Installation - Electrical

CVHE-IN-11C

Library	**Service Literature**
Product Section	**Refrigeration**
Product	**Centrifugal Liquid Chillers, Water-Cooled**
Model	**CVHE, CVHF, CVHG Cooling Only & Heat Recovery**
Literature Type	**Electrical - Installation**
Sequence	**11C**
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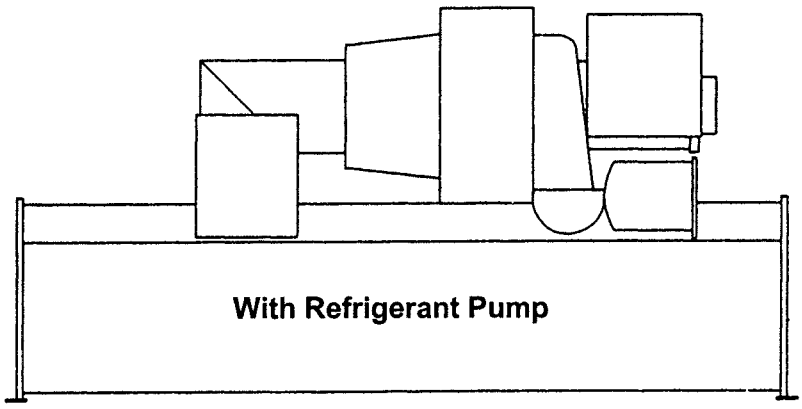
Supersedes	**SV-RF-CTV-CVHE-IN-11B-2000**

Three manuals ship together as Installation information:

CVHE-IN-9C - General Information
CVHE-IN-10C - Water Piping
CVHE-IN-11C - Electrical

Water Cooled CenTraVac®

Design Sequence	
CVHE "3G"	CVHE 60 HZ 230, 250, 280, 320, 360, 400, 450, 500
	CVHE 50 HZ 190, 210, 240, 270, 300, 330, 370, 420
CVHF "1T"	CVHF 60 HZ 350, 410, 485, 555, 640, 650, 770, 910, 1060, 1280, 1470, 1720
CVHG "1J"	CVHG 50 HZ 350, 410, 480, 565, 670, 780, 1067



With Refrigerant Pump

X39640505-04

Since the Trane Company has a policy of continuous product and product data improvement, it reserves the right to change design and specifications and without notice. Only qualified technicians should perform the installation and servicing of equipment referred to in this publication.

Warnings and Cautions

NOTICE

Warnings and Cautions appear at appropriate locations throughout this manual. Read these carefully.

WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices and where property-damage-only accidents could occur.

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Electrical

Note: Unit-mounted starters are available as an option on CVHE, CVHF, CVHG units with RLAs of 1315 amps or less, and with a nominal voltage of no more than 600 volts.

While this option eliminates most field-installed wiring requirements, the electrical contractor must still complete the electrical connection for: (1) Power supply wiring to the starter, (2) Other unit control options present, and (3) Any field-supplied control devices.

General Requirements

⚠ WARNING
LOCK SUPPLY POWER AND CHILLER DISCONNECT SWITCHES OPEN. Failure to do so could result in injury or death due to electrical shock or contact with moving parts.

As you review this manual, along with the wiring instructions presented in this section, keep in mind that:

Typical field connection requirements for remote-mounted starters are shown in fold-out drawings at the end of the manual, respectively, and summarized in Table 1.

All field-installed wiring must conform to NEC guidelines, as well as to any applicable state and local codes. Be sure to satisfy proper equipment grounding requirements per NEC.

Compressor motor electrical data including motor kw, voltage utilization range, rated load amps and locked rotor amps is listed in Tables 2 through 13 for your reference.

All field-installed wiring should be checked for proper terminations, and for possible shorts or grounds.

Note: The typical customer connection diagrams shown in this manual are representative of standard CVHE, CVHF CVHG units, and are provided only for general reference. Always refer to the actual wiring diagrams that shipped with the chiller for specific as built electrical schematic and connection information.

