



SERVICE MANUAL

FOR

ROOF TOP AIR CONDITIONERS

PREFACE

This service manual is primarily intended for the use of qualified individuals specially trained and experienced in the service of this type of equipment and related system components.

Installation and service personnel are required by some states, counties or cities to be licensed. Persons not qualified shall not attempt to service this equipment or interpret this service manual.

SCOPE

This is not a basic refrigeration and air conditioning manual and does not therefore, cover the principles of refrigeration or air conditioning. The user of this manual should have already accomplished a thorough study of refrigeration and air conditioning.

WARNING

Improper installation may damage equipment, can create a hazard and will void the warranty.

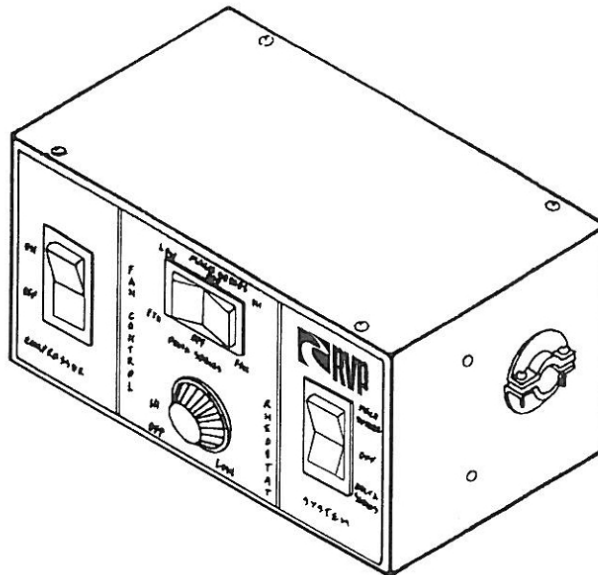
The use of components not tested in combination with these units will void the warranty, may make the equipment in violation of state codes, may create a hazard and may ruin the equipment.

!WARNING – SHOCK HAZARD!

TO PREVENT THE POSSIBILITY OF SEVERE PERSONAL INJURY, DEATH OR EQUIPMENT DAMAGE DUE TO ELECTRICAL SHOCK, ALWAYS BE SURE THE POWER SUPPLY TO THE APPLIANCE IS DISCONNECTED BEFORE DOING ANY WORK ON THE APPLIANCE. THIS CAN NORMALLY BE ACCOMPLISHED BY SWITCHING THE BREAKER FOR THE AIR CONDITIONER TO OFF, DISCONNECTING ALL EXTERNAL ELECTRICAL CONNECTIONS AND CORDS, SWITCHING ON-BOARD ELECTRICAL GENERATORS AND INVERTORS TO OFF, AND REMOVING THE CABLE FROM EACH POSITIVE TERMINAL ON ALL STORAGE AND STARTING BATTERIES.

DANGER

SOME DIAGNOSTIC TESTING MAY BE DONE ON ENERGIZED CIRCUITS. ELECTRICAL SHOCK CAN OCCUR IF NOT TESTED PROPERLY. TESTING TO BE DONE BY QUALIFIED TECHNICIANS ONLY.



