IMI CORNELIUS REMCOR INC ■ 500 REGENCY DRIVE ■ GLENDALE HEIGHTS, IL 60139-2268

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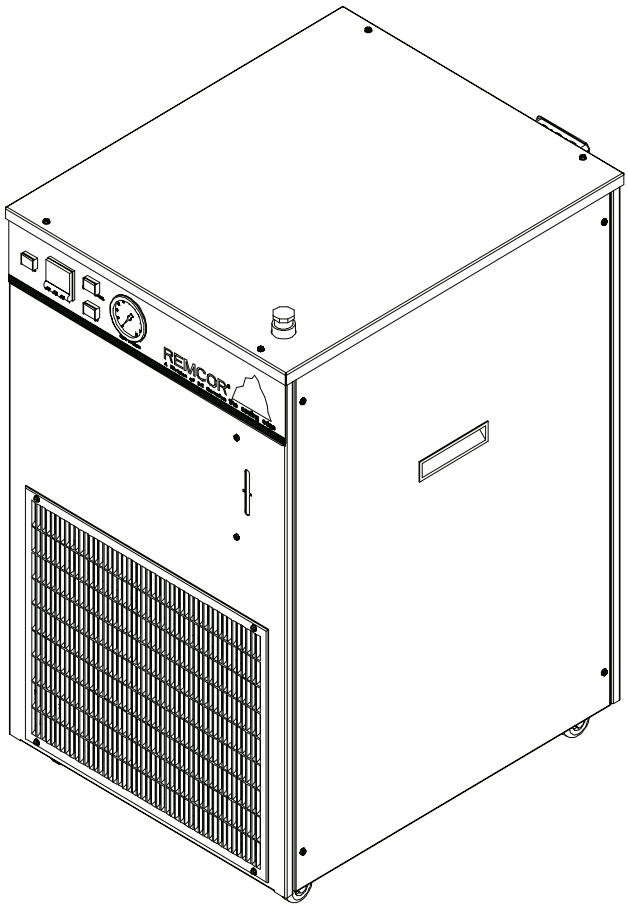
CHILLER ("CH" SERIES)

Operator's Manual

Models: CH 1001-A
CH 1501-A
CH 1502-A
CH 1503-A



Part No. 620914301
July, 2000
Revision C
Control Code A

THIS DOCUMENT CONTAINS IMPORTANT INFORMATION
This Manual must be read and understood before installing or operating this equipment

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GENERAL INFORMATION

INTRODUCTION

The REMCOR "CH" Series Recirculating Liquid Chiller is designed to provide an accurate, reliable, and user-friendly system for cooling a continuous flow of pure liquid and keep that liquid at a constant temperature in various closed loop or tank cooling applications.

The "CH" Series Chiller consists of an air-cooled refrigeration system housed in a sturdy sheet metal frame and cabinet. A standard pump and insulated liquid reservoir package provides a complete liquid cooling and circulating system.

The "CH" Series Chiller is designed to operate in a clean laboratory or industrial environment where ambient temperatures range from 40 to100° F (5 to 38° C). With proper installation, operation, and maintenance, the "CH" Series Chiller will provide years of trouble free service.

UNPACKING AND INSPECTION

This unit was thoroughly inspected before leaving the factory and the carrier has accepted and signed for it. Any damage or irregularities should be noted at the time of delivery and immediately reported to the carrier. Request a written inspection report from the Claims Inspector to substantiate any necessary claims. In the event that an immediate replacement is necessary, please contact REMCOR Chiller Sales at 1-800-551-4423.

DESIGN DATA

Table 1. Design Data

	CH1001-A	CH1501-A	CH1502-A	CH1503-A
Cooling Capacity:				
BTU/hr (W) at 80° F(27° C) and 70° F (21° C) Liquid Temperature.	12,000 (3,515)	18,000 (5,272)	18,000 (5,272)	18,000 (5,272)
Compressor Horsepower	1 (.746 kW)	1 1/2 (1.12 kW)	1 1/2 (1.12 kW)	1 1/2 (1.12 kW)
Electrical Data: Voltage/Phase/Hertz/Amperage	230/1/60 11.0 Amps	230/1/60 13.0 Amps	230/3/60 16.4 Amps	460/3/60 10.0 Amps
Refrigerant Type:	R134a	R22	R22	R22
Reservoir Capacity	6.0 gallons (22.7 liters)	6.0 gallons (22.7 liters)	6.0 gallons (22.7 liters)	6.0 gallons (22.7 liters)
Physical Dimensions, Width × Depth × Height:	22″ × 26.5X″ × 38.25″ (56cm × 67cm × 97cm)	22″ × 26.5X″ × 38.25″ (56cm × 67cm × 97cm)	22″ × 26.5X″ × 38.25″ (56cm × 67cm × 97cm)	22″ × 26.5X″ × 38.25″ (56cm × 67cm × 97cm)
Fittings:				
Process Connections	3/4" FPT (S/S)	3/4″ FPT (S/S)	3/4″ FPT (S/S)	3/4″ FPT (S/S)
Optimum Process Liquid Flow GPM (Liters/Min)	2.4 (9.0)	3.6 (13.6)	3.6 (13.6)	3.6 (13.6
Condenser Air Flow (CFM)	712	1050	1050	1050

DATA PLATE INFORMATION

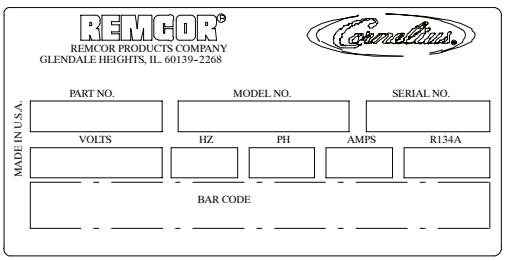

FIGURE 1. SAMPLE DATA PLATE

When servicing a REMCOR Chiller, it is important to note the information contained on the data plate located in the upper rear of the Unit.

If technical assistance is needed, the phone technician will need the Serial Number of your Chiller. That information is found on the Data Plate along with the model number, voltage requirement, and refrigerant information.

The serial Number is also needed when replacement parts are being ordered or for warranty claims. See CHILLER WARRANTY PAGE.

***Be sure* to include the serial number on any documentation or billing information.**

CHILLER INSTALLATION

Location of Chiller

(see Figure 2)

THE CHILLER MUST BE LOCATED NEAR A PROPERLY GROUNDED ELECTRICAL OUTLET. THE CIRCUIT SHOULD BE FUSED AND NO OTHER ELECTRICAL APPLIANCE SHOULD BE CONNECTED TO THE CIRCUIT. ALL ELECTRICAL WIRING MUST CONFORM TO NATIONAL AND LOCAL ELECTRICAL CODES.

The Chiller *must* be located in a well ventilated, indoor area where ambient temperatures will remain above 40° F (5° C) and will never increase above 100° F (38° C). To obtain optimum cooling capacity, the ambient temperature should be at or below 80° F (27° C).

It is very important that the air intake and discharge sides of the chiller are not obstructed by other free standing objects. A minimum of two feet of space on all four sides of the chiller will be sufficient to prevent air flow obstructions.

It is also important to direct any hot air discharge from other equipment away from the air intake side of the chiller. Condenser air entering the “CH” unit should be below 100° F (38° C) .Condenser air temperatures above 100° F (38° C) can cause the high pressure safety control to shut down the unit.

