



FRIEDRICH

Hazardgard® Series



Standard Chassis Models Using R-32 Refrigerant

North America	60 HZ	HCS15A30A, HCM20A30A, HCM24A30A
	208/230-Volt:	
International	50 HZ	HCM20A50A
	208/230-Volt:	

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INTRODUCTION

Important Safety Information

The information in this manual is intended for use by a qualified technician who is familiar with the safety procedures required for installation and repair, and who is equipped with the proper tools and test instruments required to service this product.

Installation or repairs made by unqualified persons can result in subjecting the unqualified person making such repairs as well as the persons being served by the equipment to hazards resulting in injury or electrical shock which can be serious or even fatal.

Maintenance is the responsibility of the owner. Failure to properly maintain or repair equipment may result in personal injury and/or various types of property damage (fire, flood, etc.).

Safety warnings have been placed throughout this manual to alert you to potential hazards that may be encountered. If you install or perform service on equipment, it is your responsibility to read and obey these warnings to guard against any bodily injury or property damage which may result to you or others. Due to continuing research in new energy-saving technology, all information in this manual is subject to change without notice.

This service manual is designed to be used in conjunction with the installation and operation manuals provided with each air conditioning system.

This service manual was written to assist the professional service technician to quickly and accurately diagnose and repair malfunctions.

Installation procedures are not given in this manual. They are given in the Installation/Operation manual which can be acquired on the Friedrich [website](#). Click the Link or scan the QR code to be directed to the Professional page where you can locate our technical literature.



SAFETY IS IMPORTANT

We have provided many important safety messages in this manual and on your appliance. Always read and obey all safety messages.



This is a safety Alert symbol. This symbol alerts you to potential hazards that can kill or hurt you and others.

All safety messages will tell you what the potential hazard is, tell you how to reduce the chance of injury, and tell you what will happen if the instructions are not followed.

All safety messages will follow the safety alert symbol with the word "WARNING" or "CAUTION". These words mean:



Indicates a hazard which, if not avoided, can result in severe personal injury or death and damage to product or other property.



Indicates a hazard which, if not avoided, can result in personal injury and damage to product or other property.

NOTICE

Indicates property damage can occur if instructions are not followed.



This symbol indicates that this appliance uses a flammable refrigerant. If the refrigerant is leaked and is exposed to an external ignition source, there is a risk of fire.



This symbol indicates that the Operation Manual should be read carefully.



This symbol indicates that service personnel should be handling this equipment with reference to the installation manual.



This symbol indicates that information is available such as the Installation and Operation manual, or the Service Manual.

INTRODUCTION

Important Safety Information

⚠️ WARNING: The manufacturer's warranty does not cover any damage or defect to the air conditioner caused by the attachment or use of any components, accessories or devices (other than those authorized by the manufacturer) into, onto or in conjunction with the air conditioner. You should be aware that the use of unauthorized components, accessories or devices may adversely affect the operation of the air conditioner and may also endanger life and property. The manufacturer disclaims any responsibility for such loss or injury resulting from the use of such unauthorized components, accessories or devices.

⚠️ WARNING: This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

⚠️ WARNING: The maximum altitude for this appliance is 2,000 meters (6,562 feet).

Do not use above 2,000 meters (6,562 feet).

⚠️ WARNING: Electrical Shock Hazard

Disconnect all power to the unit before starting maintenance. All electrical connections and wiring **MUST** be installed by a qualified electrician and conform to the National Code and all local codes which have jurisdiction. Failure to do so can result in property damage, severe electrical shock or death.



⚠️ WARNING: Read Installation Manual

Read this manual thoroughly prior to equipment installation or operation. It is the installer's responsibility to properly apply and install the equipment. Installation must be in conformance with the NFPA 70-2023 national electric code or current edition, International Mechanic code 2021 or current edition, and any other local or national codes.



⚠️ WARNING: Safety First

Do not remove, disable, or bypass this unit's safety devices. Doing so may cause fire, injuries, or death.

⚠️ WARNING: This Product uses R-32 Refrigerant

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.

Do not pierce or burn.

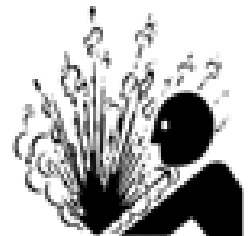
Be aware that refrigerants may not contain an odor.



**Refrigerant
Safety Group
A2L**

⚠️ WARNING: Refrigeration System under High pressure

Do not puncture, heat, expose to flame or incinerate. Only certified refrigeration technicians should service this equipment. R454B systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.



⚠️ CAUTION: Do Not Operate Equipment During Active Stages Of Construction

To ensure proper operation, Friedrich requires that all equipment is not operated during active construction phases. This includes active stages of completing framing, drywalling, spackling, sanding, painting, flooring, and moulding in the equipment's designated conditioning space. The use of this equipment during construction could result in premature failure of the components and/or system and is in violation of our standard warranty guidelines. The operation of newly installed equipment during construction will accelerate the commencement and/or termination of the warranty period.

⚠️ WARNING: Keep all air circulation and ventilation openings free from obstruction.

⚠️ WARNING: The unit should not be in contact with any equipment that will transmit vibration to the unit. Any excessive vibration or pulsation to the unit could result in damage to the refrigerant tubing.

INTRODUCTION

Personal Injury Or Death Hazards

SAFETY FIRST	 WARNING	 AVERTISSE- MENT	 ADVERTEN- CIA
	Do not remove, disable or bypass this unit's safety devices. Doing so may cause fire, injuries, or death.	Ne pas supprimer, désactiver ou contourner cette l'unité des dispositifs de sécurité, faire vous risqueriez de provoquer le feu, les blessures ou la mort.	No eliminar, desactivar o pasar por alto los dispositivos de seguridad de la unidad. Si lo hace podría producirse fuego, lesiones o muerte.



ELECTRICAL HAZARDS:

- Unplug and/or disconnect all electrical power to the unit before performing inspections, maintenance, or service.
- Make sure to follow proper lockout/tag out procedures.
- Always work in the company of a qualified assistant if possible.
- Capacitors, even when disconnected from the electrical power source, retain an electrical charge potential capable of causing electric shock or electrocution.
- Handle, discharge, and test capacitors according to safe, established, standards, and approved procedures.
- Extreme care, proper judgment, and safety procedures must be exercised if it becomes necessary to test or troubleshoot equipment with the power on to the unit.
- Do not spray water on the air conditioning unit while the power is on.
- Electrical component malfunction caused by water could result in electric shock or other electrically unsafe conditions when the power is restored and the unit is turned on, even after the exterior is dry.
- Use air conditioner on a single dedicated circuit within the specified amperage rating.
- Follow all safety precautions and use proper and adequate protective safety aids such as: gloves, goggles, clothing, properly insulated tools, and testing equipment etc.
- Failure to follow proper safety procedures and/or these warnings can result in serious injury or death.

INTRODUCTION

PERSONAL INJURY OR DEATH HAZARDS

- **REFRIGERATION SYSTEM REPAIR HAZARDS:**

- Use approved standard refrigerant recovering procedures and equipment to relieve high pressure before opening system for repair. Reference EPA regulations (40 CFR Part 82, Subpart F) Section 608.
- Do not allow liquid refrigerant to contact skin. Direct contact with liquid refrigerant can result in minor to moderate injury.
- Be extremely careful when using an oxy-acetylene torch. Direct contact with the torch's flame or hot surfaces can cause serious burns.
- Make certain to protect personal and surrounding property with fire proof materials and have a fire extinguisher at hand while using a torch.
- Provide adequate ventilation to vent off toxic fumes, and work with a qualified assistant whenever possible.
- Always use a pressure regulator when using dry nitrogen to test the sealed refrigeration system for leaks, flushing etc.

- **MECHANICAL HAZARDS:**

- Extreme care, proper judgment and all safety procedures must be followed when testing, troubleshooting, handling, or working around unit with moving and/or rotating parts.
- Be careful when, handling and working around exposed edges and corners of the sleeve, chassis, and other unit components especially the sharp fins of the indoor and outdoor coils.
- Use proper and adequate protective aids such as: gloves, clothing, safety glasses etc.
- Failure to follow proper safety procedures and/or these warnings can result in serious injury or death.

- **PROPERTY DAMAGE HAZARDS**

- **FIRE DAMAGE HAZARDS:**

- Read the Installation/Operation Manual for the air conditioning unit prior to operating.
- Use air conditioner on a single dedicated circuit within the specified amperage rating.
- Be extremely careful when using acetylene torch and protect surrounding property.
- Failure to follow these instructions can result in fire and minor to serious property damage.

- **WATER DAMAGE HAZARDS:**

- Improper installation, maintenance or servicing of the air conditioner unit can result in water damage to personal items or property.
- Ensure that the unit has a sufficient pitch to the outside to allow water to drain from the unit.
- Do not drill holes in the bottom of the drain pan or the underside of the unit.
- Failure to follow these instructions can result in damage to the unit and/or minor to serious property damage.

INTRODUCTION

Model Number Reference Guide

- This service manual is designed to be used in conjunction with the installation and operation manuals provided with each air conditioning system.
- This service manual was written to assist the professional service technician to quickly and accurately diagnose and repair malfunctions.
- Due to continuing research in new energy-saving technology, all information in this manual is subject to change without notice.
- **IMPORTANT:** It will be necessary for you to accurately identify the unit you are servicing, so you can be certain of a proper diagnosis and repair.

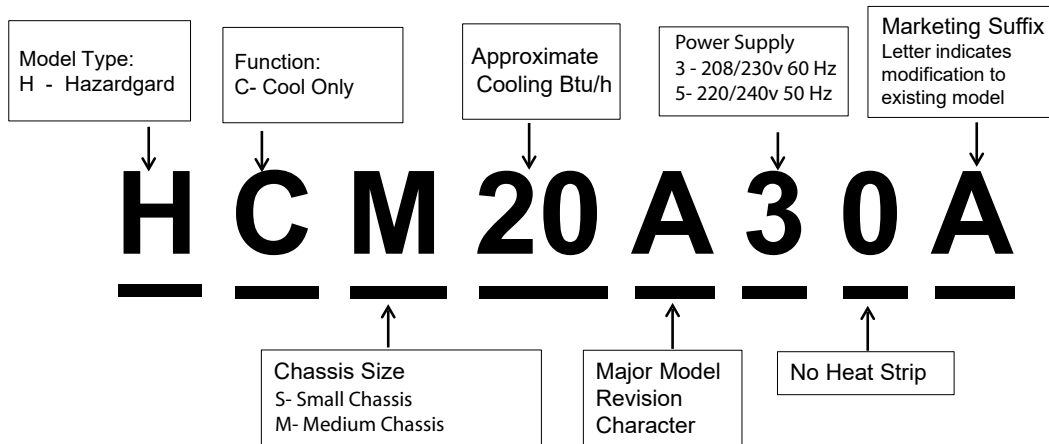


Figure 101 (Model Number Reference Guide)

Serial Number Reference Guide

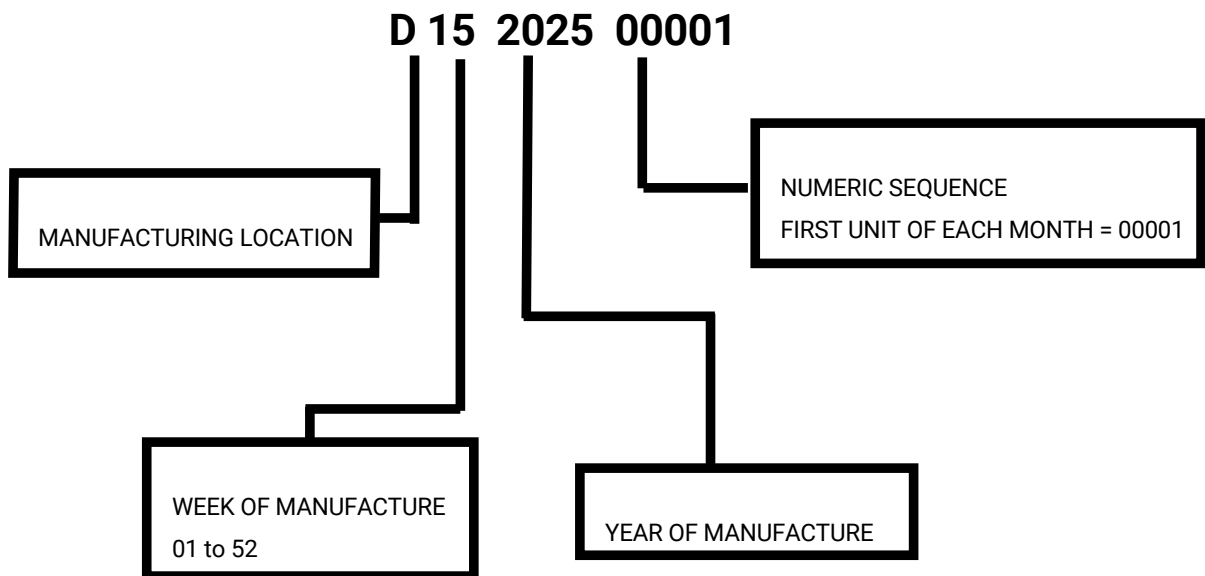


Figure 102 (Serial Number Reference Guide)

