TRANE®
AIR CONDITIONING

FILE:
TRANE REFRIGERATION PRODUCTS
LIQUID CHILLER - CENTRIFUGAL
CenTraVac
CVAA
Wiring

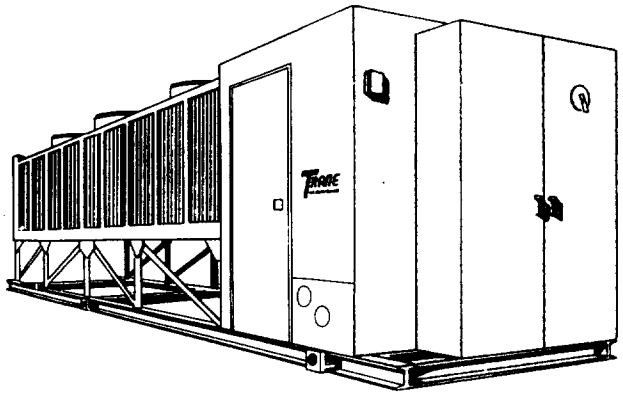
LITERATURE FILE NO.

CVAA-W-1

WIRING

Since The Trane Company has a policy of continuous product improvement, it reserves the right to change specifications and design without notice. The installation and servicing of the equipment referred to in this booklet should be done by qualified experienced technicians.

AUGUST, 1976
SUPERSEDES CVAA-W-1
DATED MAY, 1975



AIR COOLED CENTRAVAC®
LIQUID CHILLER - CENTRIFUGAL

MODELS CVAA-130
CVAA-160
CVAA-180
CVAA-210
CVAA-270
CVAA-320

MODEL NUMBER DESCRIPTION

CV A A - 130 B - AA - 1 A 10

CV — CenTraVac

A — Air Cooled Gear Driven

A — Development Sequence

130 — Nominal Capacity
130 Ton 210 Ton
160 Ton 270 Ton
180 Ton 320 Ton

B — Nominal Voltage

	Compressor Motor	Fan & Pump Motor
A	200V 60HZ	200V 60HZ
B	460V 60HZ	460V 60HZ
C	575V 60HZ	575V 60HZ

AA — Design Sequence

1 — Ambient
1 Std Amb 20F and above
2 Low Amb 0F and above

A — Condenser
A - Aluminum Fins
C - Copper Fins

10 — Evaporator
01 150# 2 Pass LH
02 150# 2 Pass RH
03 150# 3 Pass LH & RH
04 150# 4 Pass LH
05 150# 4 Pass RH
06 300# 2 Pass LH
07 300# 2 Pass RH
08 300# 3 Pass LH & RH
09 300# 4 Pass LH
10 300# 4 Pass RH

COMMERCIAL AIR CONDITIONING DIVISION
LA CROSSE, WISCONSIN 54601
PRINTED IN U.S.A.