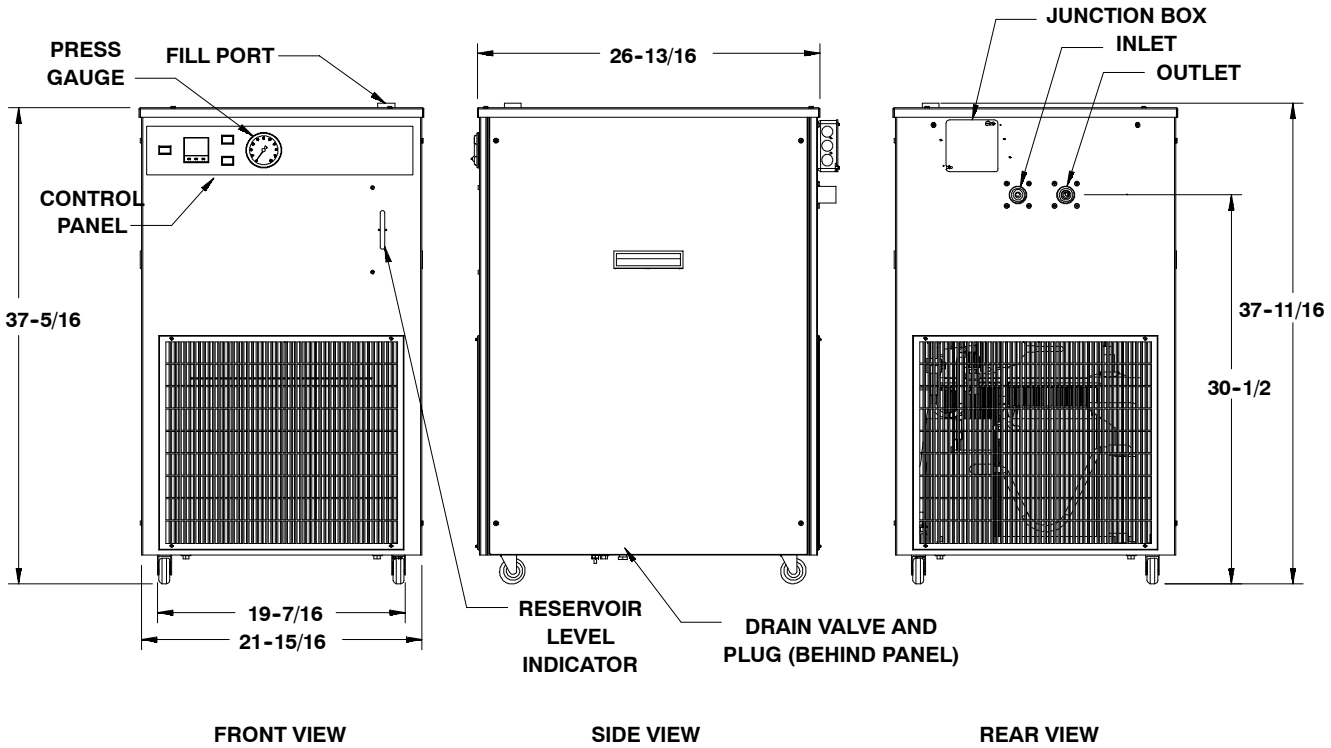

FIGURE 2. INSTALLATION

Electrical Connections

(see Figure 2 and 8)

All wiring must conform to the National Electric Code and any applicable local codes. The Chiller *must* be permanently wired by means of electrical conduit to a properly fused disconnect of proper amperage or wired to a properly rated power cord and plugged into an outlet with the appropriate disconnect and amperage rating. The electrical junction box, located on the back panel of the Chiller, includes a four terminal strip for power supply connection.

The data plate, located next to the junction box, includes the actual voltage, phase, and amperage of the Chiller.

CAUTION: On three-phase applications, it is important that the rotation of the pump, when supplied , is correct. Operating the pump in reverse for more than a few seconds will result in permanent pump damage. When the pump is operating, the shaft rotation *must* match the direction indicated on the pump housing. If the rotation is incorrect, reverse two of the three incoming power leads.

CHILLER OPERATION

CONTROL PANEL

(see Figure 3)

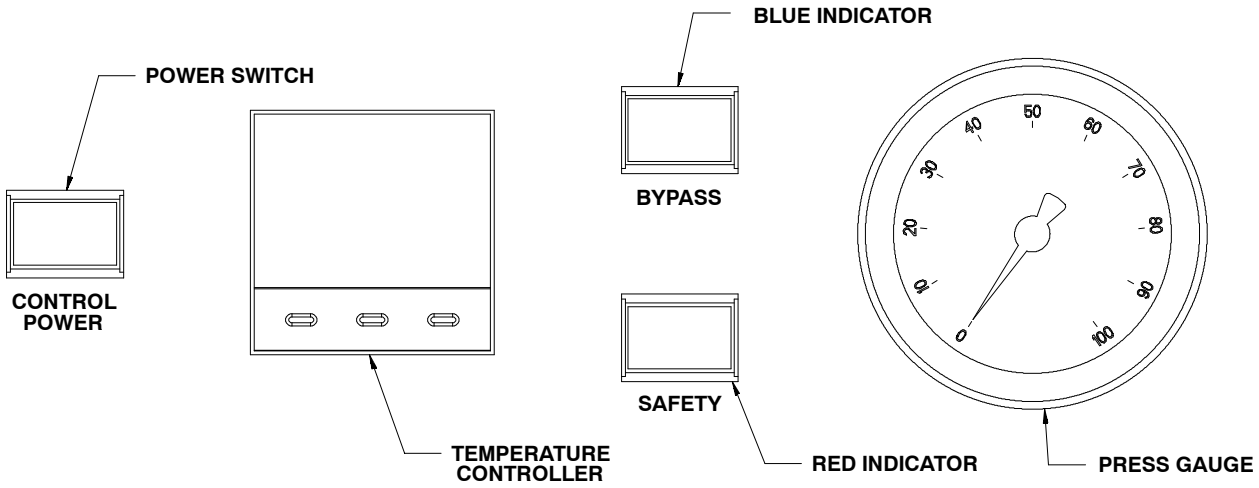

FIGURE 3. CONTROL PANEL

1. **<u>TEMPERATURE CONTROLLER</u>** (see Figure 4)

   The TEMPERATURE CONTROLLER uses a PID control algorithm to precisely monitor and control the process set point temperature. The Unit has a large LED READOUT that displays temperature. For adjusting set point and programming options, see section on TEMPERATURE CONTROLLER OPERATION.

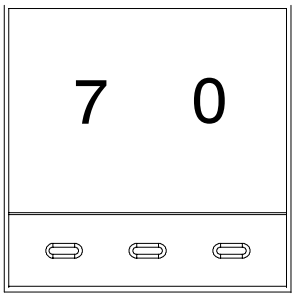

FIGURE 4. CH SERIES TEMPERATURE CONTROLLER

2. **CONTROL POWER SWITCH/LIGHT** (see Figure 3)

   A lighted ON/OFF push button switch is used to switch power to the 24 VAC control circuit. The switch lights up to indicate that the Chiller power is present.

3. **BYPASS LIGHT (BLUE)** (see Figure 3)

   A blue light is used to indicate when the system is operating at a reduced capacity. The light will cycle on and off in response to the Temperature Controller when the system temporarily requires less cooling.

4. **SAFETY LIGHT (RED)** (see Figure 3)

   A red light is used to indicate that a fault has occurred in the Chiller operation. The following conditions will illuminate the safety light.

   A. High refrigerant pressure.

   B. Low process liquid temperature.

   C. Low process Liquid flow (optional, see OPTIONAL EQUIPMENT section).

5. **HIGH-PRESSURE SAFETY** (see Figure 3)

   The high-pressure safety will shut down the compressor and pump when the refrigerant head pressure reaches 240-PSIG for R-134A refrigerant units and 350-PSIG for R-22 refrigerant units. The high pressure switch *must* be reset manually. The switch is located in the electrical box which *must* be accessed by removing the Chiller lid. The high-pressure switch can be re-set by depressing the reset button through the opening in the electrical box cover. If the control opens again, check the setting with a set of refrigeration gauges. If the setting is correct, contact the Remcor Technical Service Department.

   LOW-TEMPERATURE SAFETY

   The low-temperature safety will shut down the compressor and the pump when the process liquid temperature drops below 35° F (1.7° C). The switch will automatically reset when the liquid temperature is restored to 38° F (3.3° C). The low temperature control is located in the electrical box.

START UP

WARNING: *Never* operate the Chiller with it's panels removed.

