLOWING:**

**PREALIGNMENT INSPECT**                      **Inspect for alignment**

**ALIGNMENT INSPECTION INCLUDES THE FOLLOWING:**

- Road test and note steering wheel off-set and tire pull
- Raise vehicle, inspect the following:
- Front and rear tires for good tread, even wear P/F
- Inner tie rod ends for excessive play P/F
- Outer tie rod ends for excessive play P/F
- Upper ball joints for excessive play P/F
- Lower ball joints for excessive play P/F
- Strut rod & control arm bushings for wear P/F/NA
- Track bar and bushings for excessive play P/F/NA
- Shocks / struts, pivot bearing P/F
- Inflate tires to correct pressure.

○ Tires inflated to \_\_\_\_\_ psi.

**THIS VEHICLE NEEDS THE FOLLOWING STEERING / SUSPENSION PARTS REPLACED BEFORE A PROPER ALIGNMENT CAN BE PERFORMED:**

Install alignment machine,

Install alignment machine, measure

Caster, Camber, Toe, Steering Axis inclination, Set back, included angle, and thrust angle.

Make needed Original Equipment allowed adjustments.

**BATTERY CABLE REPAIR**      Replace battery Terminals

The battery cable repair is intended to replace a broken or corrosion damaged battery cable end with a factory quality cable end, avoiding the replacement of the cable assembly.

**BATTERY CABLE END REPLACEMENT INCLUDES:**

- Remove damaged battery cable end
- Strip wire insulation back, inspect cable for corrosion
- Install new battery cable end, using crimping tool
- Cover crimp with heat shrink tubing
- Clean battery posts and top of battery
- Install anti-corrosion washers on battery posts if applicable
- Spray battery posts & cable ends with anti-corrosion paint

Record number of each part used.

CABLE ENDS \_\_\_\_\_

Covers RED \_\_\_\_\_      BLACK \_\_\_\_\_

LUG ENDS \_\_\_\_\_

**BATTERY DRAIN TEST**                      Parasitic Draw Test

The battery drain test is used to find the source of a parasitic draw that can cause partial or total discharge of the battery while the vehicle is not running. A battery / start/ charge system test should be performed first to verify the condition of the battery and charging systems. A parasitic draw of 50-100 milliamps (.050-.100 amps) is considered normal.

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**WARNING\*\*\*\*\*CHECK FOR THEFT PROOF RADIO BEFORE DISCONNECTING BATTERY. IF EQUIPPED, INFORM SERVICE ADVISOR BEFORE PROCEEDING.**

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**THIS TEST INCLUDES:**

- Install test equipment and measure parasitic draw. Parasitic draw is \_\_\_\_\_ amps.
- This draw is Excessive / Normal
- Disconnect alternator, remove fuses to pinpoint source of excessive draw.
- THE SOURCE IS \_\_\_\_\_

**BATTERY SALE**

**Battery Installation**

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**WARNING\*\*\*\*\*CHECK FOR THEFT PROOF RADIO BEFORE DISCONNECTING BATTERY. IF EQUIPPED, INFORM SERVICE ADVISOR BEFORE PROCEEDING.**

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TEST RADIO OPERATION BEFORE BATTERY REMOVAL. PASS/FAIL  
IF FAILS,INFORM SERVICE ADVISOR BEFORE DISCONNECTING BATTERY

INSTALL NEW BATTERY INCLUDES THE FOLLOWING:

- Remove old battery
- Inspect and clean battery hold-down of corrosion Battery hold-down Pass/Fail
- Clean battery box
- Clean battery cable ends
- Install new battery with anti-corrosion washers if applicable.
- Test new battery Battery voltage after test \_\_\_\_\_ volts

Test radio operation after installation Pass/ Fail

Reset clock after replacing battery Pass/Fail

**BATTERY SERVICE**      Battery Service

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**WARNING\*\*\*\*\*CHECK FOR THEFT PROOF RADIO BEFORE DISCONNECTING BATTERY. IF EQUIPPED, INFORM SERVICE ADVISOR BEFORE PROCEEDING.**

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Battery Service includes the following:

Load test battery. \_\_\_\_\_Amps for 15 seconds

Battery voltage after test. \_\_\_\_\_Pass/Fail

Check and add water if needed.

Clean battery cables and connections and install battery anti-corrosion washers

Inspect battery Hold-down

Test radio operation after installation

Reset clock after battery service

PASS/FAIL

Pass/ Fail

Y/N



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**BATTERY/STARTER/CHARGE TEST** Test battery, starter, alternator  
STARTING AND CHARGING SYSTEM TEST

**Battery Testing**

- Battery Hold down Wedge/Cross Bar/J bolts P/F
- Test specific gravity if accessible. If more than 30 points variation, fail battery. Can't test/P/F

Load testing requires the battery to be at least 75% charged or 12.4 volts.

At the time of this test your battery was reading \_\_\_\_\_ Volts P/F

If fail charge before continuing.

After charging your battery was reading \_\_\_\_\_ Volts P/F

Apply load equal to half the battery's cold cranking amps (CCA) rating. A good battery should be able to supply half its CCA rating for fifteen seconds without dropping below 9.5 volts.

CCA Rating \_\_\_\_\_ Amps

Battery was able to hold at \_\_\_\_\_ Volts. P/F

10.0 Volts or More Good

9.6 - 9.9 Volts Fair Perform a 3 minute full charge battery test verify below 16.5 Volts.

3 minute test \_\_\_\_\_ Volts P/F

9.6 Volts or less suggest new Battery at this time

**Cable Testing**

Is corrosion visible at the battery cable ends P/F

Voltage drop cables on the part of the charging system suspected.

At alternator for charging system or at starter for starting system.

Positive cable voltage drop \_\_\_\_\_ Volts Starter/Alternator P/F

Negative cable voltage drop \_\_\_\_\_ Volts Starter/Alternator P/F

**Starter Testing**

While cranking engine measure cranking amperes, and voltage

Amperage draw \_\_\_\_\_ Amps. P/F

Cranking voltage \_\_\_\_\_ Volts P/F

**Alternator Testing**

Verify alternator belt tension and condition. P/F/Adjust

Run engine at approximately 2000 RPM measure total alternator output

Maximum output \_\_\_\_\_ Amps. P/F

Check the diode and stator of the alternator while alternator is charging. P/F

Check system voltage should be at or near 14.5 Volts.

