Compressor Will Not Run

Contactor Open

The contactor should be energized or "closed" on a call for cooling. If the contactors contacts do not pull in or close (completing the high voltage circuit) voltage will not pass thru to the compressor. If the contactor has proper low voltage applied to the coil and it does not pull in, it is a bad contactor.

Power Supply

The compressor needs high voltage to start. The voltage must be within 10% of the manufactures recommended voltage for that compressor. Check for high voltage at all disconnects switches, fuses and breakers priory to the compressor.

Defective Low-Voltage Transformer

Transformers will transform high voltage (460v, 230v 208v, 115v) to a lower voltage. Low voltage (typically 24-volts on residential systems) to energize or "close" a contactor is supplied from a transformer. If this transformer is not working or has less than 10% (21.6 volts) it will not be supplying enough voltage to pull in the contactor.

Open Thermostat

Check to make sure thermostat is calling for cooling or "closed". Even though it may look like the thermostat is calling for cooling on the outside the thermostats or subases internal contact may still be open. Note some thermostats have a built in cycle protector that will protect the compressor from energizing too many times in an hour therefore possibly holding the thermostat off.

Open Control Circuit

The control circuit is the low voltage wires between the thermostat and the contactor. This is where safeties and lockouts are located. Safeties are put in the control circuit to protect the unit from excessive temperatures (high or low), and excessive pressures (high or low). If any safeties are open, find out the reason the safety is open before resetting. Lockouts will hold the unit off until a technician arrives to diagnose the problem with the system. Lockouts will keep the unit from recycling on its safeties. Also check for broken/bad thermostat wires.

Loss of Charge

Loss of refrigerant charge may cause the compressor to overheat and trip an over-temperature switch or safety due to lack of cool refrigerant vapor over the compressors windings. Find the cause of low refrigerant and repair it according to standard practices. A compressor running for extended amounts of time with out refrigerant may permanently seize. Also high temperature in the compressors heads and cylinders may become so hot that the oil loses its ability to lubricate.

Contactor or Contactor Coil Defective

Check the contactors points or "pads". If they are melted, distorted or have fallen off from overheating the contractor will energize but no high voltage will pass thru. If the contactor has proper low voltage applied to the coil and it does not pull in, it is a bad contactor.

Loose Electrical Connection

Check both high and low voltage connections. Although the connection may look complete it may be slightly loose, weak or corroded in an area that is not visible. Check at all connectors, terminals and wire nuts. Wires can also be broken inside of their insulated sleeve.

Contactor Closed

The contactor will be energized or "closed" on a call for cooling. Check the contact points or "pads" on the contactor. If they are melted, distorted or have fallen off from over heating the contractor will energize but no high voltage will pass thru. If the contactor has proper low voltage applied to the coil and it does not pull in, it is a bad contactor

Compressor Power Supply Open

The compressor needs high voltage to start. If the power supply is open it means that no voltage is making it to the compressor. Check for high voltage at all disconnects, fuses and breakers priory to the compressor.

Loose Leads at Compressor

Important! All refrigerant must be removed from compressor; all power must be "lock in the off position". A loose lead connected to a weak compressor terminal block could violently discharge high-pressure refrigerant and oil if disturbed. Once all power has been shut off and all refrigerant has been remove according to standard practiced you can check all high voltage connections. Although the connection may look complete it may be slightly loose or be weak at a connector, terminal or wire nut. Wires can also be broken inside of their insulated sleeve.

Faulty Start Gear (1-PH)

Start assist devices are used on 1-phase units to start the compressor. Start assist devices provide a short boost of electrical energy to the compressors windings at the beginning of the cycle to start the compressor rotating. If the start assist device looks over heated or distorted it has probably failed and must be replaced.

Open, Shorted or Grounded Compressor Motor Windings

Important! All refrigerant must be removed from compressor; all power must be turned off and "locked" in the off position. All wires must be removed from compressor before checking the compressors motor windings. Open windings can be found by checking for resistance with an ohmmeter from winding to winding, there should be resistance on a compressor that is at ambient temperature. Shorted windings can be found by checking for unusually low resistance with an ohmmeter from winding to winding. Grounded compressor motor windings can be found by checking for resistance with an ohmmeter from each individual winding to metal body of the compressor their should at least 1000 ohms per name plate volt.

Compressor Stuck

Loss of refrigerant charge may cause the compressor to seize due to lack of oil (oil travels with refrigerant). Find the cause of low refrigerant and repair it according to standard practices. A temporary start assist device may be able to start a compressor that is slightly seized or stuck. A compressor running for extended amounts of time without refrigerant/oil will permanently seize.