Adaptive Frequency Drive Option

The following information is recommended when installing a drive.

Do not cut Adaptive Frequency Drive enclosure to provide electrical access. Removable panels have been provided for this purpose. Modify these panels only; away from enclosure. Refer to installation information shipped with the adjustable frequency drive or submittal drawings.

⚠ WARNING
DO NOT CUT ADAPTIVE FREQUENCY DRIVE ENCLOSURE, debris falling inside drive may cause failure of electronic components.

Table 1
Field Wiring Requirements

Description of Wiring		
Power Supply Wiring	**Starter Panel Terminals**	**UCP Terminations**
Standard Wiring: (To Terminal Block)		
3-Phase Power Supply	2TB2: G, L3, L2, L1	n/a
Starter/Motor Junction Box Interconnection (Remote Starter Only)	T1 thru T6 (as applicable by Starter Type)	n/a
Alternate Wiring: (To Circuit Breaker)		
3-Phase Power Supply	2CB1: G, L3, L2, L1	n/a
120 VAC Control Wiring		
Standard Circuits		
Chilled Water Flow Proving	n/a	1TB-10, 12 (incl. 5S1, 5K1)
Condenser Water Flow Proving	n/a	1TB1-11, 13 (incl. 5S2, 5K2)
Chilled Water Pump Relay	n/a	1U1-J12-1,2
Condenser Water Pump Relay	n/a	1U1-J14-1,2
UCP Ground Connection	n/a	G
120V Power Supply to UCP	2TB1-1, 2TB1-2	1TB1-1, 1TB-2
High Pressure Cutout	2TB1-6, 2TB1-4	1TB1-5, 1TB1-9
Oil Pump Interlock	2TB1-8, 2TB1-9	1TB1-7, 1TB1-8
Optional Wiring		
Compressor Running Relay	n/a	1U1-J16-1, 2, 3
Alarm Relay MMR	n/a	1U1-J18-1, 2, 3
Alarm Relay MAR	n/a	1U1-J22-1, 2
Limit Warning Relay	n/a	1U1-J20-1, 2,
<30 VAC Control Wiring		
Optional Wiring		
External Autostop	n/a	1U1-J5, 1, 2
Emergency Stop	n/a	1U1-J5-3, 4
Outdoor Air Temp Sensor	n/a	1U1-J5-5, 6
External Condenser Pressure Output	n/a	1U2-J7-1, 2
External Heat Pump Control	n/a	1U1-J7-5, 6
Ext. Base Loading Setpoint	n/a	1U1-J7-11, 12
Options Module Wiring		
External Free Cooling Switch	n/a	1U5-J3-5, 6
External Ice Machine Control Enable	n/a	1U5-J3-7, 8
% RLA Output	n/a	1U5-J7-3, 4
External Current Limit Setpoint	n/a	1U5-J7-11, 12
External Chilled Water Setpoint	n/a	1U5-J9-4, 5
Ice Making Relay	n/a	1U5-J8-1, 2
Tracer Controlled Relay	n/a	1U5-J18-1, 2, 3

Power Supply Wiring

To assure that power supply wiring to the starter panel is properly installed and connected, review and follow the guidelines outlined below.

3-Phase Power Source

1. Verify that the starter nameplate ratings are compatible with the power supply characteristics and with the electrical data on the unit nameplate.

2. If the starter enclosure must be cut to provide electrical access, exercise care to prevent debris from falling inside the enclosure. If the starter cabinet has a removable panel, be sure to remove the panel from the unit before drilling holes.

CAUTION

TO AVOID DAMAGE TO STARTER COMPONENTS, remove debris inside the starter panel which may cause an electrical short that seriously damages the starter components.

3. Use copper conductors to connect the 3-phase power supply to the remote or unit-mounted starter panel.

CAUTION

TO AVOID CORROSION OR OVERHEATING, use only copper conductors for terminal connections.