Model And Serial Number Location

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SPECIFICATIONS

Model	Cooling Capacity Btu/Hr.	Electrical Characteristics			Circuit Rating Breaker or T - D Fuse	Energy Efficiency Ratio EER	Moisture Removal Pints/ Hr	Air Circulation CFM	Refrigerant
		Volts Rated	Cooling Amps	Cooling Capacity (KW)	Volts - Amps				
60 HERTZ									
HCS15A30A	15,000	230/208	7.0/7.3	4.4	250V-15	10.2	5.0	375	R-32
HCM20A30A	20,000	230/208	10.0/10.7	5.86	250V-20	10.0	7.5	375	R-32
HCM24A30A	23,000	230/208	10.9/11.9	6.74	250V-20	9.9	8.8	385	R-32
50 HERTZ									
HCM20A50A	21,000	240/220	10.3/10.6	6.15	250V-20	9.5	7.5	425	R-32
Figure 201 (Specifications)									

Figure 201 (Specifications)

Dimensions

Model	Dimensions Inches						Window Width Inches		In-Wall Installation Finished Hole Inches			Weight Lbs.	
	Height	Width	Depth with Front A	Depth J Box to Louvers B	Minimum Extension Into Room	Minimum Extension Outside	Min.	Max.	Height	Width	Max. Depth C	Net	Shipping
SH15M30A	15 15/16"	25 15/16"	27 3/8"	6"	3 1/16"	16 15/16"	27 7/8"	42"	16 3/16"	26 3/16"	6"	140	167
HCS15A30A	15 15/16"	25 15/16"	27 3/8"	6"	3 1/16"	16 15/16"	27 7/8"	42"	16 3/16"	26 3/16"	6"	140	167
HCM20A30A	17 15/16"	25 15/16"	27 3/8"	6"	3 1/16"	16 15/16"	27 7/8"	42"	18 3/16"	26 3/16"	6"	151	178
SH20M30SA	17 15/16"	25 15/16"	27 3/8"	6"	3 1/16"	16 15/16"	27 7/8"	42"	18 3/16"	26 3/16"	6"	166	170
HCM24A30A	17 15/16"	25 15/16"	27 3/8"	6"	3 1/16"	16 15/16"	27 7/8"	42"	18 3/16"	26 3/16"	6"	151	178
SH20M50B	17 15/16"	25 15/16"	27 3/8"	6"	3 1/16"	16 15/16"	27 7/8"	42"	18 3/16"	26 3/16"	6"	171	175
HCM20A50A	17 15/16"	25 15/16"	27 3/8"	6"	3 1/16"	16 15/16"	27 7/8"	42"	18 3/16"	26 3/16"	6"	151	178

Figure 202 (Dimensions)

Installation Clearances

Improper installation of the Air Conditioner can cause poor performance and premature wear of the unit.

Ensure that the unit is installed with proper clearances as described below.

Ensure no obstructions or enclosures are within clearances limits to allow for proper airflow.

Ensure no open flames, or surfaces that will exceed 1000 degrees Fahrenheit are within clearances limits.

Clearances

Top and Bottom of Unit - One (1) foot

Sides of Unit - One (1) foot

Front of Unit - Three (3) feet

Rear of Unit - Three (3) feet

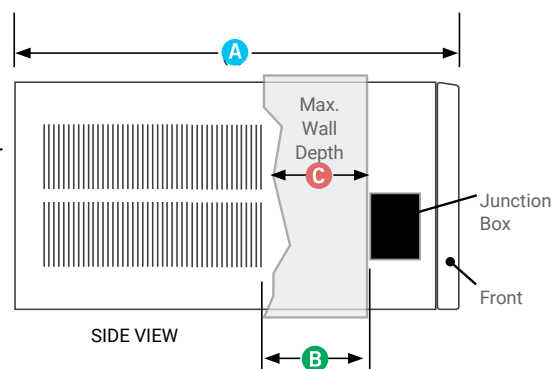


Figure 203 (Sleeve Dimensions)

SPECIFICATIONS

Electrical Data

⚠ WARNING	
	ELECTRIC SHOCK HAZARD
	Turn off electric power before service or installation.
	All electrical connections and wiring MUST be installed by a qualified electrician and conform to the National Electrical Code and all local codes which have jurisdiction. Failure to do so can result in personal injury or death.

MODEL	CIRCUIT RATING OR TIME DELAY FUSE		REQUIRED WALL RECEPTACLE
	AMP	VOLT	
HCM15	15	250	Junction Box
HCM20, HCM24	20	250	Junction Box

Figure 204 (Circuit Breaker / Wiring)

NOTICE
FIRE HAZARD
Not following the above WARNING could result in fire or electrically unsafe conditions which could cause moderate or serious property damage. Read, understand and follow the above warning.

Wire Size - Use ONLY wiring size recommended by the National Electric Code (NEC) for single outlet branch circuit.

Fuse/ Circuit Breaker - Use ONLY the correct HACR type and size fuse/circuit breaker. Read electrical ratings on unit's rating plate. Proper circuit protection is the responsibility of the homeowner.

Grounding - Unit MUST be grounded from branch circuit , or through separate ground wire provided on permanently connected units. Be sure that branch circuit is grounded.

Electrical Disconnect - Its is recoomended that an electrical disconnect is installed between the branch circuit and the junction box. Always disconnect power befor servicing.

IMPORTANT: Before you begin the actual installation of your air conditioner, check local electrical codes and the information below.

Your air conditioner must be connected to a power supply with the same A.C. voltage and frequency (hertz) as marked on the data plate located on the chassis. Only alternating current (A.C.), no direct current (D.C.), can be used.

An overloaded circuit will invariably cause malfunction or failure of the air conditioner therefore, it is extremely important that the electrical power is adequate. Consult your power company if in doubt.

OPERATION

Unit

Control Panel

Function Control (Power)

This switch is a double pole, single throw toggle switch.

ON - Turns everything on.

OFF - Turns everything off.

Temperature Control

The knob at the bottom is the thermostat which is a cross ambient type

used to maintain the desired comfort level. The thermostat reacts only to

a change in temperature at the bulb location - turn the knob clockwise to

set cooler, counter-clockwise for warmer.

Operating Temperatures

Hazardgard® meets T4 temperature classification Unit surface temperatures will not rise above 135° C/275° F. Operates at low ambient conditions without freezing at outdoor ambient temperatures as low as 7° C/45° F. Tolerates higher outdoor temperatures up to 55° C /130° F

UL LISTED

for CLASS 1, DIV 2,
GROUPS A, B, C and D.

CERTIFIED

in accordance with
ISA 12.12.01 and NFPA 70
(NATIONAL ELECTRIC CODE),
ANSI/UL 484 Room Air
Conditioners

KSA REGISTERED
and TESTED in accordance
with
SASO 2681*

FEATURES

- Direct wire connection
- Utilizes direct-wired, ¹⁵or ²⁰ amp circuit with time-delay fuse
- Hermetically sealed refrigeration system
- ²² gauge steel cabinet
- Larger, commercial grade fan motor with hermetically sealed overload for arc-free operation
- Permanent split capacitor and totally enclosed fan motor
- Enclosed fan motor has hermetically sealed overload for arc-free operation
- Stainless steel fan shaft
- Environmentally sealed on/off switch and gold plated contacts in thermostat for corrosion resistance
 - Solid-state control relays for compressor and fan operation
 - Hot gas bypass allows the air conditioner to operate at low ambient conditions without freezing

COILS COATED FOR CORROSION RESISTANCE

- MODEL SH²⁴N³⁰A
- ElectroFin® ⁵-stage, immersion ecoat process on ¹⁰⁰% of metallic surfaces on the outdoor coil provides outstanding corrosion resistance protection in coastal or corrosive environments
- ELECTROFIN BENEFITS:
 - Excellent adhesion characteristics
 - Less than ¹% thermal degradation
 - Outstanding chemical resistance
 - Passed ⁶⁰⁴⁸ hrs.ASTM B-¹¹⁷ Salt Spray
- ELECTROFIN MEETS THE FOLLOWING:
 - MIL-C-⁴⁶¹⁶⁸ Chemical Agent Resistance
 - -DS², HCl Gas
 - CID A-A-⁵²⁴⁷⁴A (GSA)
 - MIL-STD ⁸¹⁰F, Method ⁵⁰⁹.⁴ (Sand and Dust)
 - MIL-P-⁵³⁰⁸⁴ (ME)-TACOM Approval
 - MIL-DTL-¹²⁴⁶⁸ Decontamination Agent (STB)
 - DPG (Douglas Proving Grounds) Soil & Water Exposure Tests
 - GM⁹⁵⁴⁰P-⁹⁷ Accelerated Corrosion Test (¹²⁰ cycles)
 - ASTM B¹¹⁷-G⁸⁵ Modified Salt Spray (Fog) Testing-^{2,000} hours
 - ASTM B¹¹⁷ Salt Spray (tested by ARL for Lockheed Martin)
- MODELS HCM¹⁵A³⁰A, HCM²⁰A³⁰A
Diamonblue™ Advanced Corrosion Protection on the outdoor coil protects the coil against deterioration and extends the life of the unit especially in coastal or corrosive environments.



OPERATION

General Knowledge Sequence Of Refrigeration

A good understanding of the basic operation of the refrigeration system is essential for the service technician. Without this understanding, accurate troubleshooting of refrigeration system problems will be more difficult and time consuming, if not (in some cases) entirely impossible. The refrigeration system uses four basic principles (laws) in its operation they are as follows:

1. "Heat always flows from a warmer body to a cooler body."
2. "Heat must be added to or removed from a substance before a change in state can occur"
3. "Flow is always from a higher pressure area to a lower pressure area."
4. "The temperature at which a liquid or gas changes state is dependent upon the pressure."

The refrigeration cycle begins at the compressor. Starting the compressor creates a low pressure in the suction line which draws refrigerant gas (vapor) into the compressor. The compressor then "compresses" this refrigerant vapor, raising its pressure and its (heat intensity) temperature.

The refrigerant leaves the compressor through the discharge Line as a hot High pressure gas (vapor). The refrigerant enters the condenser coil where it gives up some of its heat. The condenser fan moving air across the coil's finned surface facilitates the transfer of heat from the refrigerant to the relatively cooler outdoor air.

When a sufficient quantity of heat has been removed from the refrigerant gas (vapor), the refrigerant will "condense" (i.e. change to a liquid). Once the refrigerant has been condensed (changed) to a liquid it is cooled even further by the air that continues to flow across the condenser coil.

The design determines at exactly what point (in the condenser) the change of state (i.e. gas to a liquid) takes place. In all cases, however, the refrigerant must be totally condensed (changed) to a liquid before leaving the condenser coil.

The refrigerant leaves the condenser coil through the liquid line as a warm high pressure liquid.

The liquid refrigerant next enters the metering device. The metering device is a fixed orifice (HCS15A30A, HCM20A30, HCM20A50A) or a capillary assembly (HCM24A30A). The purpose of the metering device is to "meter" (i.e. control or measure) the quantity of refrigerant entering the evaporator coil.

In the case of the fixed orifice this is accomplished (by design) through size of the orifice, and the pressure difference present across the device.

In the case of the capillary tube this is accomplished (by design) through size (and length) of device, and the pressure difference present across the device.

Since the evaporator coil is under a lower pressure (due to the suction created by the compressor) than the liquid line, the liquid refrigerant leaves the metering device entering the evaporator coil. As it enters the evaporator coil, the larger area and lower pressure allows the refrigerant to expand and lower its temperature (heat intensity). This expansion is often referred to as "boiling" or atomizing. Since the unit's blower is moving indoor air across the finned surface of the evaporator coil, the expanding refrigerant absorbs some of that heat. This results in a lowering of the indoor air temperature, or cooling.

The expansion and absorbing of heat cause the liquid refrigerant to evaporate (i.e. change to a gas). Once the refrigerant has been evaporated (changed to a gas), it is heated even further by the air that continues to flow across the evaporator coil.