Compressor Internal Protection Open

Important! Compressor may be hot! All refrigerant must be removed from compressor, all power must be "lock in the off position" and all wires must be removed from compressor before checking the compressors motor windings. An internal protector is a thermal switch that will open to protect the compressors motor windings from getting to hot. To check if the internal protector is open allow the compressor to cool down to ambient temperature then check resistance with an ohmmeter from winding to winding, there should be resistance on a compressor that is at ambient temperature.

Defective Run Capacitor

Run capacitors are used on 1-phase compressors. The run capacitor remains in the circuit all the times to help improve the energy efficiency of the motor. If a run capacitor fails, the motor will draw about 10% too much current and may over heat. If the run capacitor looks over heated or distorted it has probably failed and must be replaced.

Compressor Runs But Insufficient Cooling

High Suction Pressure Low Superheat

Check all obvious reasons for high suction first, excessive heat load at indoor coil, i.e.: heater running at the same time as the air conditioner, broken return air in attic that is sucking hot attic air into the indoor coil, metering device stuck open. Proper refrigerant charge is crucial to the systems total capacity. If high refrigerant charge is suspected remove refrigerant in

accordance with standard industry practices. Low superheat is an indication that liquid refrigerant not changing state in the evaporator and is possibly flooding back to the compressor. This can damage the compressor by liquid flooding into the cylinders and trying to be compressed. Remember compressors are made to only pump vapor refrigerant.

Unit Overcharged

The most widespread problem with high efficiency units is overcharging. This can cause starting problems, lack of capacity and premature compressor failures. Remember, you cannot overcharge a unit too increase its capacity! Some reasons a unit might be overcharged are dirty coil, slow fan, plugged filter, the unit is connected to an indoor coil with too small a piston or capillary, or the installer or mechanic has a desire to see the "right" pressure (the right pressure for high efficiency units are low). Low suction can result in low heads and a mechanic might try to overcome this with additional charge. It appears that most overcharging is done in an attempt to raise the head/suction pressure to what the installer or service mechanic considers adequate pressure. If the unit has a fixed metering device adjust the charge down to the recommended superheat found on the units label or in the installation instructions. If no manufactures recommendation superheat exists charge the unit to 15º of superheat as a default. Superheat is simply the refrigerant gas temperature above the refrigerants saturation point. To check superheat compare your actual refrigerant line temperature returning to the compressor (use a accurate thermocouple type or digital thermometer) to your refrigerants saturation point (found on a pressure temperature chart).
Pressure Temperature Chart

Incorrect Size Piston

A piston or metering device that is too large will allow too much refrigerant to pass thru it. This can cause high suction pressure, liquid refrigerant to flood back to the compressor, compressor slugging and possibly compressor failure. Also check for a stuck metering device. The piston may be stuck in a warped or overheated body assembly or small debris may have lodge in front of the piston not allowing it to seat properly.

High Suction Low Head Pressure

Suction pressure can be affected by indoor coil temperature just as outdoor coil temperatures can affect head pressure. Check all obvious reasons for high suction first, excessive heat load at indoor coil, i.e.: heater running at the same time as the air conditioner, broken return air in attic that is sucking hot attic air into the indoor coil, metering device stuck open/too large. Low suction pressures can cause a higher compression ratio and lower system capacities. There is no set suction pressure to charge your unit to every time; this is why it is important to use the superheat and subcooling methods. They take into effect your actual current temperature and pressure for your system at the time you are working on it. Check all obvious reasons for low head pressure first, i.e.: low outdoor ambient temperature, condenser fan motor or blade is to large therefore has too much CFM or metering device stuck open/too large.

Defective Compressor Valves

Valves can fail due to sludge, debris or other contaminates in the refrigerant system. Also liquid refrigerant slugging back from the system or trying to be compressed in the compressors cylinders. The suction and discharge valves in a hermetic (permanently sealed) compressor are inaccessible, thus if a valve is damaged the compressor must be replaced.

Internal Pressure Relief Open

Some compressors have a one-time only pressure relief valve while others have an auto-reset pressure relief. A pressure relief valve can sometimes fail due to debris/contaminates in the refrigerant system. Debris can lodge in an open pressure relief valve forcing it to stay open. If the compressors internal pressure relief does not reset, the compressor must be replaced.

Compressor Runs But Cycles On Internal Overload

Outdoor Fan Stopped or Cycling on Overload

Loose Lead at Fan Motor

The fan motor needs high voltage to start. Check for high voltage at all connections prior to the motor. Although the connection may look complete it may be slightly loose or be weak at a connector, terminal or wire nut. Wires can also be broken inside of their insulated sleeve.