***Always* use the power switch to turn off the Chiller when it is not being used.**

***Always* ensure that all air inlets and outlets are free from obstruction.**

***Be sure* that the reservoir is filled with fluid prior to powering up the unit.**

Process Liquid Flow, Units with Pump and Tank (Standard)

Follow standard plumbing practices and local codes in making liquid connections. The Chiller inlet and outlet connections are 3/4". Flexible hose and fittings are recommended for plumbing the system. A No. 20 mesh strainer should be installed on the Chiller inlet to prevent foreign particles from entering the system and should be cleaned monthly. Lines should be routed with as few bends as possible. Prevent lines from running near radiators, hot water pipes, etc. Any lengths of tubing that are exposed to high ambient temperatures should be insulated to prevent condensation and/or significant liquid heat loss.

After ensuring that the system is free from the obstruction, that all valves are open, and the reservoir when available is full, push the CONTROL POWER switch to the "ON" position. The pump should now be operating.

On three-phase units such as the CH1502-A and the CH1503-A, it is important to check the pump rotation. Remove the left-side panel. Momentarily push the POWER button in and observe the motor shaft. Make sure

that the shaft is rotating in the direction of the arrow indicated on the pump housing. If the rotation is incorrect, reverse two of the three incoming power supply leads at the terminal strip.

NOTE: Operating the pump in reverse for more than a few seconds will result in permanent pump damage.

All Chillers with pumps and tank are supplied with a pressure regulating valve on the pump discharge. This valve is preset at the factory to ensure that system pressure does not exceed the capabilities of the pump motor and/or piping. If this valve requires adjustment, please contact the REMCOR Service Group for the proper setting procedure and pressures.

Process liquid flow can be adjusted VIA a throttling valve and flow meter installed in the Chiller outlet line.

Once the flow has been established, the thermostat can be programmed to the desired set-point.

Process Liquid Flow, Units Without Reservoir (Optional)

Follow standard plumbing practices and local codes in making liquid connections. The Chiller inlet and outlet connections are 3/4". Flexible hose and fittings are recommended for plumbing the system. A No. 20 mesh strainer should be installed on the Chiller inlet to prevent foreign particles from entering the system and should be cleaned monthly. Lines should be routed with as few bends as possible. Prevent lines from running near radiators, hot water pipes, etc. Any lengths of tubing that are exposed to high ambient temperatures should be insulated to prevent condensation and/or significant liquid heat loss.

Proper priming of the liquid lines is essential to prevent pump cavitation. *Be certain* all air has been purged from the lines before operating the pump for an extended period of time. *Be sure* to remove any loops in the lines that may trap air. The pump *must* have a supply of water **with the level of the liquid above the inlet of the Chiller**. The supply tank *must* feed the Chiller from the side of the tank below the water level (see Figure 5).

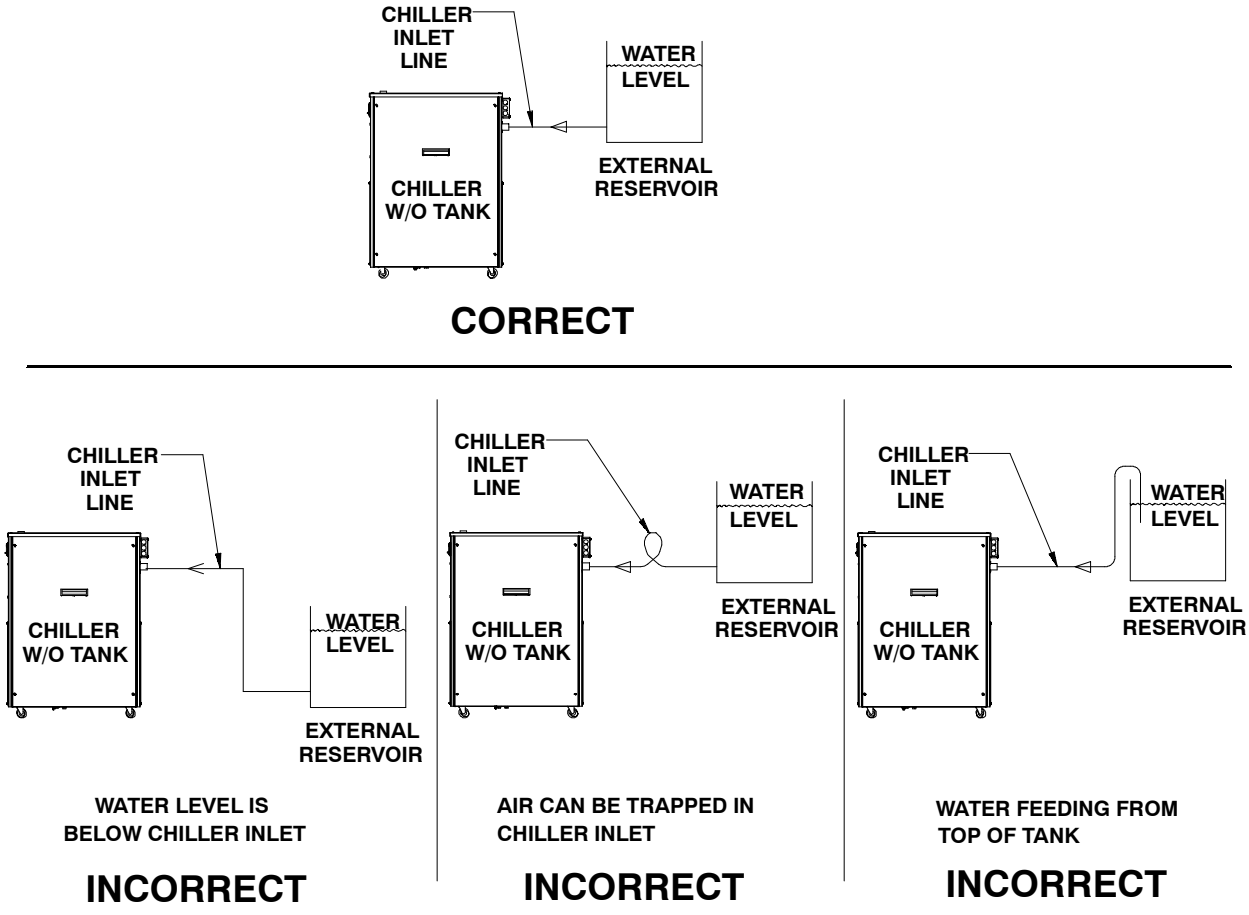

FIGURE 5. EXTERNAL RESERVOIR WATER LEVEL

TEMPERATURE CONTROLLER OPERATION

(see Figure 4)

During normal operation, the process temperature will be displayed on the Controller. The following procedure should be followed to adjust the Controller set point:

1. Push and hold the " ***** " button located at the bottom left corner of the Controller. The set point will be displayed.

2. While holding the " ***** " button, press ▲ (" UP") or ▼ " DOWN" button to raise or lower the set point until the desired value is displayed.

3. Release the " ***** " button. The display will again show the system liquid temperature. The set point can be viewed at any time by pressing the " ***** " button.

The Controller set point range has been preset at the factory. The range is 40° F (5° C) to 100° F (38° C). If operation outside this range is required, contact the Remcor Technical Services Department.

OPTIONAL EQUIPMENT

LX Model–Is equipped with a low–level alarm and a high–temperature interlock as optional items.

EX Model–Is equipped with a low–level alarm, high–temperature interlock, low–flow interlock, and RS232 communications as optional items.

A detailed description of these options is as follows:

Low–Level Alarm–A float switch located in the liquid reservoir will activate an audible alarm when the tank level drops below a critical level. It is important to note that this alarm will not shut down the system. The alarm will sound until the unit reservoir has been refilled to the full line on the sight glass.

High–Temperature Interlock–A second output on the temperature controller will sense the process liquid temperature and energize a set of normally open terminals located inside the electrical junction box on the back of the Chiller when the temperature exceeds a set limit above the set point. The high–temperature interlock is preset at the Factory to activate at 25° F (13.9° C) above the process set point with a hysteresis of 3.6° F (2.0° C). If other values are required, please contact the Remcor Technical Services Department.

