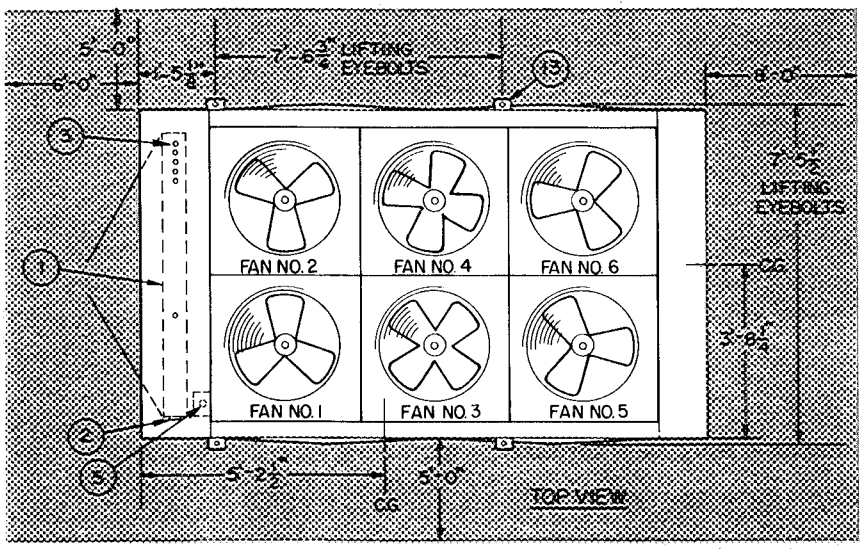
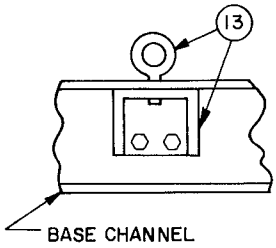
SUPERSEDED BY 30GA-13SI 7/73

Reciprocating Liquid Chillers

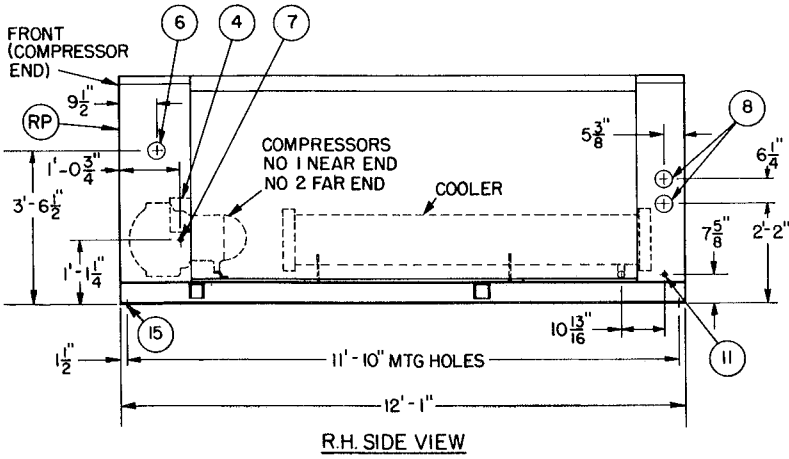
Air-Cooled Packages

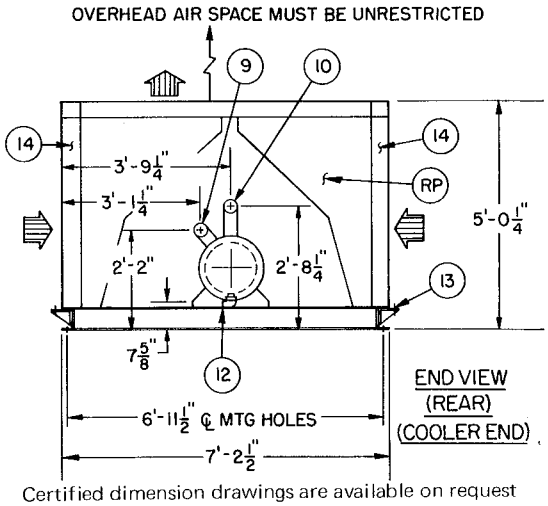




CLEARANCE FOR SERVICE AND AIR FLOW

AIR FLOW THRU CONDENSERS





Certified dimension drawings are available on request

1 — Control Box
2 — 3-1/2-in FPT — Main Power Supply
3 — 7/8-in Diam Knockouts in Bottom of Control Box
4 — Auxiliary Box
5 — 7/8-in Diam Hole — Control Power Supply (in bottom of 4)
6 — 4-3/4-in Diam Hole — Main Power Supply
7 — 1-1/8-in Diam Hole — Control Power Supply
8 — 4-1/2-in Diam Knockouts for Water Piping
9 — 3-in MPT — Water Out
10 — 3-in MPT — Water In
11 — 1-3/4-in Diam Knockout for Cooler Drain
12 — 1-in FPT — Cooler Drain
13 — Lifting Brackets and Eyebolts (4) shipped detached, to be assembled to unit at jobsite.
14 — Condenser Coil
15 — 3/4-in Diam Mounting Holes (at 4 corners)

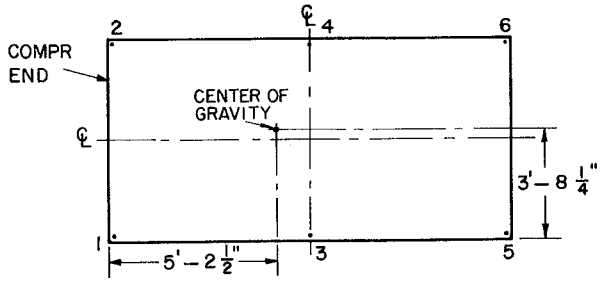
RP — Removable Access Panels

Fig. 1 — Dimension Drawing

Table 1 — Weight Distribution

UNIT 30GA	APPROX OPER WT (lb)	SUPPORT POINT (See Diagram)					
		1	2	3	4	5	6
		Weight (lb)					
055	6030	870	920	1510	1580	560	590
		1685	1760	—	—	1240	1305
065	6170	920	965	1525	1610	560	590
		1790	1870	—	—	1240	1305