System voltage \_\_\_\_\_ Volts. P/F

Listen to the alternator bearings. P/F

THE FOLLOWING ITEMS NEED TO BE REPAIRED OR REPLACED:

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**BRAKE CLEAN/ADJUST**      Rear brake clean + adjust only

THIS SERVICE IS PERFORMED TO AVOID REAR BRAKE NOISE AND FOR PROLONGED BRAKE LIFE.

- Disassemble, clean and adjust rear brakes
- Adjust emergency brake

**BRAKE DEGLAZE**      Brake Service for noise and vibration

This service is performed to help correct a brake noise or vibration complaint when the cause is glazed or warped brake rotors. This service does help stop brake noise and vibration, but due to the material some brake pads are made of, we cannot guarantee this service will stop all brake noise permanently.

**WE CAN ONLY GUARANTEE THIS SERVICE FOR 30 DAYS.**

**DEGLAZE DISC BRAKES INCLUDES:**

- Machine front or rear brake rotors
- Thoroughly clean rotors with Soap and water to remove tiny metal particles.
- Deglaze brake pads
- Apply anti-squeal compound to brake pads
- Lubricate brake caliper slides
- Reassemble and clean rotor surfaces removing all grease and finger prints.
- Road test

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**BRAKE FLUSH**

ANTI-LOCK BRAKE SYSTEM FLUSH INCLUDES:

- Inspect entire brake system for worn components or leaks.
  - If leaks or component problems exist Advise Service Advisor Now
- Flush brake fluid from master cylinder
- Install new brake fluid
- Bleed brake system
- Road test vehicle

P/F

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**BRAKE INSPECTION**    Inspect & measure brakes

During initial road test complaint was verified?    YES/NO

BRAKE INSPECTION INCLUDES THE FOLLOWING:

VISUAL INSPECTION

Brake hardware _____	P/F	Brake Calipers _____	P/F
Brake fluid _____	P/F	ABS/Brake Light _____	P/F/NA
Brake Flex Hoses _____	P/F	Wheel cylinders _____	P/F
Brake lines _____	P/F	Emerg. Brake Oper. _____	P/F
Master Cylinder _____	P/F		

FRONT

Measured from wear indicator			Spec.	Pass/Fail
Pads _____ L _____	R _____	_____	____.030____	____P/F____
Rotors _____ L _____	R _____	_____	_____	____P/F____

REAR

Shoes/Pads _____ L _____	R _____	_____	____.030____	____P/F____
Drums/Rotors _____ L _____	R _____	_____	_____	____P/F____

If complaint is vibration, measure and record rotor run-out:

Allowable limit is .002"-.006".LF \_\_\_\_\_ RF \_\_\_\_\_ LR \_\_\_\_\_ RR \_\_\_\_\_

Fail brake drums/rotors if within .030 of machine-to limit.

Parts and repairs that are needed are:

## **BRAKES FRONT**

### **Front Brake Job**

#### **FRONT WHEEL BRAKE SERVICE INCLUDES:**

- Flush brake fluid
- Measure brake rotors brake rotors require machining if: P/F
  - \* Scoring depth in excess of 1.5mm
  - \* Excessive corrosion on braking surfaces.
  - \* Pulsation concerns from lateral runout in excess of .055mm.
- Thoroughly clean rotors with Soap and water to remove tiny metal particles.
- Clean and lubricate brake caliper slides and or pins.
- Inspect Calipers for leaks or torn boots P/F
- Clean and repack wheel bearings, if needed to service rotor
- Install premium brake pads.
- Reassemble and clean rotor surfaces removing all grease and finger prints.
- Perform road test.

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**BRAKE, REAR**                      Rear 2 wheel brake job

REAR WHEEL BRAKE SERVICE INCLUDES:

- Flush brake fluid
- Resurface brake drums or rotors
- Thoroughly clean rotors or drums with Soap and water to remove tiny metal particles.
- Clean and lube backing plates, lube caliper slides.
- Install premium quality brake shoes or pads
- Reassemble and clean rotor/drum and shoe surfaces removing all grease and finger prints.
- Adjust emergency brake
- Road test

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**CARB OVERHAUL**      Carburetor overhaul

CARBURETOR OVERHAUL INCLUDES THE FOLLOWING:

ADD LABOR AND PARTS FOR REBUILD HERE

- Remove/disassemble carburetor
- Inspect for damaged or missing components
- Clean all parts in cleaning solution
- Test all vacuum and electric operated controls
- Reassemble using new gaskets and float
- Replace fuel filter/ air filter if needed
- Inspect / replace damaged vacuum hoses / pre-heat hose
- Install on vehicle, make cold engine adjustments
- Adjust base idle speed, mixture, choke settings
- Run engine until warm, final warm adjustments
- Install gas analyzer, adjust idle/ 2500 RPM mixture
- Confirm closed loop operation, if applicable
- Road test for good drivability

PLEASE NOTE: We make adjustments to factory setting. Some vehicles need to be adjusted for best drivability. If you are NOT satisfied please let us know. We will make minor adjustments if needed





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**CLUTCH FLUSH**            Clutch Flush

CLUTCH SYSTEM FLUSH INCLUDES THE FOLLOWING:

- Visually Inspect clutch master cylinder for leaks P/F
- Visually inspect clutch slave cylinder for leaks. P/F

IF EITHER OF THESE COMPONENTS FAIL DO NOT PERFORM SERVICE

- Remove old clutch fluid, flush as needed.
- Add new fluid, bleed system.

\*\*\*\*\*

**CLUTCH INSPECT**            Clutch Inspect

CLUTCH INSPECTION INCLUDES:

- Road test to verify Customer complaint Y/N
- On mechanical clutch release, inspect for:
- Correct adjustment P/F
- Clutch pedal bushings P/F
- Clutch cable or linkage P/F
- Fire wall for damage, cable operated only P/F
- Rear main seal leaks P/F
- Transmission seal leaks. P/F

On hydraulic release clutch, inspect for leaks for:

- Clutch master cylinder P/F
- Clutch slave cylinder P/F
- Hydraulic hose P/F
- Rear main seal leaks P/F
- Adjust clutch if adjustable P/F/NA

No charge for this inspection if clutch repair done here.

Road test after inspection, make note of any repairs needed:

## Constant Velocity Axle replacement.

1. Check transmission for axle shaft seal leak.  
IF LEAK IS NOTED STOP AND ADVISE SERVICE ADVISOR.
2. Remove axle per service manual recommendation
3. Replace axle seal if needed.
4. Reinstall axle and torque nut. Torque \_\_\_\_\_
5. Check transmission fluid level and add as needed. P/F

Fluid added Type \_\_\_\_\_ Amount \_\_\_\_\_

**RECHECK REPORT** For Customer Complaints

THE CUSTOMER HAS RETURNED WITH THEIR VEHICLE WITH A CONCERN ABOUT A PREVIOUS REPAIR. THE TECHNICIAN AND MANAGER WILL COMPLETE THIS "CUSTOMER CONCERN" FOLLOW THROUGH FORM.