Table 1 - Electrical Data

MODEL	UNIT CHARACTERISTICS (1)					COMPRESSOR		CONDENSER FAN MOTORS		
	LINE VOLTS (2)	VOLTAGE UTILIZATION RANGE	MINIMUM CIRCUIT AMPACITY (3)	MAX FUSE (4)	REC. TIME DELAY FUSE (5)	NAMEPLATE RLA*	LRA (6)	NO.	NAMEPLATE FLA EACH	ACTUAL KW EACH
CVAA-130 STD.	200	180-220	846	1200	800	593	3560	2	47.0	8.3
CVAA-130 LOW AMB.	200	180-220	867	1200	800	593	3560	2	47.0	8.3
CVAA-130 STD.	460	414-506	367	600	350	257	1540	2	20.5	8.3
CVAA-130 LOW AMB.	460	414-506	376	600	350	257	1540	2	20.5	8.3
CVAA-130 STD.	575	517-633	295	500	300	206	1360	2	16.5	8.3
CVAA-130 LOW AMB.	575	517-633	302	500	300	206	1360	2	16.5	8.3
CVAA-160 STD.	200	180-220	910	1200	800	644	3560	2	47.0	9.9
CVAA-160 LOW AMB.	200	180-220	930	1200	800	644	3560	2	47.0	9.9
CVAA-160 STD.	460	414-506	396	600	400	280	1540	2	20.5	9.9
CVAA-160 LOW AMB.	460	414-506	405	600	400	280	1540	2	20.5	9.9
CVAA-160 STD.	575	517-633	317	500	300	224	1360	2	16.5	9.9
CVAA-160 LOW AMB.	575	517-633	324	500	300	224	1360	2	16.5	9.9
CVAA-180 STD.	200	180-220	1064	1600	1000	745	4270	2	62.0	12.5
CVAA-180 LOW AMB.	200	180-220	1085	1600	1000	745	4270	2	62.0	12.5
CVAA-180 STD.	460	414-506	463	700	450	324	1785	2	27.0	12.5
CVAA-180 LOW AMB.	460	414-506	472	700	450	324	1785	2	27.0	12.5
CVAA-180 STD.	575	517-633	371	600	350	259	1540	2	21.6	12.5
CVAA-180 LOW AMB.	575	517-633	378	600	350	259	1540	2	21.6	12.5
CVAA-210 STD.	200	180-220	1214	2000	1200	865	5340	2	62.0	15.5
CVAA-210 LOW AMB.	200	180-220	1235	2000	1200	865	5340	2	62.0	15.5
CVAA-210 STD.	460	414-506	528	800	500	376	2130	2	27.0	15.5
CVAA-210 LOW AMB.	460	414-506	537	800	500	376	2130	2	27.0	15.5
CVAA-210 STD.	575	517-633	423	700	400	301	1700	2	21.6	15.5
CVAA-210 LOW AMB.	575	517-633	430	700	400	301	1700	2	21.6	15.5
CVAA-270 STD.	200	180-220	1434	2000	1500	1025	6210	3	47.0	11.5
CVAA-270 LOW AMB.	200	180-220	1455	2000	1500	1025	6210	3	47.0	11.5
CVAA-270 STD.	460	414-506	636	1000	600	455	2480	3	20.5	11.5
CVAA-270 LOW AMB.	460	414-506	645	1000	600	455	2480	3	20.5	11.5
CVAA-270 STD.	575	517-633	509	800	500	364	1980	3	16.5	11.5
CVAA-270 LOW AMB.	575	517-633	516	800	500	364	1980	3	16.5	11.5
CVAA-320 STD.	200	180-220	1658	2500	1500	1170	7060	3	62.0	13.5
CVAA-320 LOW AMB.	200	180-220	1678	2500	1500	1170	7060	3	62.0	13.5
CVAA-320 STD.	460	414-506	728	1200	800	514	3080	3	27.0	13.5
CVAA-320 LOW AMB.	460	414-506	736	1200	800	514	3080	3	27.0	13.5
CVAA-320 STD.	575	517-633	583	800	600	411	2460	3	21.6	13.5
CVAA-320 LOW AMB.	575	517-633	590	1000	600	411	2460	3	21.6	13.5

1. UNIT CHARACTERISTICS REFER TO ENTIRE UNIT MAIN POWER SUPPLY. ALL MODELS REQUIRE SEPARATE SOURCE 230V SINGLE PHASE 3 WIRE SUPPLY AS FOLLOWS:

VOLTAGE	MINIMUM CIRCUIT AMPACITY	MAX. FUSE	REC. TIME DELAY FUSE (CLASS K5)
230	50	50	50

ALL UNIT AMPS INCLUDE POWER FOR OIL PUMP AND CONTROLS, LOW AMBIENT UNITS INCLUDE REFRIGERANT PUMP.

2. LINE VOLTAGE 3 PHASE 60 HZ.
3. MINIMUM CIRCUIT AMPACITY PER N.E.C. 440-33.
4. MAX FUSE PERMITTED BY N.E.C. 440-22 IS 225% OF COMPRESSOR RLA PLUS REMAINING AUXILIARY FLA.
5. RECOMMENDED TIME DELAY FUSES SIZED AT APPROX. 125% OF COMPRESSOR RLA PLUS REMAINING AUXILIARY FLA. (CLASS J OR CLASS L FUSES)
6. LOCKED ROTOR AMPS IN DELTA CONNECTION.