▒▒ Four-point support



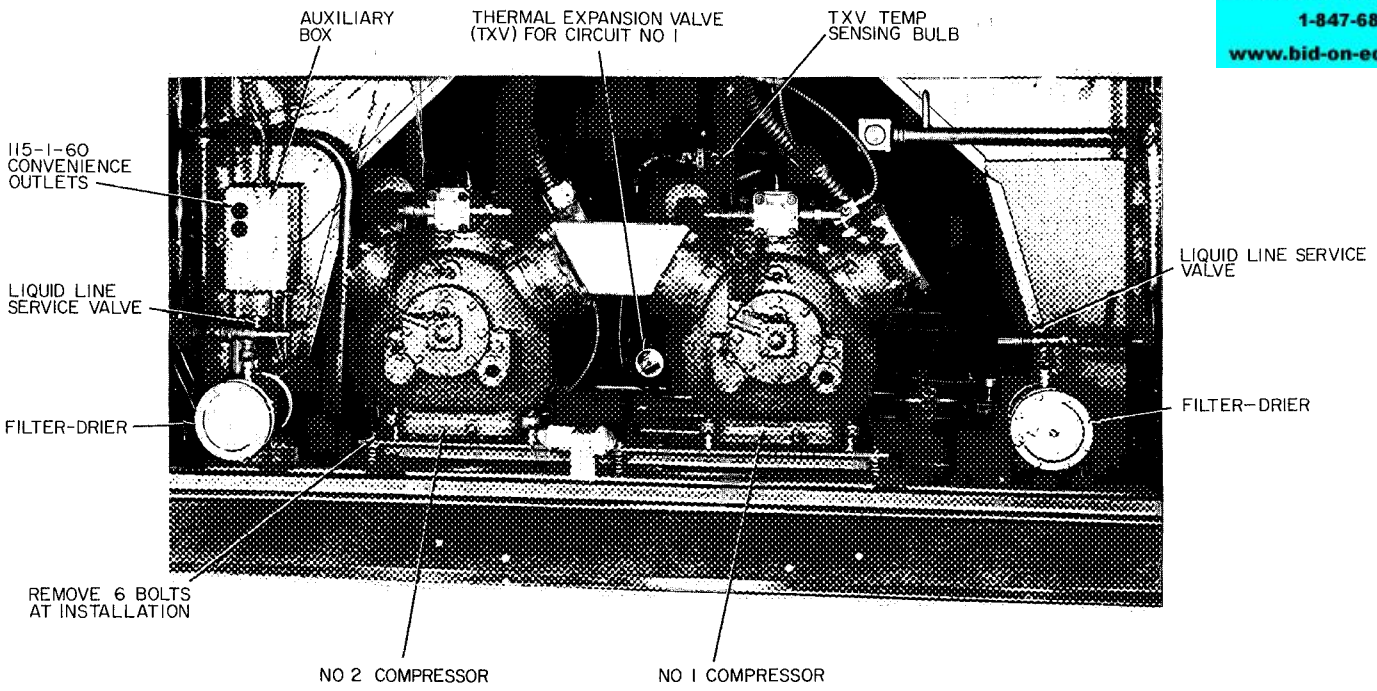


Fig. 2 – General View of Compressor Section

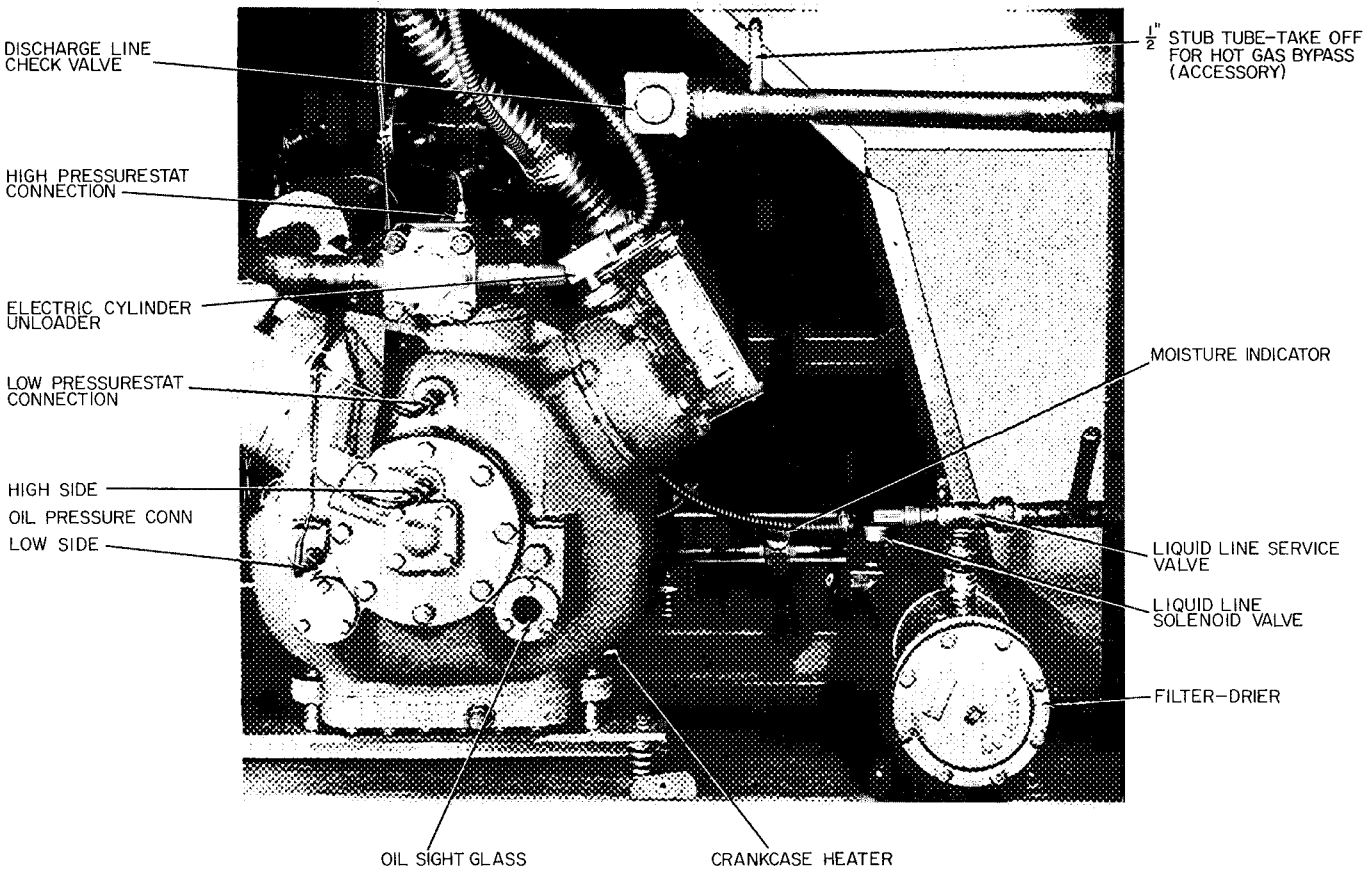


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Fig. 3 – Connections For No. 1 Compressor and Circuit No. 1

INSTALLATION

Rigging – For lifting the unit from above, four brackets and eyebolts are provided (loose) to be attached at the jobsite. The brackets and fastener hardware package are located within the base channel at the compressor end of the unit, held in place by the shipping crate. The contents of the fastener package are listed in Table 2. After the crate is removed, attach the four brackets and eyebolts, two on each side, as shown in Fig. 1. To prevent damage to the coils and other top portions of the unit when lifting, spreader bars should be used. The unit is secured to a skid by four bolts, one at each corner. The skid may be left on or removed for moving the unit into position.

Table 2 — Fastener Package

ITEM	REQ PER UNIT	DESCRIPTION
1	4	Eyebolt, 5/8–11
2	4	Hex Nut, 5/8–11
3	4	Washer, Plain–5/8
4	8	Screw, 1/2–13 x 1 1/4 Lg
5	8	Washer, Plain–1/2

Placing the Unit — Locate unit so that condenser air flow is unrestricted on all sides and above. *Be sure to provide clearance all around for servicing as shown in Fig. 1.* The unit may be mounted on a level pad directly on the base frame or mounted on raised pads at several support points. The weight distribution for four- and six-point support is shown in Table 1.

Compressor Mounting — The compressors are rigidly mounted to two rails as shown in Fig. 2. The compressor mounting rail assembly is supported on springs at six points. For shipping, the compressors are held secure by bolts thru these six springs. *At installation, remove the six bolts so that compressor-rail assembly floats freely on the springs Be sure the compressor hold-down bolts (to the rails) are tight*

Fan Thermostats — A two-step thermostat is provided for intermediate season air-side head pressure control by cycling two of the three condenser fans in each refrigerant circuit. The thermostat bulbs (one for each coil) are attached to the outer surface of the insulation on the suction line of no. 2 compressor (see Fig. 4). This is the operating location for these bulbs.