THE CONCERN IS:

THE PREVIOUS REPAIR INVOICE #'s

PULL PREVIOUS REPAIR ORDER AND CHECK ALL HISTORY  
PLEASE NOTE WHAT WAS DONE PREVIOUSLY AND ANY ADDITIONAL REPAIRS WE MAY HAVE RECOMMENDED:

PLEASE NOTE CORRECTION REQUIRED:

HOW COULD THIS INCONVENIENCE FOR OUR CUSTOMER BEEN AVOIDED:

RECOMMENDED CHANGES IN POLICY, PART SUPPLIER, OR TRAINING SHOULD BE NOTED HERE:

After reviewing this situations and making the above recommendations we believe that this type of problem can be avoided in the future. We realize that we hold ourselves to a very high standard because we desire to be the best in our field. We agree to make the above noted changes to hold those high standards.

Technician Signature: \_\_\_\_\_

Manager Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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**COOLANT SYSTEM OVERHEAT OR LEAK DIAGNOSIS** Coolant leak diagnosis first level.

**COOLING SYSTEM LEVEL 1 DIAGNOSIS INCLUDES:**

- Top off cooling system. \_\_\_\_\_ Quarts were added.
- Pressure test cooling system to specification. P/F
- Inspect all radiator hoses Leaks- P/F Maintenance P/F
- Inspect all heater hoses Leaks- P/F Maintenance P/F
- Inspect all by-pass hoses Leaks- P/F Maintenance P/F
- Visually inspect heater assembly under dash and carpet for signs of current or previous leaking. P/F
- Visually inspect radiator for leaks P/F
- Visually inspect engine freeze plugs for coolant leaks P/F
- Visually inspect water pump for signs of leaking P/F
- Visually inspect thermostat housing for leaks P/F
- Visually inspect coolant reservoir for leaks P/F
- Inspect accessory belts for condition and adjustment P/F
- Inspect for restricted air flow through radiator and Condenser P/F
- Inspect for damaged / missing fan shroud P/F/NA
- Confirm operation of electric fan / fan clutch Came on at \_\_\_\_\_ Degrees P/F/NA
- Pressure test radiator cap Holds pressure at \_\_\_\_\_ PSI P/F
- Check radiator for hydrocarbons Reading \_\_\_\_\_ PPM P/F
- Visually inspect for Coolant contaminated engine oil. P/F
- Test coolant condition and protection. \_\_\_\_\_ Degrees P/F
- Cooling system needs to be flushed? Y/N
- Check for applicable TSBs or Pattern failure Y/NA
- Verify operation of thermostat. Fail if questionable P/F

Repair or Replace parts as necessary then road test If OK Stop. If not OK go to step 2  
If no problem found go to step 2.

**Level 2:**

- 2a Replace Thermostat.
- 2b Road Test If OK Stop. If not OK go to step 3

**Level 3:**

- 3a Perform road test Stop Engine and Immediately Check Radiator for Cold spots.  
If cold spots found repair or replace radiator.
- 3b Road Test. If OK Stop. If not OK go to step 4

**Level 4:** Recheck for:

- 4a Proper Coolant Level and Condition OK
- 4b Coolant Contaminated Engine Oil. OK
- 4c Uneven Cranking and or Misfire. OK  
If Uneven Cranking and or Misfire Present Perform Cylinder Leak Test. .
- 4d Check for Combustion Leaks OK  
If Combustion Leaks, Contaminated Engine oil, or Cylinder Leakage exist.  
Inspect/Repair Head Gasket, Cylinder Head, Block.

Repair or Replace parts as necessary then road test If OK Stop. If not OK go to step 5  
If no problem found go to step 5

**Level 5:** Confirm adequate coolant flow:

5a Check condition of Water Pump Impeller.

5b Check for internal restriction in entire cooling system. (radiator, block, head)

Repair or Replace parts as necessary then road test

## **COOLING SYSTEM FLUSH CT-2**

COOLING SYSTEM FLUSH INCLUDES THE FOLLOWING:

- Inspect all cooling system hoses for condition P/F
- Inspect all fan belts for condition and tension P/F
- Visually inspect water pump and engine for leaks P/F
- Pressure test radiator pressure cap P/F
- Add flush chemical, back-flush cooling system.
- Fill with antifreeze.
- Add cooling system conditioner.
- Correct coolant protection to -34°F.
- Clean coolant overflow container, fill with coolant
- Pressure test cooling system, inspect for leaks P/F
- Road test vehicle



**CRANKS, NO-START**      Cranks, does not start

THE FOLLOWING TESTS WERE PERFORMED TO DIAGNOSE NO-START

- |  |           |
|--|-----------|
| ▪ Confirm engine cranks normally.  | PASS/FAIL |
| ▪ Test for fuel pressure.  |           |
| ▪ Install test gauge, record pressure Fuel pressure cranking _____ PSI. Spec. _____ PSI.   | P/F       |
| ▪ Verify there is fuel in tank, add 2 gallons if not.  |           |
| ▪ Inspect for tripped fuel cut switch (FORD ONLY)  | NA/P/F    |
| ▪ Test spark at ignition coil and spark plugs  | P/F       |
| ▪ Verify distributor turns if equipped   | NA/P/F    |
| ▪ Verify timing belt turns cam, if equipped.   | NA/P/F    |
| ▪ Check engine cranking vacuum _____ inches  | P/F       |
| ▪ Verify injector pulse  | NA/P/F    |
| ▪ Test for computer trouble codes, record codes in memory  | Y/N       |
| ****Codes _____  |           |
| ▪ IF MORE DIAGNOSTIC TIME IS NEEDED, CLARIFY WHAT SYSTEMS WILL BE TESTED AND ADDITIONAL TIME NEEDED. Continue using Drivability Worksheet. |           |

THE FOLLOWING ITEMS TESTED NEED REPLACEMENT OR REPAIR:

\*\*\*\*\*

**DIFFERENTIAL SERVICE**      Differential Service

DIFFERENTIAL SERVICE INCLUDES THE FOLLOWING:

- Inspect differential for leaks or damage
- Evacuate all differential fluid
- Reference service manual for correct fluid type and quantity and refill differential.