Motor Defective

If the motor has proper voltage applied to it and it does not start, it is a bad motor.

Incorrect Outdoor Fan Motor Capacitor

A capacitor that is too small will not start the fan motor. A capacitor that is too big will burn up the fan motors windings. Check the motor label or with the units manufacture to verify the capacitor is correctly sized.

Low Suction Pressure

Low suction pressures can cause a higher compression ratio and lower system capacities. There is no set suction pressure to charge your unit to every time; this is why it is important to use the superheat and subcooling methods. They take into effect your actual current temperature and pressure for your system at the time you are working on it. Many reasons can cause low refrigerant suction pressure, i.e.: low indoor temperature, dirty filters, restricted ducts, undersized ducts, closed dampers, frosted coils, restricted refrigerant line, restricted piston, incorrect piston, restricted strainer, bad indoor blower motor ect. Resist adding refrigerant until more information can be attained.

Dirty Filters

Filters should be maintained on a regular basis. Dirty indoor air filters will cause restricted airflow across indoor evaporator coil. If filters are not maintained low airflow may cause the coil to frost over or ice up completely, which would cause even more of a restriction on the airflow. Low airflow across the evaporator will not allow the refrigerant in the evaporator to change state, which is when the most effective heat transfer takes place.

Duct Restricted

A duct supply/return duct that is kinked, smashed, pinched, crushed, flattened or any anyway restricted will have the same negative effects on the airflow as dirty filters. Remember low airflow across the evaporator will not allow the refrigerant in the evaporator to change state, which is when the most effective heat transfer takes place.

Dampers Partly Closed

Dampers either motorized or manual are designed to restrict the airflow to areas that do not need or have too much air volume. Dampers must be used in moderation. Check if a damper has come loose or is positioned incorrectly thus unknowingly restricting the airflow.

Indoor Coil Frosted

A frosted indoor coil is either a sign of low airflow or low refrigerant flow. Refrigerant is pressure/temperature sensitive, which means when the refrigerant raises or falls in pressure it will raise or fall in temperature (see pressure temperature chart for exact reading). Without the room temperature air crossing the evaporator coil the refrigerant will get colder and colder till frost starts to form. Frost is not good; it can greatly impede the airflow. Eventually this frost can turn to a sheet of ice across the evaporator coil and completely block all airflow. The same effect can happen with low refrigerant flow, even if your airflow is correct. Low refrigerant flow into the evaporator (either by lack of refrigerant or restriction) will create a cold spot directly after the metering device. As the refrigerant is being continuously fed into the same cold spot it can start to frost, which can turn to ice, which could cover the entire low pressure side of the system all the way back to the compressor.

Slightly Low on Refrigerant

Proper refrigerant charge is crucial to the systems total capacity. If low charge is suspected add refrigerant to the unit according to the recommended superheat found on the units label or in the installation instructions. If no manufactures recommendation superheat exists charge the unit to 15º of superheat as a default. Superheat is simply the refrigerant gas temperature above the refrigerants saturation point. To check superheat compare your actual refrigerant line temperature returning to the compressor (use a accurate thermocouple type or digital thermometer) to your refrigerants saturation point (found on a pressure temperature chart). *Pressure Temperature Chart* If the unit is low on refrigerant due to a leak, repair it according to standard practices. A unit running for extended amounts of time with low refrigerant may cause permanent damage to the compressor.

Liquid Line Slightly Restricted

Important! Liquid line may be hot! The liquid line is the small copper line leaving the condenser coil and connecting to the metering device at the inlet side of the evaporator. A small drop in suction pressure at the compressor can reduce its capacity by a significant amount. A 2-PSI pressure drop can create a 2 to 4% capacity drop: a 7-PSI drop can create a 10% capacity drop. If the liquid line is kinked, plugged or restricted it can actually meter the refrigerant before it gets to the metering device. A condition like this will cause the metering to have inadequate refrigerant. To check if a liquid line has a restriction use an accurate thermocouple type or digital thermometer. If the restriction is severe the liquid line will have a temperature drop across that area. Also check for liquid line dryers that are full or have been left in the refrigerant circuit to long.

Piston Restriction

It is not uncommon for a refrigerant system without a screen, dryer or refrigerant filter to have a piston/metering device restriction. The orifice in the metering device is one of the smallest areas in the entire refrigerant system. This restricted condition will cause low suction pressure. To clean the metering device the refrigerant must be removed from the system according to standard practices and the metering device *if* accessible can be removed and cleaned and replaced.