Chilled Water and Drain Piping — The leaving and return chilled water connections are at the rear of the unit (end opposite compressors). See Fig. 4. The piping can run either directly down thru the base of the unit or out at the side thru a rear corner panel provided with two 4-1/2-in. diam knockouts. The leaving chilled water pipe leaves the cooler at the far end as viewed in Fig. 4. See Cooler and Pipe Heater Cables.

Power Supply — Electrical characteristics of available power supply must agree with unit nameplate rating. Supply voltage must be within the limits shown in Table 3. *Operation of unit on improper supply voltage or with excessive phase unbalance constitutes abuse and is not covered by Carrier Warranty.*

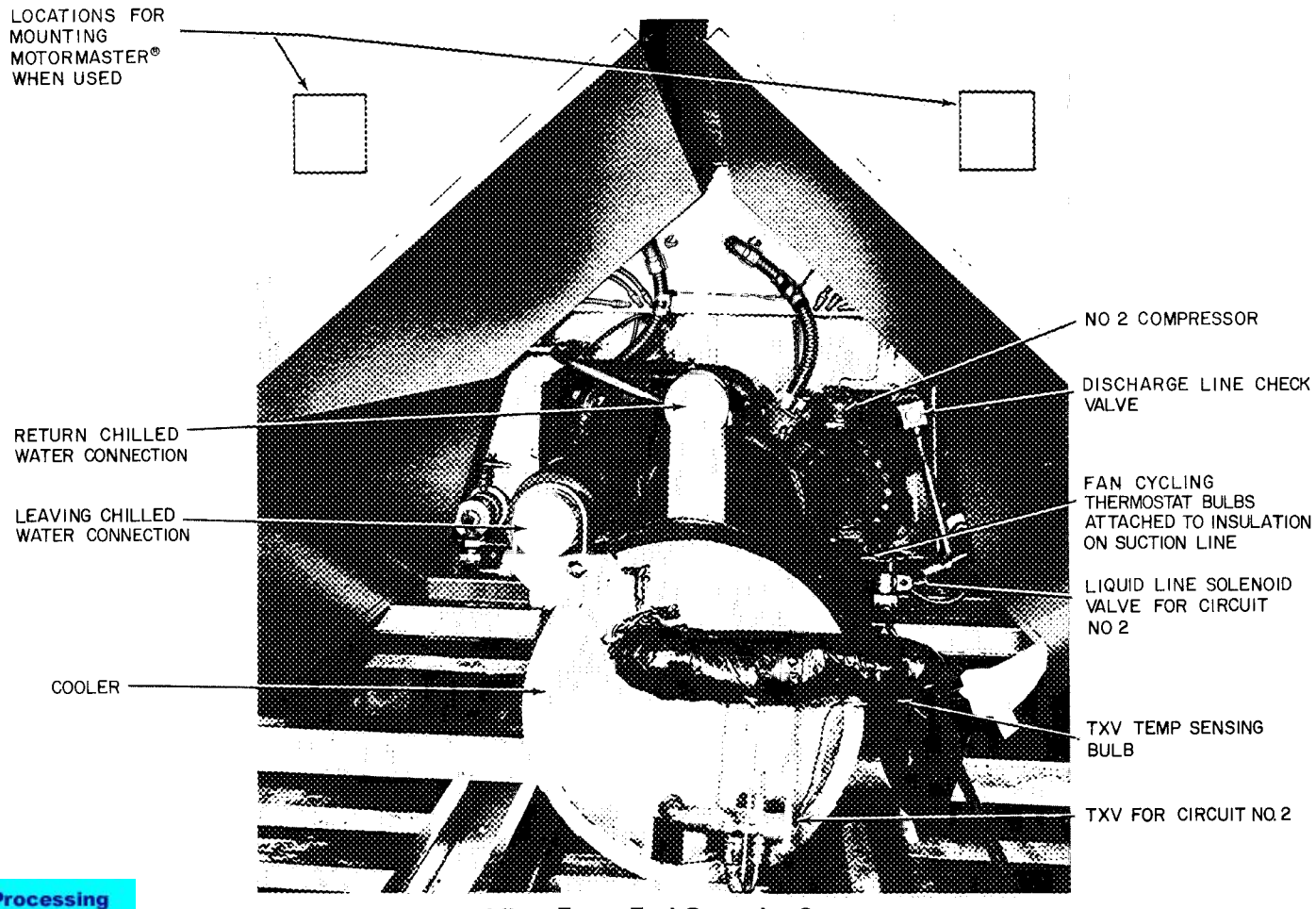


Fig. 4 — View From End Opposite Compressors

Power Wiring – All power wiring must comply with applicable local and national codes. Install a field-supplied branch circuit disconnect of a type that can be locked "Off" or "Open."

FIELD CONNECTIONS

1. Main power – Bring wires from disconnect switch thru hole in side panel at right front corner (Fig. 1, item 6) and connect to terminals on terminal board TB1 as shown in Fig. 5, Field Wiring Connections.
2. Auxiliary Power – Bring separate 115-1-60 power into unit (Fig. 1, item 7) and connect to terminals on terminal board TB4 in auxiliary box as shown in Fig. 5. This supplies power for control circuit, compressor crankcase heaters, cooler heater, chilled water pipe heater and convenience outlets (7 allowable amps) for miscellaneous auxiliary 115-volt applications. *Make provision for this auxiliary power to always be on, even when unit power is off, to ensure power to crankcase and cooler heaters.*

   In addition to the main control circuit switch, each compressor circuit has a separate toggle switch to cut either circuit out without affecting the operation of the other.
3. Motormaster® Accessory (32 Series) is available for all-season head pressure control to supplement fan cycling. A separate MOTORMASTER control is required for each refrigerant circuit to modulate the speed of the noncycling fan motor (no. 1 and no. 2, adjacent to the compressors). On low voltage units (208, 230 volt), these motors are single phase, with running capacitors as standard equipment. To use MOTORMASTER on 460-, 575-volt units, fan motors no. 1 and 2 must be changed to single-phase motors with running capacitors and a step-down transformer (to 230 volt), all available from Carrier Parts Center. The Carrier numbers for these parts are:

   Motor – HC52TE230
   Capacitor – HC96LH030
   Transformer – HT01AH953 for 460 volts,
   HT01AH955 for 575 volts.

   Refer to Fig. 5 for installation of MOTORMASTER on 208-, 230-volt units and Fig. 6 for installation of 460-, 575-volt units.

   Remove red wires between terminals [46] and [47] and terminals [49] and [50].

   Fig. 4 and 7 show mounting locations for 32 Series MOTORMASTER controllers and sensors. Also, refer to detailed Installation Instructions furnished with the accessory package.
4. Control Circuit Interlocks – *A flow switch (CWFS) should be installed in the chilled water line to prevent unit from running when water is not circulating thru the cooler.* This switch (Carrier no. HR81LY030) is available as an accessory, or equivalent can be field purchased. Also, auxiliary contacts for the chilled water pump starter (CWPS) should be installed in the control circuit as additional protection against unit operation when pump is not running. Both of these items should be interlocked electrically in the control circuit. Refer to Fig. 5 for installation.