4. Size the power supply wiring in accordance with NEC, using the RLA value stamped on the chiller nameplate and control power load on L1 and L2.

5. Make sure that the incoming power wiring is properly phased; each power supply conduit run to the starter must carry the correct number of conductors to ensure equal phase representation. See Figure 1.

6. As you install the power supply conduit, make sure that this position does not interfere with the serviceability of any of the unit components, nor with structural members and equipment.

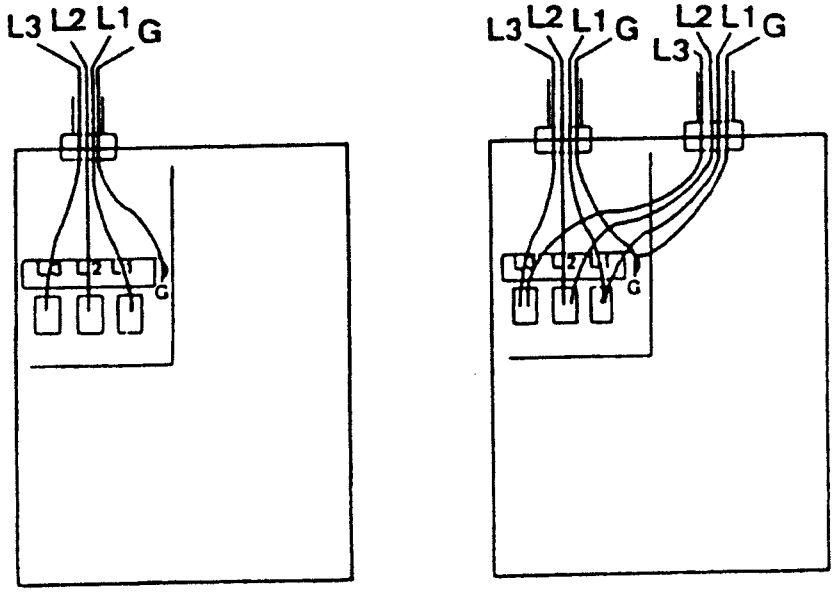
Also, assure that the conduit is long enough to simplify any servicing that may be necessary in the future (e.g., starter removal).

Note: Use flexible conduit to enhance serviceability and minimize vibration transmission.

Circuit Breakers and Fusible Disconnects

Size the circuit breaker or fuse disconnect in compliance with NEC or local guidelines.

Figure 1
Proper Phasing for Starter Power Supply Wiring



Optional PFCCs

Power factor correction capacitors (PFCCs) are designed to provide power factor correction for the compressor motor. They are available as an option.

Note: Remember that the PFCC nameplate voltage rating must be greater than or equal to the compressor voltage rating stamped on the unit nameplate. See Table 16 to determine what PFCC voltage rating is appropriate for each compressor voltage application.

⚠ CAUTION

PFCCS MUST BE WIRED INTO THE STARTER CORRECTLY! Misapplication of these capacitors could result in a loss of motor overload protection subsequently cause motor damage.

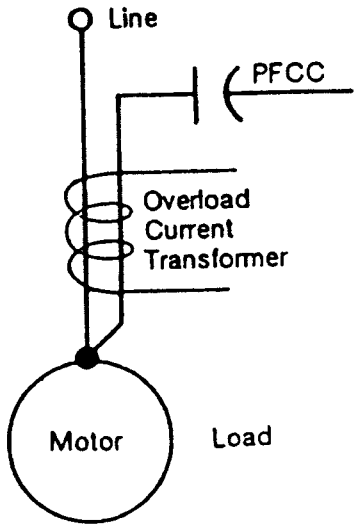
Table 2
PFCC Sizing per Compressor Voltage Application

PFCC Design Voltage	Compressor Motor Rating (See Unit Nameplate)
240/60Hz	208V/60Hz
480V/60Hz	380V/60Hz 440V/60Hz 460V/60Hz 480V/60Hz
600V/60Hz	575V/60Hz 600V/60Hz
2400V/60Hz	2300V/60Hz 2400V/60Hz