*RATED LOAD AMPS.

Table 2 - Electrical Connection Data

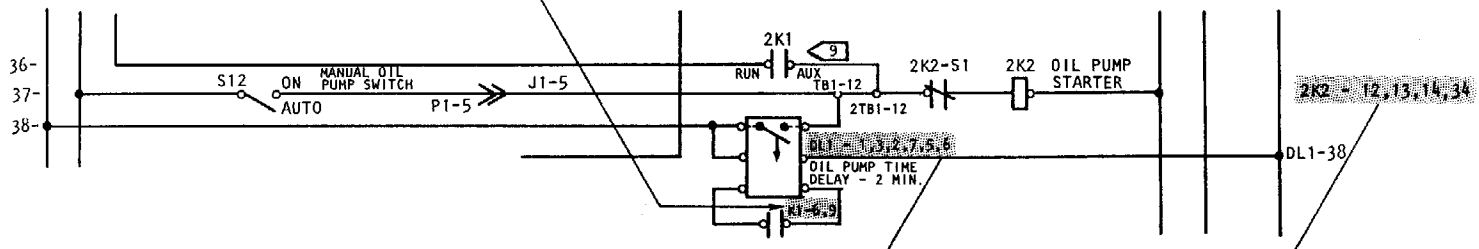
UNIT SIZE	VOLTAGE	WIRES/ PHASE	WIRE SIZE RANGE (CU/AL)	
			MIN.	MAX.
130	200	4	4/0	500 MCM
	460	2	3/0	250 MCM
	575	1	250 MCM	500 MCM
160	200	4	4/0	500 MCM
	460	2	3/0	250 MCM
	575	2	3/0	250 MCM
180	200	4	4/0	500 MCM
	460	2	250 MCM	500 MCM
	575	2	3/0	250 MCM
210	200	4	4/0	500 MCM
	460	2	250 MCM	500 MCM
	575	2	250 MCM	500 MCM
270	200	4	500 MCM	*600 MCM
	460	3	3/0	400 MCM
	575	2	250 MCM	500 MCM
320	200	4	500 MCM	*600 MCM
	460	3	3/0	400 MCM
	575	2	250 MCM	500 MCM

*COPPER (CU) ONLY

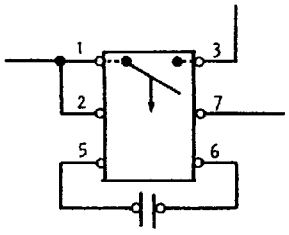
NOTE: LUG SIZES ARE THE SAME FOR STANDARD AND LOW AMBIENT.

DESCRIPTION OF AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) DRAWING SYSTEM

The designation K1-6,9 refers to a pair of relay contacts connected to Terminals 6 and 9 of Relay K1.



The numbers following DL1 designate terminal numbers. They are numbered from left to right and top to bottom, as indicated on sketch below.



The designation 2K2-12, 13, 14, 34 refers to the fact that the oil pump starter coil (2K2) has normally open contacts on lines 12,13,14 and 34, found on the left side of the diagram. If the designation were 2K2-$\overline{16}$,24 it would signify a normally closed contact on Line 16 and a normally open contact on Line 24.

Electronic Controls

DL1 (Line 38) is an off-delay timer. Its purpose is to keep the oil pump motor energized for two minutes after the compressor has been de-energized to provide oil pressure during coast-down.

DL2 (Line 53) is an on-delay timer. Its purpose is to delay the start of the compressor while oil pressure builds up. When 115 volt power is fed to Terminal 2, a 14 second delay period is initiated. At the end of this period, a full 115 volts is allowed to pass through DL2.

DL3 (Line 57) is an anti-recycle time delay. Its purpose is to prevent a restart of the compressor within 30 minutes of the previous start.