→ **Table 3 – Electrical Data**

UNIT							EACH COMPRESSOR			EACH FAN MOTOR (see Notes 2, 3)			
		Volts								FLA		Protection	
30GA	Model	Compr Motor Nameplate	Supplied* Min	Supplied* Max	KW	WSA	ICF	FLA	LRA	MTA (see Note 4)	No. 1 & 2†	No. 3-6	MTA	Type
055	410	208	187	229	86.3	302	643	117	487/*332*	164	6.2	6 6	46	Circuit Breaker
	510	230	198	254		264	577	101	440/*300*	142	6 2	6 0	46	
	610	460	414	506		133	289	51	220	71	3.0	3.0	27	
	110	575	518	632		105	230	40	176	56	2 4	2 4	21	
065	400	208	187	229	117 1	399	863	160	664/*420*	220	6 2	6 6	46	Circuit Breaker
	500	230	198	254		360	780	144	600/*380*	202	6.2	6 0	46	
	600	460	414	506		180	390	72	300	101	3 0	3 0	27	
	100	575	518	632		146	312	58	240	81	2 4	2 4	21	

FLA – Full Load Amps

ICF – Maximum Instantaneous Current Flow during starting (full LRA for starting compressor plus FLA for other compressor plus FLA for fan motors)

KW – Maximum Unit Power Input at operating conditions of 50 F Leaving Water Temp, 115 F Condenser Entering Air Temp and nominal voltage

LRA – Locked Rotor Amps *Values in italics* are for part-winding start The greater value is the full LRA

MTA – Must Trip Amps

WSA – Wire Sizing Amps per NEC, Section 430-24

*Units are suitable for use on electrical systems where voltage supplied to the unit terminals is never below or above the listed min and max limits

†Adjacent to compressor compartment Single phase on 208-, 230-volt units for use with Motormaster® head pressure control

NOTES

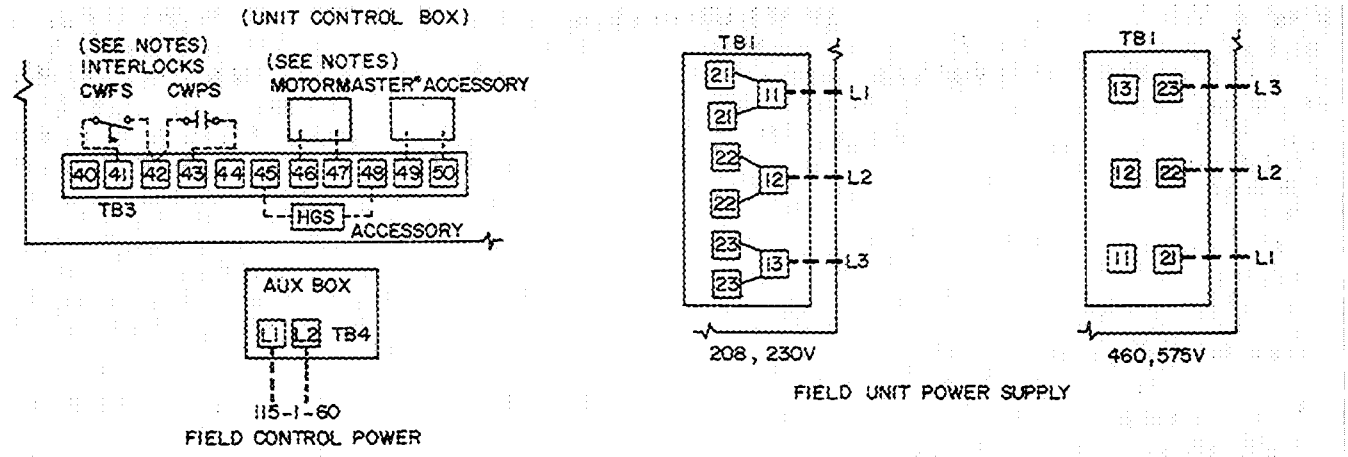
1 Maximum allowable phase unbalance 2% in voltage, 10% in amperes

2 All fan motors, except as noted, are 3 phase.

3 All fan motors are wired thru one circuit breaker

4 On 208-, 230-volt units, there is one 6-pole circuit breaker for each compressor; each winding is wired thru 3 poles The MTA for each winding is one-half the value shown
The circuit breaker for each compressor on 460- 575-volt units is 3 pole

5 Compressor starting sequence, 1-2.

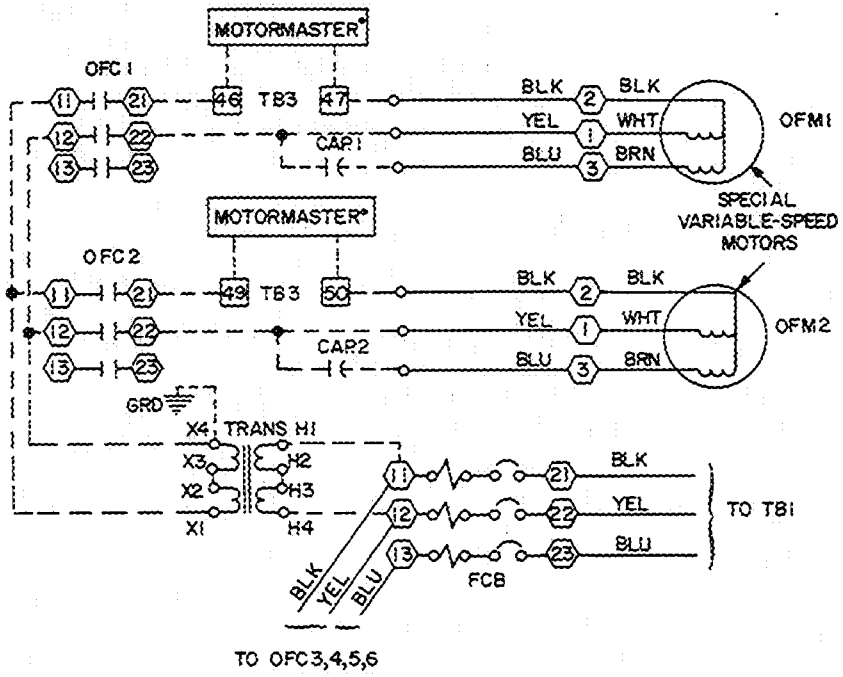


NOTES:

1. Remove RED wire between terminals 41 and 43 when installing interlocks.
2. Remove RED wire between 46 and 47 and between 49 and 50 when installing MOTORMASTER. (See Fig. 6 for installation on 460-, 575-volt units).

CWFS — Chilled Water Flow Switch
CWPS — Chilled Water Pump Switch (Aux)
HGS — Hot Gas Bypass Solenoid
TB — Terminal Board
– – – – Field Wiring

Fig. 5 — Field Wiring Connections



NOTES:

1. All wires from OFC1 to OFC3 and from OFC2 to OFC4 must be removed.
2. Remove RED wire between 46 and 47 and between 49 and 50.

LEGEND

Cap. — Capacitor
FCB — Fan Circuit Breaker
Grd — Ground
OFC — Outdoor Fan Contactor
OFM — Outdoor Fan Motor
TB — Terminal Block
Trans — Transformer
– – – – Denotes field wiring

Fig. 6 — Motormaster® Wiring (460- and 575-Volt)

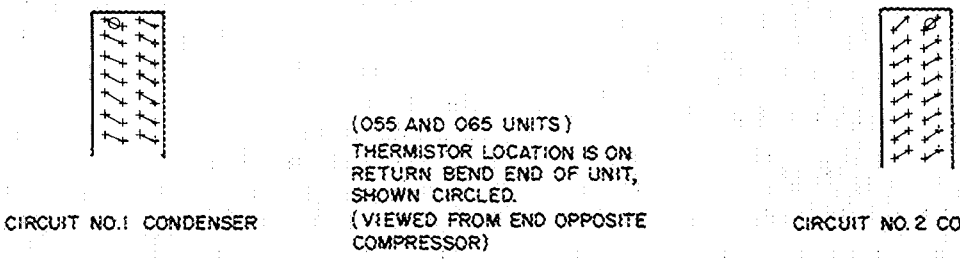


Fig. 7 — Thermistor Locations (for Motormaster®)