The particular system design determines at exactly what point (in the evaporator) the change of state (i.e. liquid to a gas) takes place. In all cases, however, the refrigerant must be totally evaporated (changed) to a gas before leaving the evaporator coil.

The low pressure (suction) created by the compressor causes the refrigerant to leave the evaporator through the suction line as a cool low pressure vapor. The refrigerant then returns to the compressor, where the cycle is repeated.

ROUTINE MAINTENANCE

Filter Removal / Installation

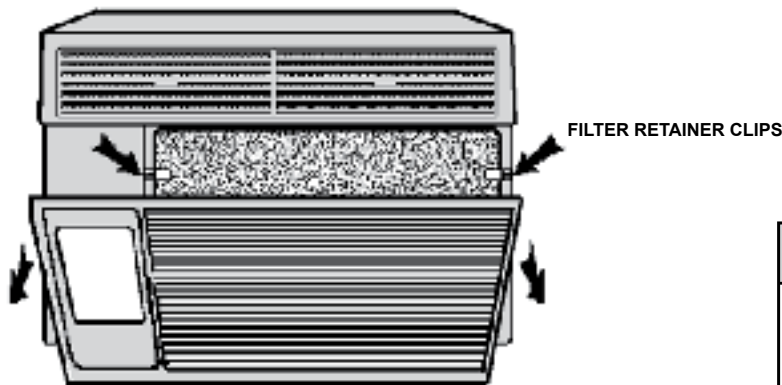
The filter in your Friedrich removes dust, pollen and other impurities from the air as they are drawn through the unit. The filter is permanent and reusable, and has a germicidal treatment which is not affected by periodic washing. A clogged, dirty filter reduces the air flow through the unit and reduces its efficiency. You should check the filter every seven to ten days, depending on the amount your unit is used. Clean the filter regularly.

Air Filter

Clean the unit air intake filter at least every 300 to 350 hours of operation. Clean the filters with a mild detergent in warm water and allow to dry thoroughly before reinstalling.

Coils And Base Pan

The indoor coil (evaporator coil), the outdoor coil (condenser coil) and base pan should be inspected periodically (yearly or bi-yearly) and cleaned of all debris (lint, dirt, leaves, paper, etc.). Clean the coils and base pan with a soft brush and compressed air or vacuum. If using a pressure washer, be careful not to bend the aluminium fin pack. Use a sweeping up and down motion in the direction of the vertical aluminum fin pack when pressure cleaning coils. Cover all electrical components to protect them from water or spray. Allow the unit to dry thoroughly before reinstalling it in the sleeve.



The filter can be removed for cleaning by opening the front of the unit and releasing the filter from its retaining clips.

Figure 401 (Air Filter)

Blower Wheel / Housing / Condenser Fan / Shroud

Inspect the indoor blower housing, evaporator blade, condenser fan blade and condenser shroud periodically (yearly or bi-yearly) and clean of all debris (lint, dirt, mold, fungus, etc.). Clean the blower housing area and blower wheel with an antibacterial / antifungal cleaner. Use a biodegradable cleaning agent and degreaser on condenser fan and condenser shroud. Use warm or cold water when rinsing these items. Allow all items to dry thoroughly before reinstalling them.

Electronic / Electrical / Mechanical

Periodically (at least yearly or bi-yearly): inspect all control components: electronic, electrical and mechanical, as well as the power supply. Use proper testing instruments (voltmeter, ohmmeter, ammeter, wattmeter, etc.) to perform electrical tests. Use an air conditioning or refrigeration thermometer to check room, outdoor and coil operating temperatures. Use an electronic tester to measure wet bulb temperatures indoors and outdoors. For performance tests see Figure 403

⚠ WARNING



ELECTRIC SHOCK HAZARD

Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.

Failure to do so could result in serious injury or death.

⚠ WARNING



CUT/SEVER HAZARD

Be careful with the sharp edges and corners. Wear protective clothing and gloves, etc.

Failure to do so could result in serious injury.

NOTICE

Do not use a caustic coil cleaning agent on coils or base pan. Use a biodegradable cleaning agent and degreaser, to prevent damage to the coil and/or base pan.

ROUTINE MAINTENANCE

NOTICE

Do not drill holes in the bottom of the drain pan or the underside of the unit. Not following this notice could result in damage to the unit or condensate water leaking inappropriately which could cause water damage to surrounding property.

Sleeve / Drain

Inspect the sleeve and drain system periodically (at least yearly or bi-yearly) and clean of all obstructions and debris. Clean both areas with an antibacterial and antifungal cleaner. Rinse both items thoroughly with water and ensure that the drain outlets are operating correctly. Check the sealant around the sleeve and reseal areas as needed.

Front Cover

Clean the front cover when needed. Use a mild detergent. Wash and rinse with warm water. Allow it to dry thoroughly before reinstalling it in the chassis.

Clearances

Inspect the surrounding area (inside and outside) to ensure that the unit's clearances have not been compromised or altered.

Top and Bottom of Unit - One (1) foot

Sides of Unit - One (1) foot

Front of Unit - Three (3) feet

Rear of Unit - Three (3) feet

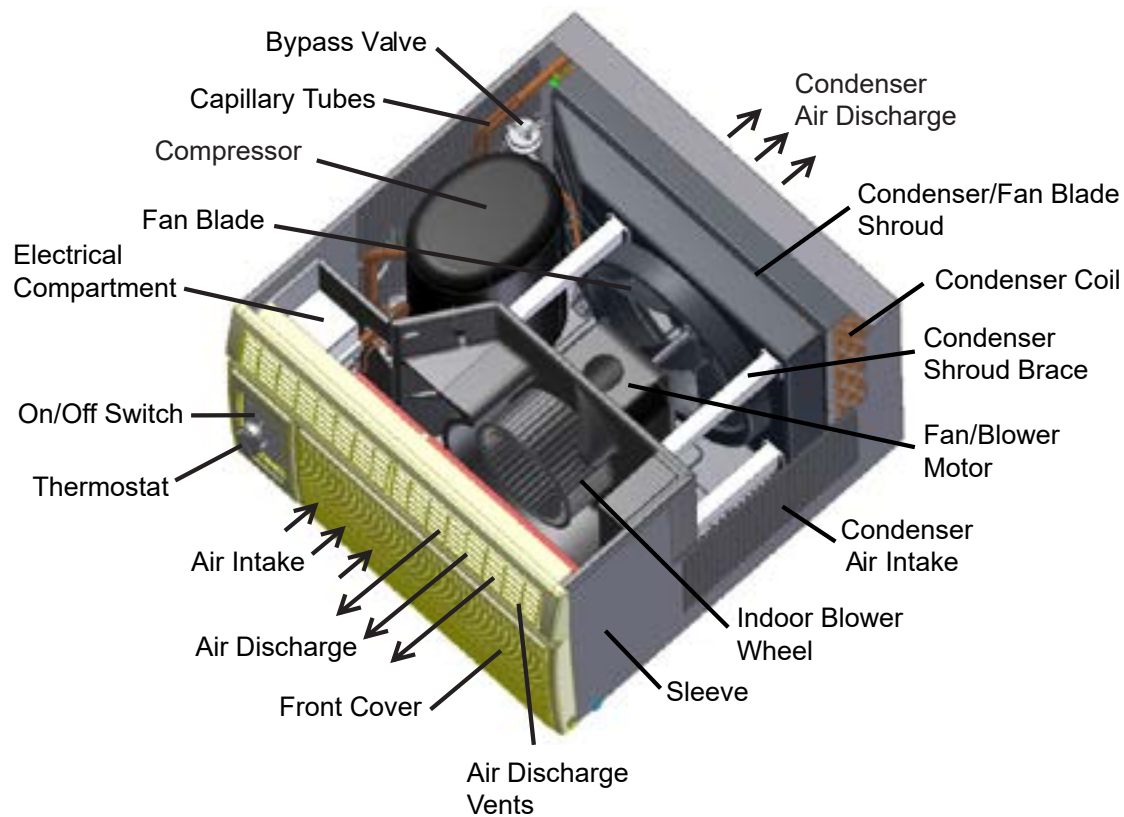


Figure 402 (Component ID)

ROUTINE MAINTENANCE

ROOM AIR CONDITIONER UNIT PERFORMANCE TEST DATA SHEET

JOB NAME _____ TECH'S NAME _____

DATE _____ MODEL# _____ SERIAL # _____

CHECK THE INSTALLATION	ACCEPTABLE YES	NOT ACCEPTABLE NO
IS A CHASIS GASKET INSTALLED?	_____	_____
IS THE FRESH / EXHAUST AIR VENT OPEN?	_____	_____
IS A FRIEDRICH SLEEVE INSTALLED?	_____	_____
IS A FRIEDRICH OUTDOOR GRILLE INSTALLED?	_____	_____
IS MAINTENANCE BEING PERFORMED?	_____	_____

ELECTRICAL

LINE VOLTAGE (STATIC) _____ VOLTS
 START UP VOLTAGE _____ VOLTS
 AMPERAGE DRAW (COOL) _____ AMPS
 AMPERAGE DRAW (HEAT) _____ AMPS

COMPRESSOR

LOCKED ROTOR AMPS _____
 AMPS _____
 RUNNING AMPERAGE DRAW _____ AMPS

INDOOR CONDITIONS

INDOOR AMBIENT TEMPERATURE _____ F
 RELATIVE HUMIDITY (RH) INDOOR _____ %
 DISCHARGE AIR TEMPERATURE (INDOOR)(COOL) _____ F
 DISCHARGE AIR TEMPERATURE (INDOOR)(HEAT) _____ F
 RETURN AIR TEMPERATURE (INDOOR)(COOL) _____ F
 RETURN AIR TEMPERATURE (INDOOR) (HEAT) _____ F

OUTDOOR TEMPERATURE

OUTDOOR AMBIENT TEMPERATURE _____ F
 RH OUTDOOR RELATIVE HUMIDITY _____ %
 DISCHARGE AIR TEMPERATURE (OUTDOOR)(COOL) _____ F
 DISCHARGE AIR TEMPERATURE (OUTDOOR)(HEAT) _____ F
 INTAKE AIR TEMPERATURE (OUTDOOR)(COOL) _____ F
 INTAKE AIR TEMPERATURE (OUTDOOR)(HEAT) _____ F

COOLING OR HEATING AREA

AREA W _____ * L _____ = FEET SQUARED

FOR A GENERAL GUIDE REFER TO SIZING GUIDE TO THE RIGHT

FOR EXACT LOAD CALCULATIONS CONSULT MANUAL J OR M.

Figure 403 (Test Data Sheet)

COOLING SIZING GUIDE

AREA TO BE CONDITIONED IN SQ. FT.	APPROXIMATE COOLING BTU REQUIRED
100 - 150	5000
150 - 250	6000
250 - 300	7000
300 - 350	8000
350 - 400	9000
400 - 450	10000
450 - 550	12000
550 - 700	14000
700 - 1000	18000
1000 - 1200	21000
1200 - 1400	23000
1400 - 1500	24000
1500 - 2000	30000
2000 - 2500	34000

Guide based on normal
 room insulation, average
 number of sun exposed
 windows and two person
 occupancy.