DL4 (Line 61) is an instant-close time-to-open device. Its purpose is to keep control relay K6 (Line 61) energized during start-up until normal operating pressure in the evaporator can be established.

U1 (Lines 18 and 55) is an electronic capacity control. Its purpose is to signal the vane actuator 5A2 (Line 55) to position the compressor inlet vanes in response to leaving water temperature. The leaving water temperature is sensed by sensor 5R1 (Line 15). Current transformer 2T1 (Line 7) measures line current to the compressor motor and overrides the temperature sensor to reposition the inlet vanes to prevent motor overload. Included in this circuitry is the ability to select motor current from 40 to 100 percent full load current (demand limiter). The demand limit knob is on U1.

U4 (Lines 67 and 76) is a solid state motor temperature cutout. Its temperature sensors 5B1R1, -2, -3 are in the compressor motor windings.

S10 (Line 50) is also an ambient temperature switch but it closes its contacts to energize the liquid refrigerant pump starter 2K6 (Line 51) when ambient temperature falls below 35 F. This is provided on low ambient units only.

Sequence Of Operation

When the chilled water pump starter 6K1 is energized and chilled water flow is established, control power will pass through the flow switch 6S1 (Line 31) and chilled water pump starter interlock 6K1 to the system switch S1. With S1 in the "auto" position, power will pass through the system low ambient limit, S2, to the chilled water demand switch, S22. S22 has its sensor in the chilled water entering or leaving the evaporator. Upon a rise in water temperature, S22 will close and pass the starting signal on to the normally open contacts of control relays K6, K7, K8, K9 and K10 (Line 32). These relays must be energized by the various safety circuits (and manually reset if locked out) before the start signal can reach Terminal TB1-3 (Line 34). The start signal then passes through the vane actuator limit switch 5A2S1 (if vanes are in the closed position), through the low oil temperature switch 5S2B (if the oil temperature is high enough), through the contacts of the anti-recycle timer DL3 (if 30 minutes has elapsed since the previous start) and through the high system pressure start-inhibit switch S4A (if the condenser pressure is below a safe limit) to energize control relay K1.

One set of normally open contacts of K1 (Line 34) close to keep K1 energized during the anti-recycle timer timing period. A second set of normally open contacts of K1 (Line 41) close to energize the oil pump timer, DL1 (Line 38). DL1 contacts close to energize the oil pump starter 2K2 (Line 37). A third set of K1 contacts, normally closed (Line 58), open to initiate the two minute delay period of the low pressure override timer DL4.

When the oil pump starter 2K2 is energized, a set of auxiliary contacts of 2K2 (Line 34) close to energize the liquid refrigerant solenoid valve 5L1 (Line 34) and feed the start signal to the compressor start time delay DL2 (Line 53). After a 14 second delay, the start signal will pass through DL2 to energize control relay K3 and the compressor hour meter M1 (Line 55).

When K3 is energized, two sets of normally open K3 contacts (Lines 55 and 56) close to energize the compressor motor starter pilot relay 2K1 (Line 56). Another set of normally closed K3 contacts (Line 54) open to indicate a "start" on the number-of-starts counter M2 (Line 54). Another set of normally open K3 contacts (Line 56) close to initiate the 30 minute anti-recycle timer DL3. A final set of normally closed K3 contacts (Line 71) open to put control relay K6 under the control of the oil pressure control S19 (Line 72).

The compressor motor will now accelerate. Upon completion of the acceleration period, the auxiliary run contacts 2K1 (Line 36) close to keep the oil pump starter energized as long as the compressor starter remains closed. A second set of auxiliary run contacts 2K1 (Line 57) close to energize control relay K2. A set of normally open contacts of K2 (Line 15) close to complete the capacity control module, U1, circuitry allowing U1 to control the vane actuator 5A2 (Line 55) in response to the chilled water temperature sensor 5R1 (Line 15).

With the unit in operation, the condensing pressure will rise to close fan 1 condensing pressure switch S4B (Line 41). Control power will now pass through S4B and S5 to energize fan 1 starter 2K3 (Line 42). 2K3 auxiliary contacts (Line 40) will close to keep the fan starter energized. Ambient temperature switches S6 and S8 start and stop the other condenser fans.