→ **Table 4 — Physical Data**

UNIT 30GA	055	065
UNIT WEIGHT (lb)		
Shipping	6375	6515
Net	5775	5915
REFRIG CHARGE	R-22	
Lb per Circuit	66	
COMPRESSORS (Two)*	Reciprocating Hermetic	
Model 06E Ckt 1	B275	B299
Model 06E Ckt 2	A275	A299
Cyl/Compr ... Rpm	6 1750	
Oil Charge/Compr (pt)	19	
CONDENSER FANS	Propeller, Direct Drive	
Rpm	1140	
No. ... Diam (in.)	6 . 28	
Motor Hp	See Note †	
Air Qty/Coil (cfm)	19,300	
CONDENSER COILS		
No. ... Fins/In.	2 16	
Rows/Coil	4	
Face Area/Coil (sq ft)	39 6	
Max Working Press. (psig)	450	
COOLER (One)	Shell and Tube	
Refrig Circuits	2	
Max Working Press. (psig)		
Refrig Side	235	
Water Side	250	
Net Water Volume (gal.)	23 5	
WATER CONNECTIONS (in.)		
Inlet and Outlet (FPT)	3	
Drain (FPT)	1	

*Prefix: A — no unloader; B — one unloader
†NEC rated hp single-phase, 0.65; 3-phase, 1 75.

Initial Check — Do not attempt to start the Liquid Chiller, even momentarily, until the following steps have been completed:

1. Check all auxiliary components such as chilled liquid circulating pump, air-handling equipment, or other equipment to which the chiller supplies liquid. Consult the manufacturer's instructions. Pump auxiliary contactor and flow switch interlocks must be properly installed (see Fig. 5).
2. Check chilled water safety thermostat. See Safety Thermostat for adjustment.
3. Backseat (open) compressor suction and discharge shutoff valves. Close valves one turn to allow pressure to reach test gages.
4. Open liquid line valve.
5. Fill chilled liquid circuit with clean water or other noncorrosive fluids to be cooled.
6. Set temperature controller (see Four-Step Controller).
7. Check tightness of all electrical connections.
8. Compressor oil should be visible in bull's eye (see Oil Charge).
9. Be sure there are no refrigerant leaks (see Leak Test and Dehydration).
10. Be sure unit is fully charged with refrigerant (see Refrigerant Charge).
11. Electrical power source must agree with unit nameplate rating.
12. Be sure crankcase heater in each compressor is firmly locked in place.
13. Be sure compressor hold-down bolts are tight and compressor-mounting rail assembly is floating freely on the springs (see Compressor Mounting and Fig. 2).

Leak Test and Dehydration — All 30GA units are shipped with complete operating charge of Refrigerant 22. If a leak has occurred and the charge lost, the unit should be thoroughly leak-checked and dehydrated. For leak testing and dehydration procedures, refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, Sections 6 and 7.

Refrigerant Charge — When additional or complete field charging is required, refer to Table 4 for charge quantity and use the Liquid Charging Method. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, Section 8, for charging procedures.

Immediately ahead of the filter-drier is a factory-installed liquid shutoff-charging valve. A 1/4-in. flare connection is provided for field charging. *Never charge liquid into low-pressure side of system.*

Auxiliary Power Circuit — Switch 115-1-60 field disconnect to "On", but leave the control circuit switch (SW1) at *"Off"* The crankcase heater will be energized, and should be allowed to operate for 24 hours before the control circuit is energized.

Actual Start-Up should be done only under supervision of a qualified refrigeration mechanic.

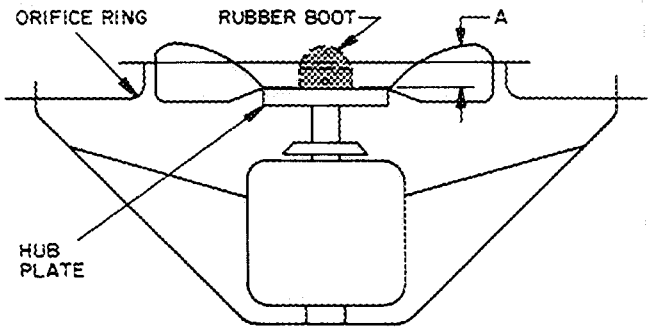
Proceed as follows·

1. Be sure compressors are warm (crankcase heaters should be energized for 24 hours before start-up).
2. Open any compressor and system service valves that were closed during charging.
3. Turn circuit switches SW2 and SW3 to "On."
4. Turn control circuit switch (SW1) to "On."
5. Push control reset buttons and chilled water safety thermostat reset button to ensure circuit operation.
6. Be sure all safety devices are satisfied.
7. Set thermostat in conditioned space to desired temperature.

Access for Servicing — At each end of the unit, removable panels for easy servicing permit quick access to compressors, condenser headers, filter-driers, cooler, and control valves. For shipping, these panels are fastened with screws but after installation the screws should be removed. Sheet metal clips allow removal of panels without tools when screws are out.

UNIT CONTROL BOX, with hinged covers, contains all the bare electrical components. Circuit breaker toggles, control circuit ON-OFF switch, reset buttons and chilled water temperature adjustment are accessible without opening the control box covers. All routine service and maintenance can be performed without being exposed to current-carrying components. Within the control box are two control circuit modules, which provide the serviceman with a separate group of protection components for each refrigerant circuit. Each component is readily accessible and easily replaceable.

CONDENSER FANS – Each fan motor is clamped in a formed-wire mount. Each clamp consists of two formed-steel straps with two sets of bolts, washers and nuts. The motor mount is supported from fan deck and cushioned with four rubber "Finger Flex" vibration isolators. In case a fan motor must be repaired or replaced, be sure these vibration isolators are used when motor is reinstalled. Be sure the wire fan guard is in place over each fan before starting unit. See Fig. 8 for proper fan installation. Secure fan hub on motor shaft with one setscrew. Be sure rubber boot is over the exposed end of motor shaft and fan hub to ensure against rusting.



FAN	DIM. A (in.)
3 Blades (no. 1,2,5,6)	2 5/8
4 Blades (no. 3,4)	1 1/2

Fig. 8 – Condenser Fan Adjustment

Oil Charge – Each compressor is factory-charged with 19 pints of oil. When additional oil or a complete charge is required, use only Carrier approved compressor oil (specification no. PP33-2). Do not reuse drained oil or oil that has been exposed to atmosphere. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, for procedures to add or remove oil.

Thermal Expansion Valves (TXV) – One for each refrigerant circuit (see Fig. 2 and 4). Factory set to maintain 10 F superheat of vapor leaving cooler to control flow of liquid refrigerant to each circuit. Superheat can be reset but should be done only if absolutely necessary. The complete power head and cage assembly can be removed for servicing without removing the body flange from the liquid line. Each thermal expansion valve has a non-condensable charge in the power element.

Liquid Line Solenoid Valves – One in each refrigerant circuit, interlocked with compressor contactors to shut off flow of liquid to cooler on compressor shutdown. Fig. 3 and 4 show the location in each circuit.

Moisture Indicator (See Fig. 3; similar location in circuit no. 2) – Clear flow of liquid refrigerant indicates sufficient charge in system. Bubbles indicate undercharged system or presence of non-condensables. Moisture, measured in parts per million (ppm), in system will change color of indicator. *Green (dry) – moisture is below 45 ppm, chartreuse (caution) – 45 to 130; yellow (wet) – above 130.* Change filter-drier cores at first sign of moisture in system.