ADD FLUID HERE   ATF\_\_\_\_\_   BG75216\_\_\_\_\_   75W90SSG\_\_\_\_\_   LIMITED SLIP ADDITIVES \_\_\_\_

\*\*\*\*\*

**DOOR LOCK,WINDOW**                      Door lock, window inspect

DOOR LATCH, WINDOW INSPECT INCLUDES THE FOLLOWING:

- Remove door panel to access internal door components
- Inspect window regulator / door latch for proper operation

The following items were / are in need of repair:

## **EGR SERVICE**

## **EGR Service**

Our exhaust gas recirculation (EGR) service is performed to clean carbon from passages in the EGR system. The EGR system is designed to lower combustion temperatures to prevent the formation of Oxides Of Nitrogen (NOX), an ozone depleting chemical.

Our EGR service is also designed to help prevent or to correct some drivability complaints.

**EGR CLEANING SERVICE INCLUDES:**

- Remove EGR valve to access port
- Install EGR cleaning tool
- Inject high quality cleaning chemical, run engine

Reinstall EGR valve, test for proper valve operation

## Electrical Device Failure.

Use this when an electrical device has been reported as failing.

1. Get wiring diagram of the affected circuit.
2. Mark on the wiring diagram with colored highlighters the power and ground circuits.
3. Use system description in alldata or owners manual to make sure you know how the system is intended to work.
4. Check power supply including fuses.
5. Check ground or switching circuits.
6. After a check of this circuit this is what is needed.

**ENGINE REPLACE            Replace engine checklist**

**THE FOLLOWING ITEMS NEED TO BE INSPECT/REPLACED WHEN THE ENGINE IS REPLACED:**

Please check off any item that needs replacement.

- Radiator flow tested and rodded out if possible.
- Radiator hoses
- Thermostat (Replace)
- Timing Belt (Replace if not new)
- Water pump (Replace)
- Heater and by pass hoses
  - \_Upper radiator\_
  - \_Lower radiator\_
  - \_By-Pass
  - \_Heater\_\_\_ Quantity and location
    - \_\_\_\_\_
    - \_\_\_\_\_
  - \_other \_\_\_\_\_
- Engine mounts \_\_\_ Quantity and location \_\_\_\_\_
- Transmission mounts \_\_\_ Quantity and location \_\_\_\_\_
- Clutch
- Fan belts. Please indicate quantity and location \_\_\_\_\_
- Spark plugs (Replace)
- Spark plug wires
- Distributor cap
- Ignition rotor
- PCV Valve
- Air filter
- Fuel filter (Replace)

**Other** \_\_\_\_\_

**EXHAUST LEAK, INSPECT** Muffler/Exhaust Inspect

Exhaust system inspection includes the following:

- Install smoke machine, inspect the following for leaks: P/F
- Engine exhaust manifolds and gaskets P/F/NA
- Air injection system, if equipped P/F
- Front exhaust pipe P/F
- Catalytic converter at connections P/F
- Mid-pipe / resonator P/F
- Muffler and connection pipes P/F
- Tailpipes P/F
- Inspect catalytic converter for loose substrate P/F
- Inspect complete system for rust-through P/F
- Inspect exhaust hangers for missing/damaged parts P/F

\*\*\*\*\*NO CHARGE FOR INSPECTION IF REPAIRS ARE MADE\*\*\*\*\*

THE FOLLOWING PARTS NEED TO BE REPLACED:

\*\*\*\*\*

**FUEL SYSTEM CLEANING AIR INDUCTION ONLY**      **BG Intake Cleaning**

Air induction system cleaning is recommended as maintenance and should be performed every 30,000 miles.

AIR INDUCTION SERVICE INCLUDES:

- Install air induction system cleaning equipment.
- Clean air intake system.
- Inspect air and fuel filters.
- Air filter needs replacement? Yes/No
- Fuel filter needs replacement? Yes/No
- Perform final road test.



**FUEL SYSTEM CLEANING**      Motorvac Cleaning

This fuel system service cleans fuel rails, injector screens, fuel pressure regulator, decarbonizes valves, increases engine vacuum lost to carbon build-up, improves engine performance and helps with cold start conditions.

**INCLUDES AIR INTAKE SYSTEM CLEANING.**

Motorvac fuel system cleaning includes the following:

- Road test to verify no drivability problems.
- Install Motorvac Unit, observe fuel pressure with engine running
  - Pressure \_\_\_\_\_ SPEC. \_\_\_\_\_
- Test fuel pressure maximum output. \_\_\_\_\_
- Test fuel volume.
- Test for fuel system leaks.
- Identify source if fails Fuel pump / regulator / injectors
- Test engine vacuum before \_\_\_\_\_ system cleaning.
- Back flush injectors and rails.  
Install air induction system cleaning equipment.
- Clean air intake system.
- Inspect air and fuel filters.
- Air filter needs replacement?
- Fuel filter needs replacement?
- Most cars show an improvement in vacuum after cleaning.
- Test engine vacuum after \_\_\_\_\_ system cleaning.
- Perform final road test.

PASS/FAIL

PASS/FAIL

PASS/FAIL

PASS/FAIL

Yes/No

Yes/No

\*\*\*\*\*

**HEADLAMP REPLACE**                      Replace headlamp, aim

REPLACE HEADLAMP INCLUDES:

- Inspect all lights including headlamps, tail lamps, turn signals, and license plate lamp.
- Replace headlamp.
- Aim headlamps

\*\*\*\*\*

**HEAT COMPLAINT**      **Insufficient or no heat**

Our no heat complaint diagnosis includes the following:

- Inspect for low coolant level P/F
  - \_\_\_\_\_ quarts of coolant was added.
- Cooling system needs to be flushed? Y/N
- Pressure test cooling system for leaks. P/F
- Test thermostat operation. Using inferred thermometer P/F
- Test flow thru heater core using inferred thermometer P/F
- Test radiator cap. P/F
- Test heater fan operation on all speeds. P/F
- Test / Inspect heater vent operation at dash control. P/F
- Test / Inspect heater control valve if accessible. P/F N/A
- Inspect vacuum system, if vacuum controlled heater vent system . P/F/NA
- Inspect fan belts. P/F
- Verify engine temperature gage reads engine temperature properly. P/F-NA

IF ADDITIONAL TIME IS NEEDED, INDICATE WHAT SYSTEMS WILL BE INSPECTED /DIAGNOSED  
THE FOLLOWING ITEMS NEED REPAIR/SERVICE TO CORRECT COMPLAINT