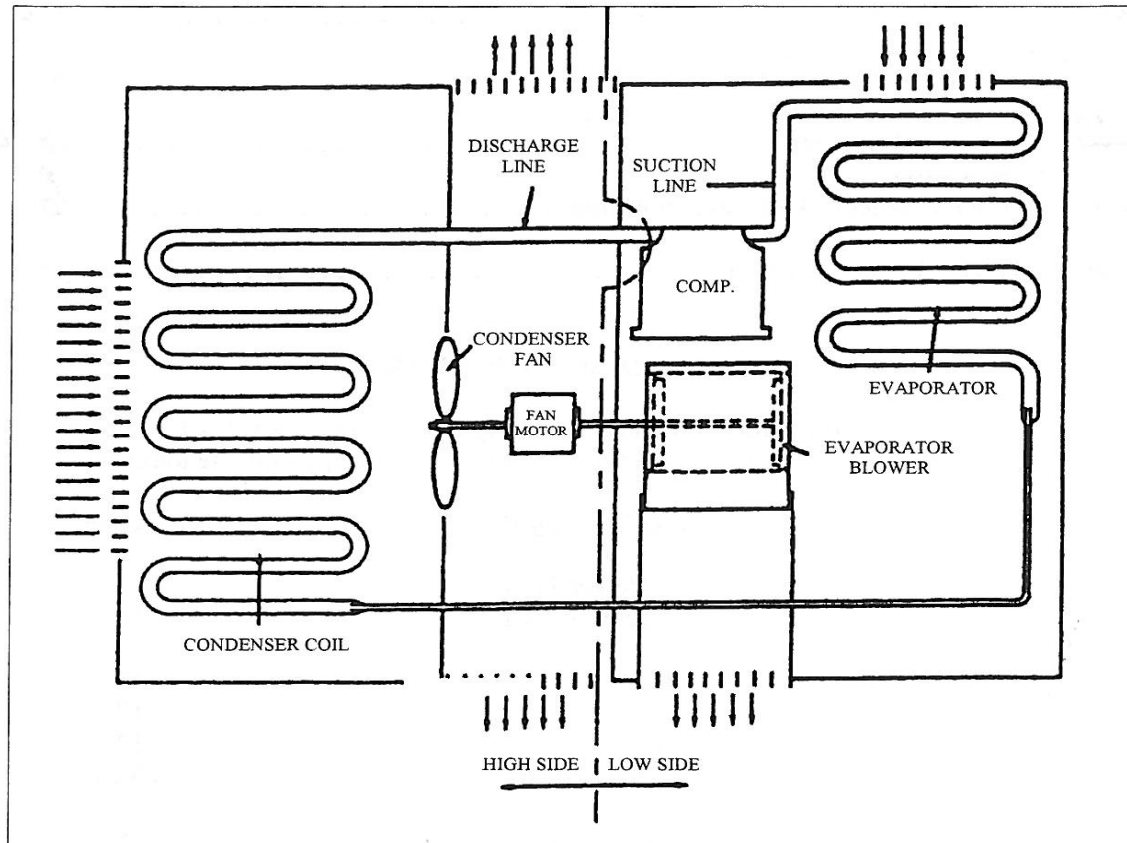
**6757A7201
SERVICE TEST DEVICE**

This test device is an invaluable aid in quickly diagnosing repairs to all Airxcel, Inc. roof top air conditioners produced after 1979.

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BASIC COMPONENTS AND THEIR FUNCTIONS REFRIGERATION SYSTEM DIAGRAM



I. BASIC COMPONENTS

Compressor

The compressor is called a hermetic compressor which means that it is completely sealed (welded together). It is, therefore, not internally field serviceable. Inside the compressor housing is an electric motor which drives the compressor.

Mounted on the outside of the compressor housing is a two-terminal overload switch. Note: We have a few models with internal overloads that are non-serviceable. The switch is connected in series with the common terminal, so if the switch opens, it will cut the power to the compressor motor. The switch will open as the result of either heat or amperage conditions that could be harmful to the compressor.

Condenser Coil

The purpose of the finned condenser coil is to transfer heat from the high pressure refrigerant to the warm outdoor air. As the outdoor air passes over the coil, the heat transfer will cause the air temperature to rise. Thus the condenser discharge air will be several degrees warmer than the condenser entering air.

Metering Device

The refrigerant enters the cap tube from the condenser as a warm high pressure liquid. As the refrigerant flows through the small diameter cap tube, the pressure drops rather rapidly. The liquid temperature is constantly lowered as it passes through the cap tube. As the refrigerant leaves the cap tube, it is still mostly liquid; however, a small portion has changed to a vapor called flash gas. When the liquid refrigerant passes from the cap tube to the evaporator, it is at low side pressure and will therefore vaporize at low temperature as it picks up heat from the air being conditioned.

