

Air Conditioning Overview

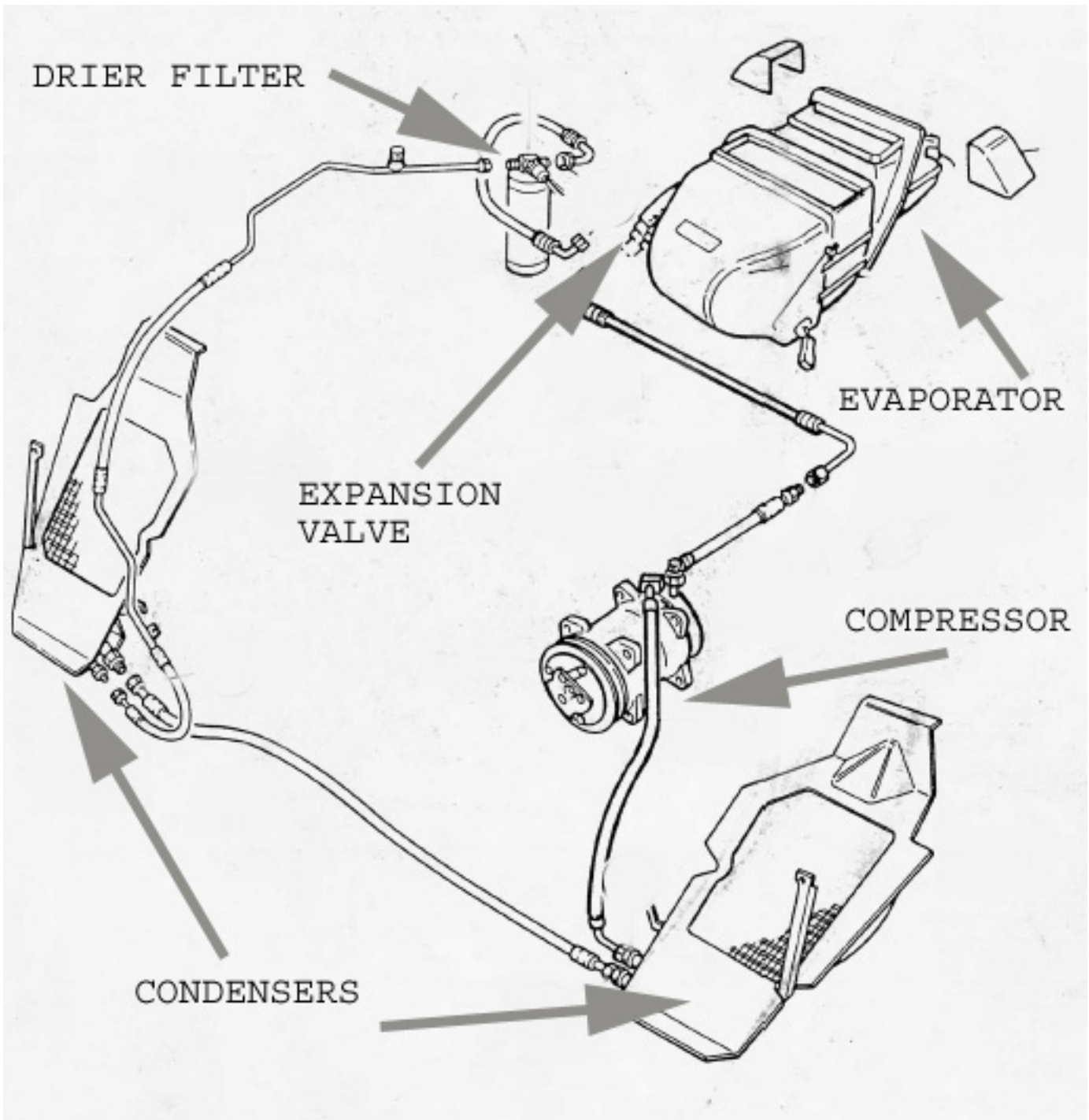
You may think that I am insane but the truth is somewhere in the middle. Once you get started with Alfa virus there is no point of return. Not long ago I managed to find a wrecked series 3 Alfa 33 which had a factory installed A/C unit. To tell the truth, the search of an A/C system had begun some years ago but at the last moment I stopped the transplant since I was reluctant to trust the hands of mechanics who would install the setup to my car. I had been afraid of low quality job and I wouldn't risk letting anyone molest my stock setup car.

So, the magic moment of finding a wrecked 33 with A/C installed came and the price to obtain the items was very very low ... as low as 60 € for compressor, piping, evaporator excluding condensers which had been not worth dealing since the car had suffered from a front end collision.

In addition, I knew that I wasn't buying something right out of the package, there were issues to deal with but hey, what the heck ... it was only 60 € and I would be able to setup the system according to specs and procedures all within a wide time frame.

Let's make a brief overview of the A/C system of the 33. There is so much saying about that system meaning being inefficient, awkward etc. but hey it is typical Alfa setup.

Here you can see a view from the main components.



An A/C system has the primary role to cool down and dehumidify the air inside the passenger compartment. This process requires the items you see in the picture above and the presence of a special gas called refrigerant. This gas (commonly known as Freon) and its variations is widely used in refrigerators and it actually absorbs heat in order to change its status (liquid to gas and vice versa) which results in conditioned air inside the passenger compartment.

Freon originally used in the A/C system of the Alfa 33 is CFC - 12 (R12). However since current legislation has prohibited R-12 as of 1996, a new substitute is used HFC-134a (R134a) which produces more or less the same cooling results.

Freon is a non poisonous, unflammable, non explosive and anticorrosive element which suits automotive needs and safety features.

A few words for the A/C system cycle:

Freon leaves the compressor (from port Discharge or "D") as a gas at a high pressure (10-18 bar) and temperature (80-100 C) where it enters the condensers. With the help of electric fans and dynamic air, Freon cools down at 40-50C and leaves in liquid form where it enters the drier filter. The main purpose of this filter is to filter out any moisture inside Freon so that upon entering the expansion valve no freezing or clogging can occur which will reduce the system efficiency and operation.. The main role of the Thermal Expansion Valve (TXV) is to atomize Freon in order to lower its pressure and temperature; once atomized Freon has entered the evaporator in liquid form, it absorbs heat from the passenger compartment as according to its physical properties it needs to change its status (from liquid to gas). In this stage air inside the passenger compartment is significantly cooled down and dehumidified; moisture condensed is drained off the vehicle and Freon returns to the compressor (from port Suction or "S") in gas form and low pressure status. The cycle is then repeated.

As a safety measure, a Trinary Pressure Valve located at the drier filter, serves to

- deactivate the compressor electromagnetic coupling in the case of fall or rise in the pressure (serves as a minimum or peak pressure switch)
- activates the right side condenser fan when pressure at the drier filter reaches 15-17 bar (fan operation stops when pressure is reduced by 3-4 bars); left side condenser fan is always activated during the operation of the A/C system

Finally a special device ensures fast idle when compressor is engaged.

A few words regarding retrofitting R134a in a R12 A/C system. Some components of the system must be replaced with R134a compatible elements. A list follows:

- Recover R12 Freon from the system.

- Drain off compressor oil. Since R12 is compatible only with mineral compressor oil, ester refrigerant oil must be used with R134a. Simply drain off mineral oil and add the same quantity of ester oil
- Replace drier filter specific to R134a desiccant (XH-7 or XH-9)
- Replace expansion valve specific to R134a
- Replace O-rings specific to R134a (HNBR type)
- Fit compressor High and Low pressure service port fittings specific for R134a

Let's begin our project but first we will make a stop to the donor car that the A/C unit came from.