**HEATER CORE REPLACE**      Replace heater core

HEATER CORE REPLACE INCLUDES THE FOLLOWING:

- Pressure test to verify heater core leaks. P/F
- Verify all heater controls and fan work properly. P/F
- Verify A/C system works, if equipped. P/F
- Inspect condition of heater hoses. P/F
- Inspect condition of antifreeze. Needs flush? Y/N

**If any of the above fails, inform Service Advisor BEFORE proceeding.**

- Drain cooling system.
- Disassemble dashboard as needed to access heater core.
- Replace heater core with new part.
- Install new heater hoses if needed.
- Reassemble dashboard.
- Refill cooling system. Pressure test, inspect for leaks. P/F
- Verify heater controls and fan work properly. P/F
- Verify A/C system works properly. P/F

# 16 Point Inspection Instructions and Standards.

## General Instructions.

Our complimentary inspection is designed to give the customer an overview of the obvious problems evident at the time of service. It is a visual hands off inspection. It is not intended to replace detailed inspections to determine the cause of specific problems or symptoms. Technicians are advised to only note items that are obvious and would be obvious to another technician or shop without disassembly or in depth inspection. If the technician sees something that indicates a possible problem, or indicates the very early signs of a pattern failure, he should recommend an inspection of that subsystem or ask the customer if there is a particular symptom that fits his observation.

Since some problems are very relative in nature we will use the following guidelines.

Before any specific repairs are recommended from the 16pt inspection the leak must meet the guidelines for a level 3 or higher leak. Level 1 and 2 leaks should not have a specific repair recommended but tech should simply note the observation and if the customer has a specific symptom or would like to pursue the potential early sign they can be advised accordingly.

Leaks should be categorized as follows:

- Level 1 Leak shows up as a film mixed with dust. No evidence at this time that it is hitting the ground.
- Level 2 Leak shows up as a moist film not covered with dust. Or in the case of coolant it may appear as a dry chalk looking track. There are no visible droplets at the time of the inspection.
- Level 3 Leak shows up as a moist film and there is at least one droplet visible at the time of inspection. Customer would most likely be seeing drops on garage or driveway floor.
- Level 4 Leak shows up as a visible drip during the time of inspection. Customer likely is seeing leaks on garage or driveway and may be adding fluid. This is a serious leak and should be taken care of immediately.
- Level 5 Leak shows up as a steady drip during the inspection. This is a severe leak and must be repaired before any other repair work is done at this shop.

**1. Tire Condition** Look at all four tires. Look for uneven wear, at the center and outer edges.

Recommend alignment for severe uneven wear with greater than 2 mm tread differences. Recommend replacement of tires if tires are within one millimeter of the wear bars at any point across the tread.

Recommend rotation for minor wear of front tires on edges.

## 2. CV Axles/Boots.

U-Joints - Give universal joints both a visual and a physical check note excessive movement.

Recommend U-joint replacement with any noticeable movement.

CV Joints - Loose joints or cracked or cut boots should be noted.

Recommend replacement of axle

For any noticeable movement.

If boot is torn and openly exposed.

Obvious noise.

Recommend boot replacement

If boots have cracks in at 1mm or deeper.

**3. Steering components.** This category encompasses the pitman arm, idler arm, relay rod/drag link, tie rods and tie rod- ends, ball joints, control arms and strut rods. Abide by the original equipment manufacturer's recommendations.

Recommend prealignment inspection if you suspect a component may be out of specification but are unsure. There are situations where you may find what appears to be excessive play in a part. Be certain that it IS excessive, beyond specifications, before listing the condition as a "fail".

Recommend replacement Tie rod or ball joint or boot.

If grease boot missing or torn and if boot is not available separately, suggest replacement of tie rod end or ball joint.

Tie Rod Looseness (perceptible horizontal movement) Do not use pliers or pry bar to check ball and socket movement. Use only moderate hand pressure.

Ball joint wear exceeds manufacturer's specifications.

**4. Struts/Shocks** Inspect for visible fluid leaking jounce for excessive wear and check for tire cupping. Recommend Replacement when

Leaking oil, enough for fluid to be running down the body

Recommend a suspension inspection to determine cause.

Tire cupping **NOTE:** Although shocks or struts may have contributed to tire cupping, an inspection is needed of the entire suspension system. If the shock or strut is found to be contributing to the tire cupping, require replacement.

**5. Exhaust / Muffler** – Give exhaust pipes and muffler a look while under the vehicle. You may want to use a rubber mallet on the, exhaust to pinpoint loose material in pipes, mufflers, resonators, catalytic converters, and rattling heat shields

Recommend replacement for

Body shell distorted, affecting performance or structural integrity

Corrosion hole (exhaust leaking)

Puncture (other than a drain hole)

Rattling or knocking noise from inside muffler

Seam open (exhaust leaking)

Suggest Replacement for:

Weak due to corrosion, but no leaks present

Outer wrap peeling (exhaust not leaking)

**7. Brake friction material** - Inspect pad thickness to determine whether or not brake work is imminent.

Recommend brake inspection if in doubt as to the useful life of brake components.

Recommend replacement of friction material for:

Friction material worn to, or below minimum specifications

Suggest replacement of friction material Worn close to minimum specifications

**8. Brake / Clutch hydraulics**

DOT 3, DOT 4, and DOT 5.1 brake fluids are clear or light amber in color.

Recommend replacement of any component with visible leaks.

Recommend flush of hydraulic fluid that is dark brown or black.

**9. Transmission and fluid.** Check automatic transmission fluid color and transmission for category 3 or higher leaks. (See Leak description.)

Recommend transmission flush for fluid that is dark brown or black.

Suggest transmission maintenance interval be checked for dark red fluid.

**10. Drive belts.** Check drive belts for cracks. Listen for noise.

Recommend drive belt replacement for:

Visible cracks.

Belts squealing that are adjusted properly.

Recommend belt adjustment for belt noise when belts don't appear cracked or glazed.

**11. Coolant, Radiator, and Hoses.** Visual inspection of coolant, coolant leaks, and hoses.

Recommend coolant flush when coolant is brown or rusty colored.

Recommend cooling system repair or inspection for leaks above category 3.

Recommend hose replacement for hoses swollen or leaking.

**12. Battery / Cables.** Visual inspection of battery, mounting hardware and cables.

Recommend battery service for visible corrosion, dirty or wet battery top.

Recommend battery mounting hardware for missing hardware.

Recommend starting and charging system test for:

Swollen battery case.

Low fluid level.

**13. Wiper Blades.** Use wipers and washers check for streaking.

Recommend replacement of blades for torn wiper blades.