1. If heavily shaded, reduce cooling Btus required by 10%
2. If very sunny, increase cooling Btus required by 10%
3. Add 500 Btus per person over 2 people
4. Add 4,000 Btus if the area is a kitchen

Figure 404 (Cooling Sizing Guide)

TROUBLESHOOTING

Problem	Possible Cause	Possible Solution
Unit does not run	Power disconnected.	Check power source.
	Branch circuit fuse blown or circuit breaker tripped.	Replace fuse, reset breaker. If repeats, check fuse or breaker size. Check for shorts in unit wiring and components.
	Loose or disconnected wiring at switch.	Check wiring & connections. Connect per wiring diagram.
	Inoperative switch (On-Off).	Test for continuity, 3 and 2, 5 and 6. If bad, replace.
Compressor runs continually. Does not cycle off.	Excessive heat load.	Test cooling performance of unit. Unit undersized.
	Restriction in line.	Check for partially iced coil. Check temperature split across coil.
	Refrigerant leak.	Check for presence of oil on silver soldered connections. Check for partially iced coil. Check split across coil. Check for low running amperage.
	Thermostat contacts stuck.	Check operation of thermostat. Replace if contacts remain closed.
	Incorrect thermostat setting.	Set to correct setting.
Thermostat does not turn on compressor	Loss of charge in thermostat bulb.	Replace thermostat.
	Thermostat contacts open.	Test for continuity at terminals 1 and 2. Replace if defective.
	Incorrect wiring or loose wires.	Connect per wiring diagram. Tighten loose wires.
	System switch open.	Test for continuity at switch terminals 2 and 3.
Thermostat does not turn off compressor	Thermostat set at coldest point	Adjust.
	Thermostat contacts stuck.	Disconnect power to the unit. Remove cover of thermostat and check if contact is stuck, if so replace thermostat.
	Switch (On-Off) shorted.	Test switch for open contacts at terminals 2 and 3 with switch in "Off" position.
NOTE: If Inside Coil Freezes Up; Your Friedrich Hazardgard is designed not to freeze with outdoor temperatures as low as 45°F (7°C). If the indoor coil should ice over while cooling, set the thermostat to the warmest position until the ice on the coil is gone. Setting the thermostat to a slightly warmer position will probably keep ice from forming on the coil. A dirty filter will contribute to icing.		
Figure 501		

TROUBLESHOOTING

Problem	Possible Cause	Possible Solution
Compressor attempts to start, or runs for short periods only. Cycles on overload.	Compressor attempts to start before system pressures are equalized.	Allow a minimum of 3 minutes to allow pressures to equalize before attempting to start.
	Low or fluctuating voltage.	Check voltage with unit operating. Check for other appliances on the circuit. Unit should be on separate circuit for proper voltage, and be fused separately.
	Incorrect wiring.	Connect per appropriate wiring diagram.
	Shorted or incorrect capacitor.	Replace capacitor.
	Restricted or low air flow through condenser coil.	Check motor fan blade.
	Compressor running abnormally hot.	Check for refrigerant restriction, blocked airflow, loose wires at compressor terminals and fan motor capacitor voltage.
	Overload opens too soon.	Change compressor if all other corrections above are normal.
Compressor does not start - fan motor runs.	Thermostat contacts not closing.	Check continuity of thermostat at coldest setting. If compressor runs, replace thermostat.
	Low voltage supply.	Check for nameplate voltage. Provide proper voltage.
	Switch (On-Off) inoperative.	Test for continuity.
	Defective capacitor.	Test with analyzer, replace if needed.
	Compressor internal overload open.	Check voltage at compressor terminals. If voltage is satisfactory, replace compressor.
	Solid state relay open.	Replace relay.
	Open or shorted compressor windings.	Check windings for continuity and resistance. If open, replace compressor.
Does not cool, or cools only slightly.	Thermostat open or inoperative.	Set to coldest position. Test thermostat and replace if necessary.
	Dirty air filter.	Clean as recommended in Owner's Manual.
	Dirty or plugged condenser or evaporator coil.	Clean coils.
	Poor air circulation in area being cooled.	Adjust air louvers. Check application. Check for dirty filter or evap coil. Check fan motor. Correct as needed.
	Low capacity - undercharge.	Check for leak and make necessary repairs.
	Compressor not pumping properly.	Replace compressor.

Figure 501

TROUBLESHOOTING

Problem	Possible Cause	Possible Solution
Fan motor does not run.	Defective switch (On-Off)	Check continuity across terminals 2 and 3.
	Fan capacitor open.	Test with capacitor analyzer. Replace if bad.
	Inoperative fan motor.	Check power and if okay, perform continuity test. Replace if bad.
	Incorrect wiring of fan circuit.	Connect per wiring diagram.
	Solid state relay open.	Replace relay.
	Seized motor bearings.	Replace motor.
	Bound fan blade or blower wheel.	Adjust for proper clearance.
Switch (On-Off) does not cut fan motor off.	Defective (On-Off) switch or defective relay.	Replace switch or relay.
Noisy and/ or vibration.	Poor installation.	Refer to Installation/ Operation Manual for proper installation.
	Fan blade striking chassis or blower wheel housing.	Adjust fan blade or blower wheel clearance.
	Compressor vibrating.	Check for deteriorated compressor grommets. Replace as needed.
	Loose cabinet parts, improperly mounted components, tubing rubbing.	Adjust and tighten as required.
Water leaks into room.	Evaporator drain pan overflowing. Dirty evaporator coil	Clean obstructed drain trough. Clean Coil
	Condensation forming on bottom of base pan. Dirty evaporator coil.	Evaporator drain pan broken or cracked. Replace chassis seal gasket missing or defective.
	Water dripping from discharge air grilles.	Extremely high humidity conditions. Check application.
	Water in center section of base pan (compressor area).	Drain trough. Check level. Ensure 1/4" tilt toward rear.
Excessive water leaks outside.	Dirty condenser coil.	Clean with steam or detergent.

Figure 501

COMPONENT TESTING

Component ID

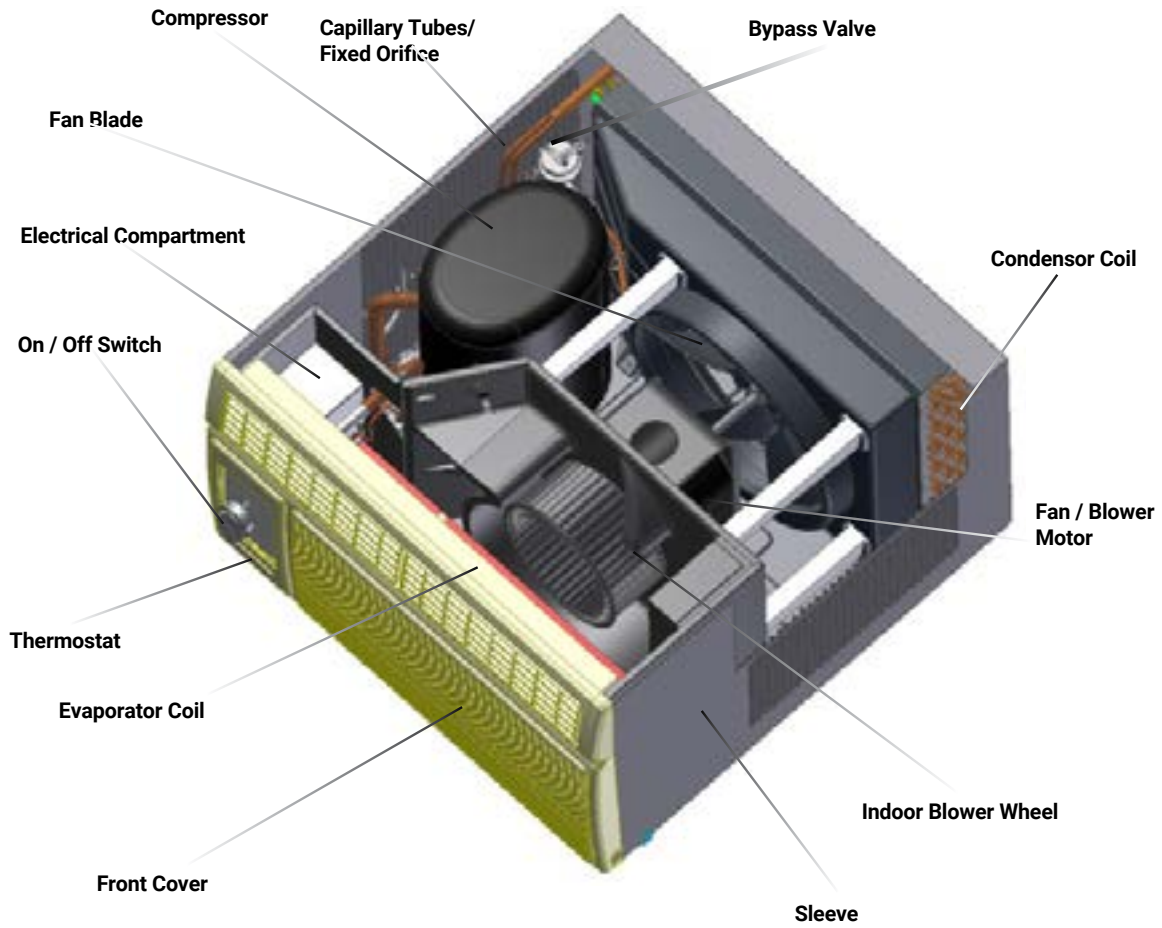


Figure 601 (Component Identification)

COMPONENTS TESTING

Component Definitions

A. Mechanical components

Plenum assembly

Diffuser with directional louvers used to direct the conditioned airflow.

Blower wheel

Attaches to the indoor side of the fan motor shaft and is used for distributing unconditioned, room side air through the heat exchanger and delivering conditioned air into the room.

Slinger fan blade

Attaches to the outdoor side of the fan motor shaft and is used to move outside air through the condenser coil, while slinging condensate water out of the base pan and onto the condenser coil, thus lowering the temperature and pressures within the coil.

B. Electrical components

Thermostat Control

Used to maintain the specified room side comfort level.

System Switch

Used to regulate the operation of the fan motor and the compressor or to turn the unit off. For troubleshooting, refer to the wiring diagrams and schematics in the back of this service manual.

Solid State Relay

Used to energize the compressor and fan motor. Each unit has 2, 50 amp, 208/230 volt relays.

Capacitor

Reduces line current and steadies the voltage supply, while greatly improving the torque characteristics of the fan motor and compressor motor.

Fan Motor

Dual shafted fan motor operates the indoor blower wheel and the condenser fan blade simultaneously. (When unit is turned on, the fan motor runs continuously).

⚠ WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.

C. Hermetic components

Compressor

Motorized device used to compress refrigerant through the sealed system.

Low ambient bypass (hot gas bypass) valve

The Hazardgard unit is designed to operate at low outside ambient temperatures. This is accomplished by the use of a bypass valve installed in the refrigeration circuit. The valve is connected between the discharge line at the compressor and the suction process tube. The valve responds to suction pressure which, when reduced in the system, causes the valve to open and bypass hot gas from the high pressure side to the low pressure side of the system. The hot gas entering the compressor mixes with the cool gas returned through the suction line, thus increasing the suction pressure. The valve is preset to open when the suction pressure reaches 88 psig. This pressure setting cannot be altered. The system can be operated at outdoor temperatures as low as 45°F before the evaporator coil will begin to accumulate frost.

Capillary tube (HCM24A30A)

A cylindrical metering device used to evenly distribute the flow of refrigerant to the heat exchanger (evaporator coils). In the case of the capillary tube this is accomplished (by design) through size (and length) of device, and the pressure difference present across the device.

Fixed Orifice (HCS15A30A, HCM20A30, HCM20A50A)

The metering device is a fixed orifice. The purpose of the metering device is to "meter" (i.e. control or measure) the quantity of refrigerant entering the evaporator coil. In the case of the fixed orifice this is accomplished (by design) through size of the orifice, and the pressure difference present across the device.

COMPONENTS TESTING

Hermetic Components Check

⚠ WARNING	
	BURN HAZARD Proper safety procedures must be followed, and proper protective clothing must be worn when working with a torch. Failure to follow these procedures could result in moderate or serious injury.

⚠ WARNING	
	CUT/SEVER HAZARD Be careful with the sharp edges and corners. Wear protective clothing and gloves, etc. Failure to do so could result in serious injury.

Metering Device - Capillary Tube /Fixed Orifice

All units are equipped with capillary tube metering devices.
Checking for restricted capillary tubes.

1. Connect pressure gauges to unit.
2. Start the unit in the cooling mode. If after a few minutes of operation the pressures are normal, the check valve and the cooling capillary are not restricted.
4. If the operating pressures are lower than normal capillary is restricted.

