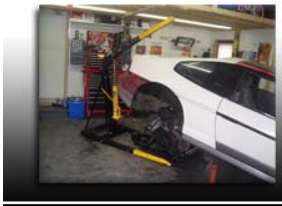

Tech Articles

Proper Air Conditioning System Servicing and Retrofitting to R-134a

by: Ryan Gick

With the summer months upon us, it may be time to consider having your A/C system serviced. All Fieros that came with factory A/C were charged with R-12 refrigerant. R-12 is expensive and hard to find these days and if your car's A/C system is in need of servicing, you may consider converting to R-134a. Retrofit kits are available from most auto parts stores for the do-it-yourselfer, but you shouldn't simply dump one of these kits into your car and I'll explain why later in this article. There are R-12 substitute refrigerants available that are advertised to work in existing R-12 systems, but these substitute refrigerants may render your A/C system unserviceable at your local repair shops due to EPA regulations governing the use and handling of refrigerants. The EPA laws state that different refrigerants cannot be mixed and dedicated equipment must be used for every different type of refrigerant a shop services. Most repair shops these days only have equipment on-hand to service R-134a systems; few still have equipment to service R-12 systems; fewer yet have equipment to deal with systems using R-12 refrigerant substitutes. Any system converted to use a different refrigerant than what was factory installed must be marked stating such and must have new conversion fittings installed to prevent different refrigerants from being mixed when serviced.

R-12 systems were lubricated by special mineral oils. R-134a refrigerant requires the use of synthetic lubricants, some of which are NOT compatible with the older mineral oil. PAG (Polyalkylene Glycol) is one of the synthetic lubricants used with R-134a refrigerant. The problem is PAG is not compatible with mineral oils and mixing the two can result in the formation of a glue-like compound which can clog up the system. Therefore PAG oil is not sold with R-12 to R-134a retrofit kits. Instead, Polyol Ester (ESTER) oil is used. ESTER lubricant is another synthetic lubricant that is compatible with R-134a refrigerants. It has slightly different lubrication qualities than PAG oil, but can be used and mixed with PAG oils without creating a problem. ESTER also does not form a glue-like substance when it comes in contact with mineral oils.

Another problem with PAG oil is that if it comes in contact with moisture, it can form an acid that will eat the aluminum parts of the A/C system. I have seen many A/C compressor leaks on later model GM engines due to the fact that the compressor is usually mounted low on modern front wheel drive cars which exposes them to water splash from the front tires. The seals used in the A/C system cannot effectively seal the refrigerant against leakage because the refrigerant molecules are too small. The oil used to lubricate the A/C system also acts as a barrier to seal the system. Therefore, the oil can be exposed to the external ambient environment which can ultimately expose it to moisture. Most of the leaks on modern A/C compressors I have seen have been around the area where the case halves come together. I have taken a few of these leaking compressors apart to find the sealing areas corroded badly due to the acidic conditions formed when the factory PAG oil encountered moisture. For this reason I have switched to using ESTER oil in all of the conversions I have performed.

As explained earlier, you simply shouldn't dump a R-134a retrofit kit into your Fiero. Any old R-12 refrigerant that may still be in the system must be properly reclaimed and recycled

per federal regulations. If you don't have the proper equipment to do this, you should seek out a local repair shop that would be willing to do this for you. Once the old refrigerant is out, you should remove and throw away the accumulator (dryer) and orifice tube (expansion valve). Both are located in the front spare tire compartment of the Fiero. The accumulator looks like an aluminum cylinder hanging near the center of the firewall and the orifice tube is located in the smaller, high side A/C line just under the accumulator. The orifice tube is in a small section of A/C line that can actually be removed from the vehicle, and I recommend doing this to replace it.

Any time a component is removed from the A/C system, the seals or o-rings that seal it up to the system MUST be replaced. Kits are available at most auto parts stores that contain all of the o-rings a stock Fiero A/C system needs. You should also be able to purchase a new accumulator and orifice tube. More expensive variable orifice valves can be purchased and installed into the Fiero that can improve system performance when using R-134a. It is also good practice to remove the A/C compressor from the engine and completely drain the old mineral oil out of it and refill using ESTER synthetic lubricant. Most compressors have a crankcase drain plug on the side of them to aid in draining and refilling the oil. Another good practice is flushing the A/C system before installing R-134a refrigerant.