Evaporator Coil

The purpose of the finned evaporator coil is to transfer the heat from the warm and moist indoor air to the cold low pressure refrigerant.

II. AIR HANDLING

Fan Motor

The air conditioning unit has **one** double end shaft fan motor. On one shaft is mounted a centrifugal or squirrel cage blower which draws air (return air) out of the recreational vehicle and blows the conditioned air down into the recreational vehicle. On the other end is mounted an axial flow or propeller type fan which circulates outdoor air through the condenser coil.

* Some models use a squirrel cage on both ends of the motor.

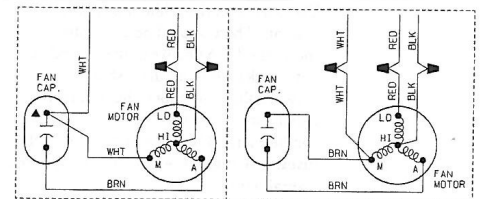
An important step in installing a replacement fan motor is to check the direction of rotation before it is installed. On all models, the condenser fan pulls the air through the coil.

Fan Motor Check Procedure

If a fan motor refuses to perform properly, it can be checked in the following manner:

1. Be sure the motor leads are connected properly.
 - a) The black wire from the motor connects to a black wire inside a wire nut then the black wire connects through the

disconnect plug to the selector switch. The red wire from the motor connects to a red wire in a wire nut then the red wire connects through the disconnect plug to the selector switch.



- b) The white wire from the motor connects to the fan capacitor or a white wire in a wire nut then the white wire connects through the disconnect plug to the thermostat.
- c) The brown wires from the motor connect to the fan capacitor.

2. If there is a reading of 0 between any two leads, the motor is shorted and is no good. If there is a reading of infinity (no meter reading at all) between any two leads, the winding is open and the motor is no good.

Note: A motor with 2 brown leads will have a 0 reading between 1 brown wire and either the black or white wire.

Filters

The filters should always be in place when the system is running. More important than their purpose of cleaning the air in the living space is the protection the filters give the evaporator coil. Without filters, a wet evaporator coil will quickly stop up so that adequate air cannot pass through it. Filters must be installed to completely fill the filter rack so that no air can flow around them or bypass them and carry dust, lint, etc. to the evaporator. If an evaporator has not been properly protected by its filter, the entire unit must be removed from the recreational vehicle and the coil cleaned with special detergent and water.

III. ELECTRIC POWER CIRCUITS

Safety

Voltage (electrical pressure), whether high or low, will not hurt you. It is the current through vital parts of your body that does the damage, and under the right conditions, 115 volts (domestic USA) is plenty to drive a deadly dose of current (amperes) through your body.

Another imminent danger from electric shocks in addition to electrocution is reaction. An electrical shock causes uncontrollable muscular contractions which can cause further injuries.

Remember that electricity can be very dangerous - but you can safely work with it. In order to be safe, you must know what you are doing. You must work deliberately and carefully. **You must think safety before each move.**

THINK SAFETY

Power Supply – from Commercial Utility

1) Wire Size

The power supply to the air conditioner must be wired through a circuit breaker or time delay fuse. The power supply must be 20 amperes and 12 AWG wire minimum. Any size larger at any time may be used and **should** be used if the length of the wire is over 32 feet.

2) Color Code

The electric power from the electric service panel should be delivered through a 3 conductor cable and the Service Technician should check to be sure the color code is correct. The electrician probably installed the cable with the colors according to code, but do not bet your life on it.

- a) The wire with black insulation is the hot wire and there should be 115 volts (domestic USA) between it and either of the other wires. All switches, fuses, circuit breakers, disconnects, etc. should be in this line.
- b) The wire with the white insulation is the neutral. There should be 115 volts (domestic USA) between the neutral and the hot (black) wire, but there should be 0 volts between the neutral and the ground (the green wire or the frame of the air conditioner).
- c) The third wire may be covered with green insulation or it may be a bare metal wire. It is the ground wire. There must be 115 volts (domestic USA) between this wire and the hot (black) wire and 0 volts between it and the neutral (white) wire. The ground wire must be securely fastened to the air conditioner cabinet. A ground screw is provided for this purpose.