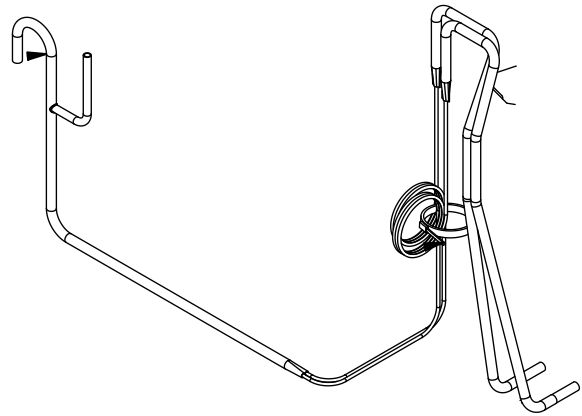


Figure 601 (Capillary Tubes)

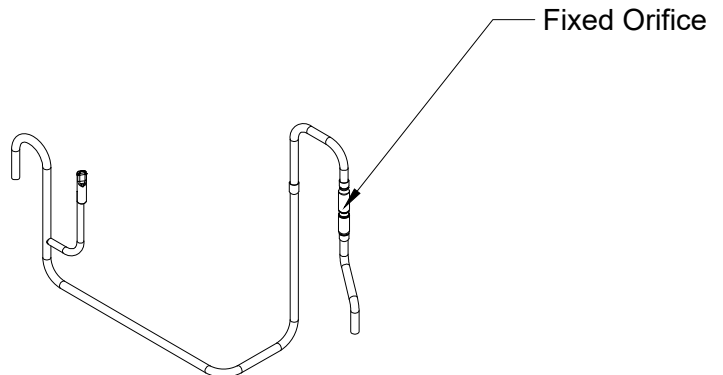


Figure 602 (Capillary Tubes)

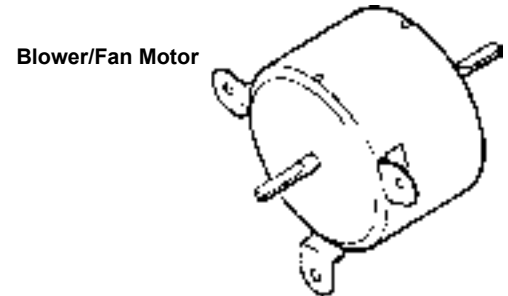
COMPONENTS TESTING

Fan Motor

A 230 volt single phase permanent split capacitor motor is used to drive the evaporator blower and condenser fan. A running capacitor is wired across the start and run terminals of the motor.

The motor is totally enclosed and is protected with a line voltage overload located internally of the motor. The motor shaft is stainless steel to resist corrosion. When the unit is turned on, the motor runs continuously.

⚠ WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.



Blower/Fan Motor

Figure 603 (Blower Fan Motor)

Blower / Fan Motor Test

1. Determine that the capacitor is serviceable.
2. Disconnect fan motor wires from fan speed switch or system switch.
3. Apply "live" test cord probes on black wire and common terminal of capacitor. Motor should run at high speed.

Solid State Relay

Two 50 amp rated 208/230 volt solid state relays are used to energize the compressor and fan motor. Terminals 3 and 4 are the 208/230 volt line side. Terminals 1 and 2 are load side contacts.

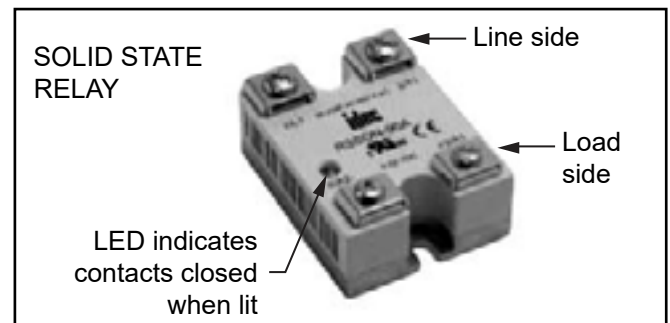


Figure 604 (Solid State Relay)

System Control Switch

This switch is double pole, single throw. Check for continuity between terminals 2 and 3, and 5 and 6.

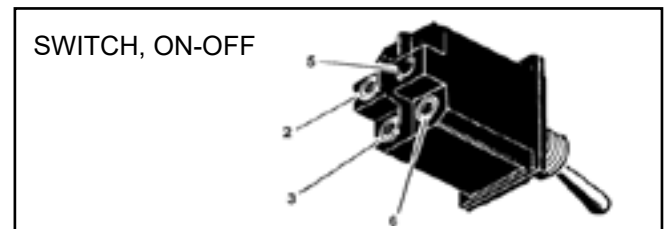


Figure 605 (On/ Off Switch)

COMPONENTS TESTING

Capacitor Checks

⚠ WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.

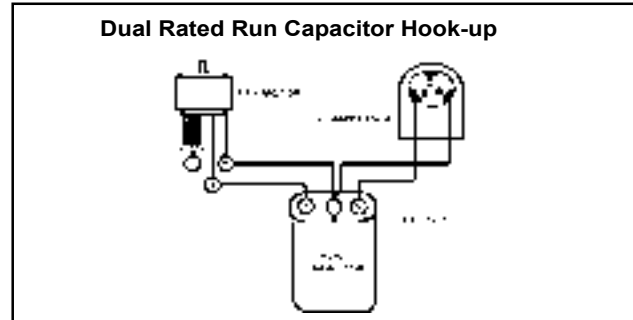


Figure 606 Dual Rated Capacitor Hook-Up

Many motor capacitors are internally fused. Shorting the terminals will blow the fuse, ruining the capacitor. A 20,000 ohm 2 watt resistor can be used to discharge capacitors safely. Remove wires from capacitor and place resistor across terminals. When checking a dual capacitor with a capacitor analyzer or ohmmeter, both sides must be tested.

Capacitor Check

The voltmeter will show whether the capacitor is "open" or "shorted." It will tell whether the capacitor is within its micro farads rating and it will show whether the capacitor is operating at the proper power-factor percentage. The instrument will automatically discharge the capacitor when the test switch is released.

Capacitor Connections

The starting winding of a motor can be damaged by a shorted and grounded running capacitor. This damage usually can be avoided by proper connection of the running capacitor terminals.

From the supply line on a typical 230 volt circuit, a 115 volt potential exists from the "R" terminal to ground through a possible short in the capacitor. However, from the "S" or start terminal, a much higher potential, possibly as high as 400 volts, exists because of the counter EMF generated in the start winding. Therefore, the possibility of capacitor failure is much greater when the common terminal is connected to the "S" or start terminal. The common terminal should always be connected to the supply line, or "R" terminal, never to the "S" terminal.

When connected properly, a shorted or grounded running capacitor will result in a direct short to ground from the "R" terminal and will blow the line fuse. The motor protector will protect the main winding from excessive temperature.

Testing The Thermostat

Remove the wires from the thermostat. Turn the thermostat to its coldest position. Check to see if there is continuity between the two terminals. Turn the thermostat to its warmest position. Check continuity to see if the thermostat contacts open.

Note: The temperature must be within the range listed to check the thermostat. Refer to the troubleshooting section in this manual for additional information on thermostat testing.

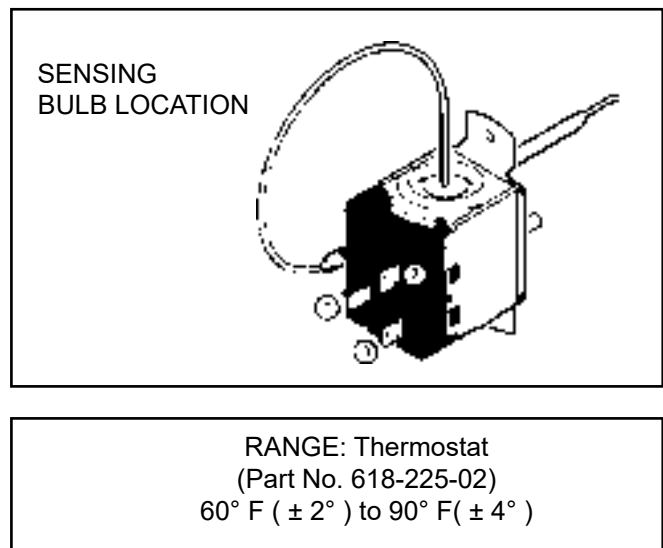


Figure 607 (Thermostat)

COMPONENT TESTING

Compressor Checks

⚠ WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation.
	All electrical connections and wiring MUST be installed by a qualified electrician and conform to the National Electrical Code and all local codes which have jurisdiction.
	Failure to do so can result in personal injury or death.

⚠ WARNING	
	BURN HAZARD Proper safety procedures must be followed, and proper protective clothing must be worn when working with a torch.
	Failure to follow these procedures could result in moderate or serious injury.

Locked Rotor Voltage (L.R.V.) Test

Locked rotor voltage (L.R.V.) is the actual voltage available at the compressor under a stalled condition.

Single Phase Connections

Disconnect power from unit. Using a voltmeter, attach one lead of the meter to the run "R" terminal on the compressor and the other lead to the common "C" terminal of the compressor. Restore power to unit.

Determine L.R.V.

Start the compressor with the volt meter attached; then stop the unit. Attempt to restart the compressor within a couple of seconds and immediately read the voltage on the meter. The compressor under these conditions will not start and will usually kick out on overload within a few seconds since the pressures in the system will not have had time to equalize. Voltage should be at or above minimum voltage of 197 VAC, as specified on the rating plate. If less than minimum, check for cause of inadequate power supply; i.e., incorrect wire size, loose electrical connections, etc.

Amperage (L.R.A.) Test

The running amperage of the compressor is the most important of these readings. A running amperage higher than that indicated in the performance data indicates that a problem exists mechanically or electrically.

Single Phase Running and L.R.A. Test

NOTE: Consult the specification and performance section for running amperage. The L.R.A. can also be found on the rating plate.

Select the proper amperage scale and clamp the meter probe around the wire to the "C" terminal of the compressor.

Turn on the unit and read the running amperage on the meter. If the compressor does not start, the reading will indicate the locked rotor amperage (L.R.A.).

Overloads

The compressor is equipped with an internal overload which is embedded into the motor winding. It senses both motor amperage and winding temperature. High motor temperature or amperage heats the overload causing it to open, breaking the common circuit within the compressor. Heat generated within the compressor shell, usually due to recycling of the motor, is slow to dissipate. Should the internal temperature and/or current draw become excessive, the contacts in the overload will open, turning off the compressor. The overload will automatically reset, but may require several hours before the heat is dissipated.

Checking the Internal Overload

1. With no power to unit, remove the leads from the compressor terminals.
2. Using an ohmmeter, test continuity between terminals C-S and C-R. If no continuity, the compressor overload is open and the compressor must be replaced.

COMPONENT TESTING

Compressor Checks

⚠ WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.
	Failure to do so could result in serious injury or death.

⚠ WARNING	
	HIGH PRESSURE HAZARD Sealed Refrigeration System contains refrigerant and oil under high pressure.
	Proper safety procedures must be followed, and proper protective clothing must be worn when working with refrigerants. Failure to follow these procedures could result in serious injury or death.

Single Phase Resistance Test

In a single phase PSC compressor motor, the highest value will be from the start to the run connections ("S" to "R"). The next highest resistance is from the start to the common connections ("S" to "C"). The lowest resistance is from the run to common. ("C" to "R") Before replacing a compressor, check to be sure it is defective.

Remove the leads from the compressor terminals and set the ohmmeter on the lowest scale (R x 1).

Touch the leads of the ohmmeter from terminals common to start ("C" to "S"). Next, touch the leads of the ohmmeter from terminals common to run ("C" to "R").

Add values "C" to "S" and "C" to "R" together and check resistance from start to run terminals ("S" to "R"). Resistance "S" to "R" should equal the total of "C" to "S" and "C" to "R."

GROUND TEST

Use an ohmmeter set on its highest scale. Touch one lead to the compressor body (clean point of contact/ copper connection is a must) and the other probe in turn to each compressor terminal. If a reading is obtained the compressor is grounded and must be replaced.

Check the complete electrical system to the compressor and compressor internal electrical system, check to be certain that compressor is not out on internal overload.

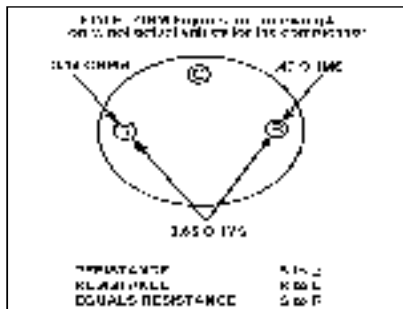


Figure 608 (Resistance Chart)

Complete evaluation of the system must be made whenever you suspect the compressor is defective. If the compressor has been operating for sometime, a careful examination must be made to determine why the compressor failed.

Many compressor failures are caused by the following conditions:

1. Improper air flow over the evaporator.
2. Overcharged refrigerant system causing liquid to be returned to the compressor.
3. Restricted refrigerant system.
4. Lack of lubrication.
5. Liquid refrigerant returning to compressor causing oil to be washed out of bearings.
6. Non-condensables such as air and moisture in the system. Moisture is extremely destructive to a refrigerant system.
7. Capacitor.

CHECKING COMPRESSOR EFFICIENCY

The reason for compressor inefficiency is normally due to broken or damaged suction and/or discharge valves, reducing the ability of the compressor to pump refrigerant gas.

NOTE: Before installing valves and gauges, check the compressor discharge temperature and compressor current, Low compressor amperage combined with low discharge temperature is an indication that the compressor might be faulty,

This condition can be checked as follows:

1. Install a piercing valve on the suction and discharge or liquid process tube.
2. Attach gauges to the high and low sides of the system.-
3. Start the system and run a "cooling or heating performance test." If test shows:
 - A. Below normal high side pressure
 - B. Above normal low side pressure
 - C. Low temperature difference across coil

The compressor valves are faulty - replace the compressor.