Filter-Driers (See Fig. 2) – Whenever the moisture-liquid indicator shows presence of moisture, replace filter-drier core. Refer to Carrier Standard Service Techniques Manual, Chapter 1, Refrigerants, for details on servicing filter-driers.

Liquid Line Service Valve (shutoff and charging) is located immediately ahead of each filter-drier (see Fig. 2), provided with 1/4-in. flare connection for field charging, open to downstream when shutoff valve is closed. If flashing is evident in either liquid line sight glass after unit has been running for a short time, additional charge will be required. Maintain 125 F saturated condensing temperature (by blocking the air flow to each condenser if necessary) and charge each circuit until sight glass is full and clear (this is the minimum operating charge). Then add 8 lb per circuit for optimum charge.

Compressor Protection – Each compressor is fully protected against overload, independent of the other compressor.

CIRCUIT BREAKER – Calibrated trip, manual reset, magnetic. Protects against overcurrent condition.

ROBERTSHAW SOLID STATE SYSTEM – Three temperature sensors embedded in motor windings of each compressor and a solid state module located in control box. Compressor protected against thermal overload.

The sensors in the motor windings are part of a temperature bridge. If the motor winding overheats, the bridge circuit will unbalance and stop current flow thru silicone-controlled rectifier. This de-energizes a relay in the module which opens a set of contacts. Opening these contacts shuts off compressor and locks out that part of the control circuit. To re-energize that compressor control circuit, press reset button in control box.

If *one* of the sensors opens, it can be jumpered with a 75-ohm, 2-watt resistor. *Be sure sensor is not shorted to winding when jumpering it out.*

When checking or testing sensors, do not apply more than 6 volts across terminals. Many test instruments exceed this voltage rating; check before using. If a component in the motor protection module package fails, the entire package must be replaced.

OIL PRESSURE SAFETY SWITCH (OPS) protects against damage from loss of oil and failure of pressure buildup during start-up. Oil switch is bypassed for approx 40 seconds thru switch E of four-function Time Guard timer (see Sequence of Operation). *If a compressor is locked out by its OPS, determine and correct the cause* (such as loss of compressor oil or flooded compressor) before restarting the compressor. When ready to restart, press reset button for that compressor. Failure to correct the trouble before starting the compressor is considered abuse. *Equipment failure due to abuse is not covered by the Warranty.*

TIME GUARD – Protects compressor against short cycling. See Sequence of Operation.

CRANKCASE HEATER (see Fig. 3) – A 125-watt cartridge-type heater in each compressor prevents accumulation of liquid refrigerant in crankcase during brief or extended shutdown periods. Source of 115-volt power is the auxiliary control power, independent of the main unit power. This ensures compressor protection even when main unit power disconnect switch is off.

→ *Crankcase heaters should be energized at all times when unit is not operating.* However, during a prolonged shutdown, or during servicing, the heaters may be de-energized providing compressor service valves are closed. When operation is to resume, the service valves must be reopened and the heaters should be energized for 24 hours before unit start-up.

DISCHARGE LINE CHECK VALVE (see Fig. 3 and 4) protects against refrigerant oil migration and flooded starts after a prolonged shutdown.

Cooler Freeze-Up Protection

HEATER CABLES (cooler and chilled water piping) – The cooler is helically wrapped over the entire length with a lead-sheathed 400-watt, 115-volt heater cable between the shell and the 2-in. thick insulation blanket. The 3-in. diam chilled water pipe is helically wrapped with a 200-watt, 115-volt heater cable between the pipe and the 1/2-in. thick insulation. The outdoor portion of field piping from the unit should be similarly protected against freeze-up.

A thermostat energizes the factory-installed heater cables whenever the ambient temperature is 35 F or lower. The chilled water system is protected down to -20 F ambient by the electric heaters plus the insulation.

The electric heater cables should be checked for current draw. For this check, install an ammeter in series with the cables. At 120 volts, the cooler heater *must* draw between 3 and 3.66 amps and the pipe heater *must* draw between 1.55 and 1.80 amps.

Since the 115-volt auxiliary power source for the factory-installed heater cables is separate from main unit power source, power to heaters is ensured at all times. From the same separate source, a 115-1-60 convenience outlet is provided for auxiliary field-supplied heaters.

CAUTION: Do not disconnect auxiliary heater cable power while servicing compressor when ambient is below 40 F.

SAFETY THERMOSTAT (see Fig. 9) – Non-cycling, manual reset type, to protect against freeze-up due to operating malfunction. The standard thermostat is Carrier no. HH22PB056, with a range of 33 to 55 F. The sensing bulb is installed in top of cooler shell at leaving chilled water end. Thermostat for normal operating temperatures is set to break the control circuit at 36 ± 2 F, locking out the unit. The thermostat must be reset before the unit can be restarted. The chilled water circulating pump continues to operate during the lockout period.

When cooling below 33 F (glycols or brines), use thermostat part no. HH22PB030, with well no. 30HH406102, available from Carrier Parts Center. Install well in connection provided in leaving chilled water line elbow at exit from cooler. This control has a range of -20 F to +50 F.

Check thermostat at installation and at least once each season thereafter.

To Check – Insert screwdriver into adjusting slot and turn dial assembly until desired cutoff temperature is directly under fixed indicator. Place bulb in vacuum bottle filled with mixture of water and crushed ice. Stir mixture with thermometer.

As ice melts, temperature of mixture will go down. Note temperature where thermostat cuts out. This should be within one or two degrees of dial setting. Recalibrate if variation is greater.

To Recalibrate – Break painted seal at dial screw. With a screwdriver in the adjusting slot, *hold the angular position of the dial assembly while completing the following steps*

1. Loosen the two dial screws.
2. Rotate *dial only* until the number under the fixed indicator is the cutout temperature of the mixture when thermostat was checked.
3. Retighten dial screws.

Turn dial assembly until desired compressor cutoff temperature is directly under fixed indicator. Recalibration is now complete.

WINTER SHUTDOWN – If unit is to be shut down for winter, remove drain plugs and drain cooler. Use air pressure to blow out any residual

water. As an alternate procedure, refill with 50/50 mixture of ethylene glycol and water.

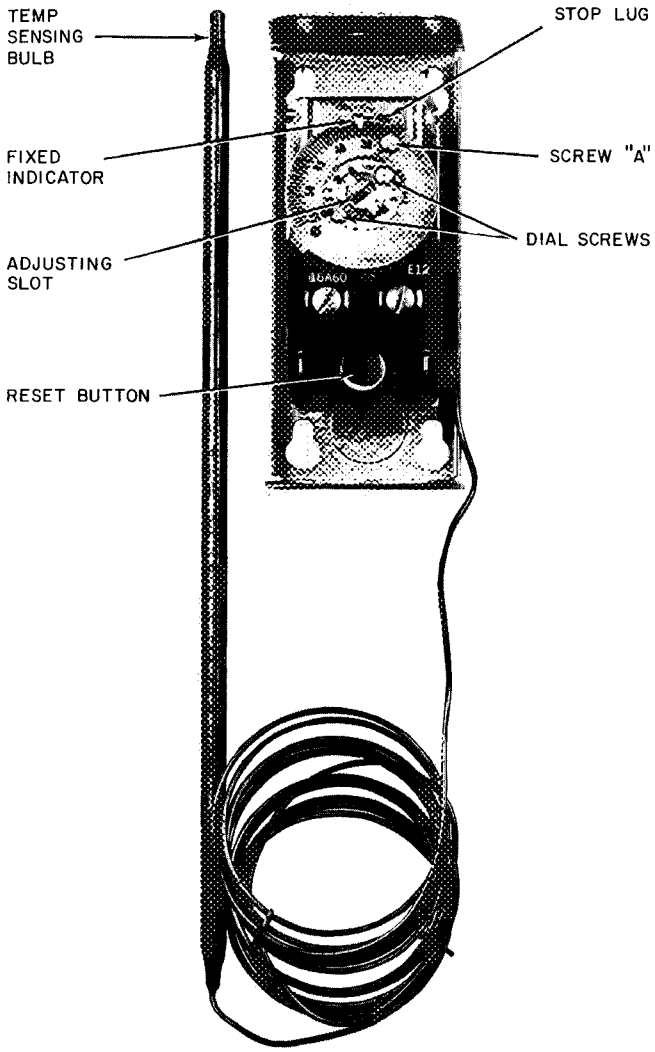


Fig. 9 – Safety Thermostat

High-Pressure Switch has fixed, nonadjustable settings.