3) Voltage

The voltage (electrical pressure) at the unit should be 115 volts (domestic USA) and all electrical components will perform best at the correct voltage. However, the voltage will vary and the air conditioning system will perform satisfactorily within plus or minus 10% of the rated (115) voltage (domestic USA). Therefore, the voltage has to be between 103.5 volts and 126.5 volts.

Power Supply – Generated by on-board motor generator

If the power supply for the recreational vehicle is supplied by an on-board motor generator, its wiring may be identical to the commercial power described above.

There are, however, some motor generators on which both the current carrying leads are insulated from the ground. That is to say; there is no grounded neutral, so there will be

115 volts (domestic USA) between the black and white leads, but there will be 0 volts between either lead and ground.

WARNING

The service technician must keep in mind when checking to make sure that the power is turned off. Check only between the hot (black) lead and the neutral (white) lead.

IV. CAPACITORS

Run Capacitor

The purpose of the run capacitor is to improve motor efficiency during running. The run capacitor is always connected between the start and run or main terminals of the motor.

On some older models, one of the terminals on the run capacitor will have a red dot (the identified terminal). The identified terminal should always be connected to the run or main terminal of the motor and to the neutral line.

Start Capacitor

Most models use a start capacitor and a start relay to give the compressor high starting torque. The compressor will, therefore, start against normal pressure difference (head pressure minus suction pressure) even when shut down for a short period of time. The start relay will disconnect the start capacitor when the motor reaches approximately 75% running speed.

Start (Potential) Relay

The start relay consists of –

- 1) Normally closed contacts internally between terminals #1 and #2 which switch in the start capacitor in parallel to the run capacitor during shut down and then switch out the start capacitor when the motor reaches approximately 75% normal running speed.
- 2) A high voltage coil internally between terminals #5 and #2 to actuate the contacts.

Positive Temperature Coefficient Resistor (Commonly Known as the PTCR Start Device)

The resistor acts like a potential relay in that it takes the start capacitor out of the start circuit, but uses resistance of electrical flow (back EMF from compressor) instead of opening a set of contacts. The service person should be careful handling the resistors. They will be hot during operation (up to 160 degrees F). The air conditioner needs to be off for 3-5 minutes during cycle time and when servicing to let the resistor cool down.

V. METERS

Ammeter and Its Use

An ammeter is an instrument used for measuring electric current. This instrument has snap-around jaws that will allow you to read the current through a wire without detaching the wire from the system. These meters also have volt meter and ohm meter attachments so they are an excellent multi-purpose meter. **NO TECHNICIAN SHOULD EVER ATTEMPT A SERVICE CALL WITHOUT ONE.**

Ohm Meter and Its Use

An ohm meter is really a resistance meter that is calibrated in ohms. The ohm meter has its own power source, a small dry cell, which forces a small amount of current through a conductor via the meter probes. The meter must be calibrated to read 0 ohms when the probes are touched

together each time it is used because as the dry cell loses its charge, the meter will get out of calibration.

If the probes of an ohm meter are attached to the terminals of a closed switch, the meter will read 0. This means that there is virtually no resistance to current flow through the switch. Now, if the switch is turned off, the contacts will be open and there will be a very high resistance. In fact, the resistance is so high it is an infinite number of ohms so we call this reading infinity.

Volt Meter and Its Use

If we attach one volt meter probe to the hot line and the other probe to the neutral line of a standard circuit, the meter reading will be the electromotive (electron moving) force or pressure difference between the two lines.

VI. FREE DELIVERY CEILING ASSEMBLIES

Selector Switch – Free Delivery Ceiling Assemblies

The selector switch is mounted on the left side of the interior ceiling assembly. The selector switch allows the unit to be operated on high to low blower only, or high to low blower with compressor operation for cooling. On heating and cooling models, the selector switch can also switch in the electric heater at low blower operation only.