Suggest replacement of blades for streaking blades

**14. Headlight operation.** Check operation of headlights both high and low beams.

Recommend replacement of headlamp bulb for:

Inoperative headlights.

May require an electrical system diagnosis.

Cracked lens.

**15. Exterior lighting.** Check operation of stop, tail, turn and marker lights.

Recommend replacement of bulb for inoperative light.

May require an electrical system diagnosis.

**16. Other.** Make note here of other obvious problems to be brought to the attention of the customer.

**Mileage based maintenance recommendations.** Use this portion to advise the customer of items that show no visible sign of needing service but have a specific maintenance interval.

**Minor service** recommend at 6 month 7,500 mile intervals

**Intermediate service** recommend at 1 yr 15,000 mile intervals.

**Major Service** recommend at 3 year or 30,000 mile intervals.

**Valve adjustment** recommend at manufacturers recommend intervals

We recommend at least every 30,000 on adjustable valves.

**Transmission Service** recommend at 3 year or 30,000 mile intervals.

**Timing Belt** recommend at manufacturers recommended intervals.

Suggest water pump, seals or other components known to have pattern failures but don't require. Final decision rests with customer.



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**LIGHT BULB REPLACE**      Tail, brake, marker light replace

- Inspect all lights for proper operation.
- Replace burned out bulb. Replacement in some case involves removing trim pieces, lamp assemblies or other obstructions.

\*\*\*\*\*

**LOF** Lube, oil, filter

OUR OIL CHANGE SERVICE INCLUDES THE FOLLOWING:

- Change oil and replace oil filter.
- Replace drain plug gasket, torque drain plug to \_\_\_\_\_ft/lbs
- Lubricate all grease fittings.
- Inspect and top off all fluid levels including: Battery water if servicable
- Transmission fluid
- Power steering fluid
- Brake fluid
- Antifreeze level and protection. Good to \_\_\_\_\_\*F
- Windshield washer reservoir
- Transfer Case
- Front Differential & Rear Differential
- Inspect all Lights
- Test Horn
- Inspect Condition of Fan Belts
- Coolant Hoses
- Check and correct all tire pressures to \_\_\_\_\_ psi.
- Install "NEXT SERVICE DUE" Reminder sticker on windshield.
- Perform final road test.

NOTE ANY SERVICES NEEDED OR PROBLEMS FOUND.

HOW MUCH OIL WAS ADDED? \_\_\_\_\_

OIL FILTER USED \_\_\_\_\_

## **Maintenance SERVICE 15K      15,000 MILE SERVICE**

- Change oil & filter, check & top off all fluid levels.
- Replace air & fuel filters.
- Adjust valve if recommended.
- Inspect lights, turn signals, horn, brake lights.
- Inspect front & rear brake systems, test & adjust emergency brake
- Inspect steering & suspension systems, shocks/struts.
- Inspect ignition system, distributor cap & rotor.
- Inspect all fan belts, adjust as needed.
- Inspect exhaust system for leaks.
- Inspect coolant system, hoses, pressure test radiator cap.
- Inspect battery, clean terminals, test start/charging system
- Battery test \_\_\_\_\_ P/F
- Alternator test \_\_\_\_\_ P/F
- Rotate & balance tires, correct tire pressure, note wear.

**Maintenance Service 30K**

**30,000 MILE SERVICE**

- **Print mileage service for this vehicle from database, note additional services suggested by manufacturer.**
- Change oil & filter, inspect & top off all fluid levels.
- Inspect tail lights, brake lights, horn, turn signals.
- Replace air filter.
- Replace fuel filter if serviceable.
- Inspect front & rear brake system, rotors/drums, hoses, lines.
- Adjust rear brakes, test & adjust emergency brake as needed.
- Flush complete brake system.
- Inspect steering & suspension for wear, loose components.
- Inspect exhaust system for rust, leaks, secure mounting.
- Inspect ignition system, distributor cap, rotor, plug wires.
- Replace spark plugs. (except platinum plugs until 60k)
- Clean throttle plate.
- Replace PCV valve as needed.
- Adjust ignition timing and idle speed, if adjustable.
- Inspect fan belts, adjust as needed.
- Inspect cooling system, hoses, test pressure cap.
- Flush Automatic Transmission.
- Flush cooling system.
- Replace differential, transfer case, and/or manual transmission gearbox fluid.
- Clean & test battery, test starter & alternator.
- Alternator Output \_\_\_\_\_.
- Battery tested at \_\_\_\_\_ Amps, voltage after test \_\_\_\_\_.
- Starter draw tested at \_\_\_\_\_ Amps.
- Rotate & balance tires, correct tire pressure, note wear.

PASS/FAIL  
PASS/FAIL  
PASS/FAIL

## **MILEAGE SERV. BASIC**

### **Mileage Service**

- Change oil and filter, check and top off all fluid levels.
- Inspect lights, turn signals, horn, brake lights.
- Inspect front brake pads, rotors, lines and hoses.
- Inspect rear brake pads/shoes, rotors/drums, lines and hoses.
- Inspect test and adjust emergency brake.
- Inspect steering system, power steering pump and hoses.
- Inspect suspension, shocks/struts and torque mounting bolts.
- Inspect ignition system, distributor cap, rotor, wires.
- Inspect all fan belts and adjust as needed.
- Inspect exhaust system.
- Inspect cooling system, hoses, test pressure cap.
- Inspect battery, clean terminals and test electrical system.
- Rotate & balance tires, correct tire pressure, inspect.
- Print mileage schedule from database, note additional service

\*\*\*\*\*

**NOISE DIAGNOSIS**      Noise diagnosis

OUR NOISE DIAGNOSIS INCLUDES THE FOLLOWING STEPS:

Service Advisor road tests vehicle with Customer to verify there is a noise. YES/NO

Technician performs road test with Service Advisor to confirm noise. YES/NO

Perform visual inspection of suspected cause. If the source of the noise is not obvious, install electronic listening device, road test to identify exact location of noise.

The source of the noise is: \_\_\_\_\_

The following is needed to repair to source of the noise: \_\_\_\_\_

\*\*\*\*\*

**OIL LEAK DIAGNOSIS Level 1**

First level. Oil leak diagnosis includes the following:

- Check oil and top-off
- Use smoke machine to inspect for obvious leaks
- Inspect PCV system.
- Needs PCV Valve / Filter

Yes/No

Leaks should be categorized as follows:

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- Level 4      Leak shows up as a visible drip during the time of inspection. Customer likely is seeing leaks on garage or driveway and may be adding fluid. This is a serious leak and should be taken care of immediately.
- Level 5      Leak shows up as a steady drip during the inspection. This is a severe leak and must be repaired before any other repair work is done at this shop.