Low–Flow Interlock–A flow switch located in the Chiller water plumbing will sense when the process liquid flow has dropped below 0.5 gpm. The flow switch will energize a set of normally open terminals located in the electrical junction box on back of the Chiller. The low flow condition will also shut down the compressor and pump coils of the Chiller and illuminate the red fault indicator on the control panel. The Chiller will remain shut down and the terminals open until full flow is restored to the Chiller.

NOTE: The interlock terminals should be connected to a load that is appropriate for the following:

1. High–Temperature Interlock uses a solid–state relay rated at 5 FLA, 30 LRA @ 240 VAC.

2. Low–Flow Interlock uses a mechanical relay rated at 6 FLA, 1/2 H.P. @ 277 VAC.

RS 232 Communications–Allows the Controller to be connected to a personal computer to monitor and/or program the Controller from a remote location up to 50 feet (15 meters).

CHILLER MAINTENANCE

WARNING: Disconnect electrical power to the Chiller to prevent personal injury before attempting any internal maintenance. Only qualified personnel should service the internal components or electrical wiring.

Condenser

On air-cooled Chillers, the CONDENSER FINS should be cleaned by blowing compressed air through the condenser from the fan side. Dirt and debris accumulate on the condenser fins over time, and this build up can severely reduce the performance of the Chiller. Cleaning of the CONDENSER COIL FINS should be done approximately every three months, depending upon cleanliness of your application.

Fan Motor

On air-cooled Chillers, the condenser FAN MOTOR should be lubricated every 6 months with a few drops of SAE 10 oil.

Pump Motor

The PUMP MOTOR should be lubricated with thirty drops of SAE 20 oil once a year.

Circulation System

The CIRCULATION SYSTEM should be drained and flushed periodically to avoid build up and a possible flow restriction caused by contaminants.

Filters/Strainers

The STRAINER at the Chiller inlet should be removed and cleaned monthly.

The “Y” STRAINER, located inside the unit at the inlet of the pump, should be cleaned periodically depending on applications. If a reduction in flow or cavitation of the pump occurs, remove the strainer, flush it out with water, then replace.

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TROUBLESHOOTING

WARNING: Disconnect electrical power to the Chiller to prevent personal injury before attempting any internal maintenance. Only qualified personnel should service internal components or electrical wiring.

If repairs to the Chiller must be made, disconnect electrical power to the unit, then shut off the water source.

TROUBLE	PROBABLE CAUSE	REMEDY
CHILLER DOES NOT OPERATE, CONTROL POWER LIGHT “OFF”	A. No Power To Unit.	A. Check Main disconnect fuses, wiring, and power lead to unit.
	B. Defective Control Power Switch.	B. Replace Switch
	C. Defective Control Transformer.	C. Replace Transformer
	D. Wrong Voltage Supplied to Unit.	D. Supplied Voltage Must be within ± 10% of nameplate rating.
	E. 3–Phase Monitor tripped.	E. Check for correct voltage level on each phase of incoming 3–phase power. Check for correct phase rotation.
	F. Blown Fuse.	F. Replace Fuse (1 Amp).
PUMP DOES NOT OPERATE, BUT POWER LIGHT IS “ON”.	A. Line to or from Chiller is restricted.	A. Inspect lines and remove any obstructions.
	B. Internal or external filter is blocked with debris.	B. Remove and clean strainer, then replace.
	C. Pump Contactor is defective.	C. Replace Contactor.
	D. Damaged pump motor or impeller.	D. Replace pump motor or impeller.
UNIT RUNS CONTINUOUSLY, BUT IS NOT COOLING PROCESS LIQUID ENOUGH.	A. Condenser is restricted.	A. Clean condenser.
	B. Unit low on refrigerant.	B. Call Service.
	C. Inefficient compressor.	C. Call Service.
	D. Unit is undersized for application.	D. Call REMCOR Chiller Sales Rep.
	E. Bypass gas valve stuck open.	E. Replace solenoid valve.

TROUBLE	PROBABLE CAUSE	REMEDY
CHILLER DOES NOT OPERATE, BUT POWER LIGHT IS “ON” AND RED SAFETY LIGHT IS “ON”.	A. Unit is operating under high pressure conditions.	A. Check for dirty condenser fins or obstruction of chiller air intake. Press high pressure manual reset switch. If this problem persist, contact Remcor Service Department.
	B. Unit is operating under low temperature conditions.	B. Low or no process liquid flow. Ensure that there is adequate flow through system plumbing. or Process liquid is too cold, below 35° F. Increase thermostat setting or bypass valve stuck open. Replace solenoid valve. Check for proper voltage. or Defective thermostat, replace.
	C. Unit has experienced low flow condition (LX and EX units).	C. Check for obstruction in process liquid line plumbing.

NOTE: When servicing a REMCOR Chiller, it is important to note all information provided on the DATA PLATE located in the upper rear of the unit. If technical assistance is needed, the REMCOR Service Technician will need this information along with any description of the problem(s) you are encountering. The serial number and other information will also be required when ordering replacement parts and any other Warranty Claims.