To check the selector switch, remove wires from the terminals and rotate the switch to the proper position and read continuity as follows:

<u>Terminals</u>	<u>Switch Position</u>
L-1-3	Lo Heat
L-1	Lo Fan
L-2	Hi Fan
L-1-4	Lo Cool
L-2-4	Hi Cool

*If you do not wish to remove the wires from each terminal, disconnect the 9 pin plug from the air conditioning unit.

Thermostat (Mechanical Rotary)

The thermostat (temperature controller) is mounted on the right side of the interior ceiling assembly. The thermostat controls the on-off cycle of the compressor when the selector switch is in the cooling position. On heating and cooling models, the thermostat controls the on-off cycle of

the electric heater when the selector switch is in the heating position. The thermostat is actuated by sensing the temperature of the return air through the vent where the bulb is located. Terminal continuity should make and break if ambient air temperature is between 65 and 90 degrees F.

Heating Element

The heating element is a resistance heater of 1600 watts (5600 BTUH) capacity and is connected across the line when the selector switch is set for heating and the thermostat is calling for heat. The current draw of the heater (element only) will be 13.3 amperes at 120 volts (domestic USA models).

Limit Switch

The limit switch is a safety switch and is mounted in the heating element frame. It will open and break the circuit on temperature rise in case the air flow through the heater becomes low enough to cause the heater to overheat.

VII. SERVICE PROBLEMS AND THEIR POSSIBLE SOLUTIONS

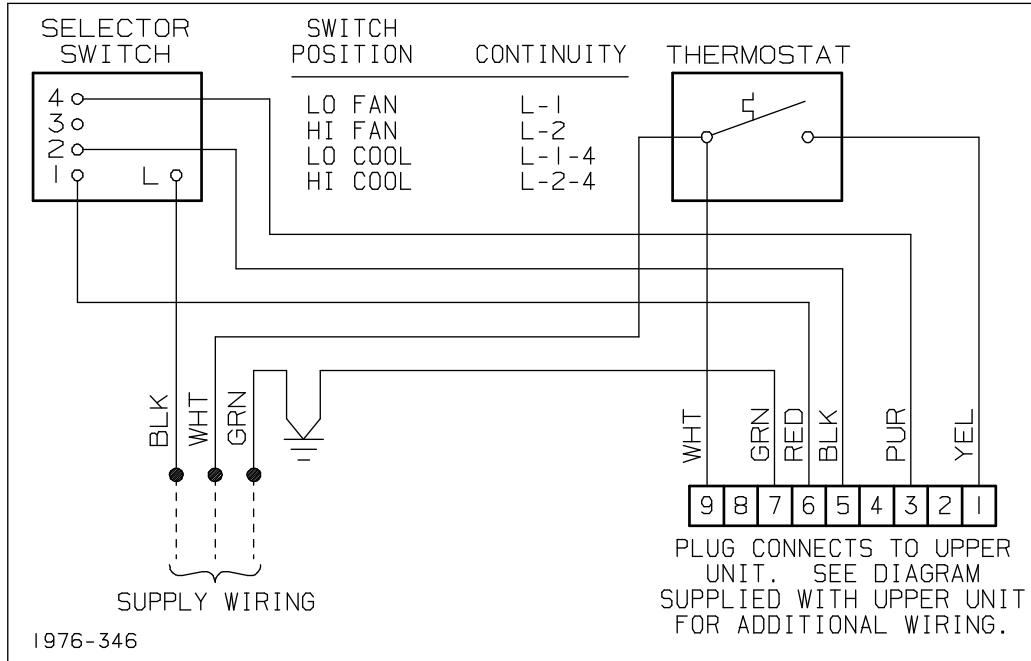
SERVICE PROBLEMS WITH AIR CONDITIONER AND FREE DELIVERY CEILING ASSEMBLIES

The following list of service problems covers only some of the more common problems which may occur and lists only the more probable causes. In many instances, it will be necessary to use the wiring diagram in this manual to check out the electrical circuits step by step, starting at the power source.