A/C flush compound is available that can be injected or poured into an open system's lines and components that will clean the system of any moisture and debris. Never flush a compressor or accumulator, and make sure the orifice tube/valve is removed from the system before flushing. With the accumulator, orifice tube/valve, and compressor removed from the Fiero's A/C system, you will need to flush out the two individual lines that travel from the front of the car to the rear. One of these lines (smaller of the two) travels up to the front of the car to the condenser (radiator-like device that sits in front of the engine's radiator) and is connected to the smaller, hi-side line that comes out to where the orifice tube line is located. The evaporator core (located behind the dash) can be flushed separately without removing it from the car since its lines come out in the front spare tire compartment. There are two connections with o-ring seals where the condenser mates with the A/C lines in the front of the car but I have rarely ever needed to replace these seals during retrofits because they usually don't leak. There are also two o-ring seals at the rear of the car where the hard lines meet the flex lines that hook up to the compressor. Make sure you replace the o-ring seals with identical parts. Some Fieros use different size/thickness o-rings depending on type of line connection so always make sure you are using the correct size o-rings for the job. You can flush the system with the approved flushing compound and it will not harm these o-rings. Just make sure any flush compound you use is completely blown out of the system using compressed air once it has done its job. See the flush compound bottle or can instructions for more details.

Once the system has been completely evacuated of flush compound (using compressed air), you can reinstall the components. If your old A/C compressor wasn't leaking and was in good working condition, it can be reused with R-134a. New compressors (if you are replacing yours) are usually shipped empty with instructions explaining how to fill them with oil before installation. Be sure to add the appropriate amount of new ESTER oil to the compressor before reinstalling with new o-rings. The proper amount of oil needed to fill the rest of the A/C system should be added to the accumulator, evaporator core, condenser, and lines. See the service manual for your specific car for proper lubricant capacities. It is also good practice to add UV dye to the oil which can help you easily detect any future leaks. Be sure to lubricate new o-rings as well as the o-rings on the orifice tube/valve using ESTER oil before installation. Once the system is fully assembled, it should be evacuated by a vacuum pump for at least 45 minutes prior to charging with refrigerant. A sealed system should hold vacuum close to 28-30 in/Hg for 15 minutes after the vacuum pump is turned off (vacuum levels may be less in high altitude locations). The stock Fiero A/C system calls for 2.5 lbs of refrigerant for a full charge. Once charged, you should start the engine and turn on the A/C to verify proper operation. It is also good practice to use the A/C system over the

next few days after charging to make sure the oil and dye gets distributed throughout the system. Check for leaks using a florescent or LED shop light. Green UV dye will glow brilliantly when exposed to the UV light given off by florescent and LED lamps. Any leaks found should be repaired only after properly reclaiming the refrigerant that is in your system.

Later model 4-cylinder Fieros came with a variable displacement A/C compressor. In these systems that don't have a cycling switch mounted on the A/C accumulator, the A/C clutch stays on during the entire time the A/C system is running. These variable displacement compressors automatically regulate their output internally based on system demand so the clutch does not need to cycle on and off. Older 4-cylinder and all V6 Fieros used a cycling clutch system where an A/C accumulator mounted cycling switch turns on and off the clutch on the A/C compressor depending on system load and demand. If your Fiero has an engine swap using a different A/C compressor type than what was originally used in your Fiero, you should reconfigure the wiring in the Fiero's A/C system to match the type of system the A/C compressor is set up for. For example, 3800 Series 2 and 3 engines came with constant run, variable displacement A/C compressors. If you have installed one of these engines/compressors into a V6 Fiero, you should remove that Fiero's A/C cycling switch from the system and splice the two wires that went to it together. However, these systems also rely on the PCM to monitor high-side A/C pressures directly using a pressure sensor and this must be installed for proper system protection if you remove the cycling switch. I usually have the A/C shop that makes my conversion lines weld in a fitting to those lines (in the engine compartment that connects the Fiero's hard lines to the compressor) so I have somewhere to install the pressure sensor. If your ECM or PCM is not using a high-side pressure sensor, regardless of what type of A/C compressor you install, there needs to be some kind of electrical high pressure cut-out switch installed to protect the system from an over-pressure condition. Factory Fiero A/C compressors have these switches already mounted in them and you may be able to transfer these to a new compressor if there is a port available for them.

Hopefully this information will help you to properly service your A/C system in your Fiero to provide many years of trouble-free operation.

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