R-32 SEALED SYSTEM REPAIR

General Information

WARNING: Electrical Shock Hazard

Disconnect all power to the unit before starting maintenance. All electrical connections and wiring **MUST** be installed by a qualified electrician and conform to all codes which have jurisdiction. Failure to do so can result in property damage, severe electrical shock or death.



WARNING: This Product uses R-32 Refrigerant

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

When not installed, the appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).

Do not pierce or burn.

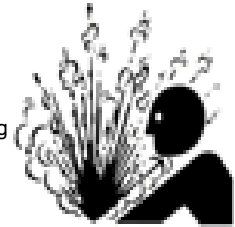
Be aware that refrigerants may not contain an odor.



**Refrigerant
Safety Group
A2L**

WARNING: Refrigeration System under High pressure

Do not puncture, heat, expose to flame or incinerate. Only certified refrigeration technicians should service this equipment. R32 systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.



 **Warning:** Prior to beginning work on systems containing FLAMMABLE REFRIGERANTS, safety checks are necessary to ensure that the risk of ignition is minimized.

NOTICE: Individuals working on these units must be EPA 608 Certified along with A2L Refrigerant Training.

 **Warning:** Refrigerant 32 cannot be used as a retrofit for R-410A refrigerant. The mixing of refrigerant across classes is prohibited. R-32 is not a drop in replacement for R-410A.

General Work Area: All maintenance staff and others working in the installation area shall be instructed on the nature of work being carried out. Work in confined spaces as defined by the Occupational Safety And Health Administration shall be avoided.

 **Warning:** Job site should be examined for safety hazards such as flammable vapors, ignition sources, ventilation and confined spaces. Create a safe perimeter with barriers and signs designating a flammable area.

 **Warning:** Work shall be undertaken under a controlled procedure so as to minimise the risk of a flammable gas or vapor being present while the work is being performed.

Check for presence of refrigerant:

- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres.
- Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.
- Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.
- The following leak detection methods are deemed acceptable for all refrigerant systems:
 1. Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used.
 2. Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.If a leak is suspected, all flame sources shall be removed/extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system per EPA guidelines. Presence of fire extinguisher: If any hot work is to be conducted on the refrigerating equipment or any associated parts, a class ABC Rated fire extinguishing equipment shall be available to hand. Have a class ABC Rated fire extinguisher adjacent to the charging area.

R-32 SEALED SYSTEM REPAIR

General Information

Warning:

No ignition sources: No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks.

Ventilated Area: Ensure that the area is in the open or that it is adequately ventilated before accessing the refrigerant in the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant away from the work area or external to building envelope.

During Repairs To Sealed Components: All power must be removed from the equipment being worked on prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a constant leak detector shall be located at the most critical point to warn of a potentially hazardous situation.

Checks And Repairs To Electrical Devices:

- Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected remove power supply to unit. DO NOT OPERATE.
- Initial safety checks shall include:
 - That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
 - That no live electrical components and wiring are exposed while charging, recovering or purging the system;
 - Verify unit is properly grounded.
- Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
- Ensure that the apparatus is mounted securely.
- Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.

The following is a list of important considerations when working with R-32 equipment:

- R-32 pressure is similar to R-410A and approximately 60% higher than R-22 pressure.
- R-32 cylinders must not be allowed to exceed 125°F, they may leak or rupture.
- R-32 must never be pressurized with a mixture of compressed air, it may become MORE flammable.
- Servicing equipment and components must be specifically designed for use with R-32 and dedicated to prevent contamination.
- Manifold sets must be equipped with gauges capable of reading 750 psig (high side) and 200 psig (low side), with a 500-psig low-side retard.
- Gauge hoses must have a minimum 750-psig service pressure rating.
- Recovery cylinders must have a minimum service pressure rating of 400 psig, (DOT 4BA400 and DOT BW400 approved cylinders).
- POE (Polyol-Ester) lubricants must be used with R-32 equipment.
- To prevent moisture absorption and lubricant contamination, do not leave the refrigeration system open to the atmosphere for extended periods of time.
- If unit refrigerant is low, recover the refrigerant, evacuate, and recharge unit to nameplate amount.
- If there is any amount of refrigerant in the system charge from the low side.
- Always charge by liquid inverted.

NOTE: Sealed system repairs require the installation of a liquid line drier.

Verify with tool manufacturers that all tools used during this repair are non-sparking and can be used with A2L Refrigerants.

No halide torches for leak testing.

Refrigerant monitors or detectors must be used to detect refrigerant in the work area.

- R-32 A2L Refrigerant Recovery System.
- Vacuum Pump rated for A2L refrigerant (capable of 300 microns or less vacuum.)
- Nitrogen bottle with purging and pressurizing capabilities up to 550 psi.
- Oxy/ Acetylene torch or similar equipment utilized for brazing.
- Non-Sparking (Not Halide) Electronic Leak Detector rated for detecting A2L refrigerant.
- Digital refrigerant scale
- Refrigeration Gauges rated for A2L Refrigerants with temp scales for R-32 refrigerant.
- Gauge Manifold (Right handed threads).
- A2L compatible Vacuum Gauge capable of 300 microns or less.
- Nitrogen regulator for purging and testing, rated to 800 psi. (Capable of low psi flow)
- Pipe tubing cutter.
- Refrigerant recovery cylinder. (Flammable A2L label)

R-32 SEALED SYSTEM REPAIR

Required Equipment

- Ventilation fan.
- Class ABC fire extinguisher.
- Process Tube adapter kit
- Recovery access tool.
- Purge hose fittings
- Pinch off and opening tools



ABC Fire Extinguisher



Recovery Machine



Vaccum Pump



Nitrogen



Guage Manifold



Nitrogen Regulator



Vaccum Guage



Process tube adapter kit



Recovery access tool



Purge hose fittings



Pinch off and opening tools



R-32 SEALED SYSTEM REPAIR

Refrigerant Removal, Recovery, and Evacuation

NOTE: When accessing the refrigerant in the system to make repairs or for any other purpose, conventional procedures shall be used. However, for FLAMMABLE REFRIGERANTS (R-32 is classified in the A2L group for mildly flammable refrigerants) it is important that best practice is followed since flammability is a consideration. Follow all EPA 608 regulations and procedures along with AHRI 15 Best Practices for A2L refrigerants.

 **Warning:** Ensure sufficient ventilation at the repair place.

 **Warning:** Ensure there are no open flame sources or hot surfaces that exceed 1200°F in the work area.

 **Warning:** Discharge capacitors in a way that won't cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks.

NOTICE: Ensure that the following precautions are taken prior to opening the sealed system.

- Verify Recovery machine is rated for A2L refrigerants.
- Mark the Job site inspection area as flammable work zone using appropriate signs.
- Utilize a Refrigerant leak detector or refrigerant monitor to sense the area for the presence of refrigerants.
- Disconnect all power supply to unit.
- Properly ground all equipment and hoses along with tank to prevent a static build up .
- Ensure adequate ventilation is provided for the job site.
- Do not mix A2L refrigerant Gages and hoses with other refrigerants.
- Keep exposure of refrigerant to Air to as minimum as possible (creates a dangerous condition).
- Under no circumstances is the mixing of refrigerants in the recovery cylinders allowed and should be strictly avoided at all times. Do not introduce oxygen into any recovery cylinders.

1. Install a piercing valve to recover refrigerant from the sealed system. (Piercing valve must be removed from the system before recharging.)
2. Recover refrigerant to EPA sec. 608 standards. If a low charge is suspected weigh recovered refrigerant and compare to unit nameplate.

NOTE: DO NOT RECOVER TO A VACUUM PRIOR TO FLUSHING WITH NITROGEN. STOP RECOVERY AT 0-5 PSI.

3. Flush refrigerant out of system with a dry nitrogen purge, make sure you energize and de-energize all reversing valves and solenoid valves to release any trapped refrigerant. (3-5 minutes).

4. Perform an evacuation to 29.9 in. hg. and break vacuum with Dry Nitrogen.
5. Re-purge the unit for 3-5 mins or until the nitrogen flows out both process tubes.
6. Re-evacuate unit to 29.9 in. hg. and break vacuum with Dry Nitrogen.
8. Open the refrigerant circuit by cutting out components.
9. Cut off the crimp on the process tubes and install a 5/16 copper access fitting to the process tube.

Transportation

Be aware that local, state, and national codes exist that regulate the transportation of flammable gases. Be sure to become informed of the regulations and always stay compliant.

R-32 SEALED SYSTEM REPAIR

Component Replacement/Brazing

 **Warning:** Ensure sufficient ventilation at the repair place.

 **Warning:** Presence of fire extinguisher. If any hot work is to be conducted on the refrigerating equipment or any associated parts, have a ABC class fire extinguisher available to hand.

 **Warning:** No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks.

 **Warning:** Ensure there are no open flame sources or hot surfaces that exceed 1200°F in the work area.

NOTE: When brazing is required, the following procedures shall be carried out in the right order:

1. Remove and recover refrigerant, and evacuate the system. Refer to the [refrigerant removal, recovery, and evacuation section](#) of this manual.

 **Warning:** Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

2. Perform a check of the work area for the presence of flammable refrigerant prior to brazing or performing any hot work. Use a non-Sparking (Not Halide) A2L certified Electronic Leak Detector rated for detecting R-32 refrigerant.

3. Re-pipe all repairs and install all components to sealed system.

NOTE: Sealed system repairs require the installation of a liquid line drier upstream of the condenser.

4. Purge nitrogen through the unit. at approximately 2-3 psi through the duration of the brazing process. (Nitrogen must be purging through the unit while any brazing is being performed.)

5. Pressure test unit to 550 psi minimum and hold pressure for 30 minutes minimum. Inspect for any leaks with a leak detection fluid and repair as required. Repeat as required until system passes leak test.

6. Triple evacuate the unit to achieve a 500 micron level.

7. Pressurize nitrogen to 550 psi and leak test all connections with a leak detection fluid. Repair any leaks found.

8. Reassemble sealed enclosures accurately. If seals are worn, replace them.

9. Charge the system with the amount of refrigerant specified on the model nameplate. [Refer to the refrigerant charging section of this manual for charging procedures.](#)

R-32 SEALED SYSTEM REPAIRS

Refrigerant Charging

WARNING: Electrical Shock Hazard

Disconnect all power to the unit before starting maintenance. All electrical connections and wiring **MUST** be installed by a qualified electrician and conform to all codes which have jurisdiction. Failure to do so can result in property damage, severe electrical shock or death.



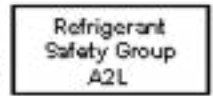
WARNING: This Product uses R-32 Refrigerant

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

When not installed, the appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.

Do not pierce or burn.

Be aware that refrigerants may not contain an odor.

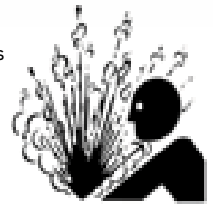


WARNING: Refrigeration System under High pressure

Do not puncture, heat, expose to flame or incinerate. Only certified refrigeration technicians should service this equipment. R32 systems operate at higher pressures than R22 equipment. Appropriate safe service and handling practices must be used.

WARNING: Freeze Hazard

Proper safety procedures must be followed, and all PPE must be utilized when working with liquid refrigerant. Failure to comply could result in minor to moderate injury.



NOTE: Always weigh in refrigerant based on the model nameplate.

Warning:

- Ensure that contamination of different refrigerants does not occur when using charging equipment.
- Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Charge unit with refrigerant cylinder in the inverted position to obtain liquid refrigerant.
- Charge the unit according to the amount on the name plate matching the unit.
- Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.
- Prior to recharging a system, it shall be pressure-tested with the dry nitrogen.

NOTE: Because the refrigerant system is a sealed system, service process tubes will have to be installed. First install a line tap and recover refrigerant from system. Refer to the [Refrigerant removal section](#) of this manual for procedures.

The acceptable method for charging the sealed system is the Weighed in Charge Method. The weighed in charge method is applicable to all units. It is the preferred method to use, as it is the most accurate.

The weighed in method should always be used whenever a charge is removed from a unit such as for a leak repair, compressor replacement, or when there is no refrigerant charge left in the unit. To charge by this method, requires the following steps:

-  **Warning:** Ensure sufficient ventilation at the repair place.

-  **Warning:** Ensure there are no open flame sources or hot surfaces that exceed 1200°F in the work area.