.....  
THE SOURCE OF THE LEAK IS:

THE SOURCE OF THE LEAK IS NOT OBVIOUS AT THIS TIME.

We make every effort to find all leaks. Some leaks are not as serious and are difficult to find. Because of that, we ask that you bring the vehicle back in 3-5 days for a free re-inspection, in most cases while you wait.

## OIL LEAK RE-REPAIR

## Oil leak Re-repair

Perform this inspection any time an oil leak is being repaired by us for a second time.

- Inspect for the source of the leak SOURCE OF LEAK \_\_\_\_\_
- Review previous invoice for what leak / leaks were repaired.
- Inspect for plugged or restricted PCV system, or vent source
- Disassemble to replace gasket or seal.
- Inspect associated parts for possible cause of leak.
- Do not assume gasket or seal was incorrectly installed.
- Make note of results of parts inspection. If associated parts are defective, they will need to be replaced.
- Replace gasket or seal, top off fluid level.
- Road test vehicle for 15-20 miles.
- Re-inspect for leaks. PASS/FAIL

We re-inspected for oil leaks and found:

Leaks should be categorized as follows:

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- Level 5 Leak shows up as a steady drip during the inspection. This is a severe leak and must be repaired before any other repair work is done at this shop.

- A. SEVERITY \_\_\_\_\_
- B. SEVERITY \_\_\_\_\_
- C. SEVERITY \_\_\_\_\_

We check the engine oil and topped off. Oil was added  
If oil was added, list quantity here \_\_\_\_\_

YES/NO  
YES/NO



## OIL PRESSURE TEST

## Oil Pressure Test

This test is used when there is cause for concern that the engine oil pressure is low or the oil pressure indicator, either light or gage does not read accurately or indicates low oil pressure.

1. -L Oil pressure test

This vehicle is equipped with an oil pressure

LIGHT/GAGE

Test oil pressure with mechanical gage and compare to pressure reading on dash gage

If indicator is light, test oil pressure sensor and light circuit. Indicator works.

PASS/FAIL

- Oil pressure, cold engine, at idle on mechanical gage \_\_\_\_\_
- Oil pressure, cold engine, at idle on dash gage \_\_\_\_\_
- Oil pressure, warm engine, at idle on mechanical gage \_\_\_\_\_
- Oil pressure, warm engine, at idle on dash gage \_\_\_\_\_
- Oil pressure, warm engine, at 2000 RPM on mech. gage \_\_\_\_\_
- Oil pressure, warm engine, at 2000 RPM on dash gage \_\_\_\_\_
- Manufactures specifications for oil pressure \_\_\_\_\_

Oil pressure is within manufactures specifications?

\*\*\*\*\*

**OIL SMOKE DIAGNOSE**                      **Diagnosis for oil smoking from engine**

Diagnosis for engine oil smoking includes the following:

- 1.                      Test/Diagnose for oil smoke
- ADJUST TIME FOR 4CYL1.0L 6 CYL.1.5L 8CYL.2.0L

Perform compression test on all cylinders

CYL#1 _____	CYL#2 _____	CYL#3 _____	CYL#4 _____
CYL#5 _____	CYL#6 _____	CYL#7 _____	CYL#8 _____

Perform cylinder leak down test

CYL#1 _____	CYL#2 _____	CYL#3 _____	CYL#4 _____
CYL#5 _____	CYL#6 _____	CYL#7 _____	CYL#8 _____

Inspect PCV system

PCV VALVE

\*P/F\*

PCV FILTER

\*P/F\*

The following repairs are suggested to correct the oil smoking complaint:

.....

**POWER STEERING FLUSH**      **Power steering flush**

This service is required for any major power steering component replacement.

Our power steering service includes the following:

- Visually inspect power steering system for leaks
- Visually inspect power steering belt
- Add power steering fluid cleaner
- Install flush machine, flush power steering system of all sludge, varnish, contaminants.
- Road test vehicle

P/F

P/F

## **SHAMPOO ENGINE**      Clean engine.

This service is not intended to locate oil leaks, but to clean a dirty engine.

- Apply degreaser foam to cold engine
- Clean engine compartment using warm water. (no steam)
- Blow dry with compressed air, including distributor.
- Road test after service.

**SPRING TIME SPECIAL**

**Spring Time Inspection**

Spring time inspection

INSPECTION SERVICE INCLUDES:

- Inspect/test cooling system, radiator, hoses and belts.
- Needs coolant flush? Yes/No
- Antifreeze protected to \_\_\_\_\*F.
- Test Air Conditioner output. R12, R134A      Duct Temp. \_\_\_\_\_P/F
- Inspect/test entire starting + charging systems + battery.
- Battery load tested at \_\_\_\_\_amps for 15 seconds Pass/Fail
- Battery cables. Pass/Fail
- Fan Belts Pass/Fail
- Starter draw tested\_\_\_\_\_ Amps for 5 seconds Pass/Fail
- Alternator load and test. \_\_\_\_\_ Amp output Pass/Fail
- Diode test. Pass/Fail
- Inspect entire brake system. Pass/Fail
- Inspect tires,rotate as needed. Tires were rotated. YES/NO
- Eighty point inspection and consultation about your car.

THE FOLLOWING ITEMS ARE IN NEED OF SERVICE OR REPAIR:

## **Steering Component Repairs.**

Warning: Before performing any steering system repairs on vehicles with SRS Supplemental Restraint Systems (Air Bags). Lock the steering before disconnecting the steering column from the steering rack. Make sure that the steering wheel does not move during the repair. If this procedure is not followed damage to the SRS Clock spring will occur.

# TIMING BELT REPLACEMENT

**NOTE:**

**Timing belt broken:** Whenever a timing belt has broken we **require** that all pumps, pulleys, or tensioners that come in contact with the belt be replaced. We will determine if vehicle is an interference engine and if engine damage is likely. If engine damage is possible but not likely based on experience we will determine what approach is most beneficial for the customer. It may be most cost affective on engines with fairly inexpensive belt replacement to just replace the belt and then check for engine damage. On engines with more complicated and expensive belt replacements it would be best to perform a cylinder leakage test to determine if engine damage has occurred before replacing the belt. In either case this should be clear to the advisor and customer.

**Timing belts that drive water pump:** When the timing belt drives the water pump we **strongly recommend** the water pump be replaced at the same interval as the timing belt. If customer declines this should be clearly stated on the repair order.