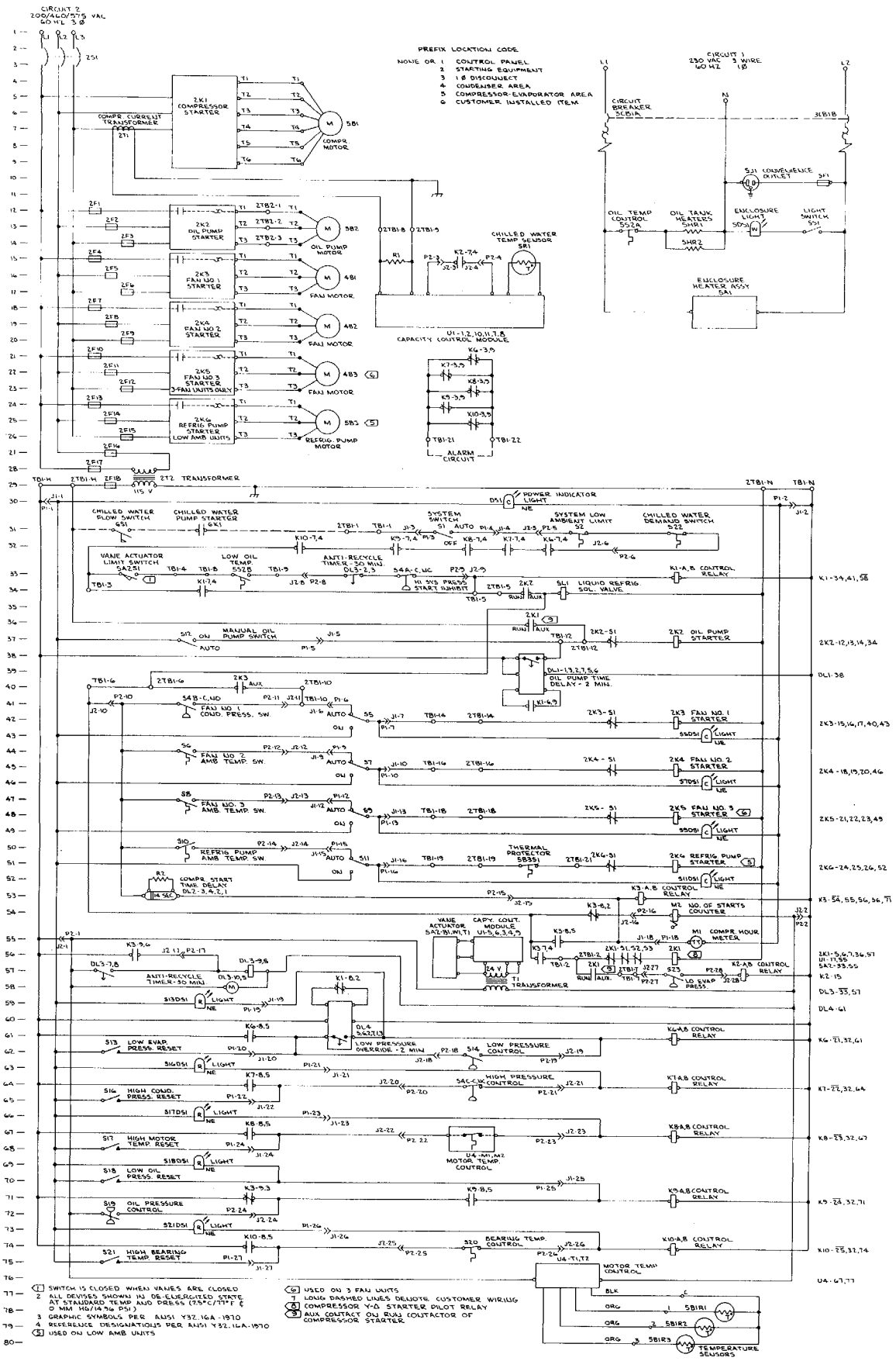


Figure 1 - Typical ANSI System Line Diagram
Air Cooled CenTraVac
Models CVAA-130 through CVAA-320