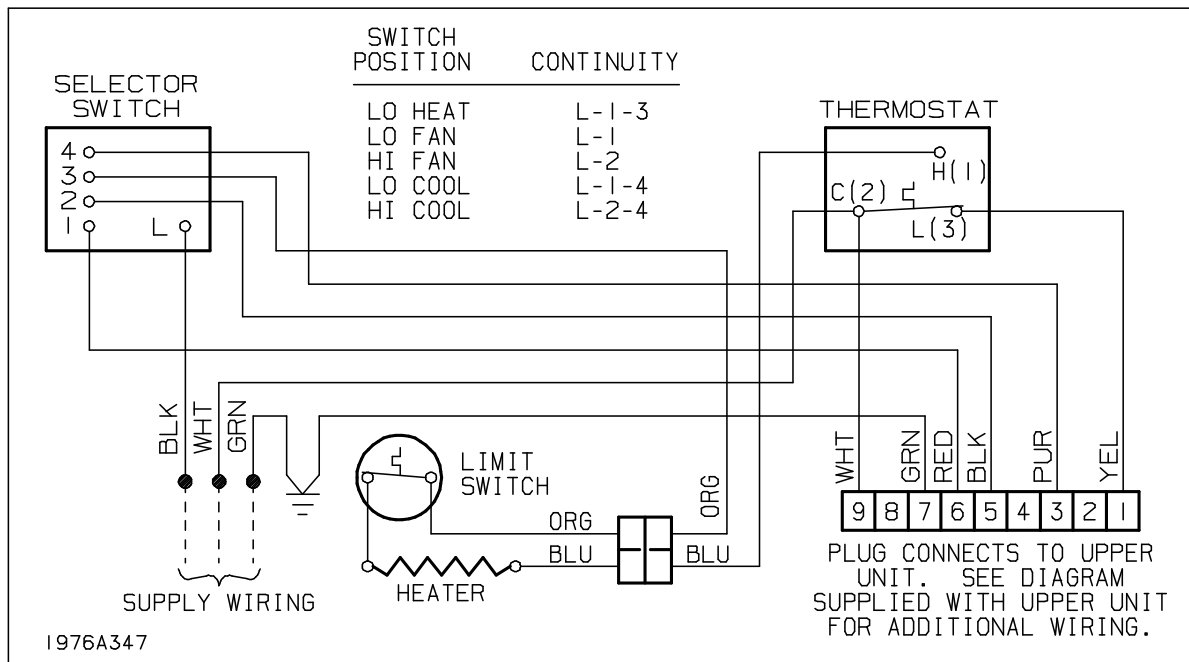
PROBLEMS	POSSIBLE CAUSES (REFER TO THE INDIVIDUAL COMPONENT CHECKOUT PROCEDURES)
Nothing Runs, No Compressor, No Fan, No Heat	No A/C Voltage, Selector Switch
Fan Runs, No Compressor Operation in the Cooling Mode	Insufficient Voltage to the Unit, Wiring, Thermostat, Start Capacitor, Run Capacitor, Start Relay, Open Overload, Selector Switch, Compressor
Heat or Compressor Runs, No Fan Operation	Wiring, Selector Switch, Fan Capacitor, Fan Motor
Fan Runs, No Electric Heat Element	Wiring, Thermostat, Selector Switch, Limit Switch, Outdoor Thermostat, Heating Element
Compressor Runs, Fan Runs, Insufficient Heat	Air Flow Restrictions, Outdoor Thermostat May Open Due to Low Ambient Temperature, (Undersized) Too Much Heat Loss in the Vehicle, Refrigeration System, Very Little or No Refrigerant Charge, Compressor
Compressor Runs, Fan Runs, Insufficient Cooling	Air Flow Restrictions, High Ambient Temperature, (Undersized) Too Much Heat Gain to the Vehicle, Refrigerant System, Very Little or No Refrigerant Charge, Compressor. (IF YOU HAVE NOT BEEN PROPERLY TRAINED IN REFRIGERATION SEALED SYSTEM REPAIRS, DO NOT ATTEMPT TO BREAK INTO THE SYSTEM.)