Incorrect Size Piston

Proper piston/metering device size is important to the systems total capacity. A system with an incorrect piston size will have low suction pressure, thus low capacity. To verify a pistons size it must be removed from the system and visually checked. Compare this to the recommended piston size found on the units label or in the installation instructions.

Indoor Strainer Restricted

Strainers are commonly placed prior to the metering device at the indoor coil to collect any debris in the refrigerant system. A small drop in suction pressure at the compressor can reduce its capacity by a significant amount. A 2-PSI pressure drop can create a 2 to 4% capacity drop: a 7-PSI drop can create a 10% capacity drop. To check if a liquid line strainer has a restriction use an accurate digital or thermocouple type thermometer. If the restriction in the strainer is severe the liquid line will have a temperature drop across that area. To clean or replace a strainer the refrigerant must be removed from the system according to standard practices before any work can be done.

Indoor Blower motor defective or cycling on Overload

A defective indoor blower motor or cycling on its internal overloads will produce inadequate airflow across the evaporator coil. Without adequate room temperature air crossing the evaporator coil the refrigerant will get colder and colder till frost starts to form. Eventually this frost can turn to a sheet of ice across the evaporator coil and completely block all airflow. Check the motor for improper lubrication, voltage or belt tension. An internal protector is a thermal switch that will open to protect the fans motor windings from getting to hot. To check if the internal protector is open allow the fan to cool down to ambient temperature then check resistance with an ohmmeter from winding to winding, there should be resistance on the fan motors that is at ambient temperature. If not change the motor.

Outdoor Fan Stopped or Cycling on Overload

Check all disconnects, fuses and breakers priory to the fan motor for high voltage. The high voltage must be within 10% of the manufactures recommended voltage. If the fan blade is not located properly on the motor shaft it will pull incorrect amperage causing the fan motor to overheat. An internal protector is a thermal switch that will open to protect the fans motor windings from getting to hot. To check if the internal protector is open allow the fan to cool down to ambient temperature

then check resistance with an ohmmeter from winding to winding, there should be resistance on the fan motors that is at ambient temperature. If not change the motor.

Outdoor Air Restricted or Recirculating

Inadequate or low airflow across the condenser coil will cause the compressor to overheat. Check for leafs, grass clippings, bushes or any items blocking airflow. If the warm air discharging off the condenser is recirculating back thru the condenser it can cause the compressor to overheat.

Restricted Discharge Tube

Important! Compressor discharge tube may be hot! The gas discharge tube off the compressor may be bent, kinked, or internally restricted. This will make the compressor to work harder then needed causing the compressor to overheat.

Overcharge or Non-Condensables in System

Overcharging the unit with refrigerant will cause the compressor to work harder then needed, possibly causing the compressor to overheat. Non-condensables (i.e.: air /moisture) in the system will take up valuable space needed inside the condenser for the refrigerant to condense thus decreasing the capacity of the condenser, which in turn will cause the compressor to work harder and possibly overheat.

Low Refrigerant Charge

Low refrigerant charge may cause the compressor to overheat and trip an over-temperature switch or safety due to lack of cool refrigerant vapor over the compressors windings. If the unit is low on refrigerant due to a leak, repair it according to standard practices. A unit running for extended amounts of time with low refrigerant may cause permanent damage to the compressor.

Line Voltage Too High or Low

The voltage must be within 10% of the manufactures recommended voltage for the unit. If the high voltage is "low" check all high voltage connections (i.e. disconnects, fuses terminal blocks, wire nuts and breakers) priory to the compressor for a loose high voltage wire. Also wires can also be broken or weak inside of their insulated sleeve. Verify that that no other loads on the electric panel are affecting the compressor. If the voltage is too high (greater than 10%) contact the local power supplier they should be able to adjust the incoming power supply.

Defective Run Capacitor

Run capacitors are used on 1-phase compressors. If the run capacitor looks over heated or distorted it has probably failed and must be replaced.

Compressor Bearings

The compressors bearings may to seize due to lack of oil. If this happens on a hermetic compressor the compressor must be changed. If this happens on a semi-hermetic compressor it is possible the bearings can be replaced. Low refrigerant flow or bad piping design can cause oil to lag out in a system and not return to the compressor were it is needed.

High Superheat

The correct amount of superheat is critical to proper unit operation. The units superheat should be its label or in the installation instructions. If the unit has a fixed metering device and no manufactures recommended superheat exists charge the unit to 15º of superheat as a default. Superheat is simply the refrigerant gas temperature above the refrigerants saturation point. To check superheat compare your actual refrigerant line temperature returning to the compressor (use a accurate thermocouple type or digital thermometer) to your refrigerants saturation point (found on a pressure temperature chart).