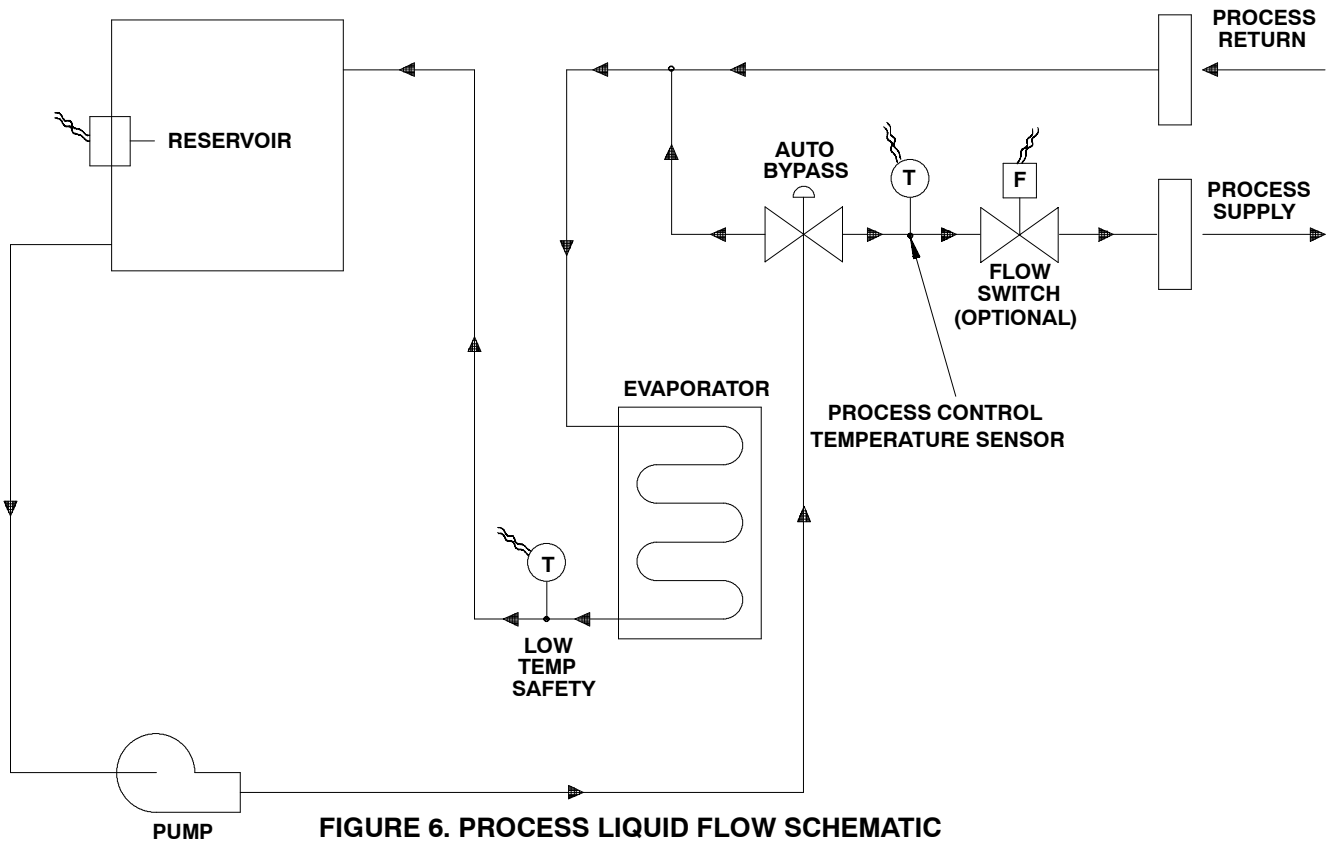


FIGURE 6. PROCESS LIQUID FLOW SCHEMATIC

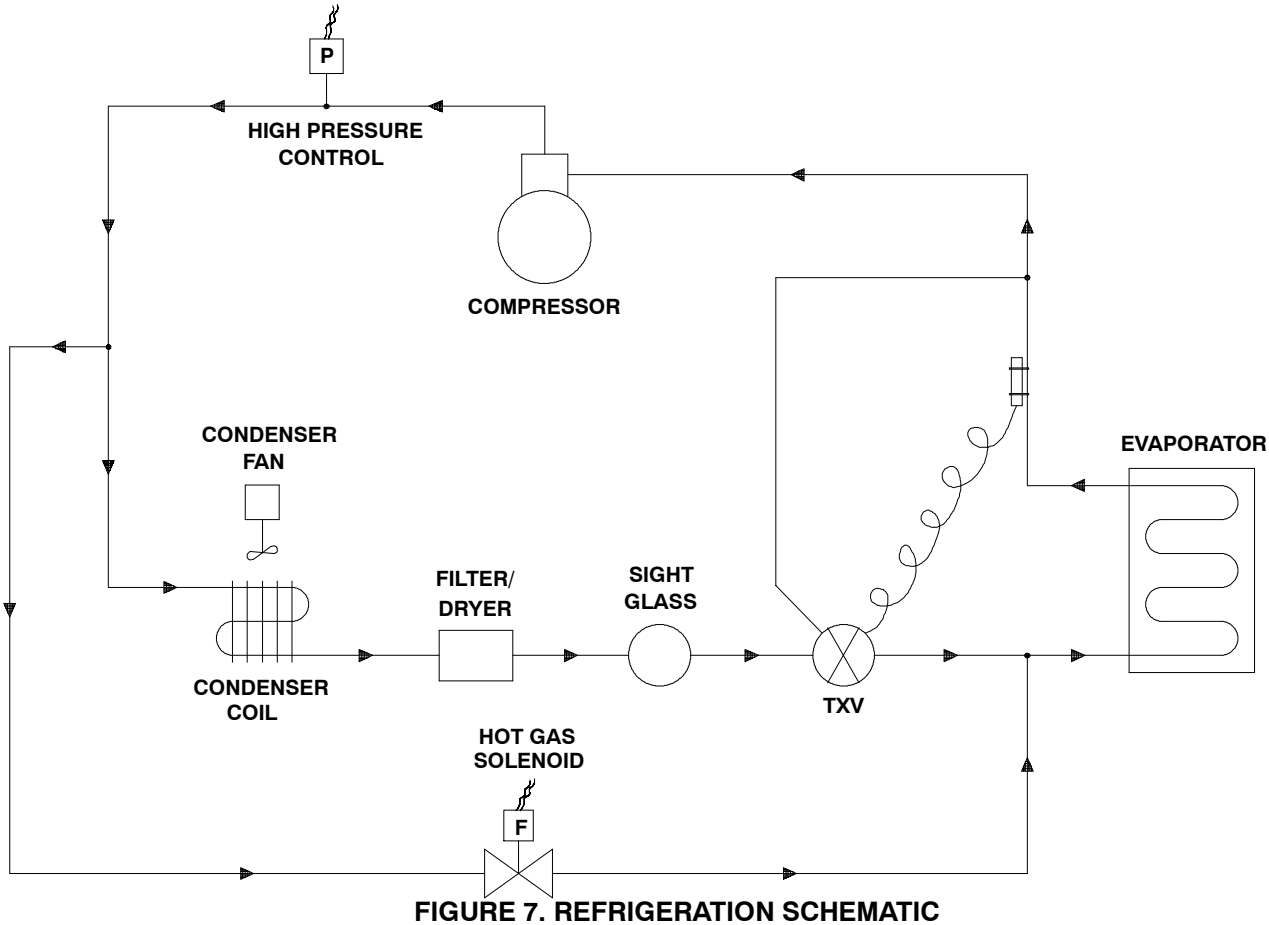
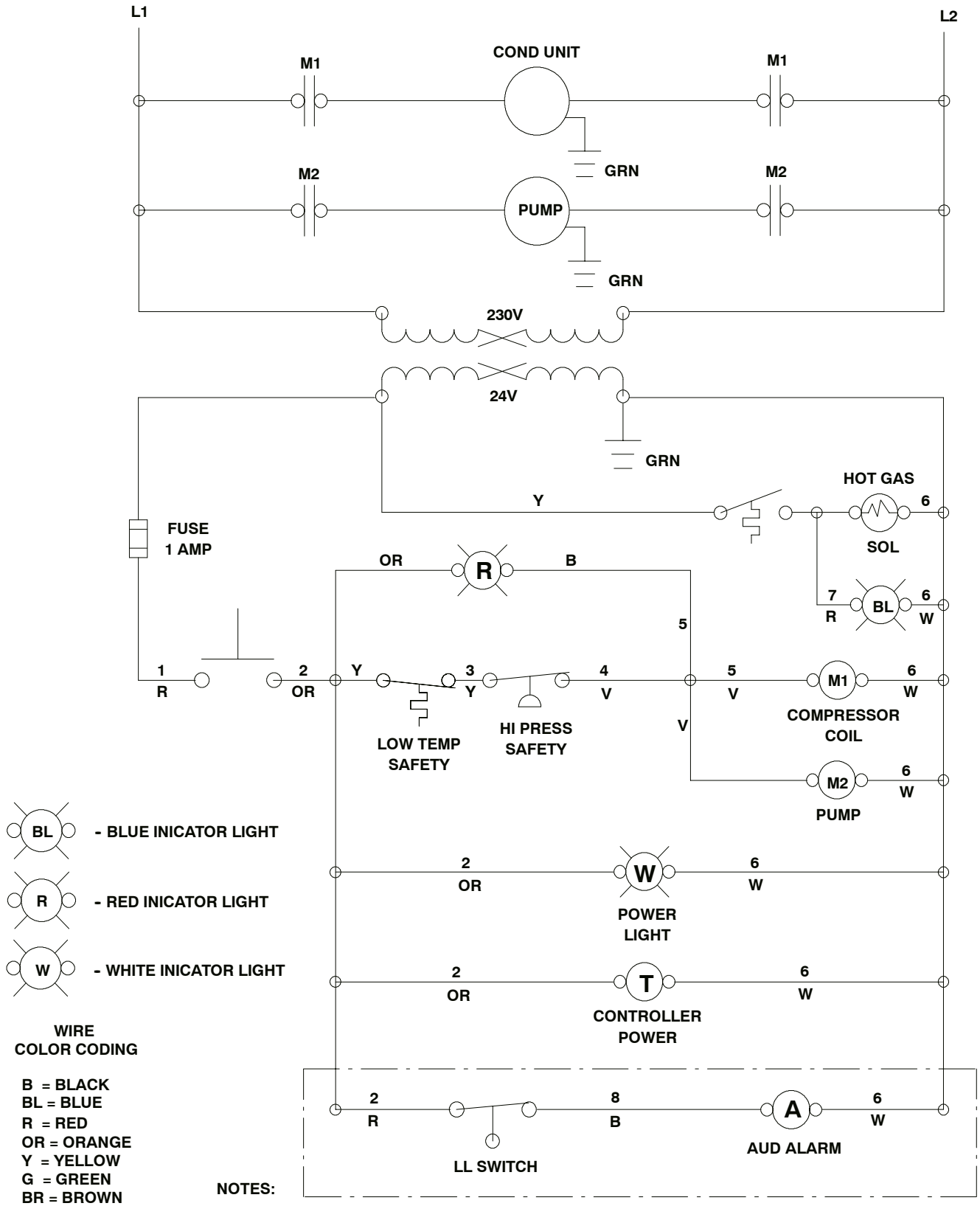