TO CHECK – Slowly close discharge shutoff valve until compressor shuts down. This should be at the cutout pressure in Table 5; compressor should restart when pressure drops to cut-in pressure shown.

Low-Pressure Switch has adjustable range from 10 psig minimum cutout to 90 psig maximum cut-in.

TO CHECK – Slowly close suction shutoff valve and allow compressor to pump down. Compressor should shut down when suction pressure drops to cutout pressure in Table 5, and should restart when pressure builds up to cut-in pressure shown.

→ **Table 5 – Pressure Switch Settings (psig)**

SWITCH	CUTOUT	DIFF	CUT-IN
High	400 ± 5	Fixed	300 ± 5
Low	29 ± 5		44 ± 5

Pressure Relief – High side relief is provided before and after the liquid line service valve with fusible plugs (Carrier part no. EK02JA203) designed to relieve at 203 to 219 F, an abnormal condition such as would occur in case of a fire.

Discharge Line Thermostat – For low-temperature application, a discharge line thermostat should be located just after the discharge valve of each compressor and wired in the control circuit so that the particular compressor will stop whenever discharge line temperature exceeds 290 F. Compressor will restart automatically when the line cools down. A suitable thermostat is Carrier no. HH18HA210.

Winter Start Control – The four-function timer provides contacts (D-D1) which bypass the low-pressure switch for 2-1/2 minutes on unit start-up.

Head Pressure Control reduces condensing capacity under low ambient conditions.

FAN CYCLING – Each refrigerant circuit has standard provision for fully automatic intermediate season air-side head pressure control. This is accomplished by cycling two of the three condenser fans in each circuit. A two-step thermostat is provided, which responds to variations in ambient air temperature. Condensing capacity is reduced to approximately 35%. See Fig. 4 for location of sensing bulbs for each circuit.

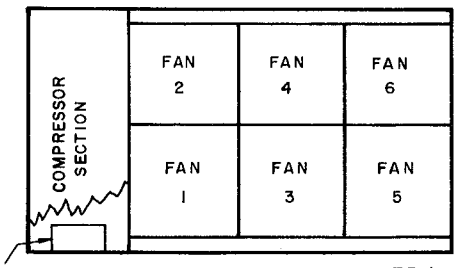
Table 6 shows the thermostat temperature factory settings. These settings can be changed in the field.

MOTORMASTER® ACCESSORY PACKAGE – For all season head pressure control to -20 F, the 32 Series MOTORMASTER is available as a field-installed accessory to supplement fan cycling. This control (one for each circuit) varies the speed of the noncycling fan in each circuit. See Section titled Field Connections.

Table 6 – Fan Cycling Control

TWO-STEP THERMOSTAT*	AMBIENT TEMP (F)	
	Cutout	Cut-in
Step 1	70	75
Step 2	57	62

*Step 1 controls fans no 3 and 4 (cycle together)
Step 2 controls fans no 5 and 6 (cycle together)



Location of transformer for MOTORMASTER (see Fig 6)

Capacity Control System consists of a four-step water temperature controller, electric cylinder bank unloader and two separately controlled refrigerant circuits (liquid line solenoid valves). A hot gas bypass accessory valve is available.

→ **Table 7 — Capacity Control Steps**

UNIT 30GA	CONTR STEPS	% CAP.	OPER CYL Total	OPER CYL Ckt* 1	OPER CYL Ckt* 2
055, 065	1	33 3	4	4	—
	2	50 0	6	6	—
	3	83 3	10	4	6
	4	100 0	12	6	6
LLS Position (X = open)	1	—	—	X	—
	2	—	—	X	—
	3	—	—	X	X
	4	—	—	X	X

LLS — Liquid Line Solenoid Valve
*Compr no. 1 is in ckt 1; compr no. 2 is in ckt 2.

FOUR-STEP TEMPERATURE CONTROLLER — Consists of load switches actuated by the pressure developed in a temperature-sensing bulb located in the return water line of the chilled water system. The controller is factory set to control from *return* water temperature thru a cooling range of 10 F. The sequence switches are factory calibrated and sealed and should not require any field changes. Table 8 shows the factory temperature settings.

→ If a different return-water cooling range or a *leaving-water* control is specified, or if brine is to be used, the controller must be changed. Consult local Carrier representative for proper controller.

The temperature at which the last step of capacity unloads is indicated by the design set point on the adjustable dial (Fig. 10). Example: design set point is at 44 F. On a reduction in load, the unit will cycle off when return water temperature drops to 44 F.

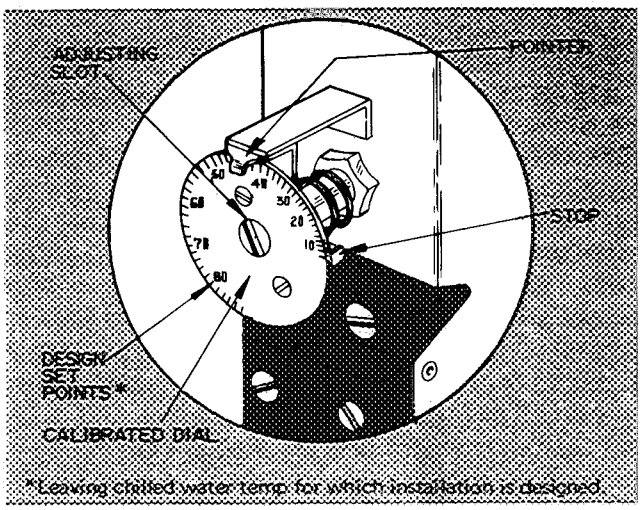
WARNING: Any alteration of factory settings, except design set point, without Carrier authorization may void the Carrier Warranty.

→ **Table 8 — Controller Temperature Settings**

SWITCH NO.	TEMPERATURE (F) Cut-in	TEMPERATURE (F) Cutout
1	47	44*
2	49½	46½
3	52	49
4	54½	51½

*Design set point

→ Design Set Point Adjustment — When unit is ready for operation, insert small screwdriver in adjusting slot (Fig. 10) and rotate to turn dial (dial may also be turned by hand). Rotate until the design set point for the installation appears directly under the pointer. Insert a thermometer in the *return* chilled water connection and allow the unit to run thru a cycle. At the instant the last step of capacity unloads (switch no. 1 opens), read the temperature. If it is not the same as the dial reading, the variation can be compensated by shifting the control point slightly. *Do not force the dial past the stop. This could cause loss of the control point and damage the instrument.*



→ **Fig. 10 — Set Point Adjustment**

HOT GAS BYPASS VALVE (Accessory) provides a further reduction in capacity when unit is operating on final step of unloading and load requirements fall below 33% of nominal full load. Control modulates the flow of hot gas into no. 1 refrigerant circuit in response to variations from a preset suction pressure. A decrease in suction pressure causes valve to admit more hot gas to restore the preset pressure. The hot gas enters the refrigerant circuit no. 1 thru the connecting tube between the thermal expansion valve and the cooler. A 1/2-in. stub tube is provided after the TXV and another 1/2-in. stub tube is located in the no. 1 compressor discharge line (see Fig. 3) for field installation of the hot gas bypass valve. Copper tubing must be field supplied.