1. Recover Refrigerant in accordance with EPA regulations. (Refer to [Refrigerant Removal, Recovery, and Evacuation Section](#)).

NOTE: If a low charge is suspected weigh recovered refrigerant and compare to unit nameplate.

NOTE: Access valves must be removed after charging is complete to return this unit to a sealed system.

2. Weigh in the refrigerant charge with the proper quantity of R-32 refrigerant per model nameplate.
3. Crimp the process tube and solder the end shut.
4. Start unit, and verify performance.

NOTE: EPA Section 608 regulations require that if a system is charged with flammable refrigerant it must have red markings on the access ports (Process tube).

R-32 SEALED SYSTEM REPAIRS

Compressor Replacement

1. Be certain to perform all necessary electrical and refrigeration tests to be sure the compressor is actually defective before replacing.
2. Recover all refrigerant from the system through the process tubes. Refer to [Refrigerant Removal, Recovery, and Evacuation](#) Section of this manual).

PROPER HANDLING OF RECOVERED REFRIGERANT ACCORDING TO EPA REGULATIONS IS REQUIRED.

3. After all refrigerant has been recovered, cut and remove compressor. Be certain to have both suction and discharge process tubes open to atmosphere.
4. Carefully pour a small amount of oil from the suction stub of the defective compressor into a clean container.
5. Using an acid test kit (one shot or conventional kit), test the oil for acid content according to the instructions with the kit.
6. If any evidence of a burnout is found, no matter how slight, refer to [Compressor Replacement -Special Procedure in Case of Compressor Burnout](#).
7. Install the replacement compressor.

CAUTION: Seal all openings on the defective compressor immediately. Compressor manufacturers will void warranties on units received not properly sealed. Do not distort the manufacturers tube connections.

8. Braze all connections. Refer to the [Component Replacement/ Brazing section](#) of this manual.
9. Charge system with proper amount of refrigerant per the model nameplate. Refer to the [Refrigerant charging section of this manual](#).

⚠ WARNING	
	ELECTRIC SHOCK HAZARD Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied. Failure to do so could result in serious injury or death.

⚠ WARNING	
	HIGH PRESSURE HAZARD Sealed Refrigeration System contains refrigerant and oil under high pressure. Proper safety procedures must be followed, and PPE must be utilized when working with refrigerants. Failure to follow these procedures could result in serious injury or death.

⚠ WARNING	
	EXPLOSION HAZARD The use of nitrogen requires a pressure regulator. Follow all safety procedures and wear protective safety clothing etc. Failure to follow proper safety procedures could result in serious injury or death.

⚠ CAUTION	
	FREEZE HAZARD Proper safety procedures must be followed, and proper protective clothing must be worn when working with liquid refrigerant. Failure to follow these procedures could result in minor to moderate injury.

⚠ WARNING	
	NEVER , under any circumstances, liquid charge a rotary-compressor through the LOW side. Doing so would cause permanent damage to the new compressor. Use a charging adapter.

R-32 SEALED SYSTEM REPAIRS

Compressor Replacement -Special Procedure in Case of Compressor Burnout

1. Recover all refrigerant and oil from the system. [Refer to Refrigerant Removal, Recovery, and Evacuation Section](#) of this manual.

2. Cut and remove compressor and fixed orifice from the system.

CAUTION: Seal all openings on the defective compressor immediately. Compressor manufacturers will void warranties on units received not properly sealed. Do not distort the manufacturers tube connections.

3. Flush evaporator condenser and all connecting tubing with dry nitrogen or equivalent. Use A2L approved flushing agent to remove all contamination from system. Inspect suction and discharge line for carbon deposits. Remove and clean if necessary. Ensure all acid is neutralized.

4. Reassemble the system, including a new metering device and strainers.

5. Install a dual port suction line drier on the common suction line and remove when the pressure differential across the drier ports reaches 3 psi. or greater.

6. Braze all connections. [Refer to the Brazing section of this manual.](#)

7. Charge system with proper amount of refrigerant per the model nameplate. [Refer to the refrigerant charging section of this manual.](#)

WARNING



HIGH PRESSURE HAZARD

Sealed Refrigeration System contains refrigerant and oil under high pressure.

Proper safety procedures must be followed, and PPE must be utilized when working with refrigerants.

Failure to follow these procedures could result in serious injury or death.

WARNING



ELECTRIC SHOCK HAZARD

Turn off electric power before service or installation. Extreme care must be used, if it becomes necessary to work on equipment with power applied.

Failure to do so could result in serious injury or death.

WARNING



EXPLOSION HAZARD

The use of nitrogen requires a pressure regulator. Follow all safety procedures and wear protective safety clothing etc.

Failure to follow proper safety procedures could result in serious injury or death.

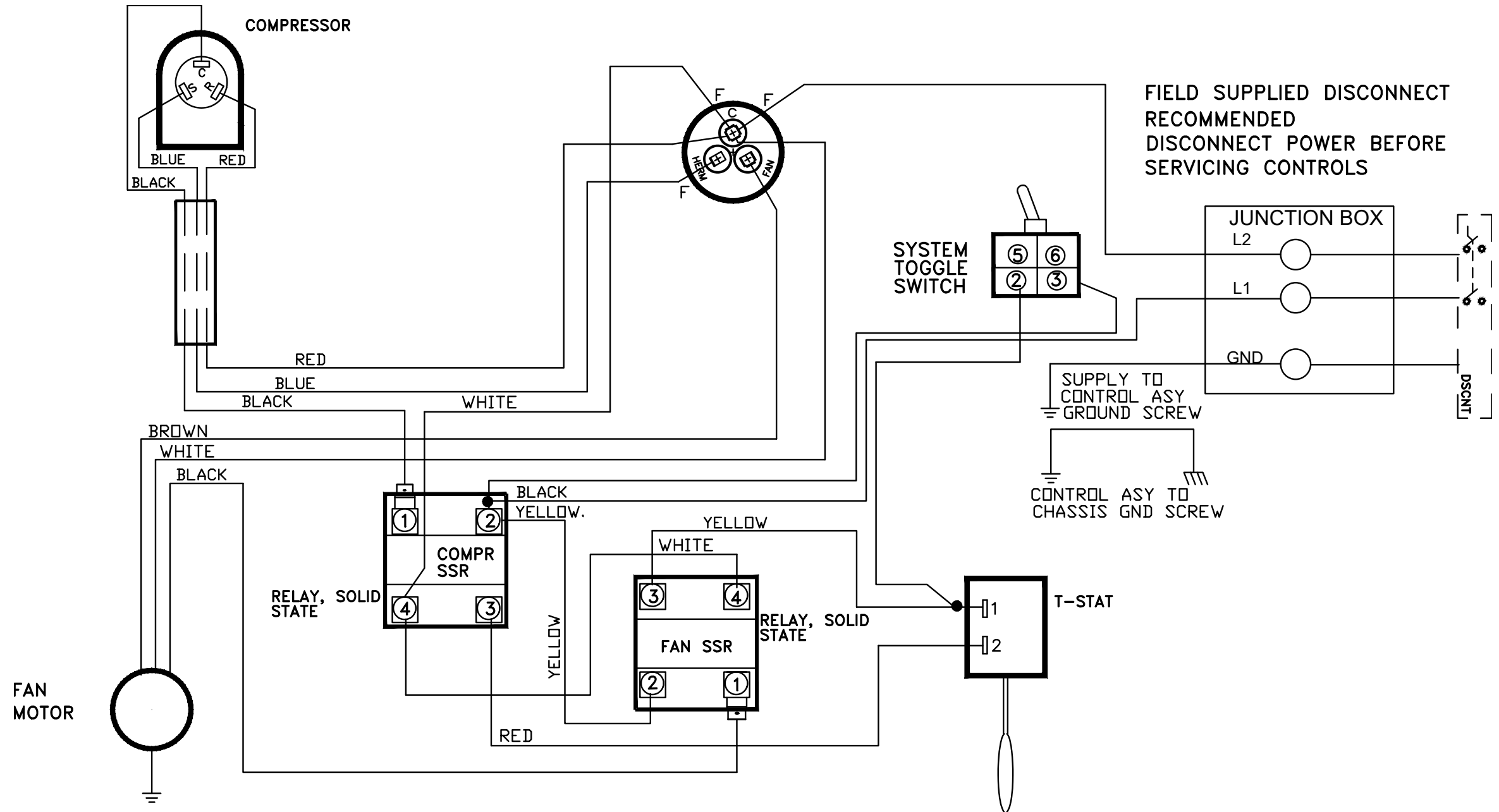
WARNING



NEVER, under any circumstances, liquid charge a rotary-compressor through the LOW side. Doing so would cause permanent damage to the new compressor. Use a charging adapter.