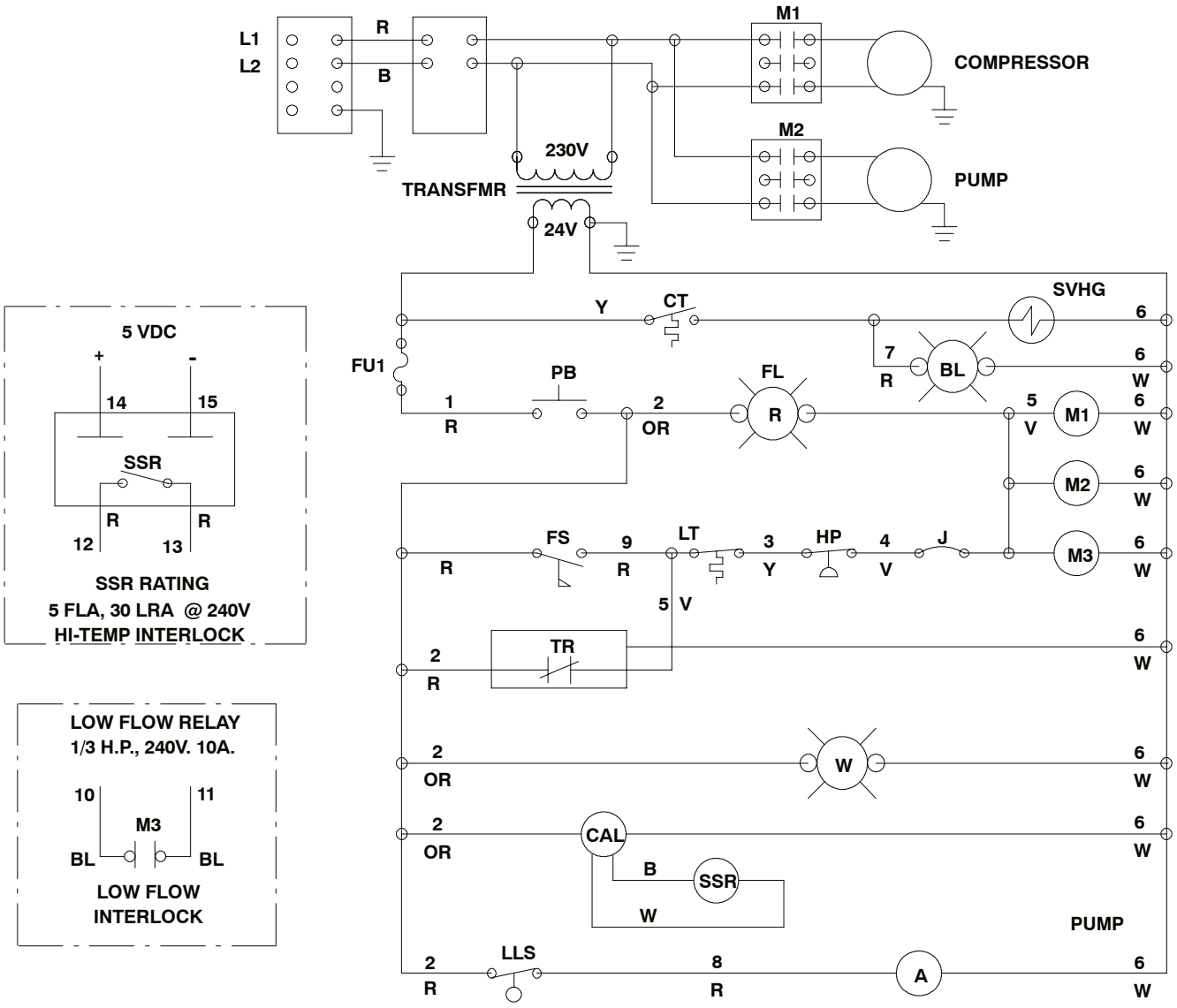
FIGURE 7. REFRIGERATION SCHEMATIC



NOTES:

1) CONDENSER FAN IS ONLY REQUIRED ON AIR COOLED UNITS.
2) THERMAL OVERLOADS ARE BUILT INTO THE COMPRESSORS.
3) SEE INSTRUCTION ON TRANSFORMER FOR HOOK UP.
4) LAST TERMINAL USED: 15
5) ITEMS IN —— - —— BOX ARE OPTIONAL.
6) COMPONENTS SHOWN IN DE-ENERGIZED CONDITION, WITH EMPTY RESERVOIR.

FIGURE 8. WIRING DIAGRAM (CH1001-A, CH1501-A, 230/1/60)



LEGEND

M1 - COMPRESSOR CONTACTOR
M2 - PUMP RELAY
M3 - LOW FLOW INTERLOCK
PB - PUSHBUTTON
FL - FAILURE LIGHT
SVHG - SOLENOID VALVE HOT GAS
BL - HOT GAS LIGHT
TR - BYPASS TIMER
LT - LOW TEMP THERMOSTAT
HP - HIGH PRESSURE CONTROL
FS - FLOW SWITCH
J - JUMPER
CAL - CAL ELECTRONIC THERMOSTAT
LLS - LOW LEVEL SWITCH
A - AUDIO ALARM
FU1 - FUSE
HTI - HIGH TEMP INTERLOCK
CT - CAL C. THERMOSTAT
SSR - SOLID STATE RELAY