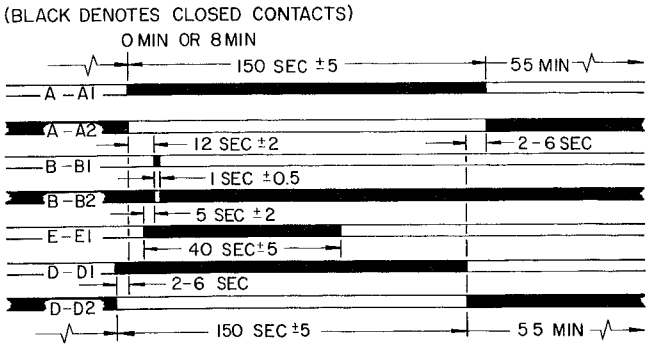
Bring the conduit from the valve thru one of the provided knockouts in the lower left corner of the control box. Connect the two wires to terminals 45 and 48 on TB3 (Fig. 5).

Timer Functions (See Chart, Fig. 11)

→ 1. Switch A (contacts A-A1 and A-A2) provides Time Guard function. Start of either compressor is delayed approximately 5.5 minutes after shutoff. The minimum time between starts of either compressor is 8 minutes; the second compressor will start in a minimum of 12 seconds after the first one starts.

2. Switch B (contacts B-B1 and B-B2) starts compressor and energizes liquid line solenoid valve (LLS). Contacts B-B1 provide part-winding start for applicable compressor motors. Simultaneously, timer relay (TR) is energized thru switch E.

3. Switch E (contacts E-E1) provides approximately 40-second bypass of oil pressure switch (OPS) at start-up. Also, this switch provides internal motor protection lockout of control circuit.
4. Switch D (contacts D-D1) bypasses the low-pressure switch (LPS) for 2.5 minutes for winter start control.



→ **Fig. 11 — Timer Cycle**

Sequence of Operation (Refer to Fig. 11 and label diagram on unit.)

At initial start-up, assume all safety devices are satisfied, the water temperature controller (WTC) is calling for full cooling capacity and all instructions on the warning label have been followed.

When control circuit switch (SW1) is turned on, the timer motor starts. The condenser fans start immediately to allow removal of warm air from condensers, thus preventing compressor shutdown on high head pressure. Time Guard delays start of no. 1 compressor from 12 seconds to approxi-
→ mately 8 minutes, depending on position of timer. Crankcase heater is de-energized when compressor starts. Compressor no. 2 will start in a minimum of 12 seconds after no. 1 starts. The liquid line solenoid valve (LLS) in each circuit opens when the compressor in that circuit starts. Timer switch contacts E-E1 open approximately 35 seconds after the compressor starts. If sufficient oil pressure builds up within these 35 seconds, the oil pressure switch (OPS) closes and compressor continues to run. If oil pressure is not high enough after 35 seconds to close OPS, compressor stops and control circuit locks out. The control circuit reset button (RB) must be depressed to reenergize the circuit. If the compressor in the other circuit has started, it will not be affected by this action. At start-up, if compressor no. 1 is off on high pressure or motor protection (CMP), compressor no. 2 cannot start. However, if both compressors are running, and either one shuts down on safety device action, the other will continue to run as long as the WTC thermostat calls for cooling.

→ With unit operating normally, WTC opens and closes water temperature switches (WTS) to unload and load cylinders and cycle compressors in response to load requirements. *As load decreases, WTC switches open in descending sequence* as follows (begin sequence at full load):

WTS4 (step 4) opens: CU is energized and compressor no. 1 unloads. Compressor no. 2 is running.

WTS3 (step 3) opens: Compressor no. 1 loads and compressor no. 2 stops. LLS2 closes.

WTS2 (step 2) opens: CU is energized and compressor no. 1 unloads. If used, accessory hot gas bypass solenoid valve (HGS) is energized.

WTS1 (step 1) opens when return water temperature reaches design set point (44 F). Compressor no. 1 stops, LLS1 closes and unit shuts off.

On load increase, WTC switches close in ascending sequence.

TROUBLESHOOTING

SYMPTOMS	CAUSE	REMEDY
Compressor does not run	Power line open	Reset circuit breaker
	Control circuit breaker tripped	Check control circuit for ground or short and repair. Reset breaker.
	Safety thermostat tripped	Reset thermostat
	Tripped starter overloads	Check the controls Find cause of trip and reset overloads
	Contactor stuck open	Replace contactor
	Loose terminal connection	Check connections
	Improperly wired controls	Check wiring and rewire
	Low line voltage	Check line voltage — determine location of voltage drop and remedy deficiency
	Compressor motor defective	Check motor winding for open or short Replace compressor, if necessary
	Seized compressor	Replace compressor
Compressor stops on low-pressure control	Low-pressure control erratic in action	Raise differential setting Check capillary for pinches Replace control
	Compressor suction valve leaking	Replace valve plate
	Compressor suction shutoff valve partially closed	Open valve
	Low refrigerant charge	Add refrigerant
	Plugged compressor suction strainer	Clean strainer
Compressor cycles on high-pressure control	High-pressure control erratic in action	Check capillary tube for pinches Set control as required
	Compressor discharge valve partially closed	Open valve, or replace if defective
	Air in system	Purge
	Condenser fan(s) not operating	Check motor and wiring Repair or replace if defective
Unit operates long or continuously	Low refrigerant charge	Add refrigerant
	Control contacts fused	Replace control
	Air in system	Purge
	Partially plugged or plugged expansion valve or strainer	Clean or replace
	Defective insulation	Replace or repair
	Service load	Keep doors and windows closed
	Inefficient compressor	Check valves, replace if necessary

SYMPTOMS	CAUSE	REMEDY
System Noises	Piping Vibration	Support piping as required Check for loose pipe connectors
	Expansion valve hissing	Add refrigerant Check for plugged liquid line strainer
	Compressor noisy	Check valve plates for valve noise Replace compressor (worn bearings) Check for loose compressor hold-down bolts
Compressor loses oil	Leak in system	Repair leak
	Plugged or stuck compressor snifter valve	Repair or replace
	Crankcase heaters not energized during shutdown	Replace heaters, check wiring
Frosted or sweating suction line	Expansion valve admitting excess refrigerant	Adjust expansion valve
Hot liquid line	Shortage of refrigerant due to leak	Repair leak and recharge
	Expansion valve opens too wide	Adjust expansion valve
Frosted liquid line	Restricted filter-drier	Remove restriction or replace filter-drier
Compressor will not unload	Burned out coil	Replace coil
	Leaky bypass piston	Clean or replace
	Stuck needle valve	Clean
	Miswired solenoid	Wire correctly
	Plugged bypass port (low side)	Clean
	Weak bypass piston spring	Replace
Compressor will not load	Damaged bypass piston	Replace
	Stuck needle valve	Clean
	Miswired solenoid	Wire correctly
	Plugged bypass port strainer (high side)	Clean
High Suction	Stuck check valve in valve plate	Examine check valve components, clean or replace as necessary.
Chattering unloader	Stuck check valve in valve plate	Examine check valve components Clean or replace as necessary.

For replacement items use Carrier Specified Parts

Manufacturer reserves the right to change any product specifications without notice.

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