WIRING DIAGRAMS

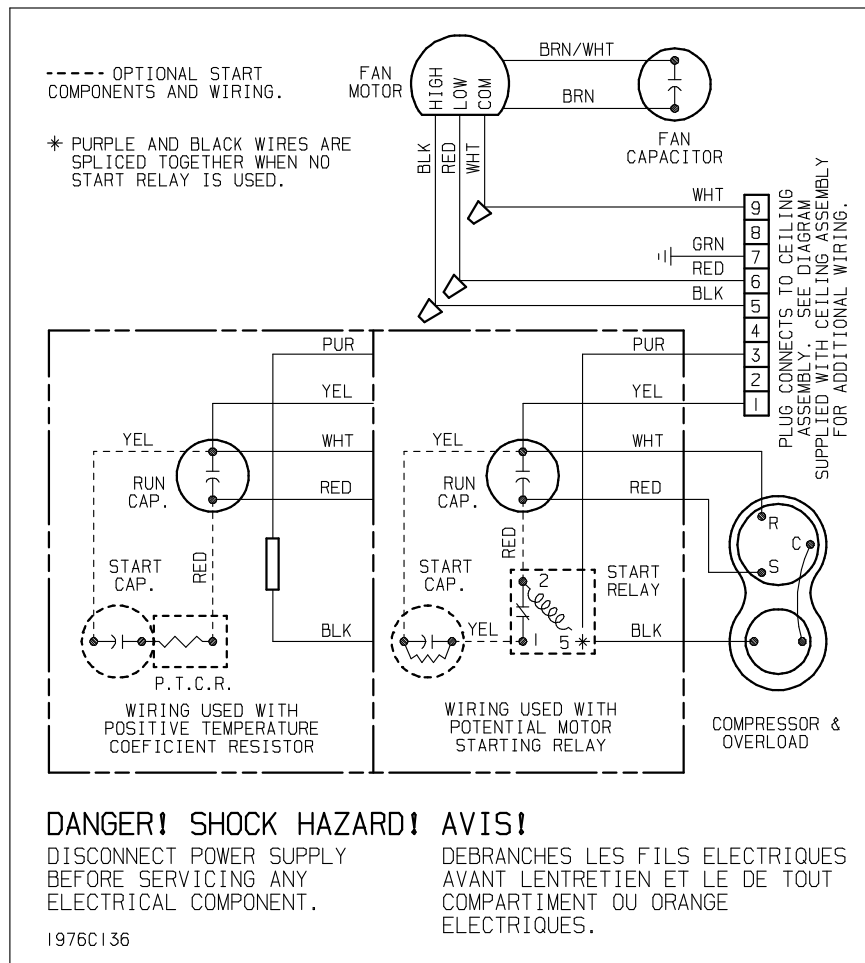
9330X713, 9330X714 COOL ONLY CEILING ASSEMBLIES