BL BLUE INDICATOR LIGHT

R RED INDICATOR LIGHT

W WHITE INDICATOR LIGHT

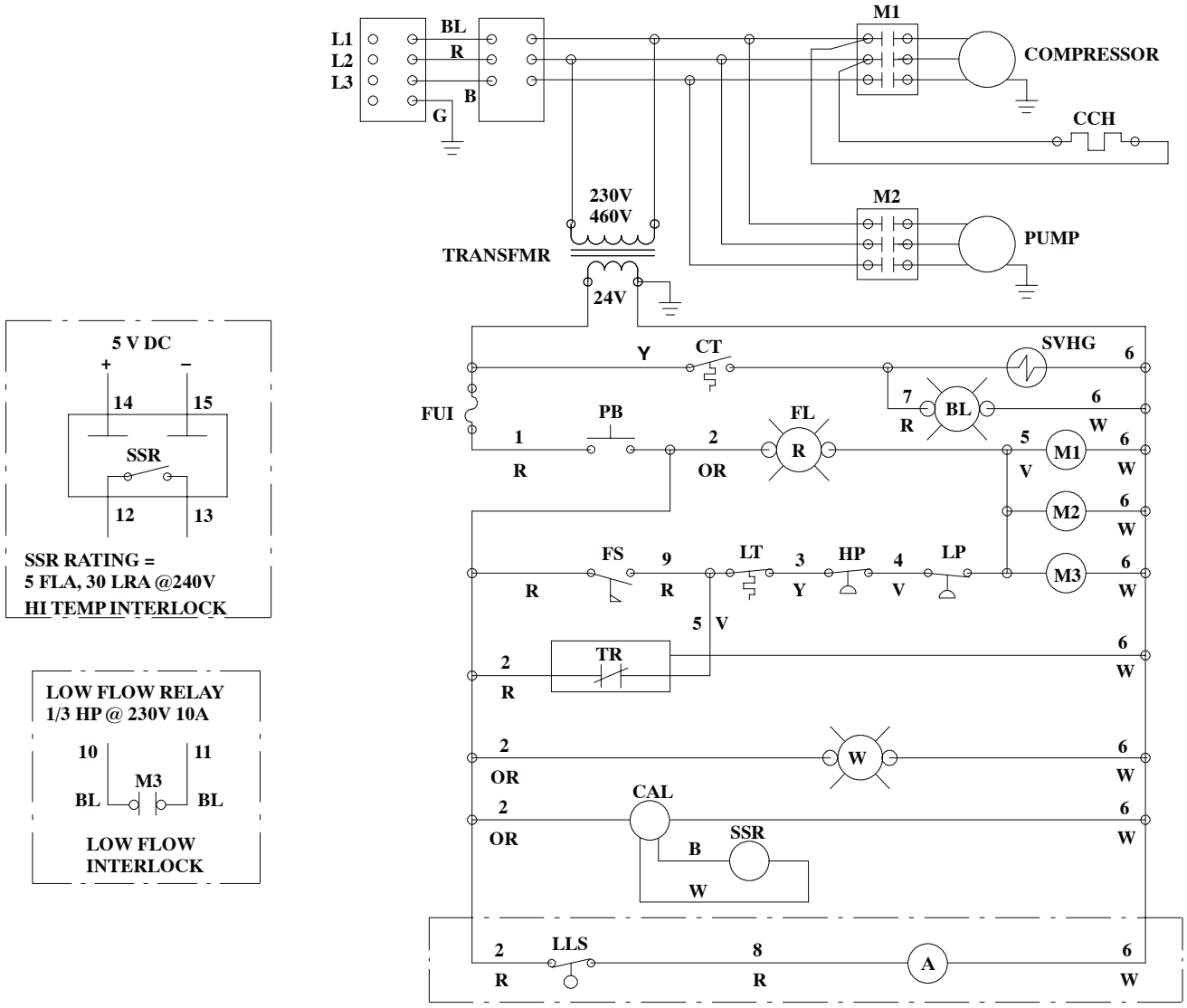
WIRE COLOR CODING

W = WHITE
V = VIOLET
BR = BROWN
G = GREEN
Y = YELLOW
OR = ORANGE
R = RED
BL = BLUE
B = BLACK

NOTES:

1) CONDENSER FAN IS ONLY REQUIRED ON AIR COOLED UNITS.
2) THERMAL OVERLOADS ARE BUILT INTO THE COMPRESSOR.
3) SEE INSTRUCTIONS ON TRANSFORMER FOR HOOK-UP.
4) LAST TERMINAL USED: 15
5) ITEMS IN——— - ——— - ———BOX ARE OPTIONAL.
6) COMPONENTS SHOWN IN DE-ENERGIZED CONDITION WITH EMPTY RESERVOIR.

FIGURE 9. WIRING DIAGRAM (CH1001 230/1/60 FLOW SWITCH HIGH TEMP. INTERLOCK, LOW LEVEL SWITCH



LEGEND

M1 - COMPRESSOR CONTACTOR
M2 - PUMP RELAY
M3 - LOW FLOW INTERLOCK
PB - PUSHBUTTON
FL - FAILURE LIGHT
SVHG - SOLENOID VALVE HOT GAS
BL - HOT GAS LIGHT
TR - BYPASS TIMER
LT - LOW TEMP THERMOSTAT
HP - HIGH PRESSURE CONTROL
FS - FLOW SWITCH
CAL - CAL ELECTRONIC THERMOSTAT
LLS - LOW LEVEL SWITCH
A - AUDIO ALARM
FUI - FUSE LAMP
HTI - HIGH TEMP INTERLOCK
CT - CAL C THERMOSTAT
SSR - SOLID STATE RELAY
CCH- CRANK CASE HEATER

BL **BLUE INDICATOR LIGHT**

R **RED INDICATOR LIGHT**

W **WHITE INDICATOR LIGHT**

WIRE COLOR CODING

B = BLACK
BL = BLUE
R = RED
OR = ORANGE
Y = YELLOW
G = GREEN
BR = BROWN
V = VIOLET
W = WHITE

NOTES:

1. CONDENSER FAN IS ONLY REQUIRED ON AIR COOLED UNITS
2. THERMAL OVERLOADS ARE BUILT INTO THE COMPRESSOR
3. SEE INSTRUCTIONS ON TRANSFORMER FOR HOOK-UP
4. LAST TERMINAL USED: 15
5. ITEMS IN ------ - ------ - ------ BOX ARE OPTIONAL
6. COMPONENTS SHOWN IN DE-ENERGIZED CONDITION WITH EMPTY RESERVOIR

FIGURE 10. WIRING DIAGRAM CH1501 230/3/60, 460/3/60 FLOW SWITCH HIGH TEMP. INTERLOCK, LOW LEVEL ALARM

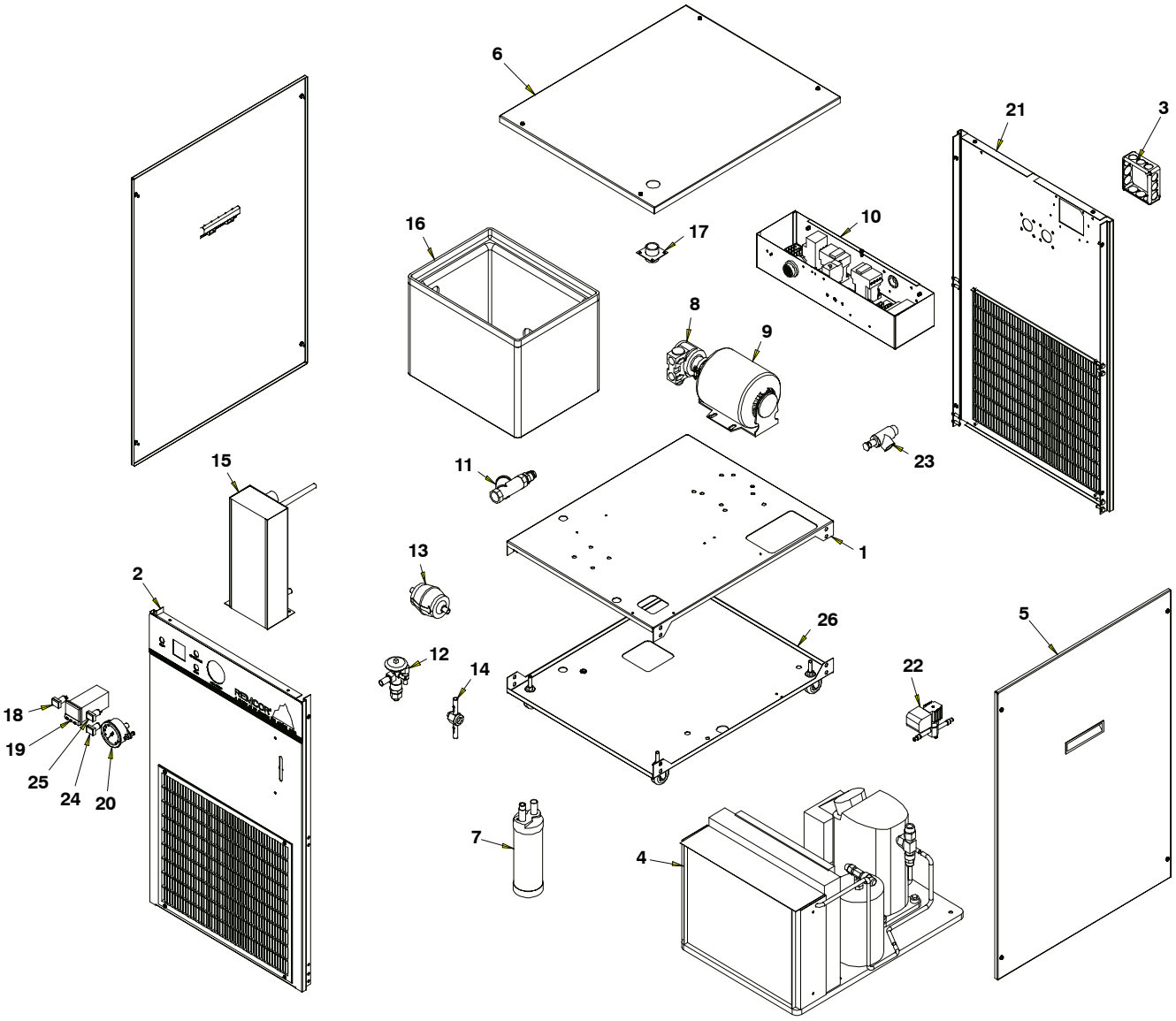


FIGURE 11. CABINET SECTION EXPLODED VIEW

CABINET SECTION

Item No.	Part No.	Name
1	620028005	Base, Pump/Tank
2	620028001	Panel, Front
3	31036	Electrical Junction Box (DX Unit)
	15696	Electrical Junction Box (EX AND LX Units)
4	620604501	Condensing Unit (Model CH1001-A)
	620604403	Condensing Unit (Model CH1501-A)
	620604402	Condensing Unit (Model CH1502-A)
	620604401	Condensing Unit (Model CH1503-A)
5	620028003	Panel, Side
6	620028004	Lid, Chiller
7	620604302	Accumulator
8	32357	Pump (Model CH1001-A, CH1501-A and CH1502-A)
	32385	Clamp (Model CH1001-A, CH1501-A and CH1502A)
	32382	Motor (Model CH1001-A, CH1501-A and CH1502-A)
9	33311	Motor, Pump (Model CH1503-A)