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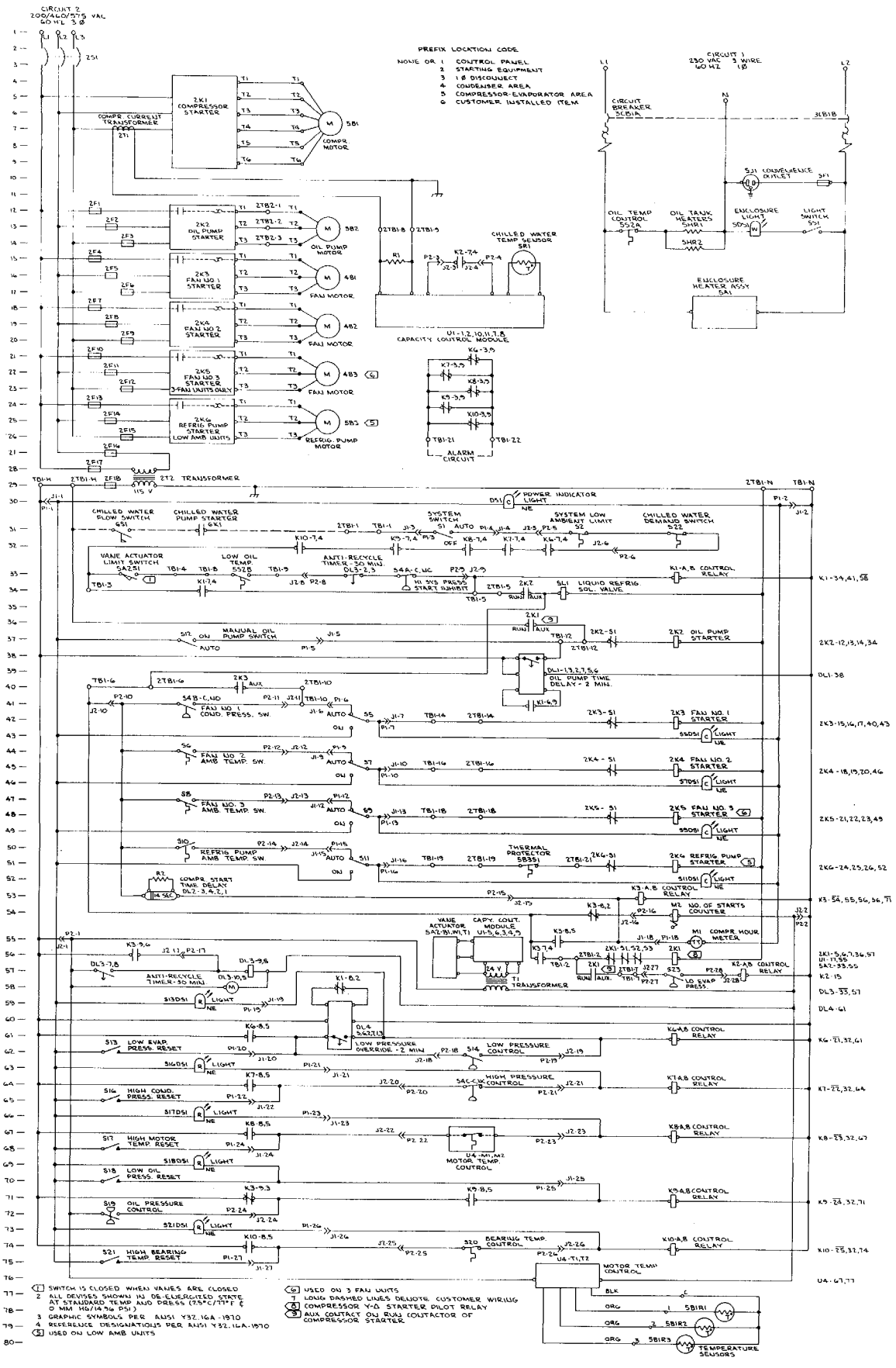