Table 2 Continued

PFCC Rating	Compressor Motor Rating (See Unit Nameplate)
480V/50 Hz	346V/50 HZ 380V/50 HZ 400V/50 Hz 415V/50 Hz
4160V/50Hz	3300V/50 Hz

Figure 2
PFCC Leads Routed through Overload Current Transformer



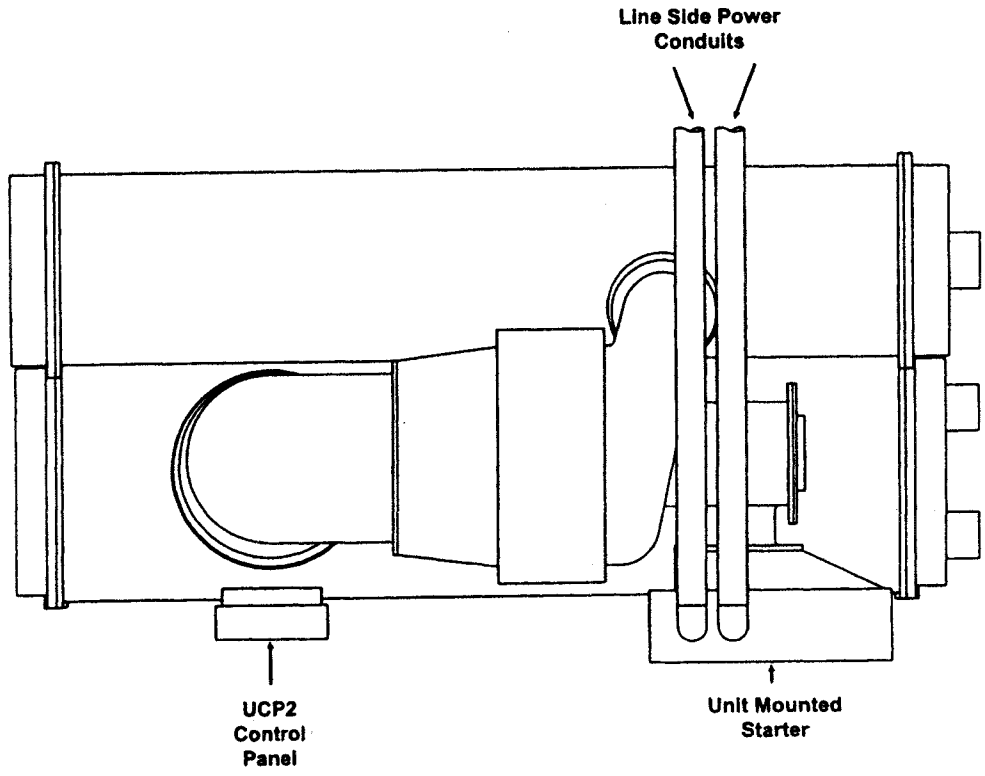
Note: See CTV-EB-44 for more details.

Interconnecting Wiring

Typical equipment room conduit layouts with and without unit-mounted starters are shown in Figures 3 and 4, respectively.

Keep in mind that the interconnecting wiring between the starter panel, compressor and UCP2 control panel is factory-installed with unit-mounted starters but must be field-installed when a remote-mounted starter is used.