Item No.	Part No.	Name
10	620306708	Electrical Box Ass'y
11	41331	Y-Strainer
12	61003	TXV (Model CH1001-A)
13	60686	Filter Dryer
14	60687	Sight Glass
15	620602503	Evaporator Ass'y (Model CH1001-A)
16	620603201	Foamed Reservoir
17	22870	Fill Port (3/4-In. SS Coupling)
18	32806	Switch, Power
19	620602701	Controller, Temperature
20	620701209	Gauge, Pressure
21	620028002	Panel, Rear
22	620602703 620602704	Solenoid Valve, Hot Gas Solenoid Coil, Hot Gas
23	40646	Bypass Valve, Water
24	32807	Indicator, Red
25	620311607	Indicator, Blue
26	620028007	Base, Refrigeration

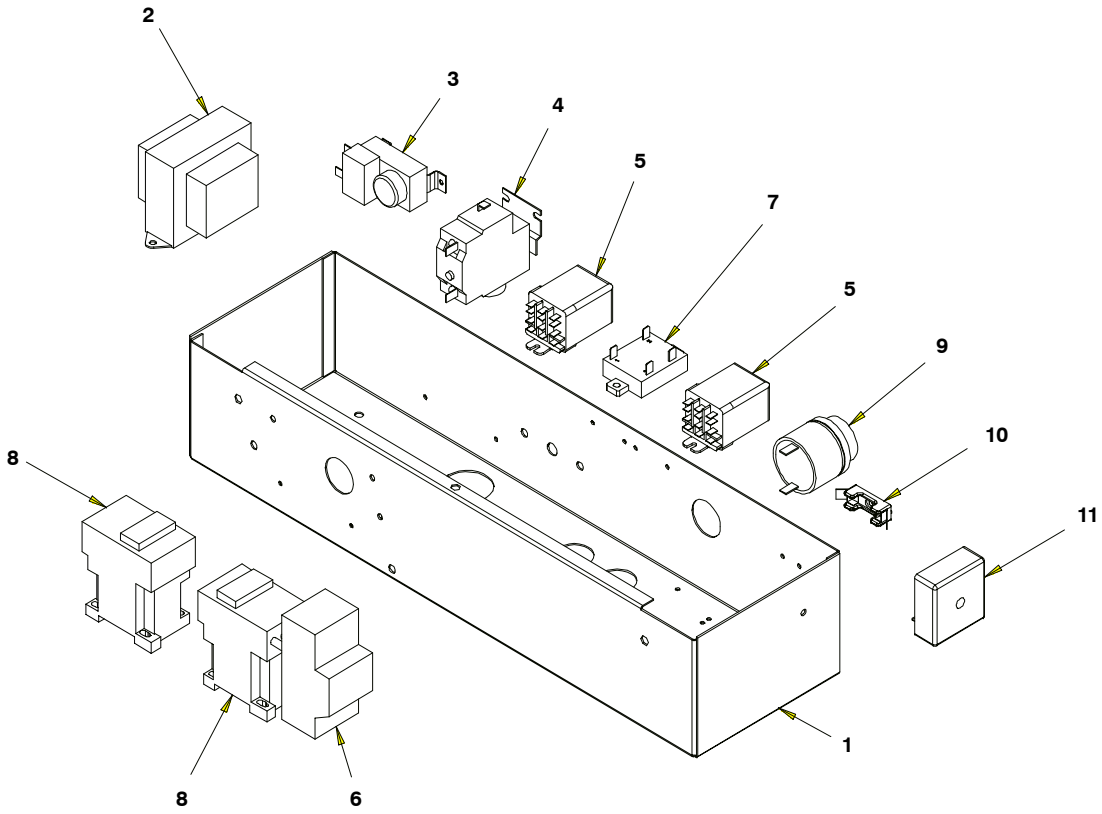


FIGURE 12. ELECTRICAL BOX ASS'Y EXPLODED VIEW

Item No.	Part No.	Name
1	620028012	Enclosure, Electrical Box
2	32829R	Transformer
3	31001	Safety, Low Temp
4	60501	Safety, High Pressure
5	33082	Pump/Low Flow Relay

Item No.	Part No.	Name
6	620305802	Relay, Overload (460V)
7	620307501	Solid State Relay, High Temperature (LX, EX)
8	620305902	Compressor/Pump (460V) Contactor
9	33339	Audible Alarm, Low Level (LX, EX)
10	31407	Fuse Block
11	620313801	Bypass Timer

WARRANTY

IMI Cornelius Inc. warrants that all equipment and parts are free from defects in material and workmanship under normal use and service. For a copy of the warranty applicable to your Cornelius, Remcor or Wilshire product, in your country, please write, fax or telephone the IMI Cornelius office nearest you. Please provide the equipment model number, serial number and the date of purchase.

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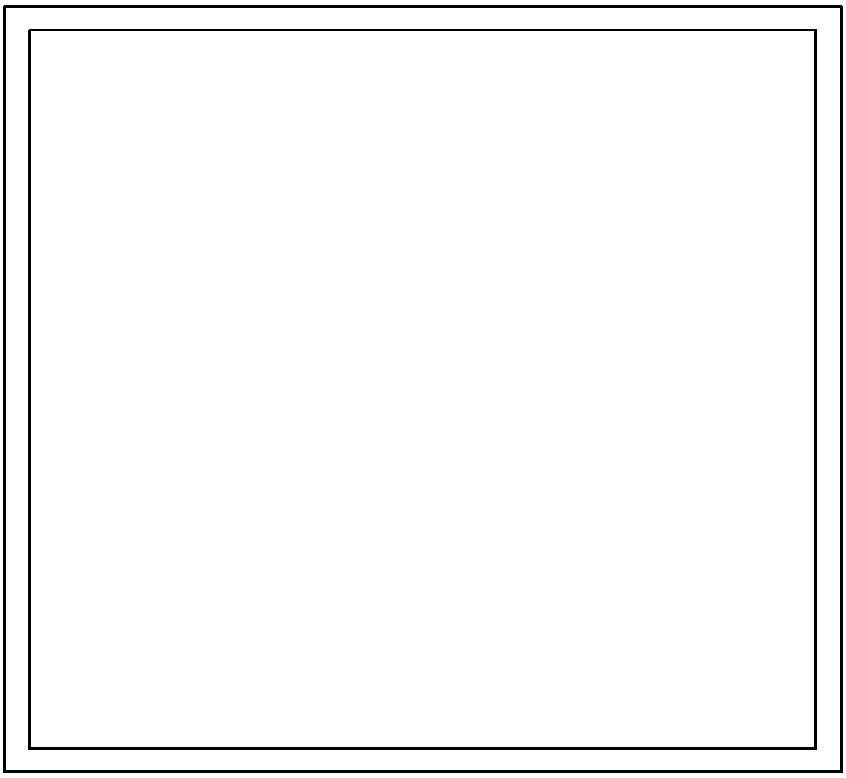

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