Figure 1 - Typical ANSI System Line Diagram
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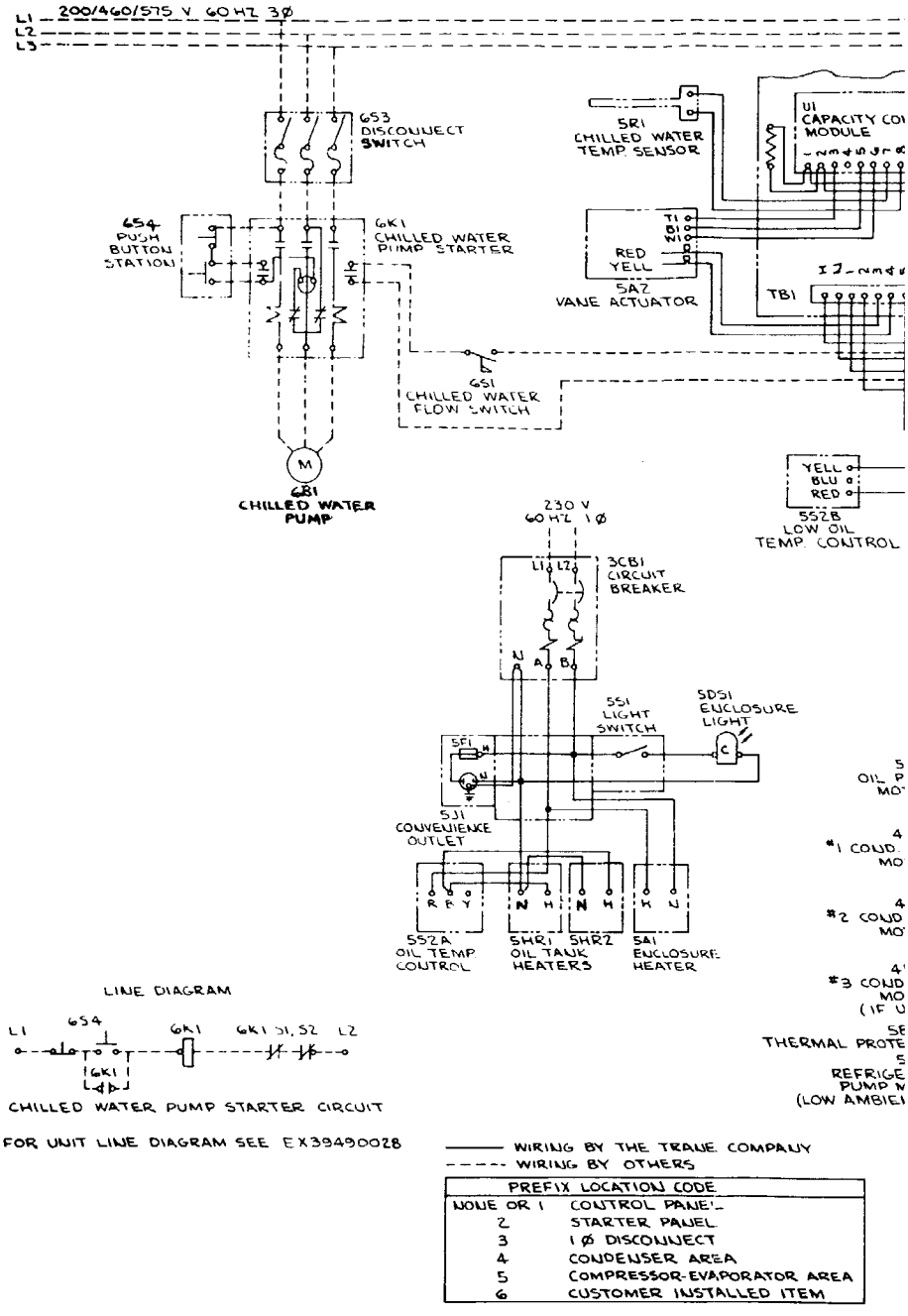