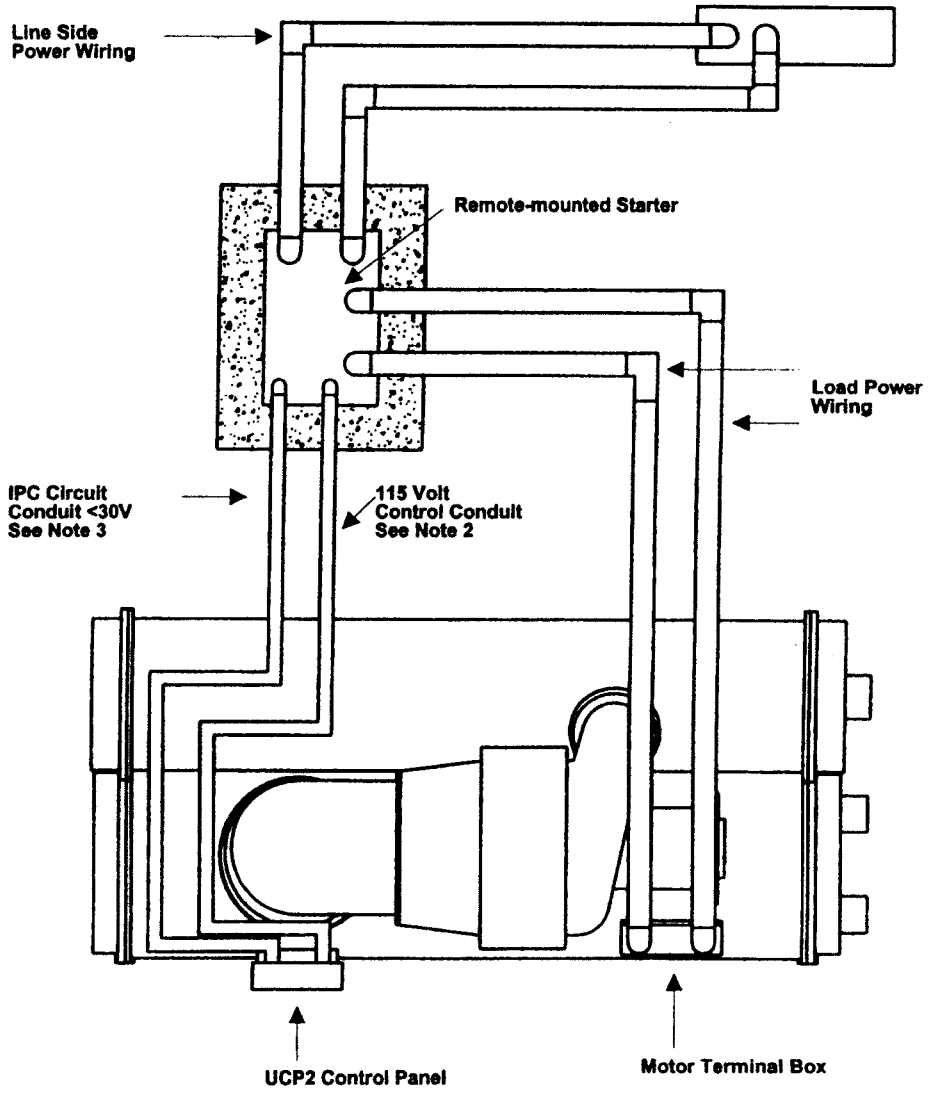
Figure 3
Typical Equipment Room Layout w/Unit-Mounted, Wye-Delta



Note:
See Starter submittal drawing for location of incoming wiring to the starter.

⚠ CAUTION
TO PREVENT DAMAGE TO THE UCP'S COMPONENTS, do not route control circuit conduit into the top of the UCP enclosure.

Figure 4
Typical Equipment Room
Layout w/Remote-Mounted Wye-Delta Starter



⚠ CAUTION
DO NOT ROUTE CONTROL CIRCUIT CONDUIT INTO THE TOP OF THE UCP ENCLOSURE. Failure to follow the above caution, could result in damage to the UCP components.

Notes:
1. Refer to the unit field connection diagram for approximate UCP knockout locations.
2. 115-Volt conduit must enter the right back portion of the unit control panel.
3. IPC circuit conduit must enter the left back portion of the UCP.
4. See starter submittal drawing for location of incoming wiring to the starter.