**Pullys and tensioners:** If we have experience indicating pattern failure of pullys or tensioners on a particular vehicle advise the service advisor before beginning repair. This should be based on solid experience or service bulletins from the manufacturer. On these vehicles the customer should be advised before work begins if customer declines this should be clearly stated on the repair order.

\*\*\*\*\*  
**WARNING\*\*\*\*\*CHECK FOR THEFT PROOF RADIO BEFORE DISCONNECTING BATTERY. IF EQUIPPED, INFORM SERVICE ADVISOR BEFORE PROCEEDING.**  
\*\*\*\*\*

1. Check for obvious leaks in the timing belt area.  
**If leaks are noted advise service advisor immediately.** P/F
2. Remove negative battery cable.
3. Remove timing belt per manufacturers recommended procedure.
4. Check for leaks at seals and water pump. P/F  
Advise any leaks at or above level 2.
5. Spin all tensioner pullys by hand check for roughness or visible leaks at seals P/F
6. Check hydraulic tensioners for leaks at the seal or looseness. P/F
7. Clean area behind timing belt.
8. Reinstall timing belt and set tension per manufacturers recommendation.
  
9. Torque front crank bolt. Torque \_\_\_\_\_
10. Reinstall battery cable.
11. Start engine check for leaks and unusual noise.  
Clicking noise at distributor indicate loose belt tension.  
Whining noise especially when cold indicates belt tension to tight. P/F
12. Reset clock.
13. Test drive.

TIRE ROTATE/BALANCE

**Tire rotate and balance**

Rotate and Balance Tires includes:

- Remove tires, inspect for condition and damage
- Inflate to proper pressure
- Balance tires
- Measure and record tread depth. LF \_\_mm, RF \_\_mm, LR \_\_mm, RR \_\_mm
- Tire condition
- Install tires,torque lug nuts to correct torque
- Road test vehicle to verify no vibration
- Tire pressure set to \_\_\_\_\_
- Lug nuts torqued to \_\_\_\_\_

Pass/Fail

P/F



**TRANSFER CASE SERVICE**      Transfer case service

Transfer case service includes the following:

P/F  
P/F

- Inspect transfer case for leaks
- Operate transfer case, verify proper operation

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**IF EITHER FAILS, DO NOT PERFORM SERVICE!!!!**

\*\*\*\*\*

- Drain transfer case fluid
- Add new fluid
- Road test

ADD FLUID HERE. \_\_\_\_\_ quantity and type of fluid.



**TRANSMISSION FLUSH SERVICE**

**AUTOMATIC TRANSMISSION SERVICE INCLUDES THE FOLLOWING:**

**INSPECT FOR TRANSMISSION OR COOLER LINE LEAKS. IF LEAKS, STOP INFORM SERVICE ADVISOR BEFORE PROCEEDING.**

- Add transmission cleaner to transmission fluid
- Road test vehicle to confirm good shifting P/F
- Inspect transmission oil pan & seals for leaks P/F
- Inspect transmission oil cooler lines for leaks P/F
- Fill transmission flush machine with appropriate fluid for vehicle.
- Install transmission flush machine and flush transmission of all sludge, varnish and contaminants.
- Add transmission fluid conditioner
- Correct transmission fluid level to "FULL" mark on dip-stick
- Perform final road test

TRANSMISSION FLUID TYPE USED \_\_\_\_\_

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## **TRANSMISSION SERVICE WITH FILTER**

Automatic Transmission service includes the following:

**DO NOT PERFORM SERVICE IF THERE ARE TRANSMISSION LEAKS.STOP**

- Road test vehicle to confirm good shifting
- Inspect transmission for leaks
- Inspect transmission cooler lines for leaks
- Add transmission cleaner to transmission fluid
- Fill fluid flush machine with the proper fluid type for vehicle
- Install transmission flush machine, flush transmission of all sludge, varnish and contaminants.  
Remove transmission oil pan, clean, install new filter and oil pan gasket. Reinstall oil pan.
- Top off fluid to "FULL" mark.
- Add transmission fluid additive

P/F

P/F

P/F

TRANSMISSION FLUID TYPE USED \_\_\_\_\_

**TUNE ,INSPECT**

**Inspect for tune-up**

Inspect for tune includes the following:

- Road test to confirm good drivability. Does vehicle have a drivability concern. YES/NO
- Remove and inspect a minimum of 2 spark plugs
- Visually inspect distributor cap, rotor, plug wires
- Visually inspect air and fuel filters
- Inspect and adjust ignition timing to factory specs.
- Inspect and adjust idle speed and choke if equipped
- Are there any drivability problems? YES/NO
- Do the spark plugs need to be replaced? YES/NO
- Does the air filter need to be replaced? YES/NO
- Does the fuel filter need to be replaced? YES/NO
- Any other tune-up related parts need replacement? YES/NO

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## **TUNE-UP**

## **Maintenance tune-up**

OUR MAINTENANCE ENGINE TUNE-UP INCLUDES:

- Replace spark plugs
- Replace ignition rotor (If needed and equipped)
- Clean air filter housing, replace filter if needed.
- Replace fuel filter (if applicable)
- Inspect PCV system and valve
- Inspect distributor cap and ignition wires for wear
- Clean carburetor, choke or throttle body
- Clean battery cables and terminals
- Adjust ignition timing (if adjustable)
- Adjust idle speed (if adjustable)
- Perform final road test.

PARTS USED:

SPARK PLUGS

PCV VALVE

IGNITION ROTOR

AIR FILTER

FUEL FILTER

WINTERTIME INSPECT Wintertime inspection

INSPECTION SERVICE INCLUDES:

- Inspect/test cooling system, radiator, hoses and belts. Yes/No
- Needs coolant flush? Yes/No
- Antifreeze protected to \_\_\_\_\*F.
- Inspect/test entire starting + charging systems + battery.
- Battery load tested at \_\_\_\_\_amps for 15 seconds Pass/Fail
- Battery cables. Pass/Fail
- Fan Belts Pass/Fail
- Starter draw tested\_\_\_\_\_ Amps for 5 seconds Pass/Fail
- Alternator load and test. \_\_\_\_\_ Amp output Pass/Fail
- Diode test. Pass/Fail
- Inspect entire brake system. Pass/Fail
- Inspect tires,rotate as needed. Tires were rotated. YES/NO
- Sixteen point inspection and consultation about your car.

THE FOLLOWING ITEMS ARE IN NEED OF SERVICE OR REPAIR:

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