Figure 2 - Interconnecting Wiring Diagram
Air Cooled CenTraVac
Models CVAA-130 through CVAA-320

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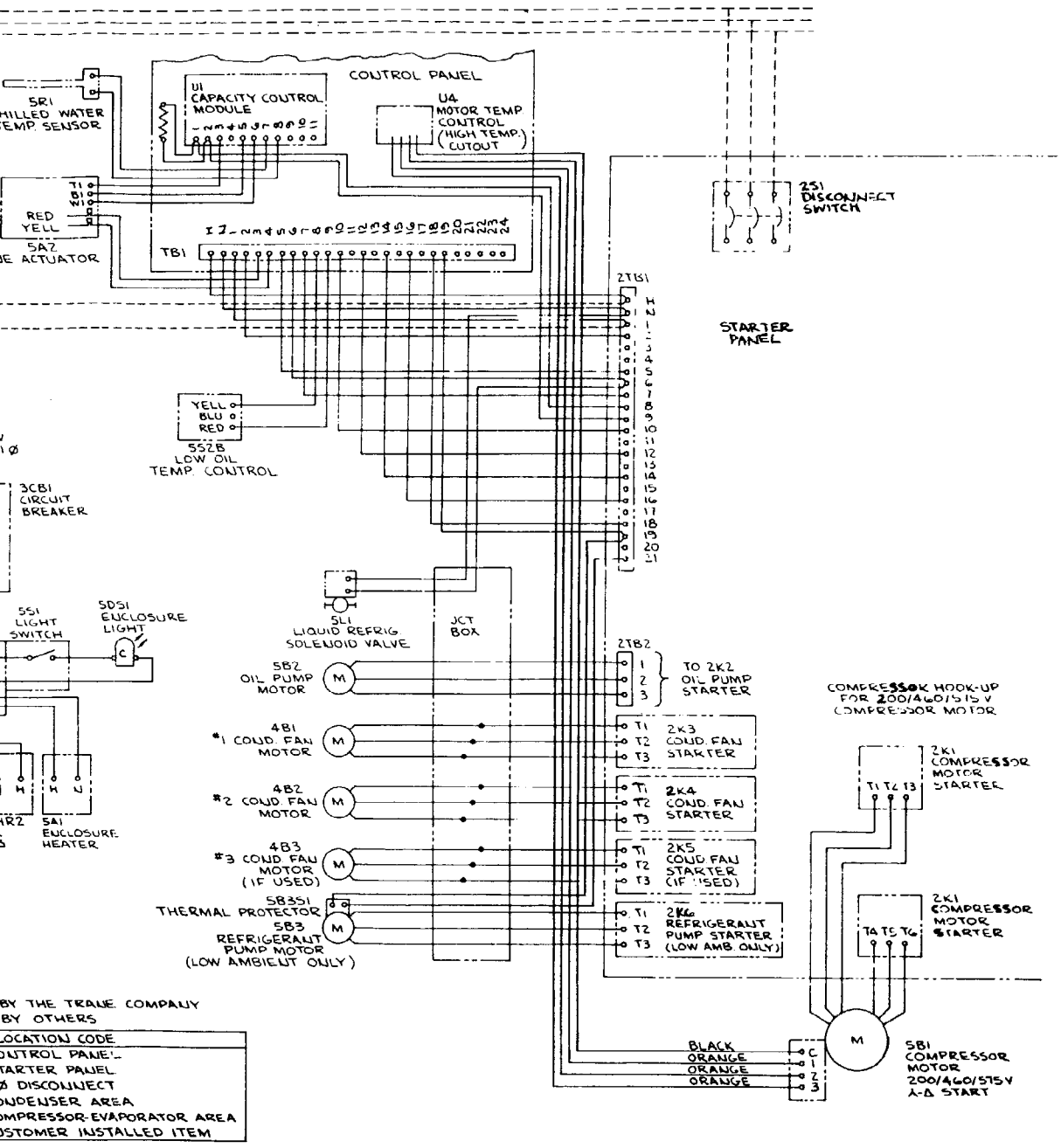

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