Starter to Motor (Remote-Mounted Starters Only)

Ground Wire Terminal Lugs. Ground wire lugs are provided in the motor terminal box and in the starter panel.

Terminal Clamps. Terminal clamps are supplied with the motor terminals to accommodate either bus bars or standard motor terminal wire lugs. Terminal clamps provide additional surface area to minimize the possibility of improper electrical connections.

Wire Terminal Lugs. Wire terminal lugs must be field-supplied.

1. Use field-provided crimp-type wire terminal lugs properly sized for the application.

Note: Wire size ranges for the starter line and load-side lugs are listed on the starter submittal drawings supplied by the starter manufacturer and/or Trane. Carefully review the submitted wire lug sizes for compatibility with the conductor sizes specified by the electrical engineer or contractor.

2. A terminal clamp with a 3/8" bolt is provided on each motor terminal stud; use the factory-supplied Belleville washers on the wire lug connections.

Figure 5 illustrates the juncture between a motor connection pad and the wire terminal lug.

3. Tighten each bolt to 24 foot-pounds.

4. Install but do not connect the power leads between the starter and compressor motor. (These connections will be completed under supervision of a qualified Trane service engineer after the prestart inspection).

Bus Bars. Install the bus bars between the motor terminals when a low-voltage "across-the-line", "primary reactor/resistor" or "auto transformer" is used.

Be sure to bus motor terminal T1 to T6, T2 to T4, and T3 to T5.

Note: Bus bars are not needed in high-voltage applications since only 3 terminals are used in the motor and starter.

Starter to UCP (Remote-Mounted Starters)

Electrical connections required between the remote-mounted starter and the chiller control panel are shown in drawing (end of manual). An example of a point-to-point starter-to-UCP connection schematic is shown at the end of the manual.

Note: Install 10 guage conduit between the right back portion when facing the front of the UCP and the starter for the 115-volt circuits; and between the left back portion of the UCP and the starter for the IPC circuit.

When sizing and installing the electrical conductors for these circuits, follow the guidelines listed.

CAUTION

KEEP INSIDE OF THE STARTER PANEL FREE FROM DEBRIS, failure to do so may cause an electrical short that seriously damages the starter components.

1. If the starter enclosure must be cut to provide electrical access, exercise care to prevent debris from falling inside the enclosure.

2. Use only shielded twisted pair for the IPC circuit between the starter and the UCP on remote mounted starters. Recommended wire is Beldon Type 8760, 18 AWG for runs up to 1000 feet.

Note: The polarity of the IPC wire pair is critical for proper operation.

3. Separate low-voltage (less than 30V) wiring from the 115V wiring by running each in its own conduit.

4. As you route the IPC circuit out of the starter enclosure, make sure that it is at least 6" from all wires carrying a higher voltage.

5. For UCP2 IPC shielded twisted pair wiring, the shield should be grounded on one end only at UCP2. The other end should be unterminated and taped back on the cable sheath to prevent any contact between shield and ground.

Refer to Figure 6 for wiring information on UCP2 Control Panel connections.

CAUTION

MAINTAIN AT LEAST 6 INCHES BETWEEN LOW-VOLTAGE (<30V) AND 115V CIRCUITS. Failure to do so could result in electrical noise that may distort the signals carried by the low-voltage wiring, including the IPC.

Purge Control Panel to UCP (Field installed purge only)

Install wiring between the purge control panel and the UCP for 115/volt circuits and the IPC circuits. See Figure 7 for wiring field installed purge.