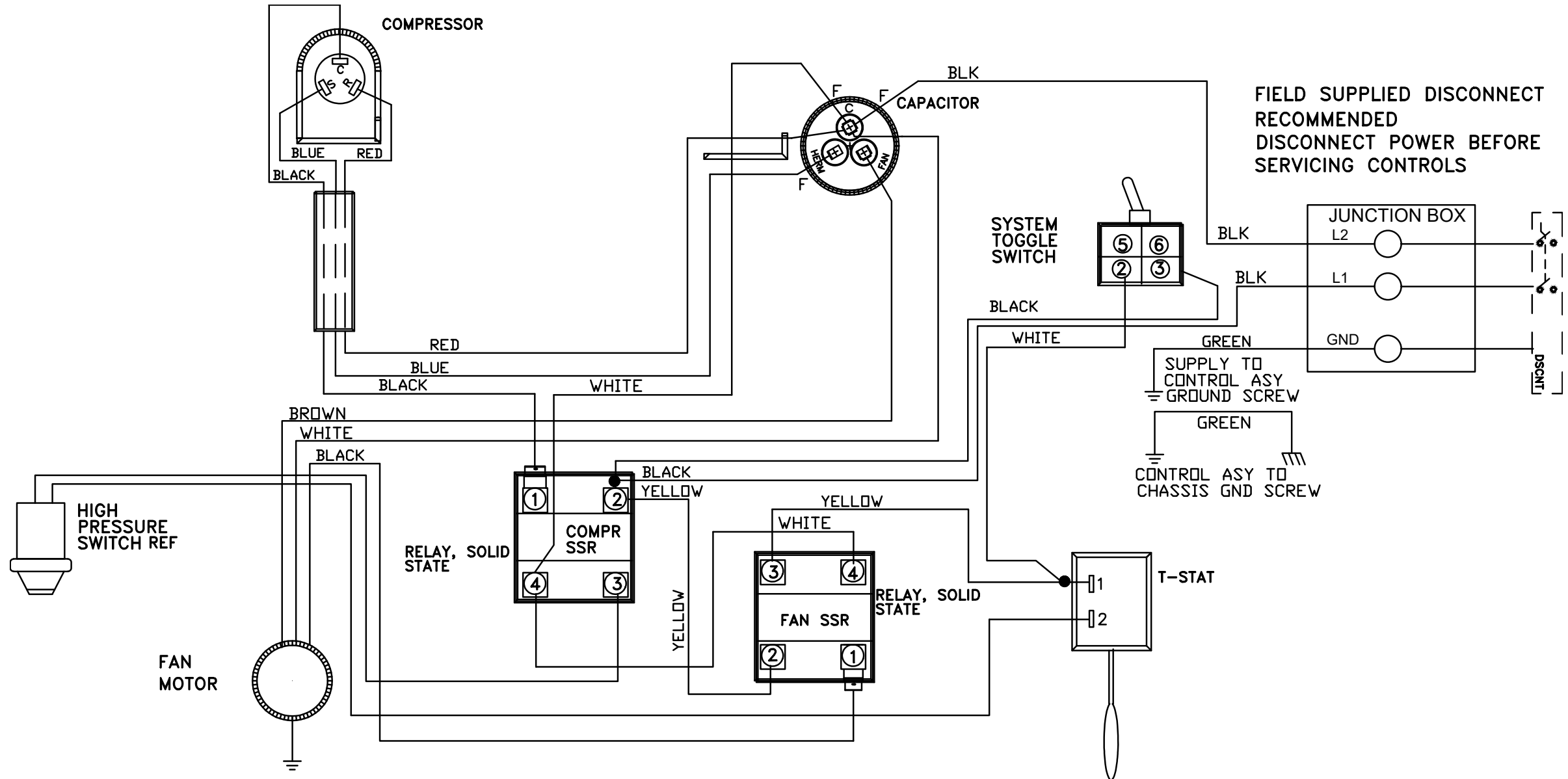
WIRING DIAGRAMS

Figure 901
HCS15A30A



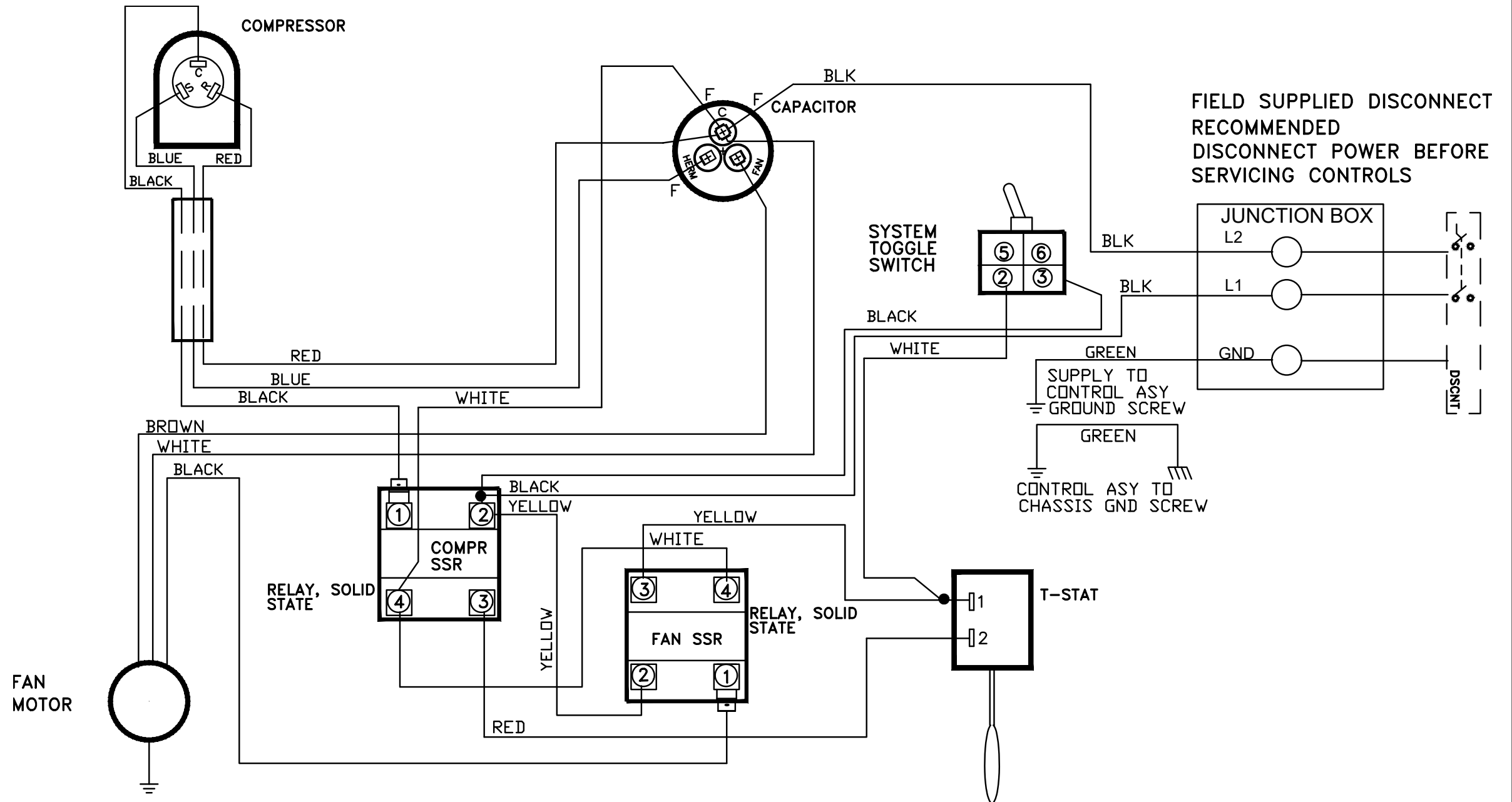
WIRING DIAGRAMS

Figure 902
HCM20A30A



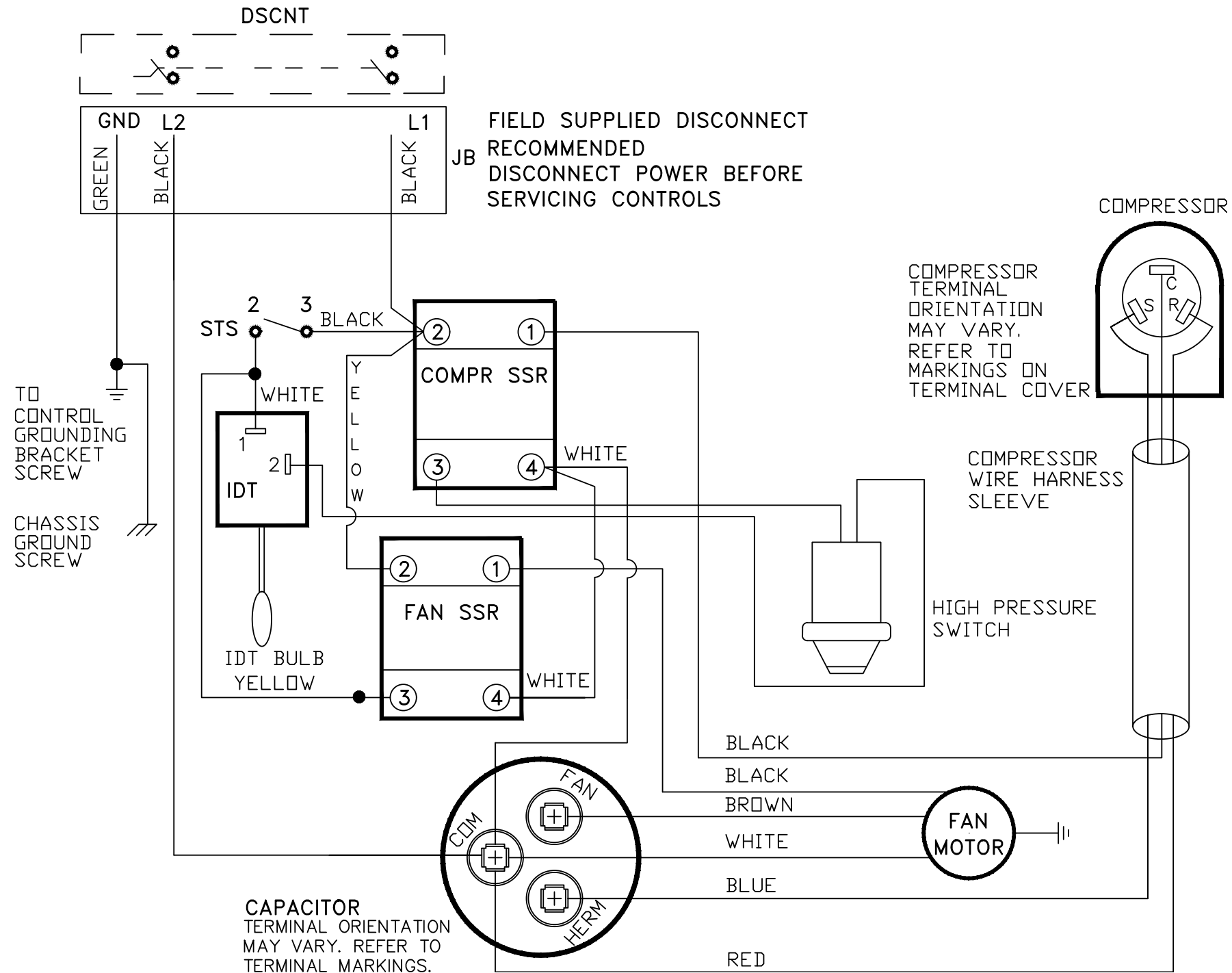
WIRING DIAGRAMS

Figure 903
HCM20A50A



WIRING DIAGRAMS

Figure 904
HCM24A30A

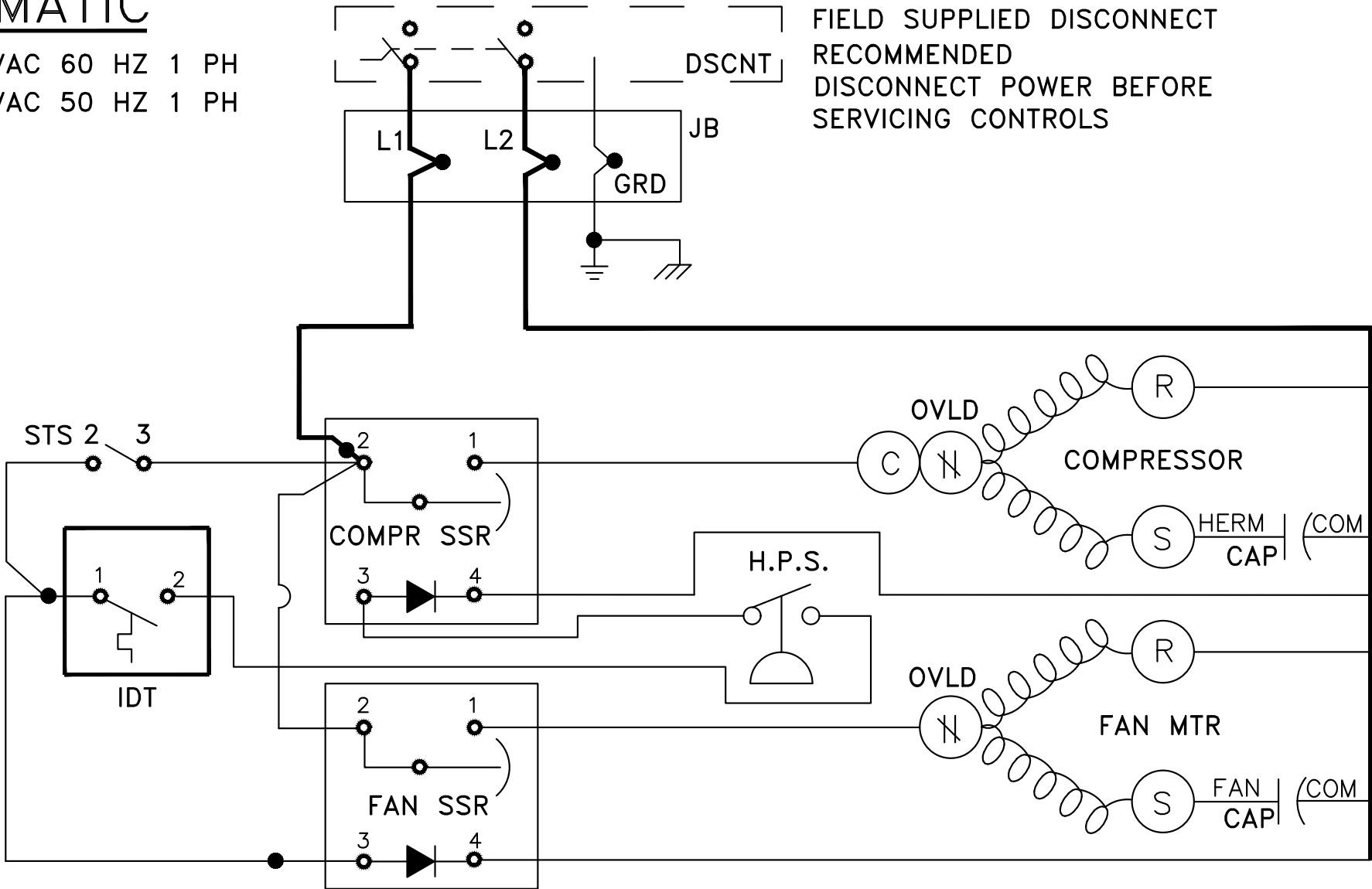


WIRING DIAGRAMS

Figure 905
Schematic

SCHEMATIC

230/208 VAC 60 HZ 1 PH
240/220 VAC 50 HZ 1 PH



LEGEND

SSR — SOLID STATE RELAY
CAP — CAPACITOR
COMPR — COMPRESSOR
MTR — FAN MOTOR

OVLD — OVERLOAD PROTECTOR
IDT — INDOOR THERMOSTAT
STS — SYSTEM TOGGLE SWITCH
DSCNT — FIELD SUPPLIED DISCONNECT

JB — JUNCTION BOX
—||— — GROUND LEAD
—●— — COMBINATION TERMINAL
H.P.S. — HIGH PRESSURE SWITCH

(NOTE: HP SWITCH NOT INSTALLED ON HCS15A30A)

APPENDIX

Where to Find The Limited Warranty

Current warranty information can be obtained by referring to <https://www.friedrich.com/professional/support/product-resources>

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