Auto air conditioner parabiosis or Japanese mistake

A.V. Kramarenko
tredexcompany37@gmail.com

Part one: epicrisis

The air conditioner in my Outback, the last relic of former life, went to the another world. It lived according to its own program: switched off in hot weather, restored in the morning, and when driving through the city center there was nothing to breathe at all. It is understandable, because modern cars are designed for air conditioner use, and without it ventilation leaves much to be desired.

The disease developed about a year - from single failures, disappearing during the drivers smoke break, and up to complete exhaustion under the first rays of the sun. But when starting the engine in the morning the air conditioner was always fresh and vigorous as a non-drinking and non-smoking old man expecting to live for a hundred years.

Of course, all therapeutic measures were taken: refrigerant was replenished, air filter was replaced, condenser and radiator were washed and checked.

No result! Then the pressure and temperature sensors, dampers and electromagnetic clutch were checked - and again everything was in order. And, the symptomatology of the disease was as follows: after switching on the cold engine the conditioner worked normally, and as it warmed up at some tact of switching on/off it stopped the compressor. Now it was possible to start it only by repeatedly pressing the button, and the probability of success was 30 percent, and it was switched on only for one cycle - further it stopped and persisted in delusions till complete cooling of under-hood space.

There was even a cowardly thought to contact the service station. But stopped the understanding of the price of inevitable replacement of all serviceable parts and the memory of condescending pat on the shoulder of the sucker: “... well, you realize that here you have to disassemble half of the car, change the compressor and all the piping... it will cost a lot, and the work for a month...”

No, this is not the way of the real Samurai!

So, if the diagnosis is not clear, it means that some symptoms were missed or misinterpreted during the examination.

Part two: Diagnostic and Therapeutic

So: turn on the air conditioner on a cold engine. We wait, watch and listen. So far everything is normal, i.e. characteristic cycles of work are observed: engine speed rises, almost immediately the clutch clicks, the compressor works, 10-20 seconds pass, the clutch is switched off, engine speed drops. Then the cycle repeats.

Signals controlling engine speed and clutch activation, undoubtedly, go through one communication channel, in the extreme case - through two, when the second just duplicates the signal of the first with a slight delay.

We continue the observation and - here it is happened: the revolutions increased, but the clutch did not turn on. A serviceable clutch, by the way ...

Clutch relay? When we checked it, it was in good working order. Check the commands on the relay- they match the engine control signals. Foul language in full: how can that be?!!!

I look sadly at the relay: it is feeding the inductive load without any spark arrestor or diode protection (NB!). Moreover, the clutch is working at the moment of switching on like a high voltage pulse source (if you know, wireless switches use this effect to power their device).

I don't understand, I can't imagine anything like that. The relay contacts will gradually burn up, and failure will be just a matter of time. If switching occurs 2-5 times per minute, then in a thousand hours of motor operation the relay will go through an on/off cycle about 120,000-300,000 times. Even a good Japanese relay will have electrical erosion wear of contacts, which will manifest itself, first of all, by failure at high temperature under the hood (there will be a gap between the contacts, i.e. their closing will stop). And as the gaps increase, the erosion rate will increase, which will cause an increasingly severe clinical picture.

So, theoretically everything is clear, let's move on to troubleshooting. We take the relay out of the connector and, note that next to stand exactly the same. The horn relay is not worn out and is certainly in new condition. We do their replacement and turn on the engine. The air conditioner works with angelic precision, the horn works too - the worn relay there will serve for the rest of the car's life. That's it! The patient is healthy, no medication is needed, and treatment costs are zero.

Conclusions:

1. If the replacement of the compressor clutch relay is not stipulated by the vehicle maintenance schedule, we are witnessing a gross design error.
2. The most practical solution would be to replace the contact relay with a low impedance semiconductor circuit.
3. The protection against voltage surges when operating on inductive loads should not be forgotten.