9330X715, 9330X916 HEAT/COOL CEILING ASSEMBLIES



7000 SERIES ROOF MOUNT AIR CONDITIONERS



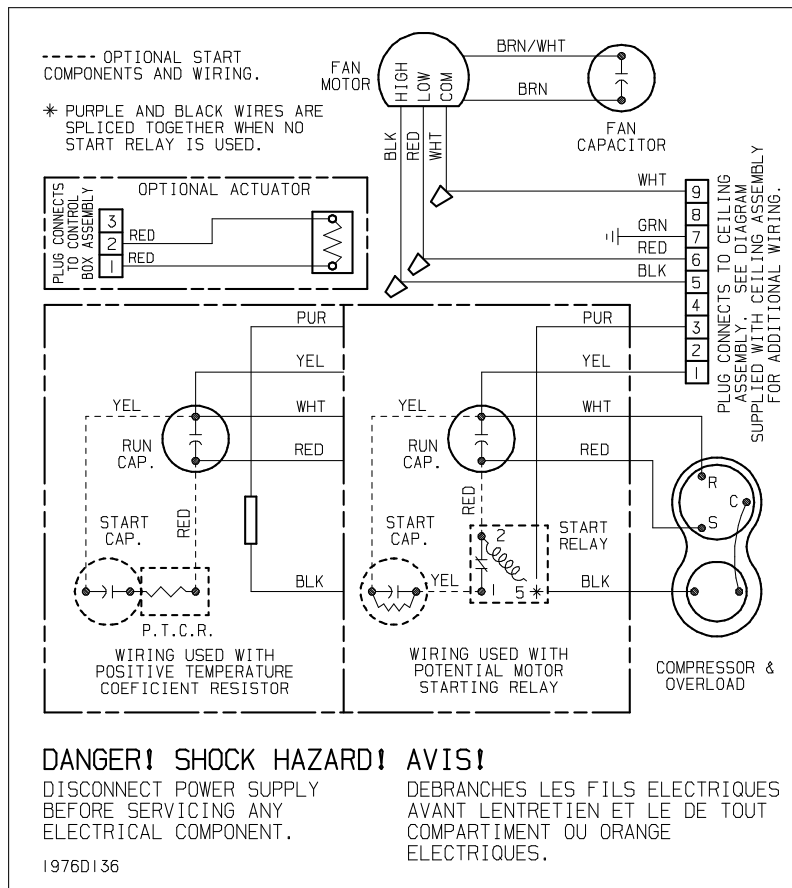
DANGER! SHOCK HAZARD! AVIS!

DISCONNECT POWER SUPPLY
BEFORE SERVICING ANY
ELECTRICAL COMPONENT.

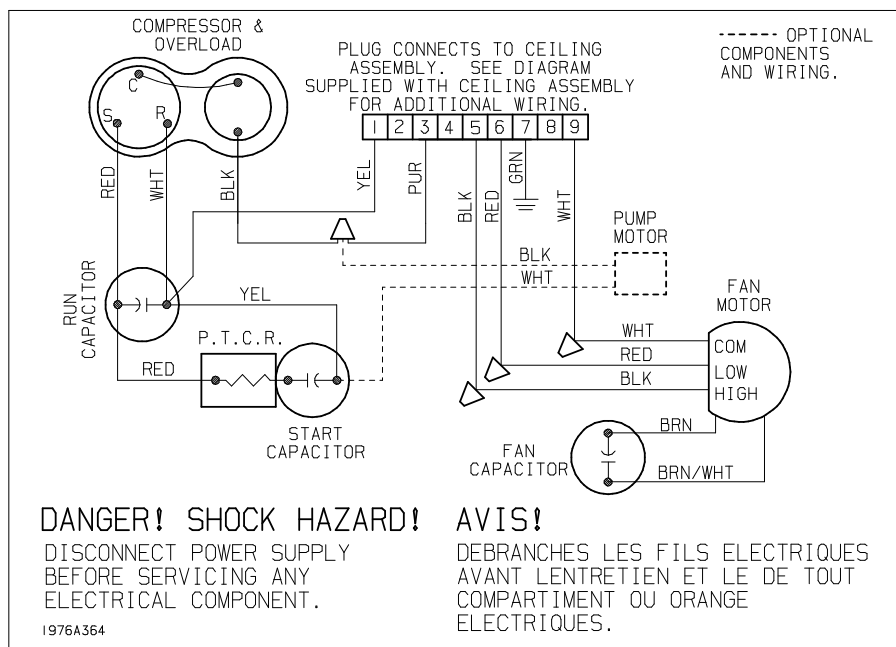
1976C136

DEBRANCHES LES FILS ELECTRIQUES
AVANT L'ENTRETIEN ET LE DE TOUT
COMPARTIMENT OU ORANGE
ELECTRIQUES.

8000 SERIES ROOF MOUNT AIR CONDITIONERS



9000 SERIES ROOF MOUNT AIR CONDITIONER





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