Figure 5
Terminal Stud, Clamp and Lug Assembly

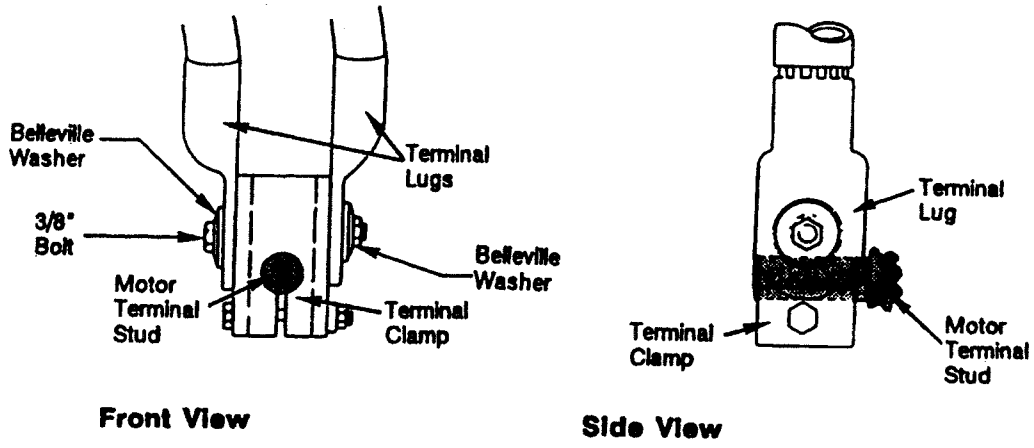


Figure 6
UCP2 Control Panel Connections

Trane supplied Remote Starter Connections

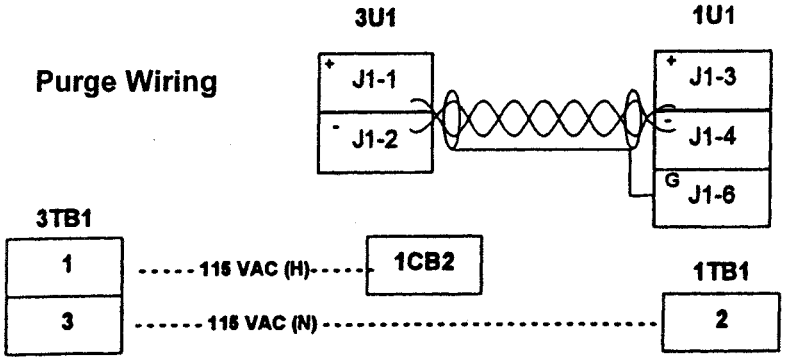
1TB1		2TB1
1	IF---115 VAC (H) ---	1
2	2C --- 115 VAC (N) ---	2
5	3D --- Run Relay ---	6
9	DC --- Start Relay ---	4
7	8C --- Oil Pump Interlock ---	8
8	9C --- Oil Pump Interlock ---	9

Note: See Manufacturer's Drawings for Starters by Others.

Trane supplied Adjustable Frequency Drive Connections

1TB1		2TB1
1	IF---115 VAC (H) ---	1
2	2C --- 115 VAC (N) ---	2
5	3D --- Run Relay ---	6
9	---- Start Relay ---	4
7	---- Oil Pump Interlock ---	7
8	---- Oil Pump Interlock ---	9

Figure 7
Field Installed Purge



Note: The polarity of the IPC wire pair is critical for proper operation.

UCP Electrical Specifications

Following is a list of constraints for the UCP2 in the control panel:

Note that the control panel is designed to receive input from the secondary of a power transformer in the starter panel.

1. **Nominal Voltage:** 115 VAC, with operating range of 98 to 132 VAC, inclusive.

2. **Maximum VA:** 4K VA (20-amp fuse) for units with the refrigerant pump

3. Power input wiring must be at least 6" from low-voltage, less than 30V wiring.

4. All signal inputs are low-voltage, less than 30V.

5. **UCP Storage Range:** -40 to 158F (-40C to 70C) i.e. not applicable for chiller.

Control Circuit Wiring

Interlock Circuits

Chilled Water Flow. Wire the evaporator water pump contactor (5K1) to a separate 120 volt single phase power supply with 14 AWG, 600 volt copper wire, then connect this circuit to 1U1-J12-1 and 2. This will allow the UCP to control the evaporator water pump, or wire the 5K1 contactor to operate remotely and independently of the UCP.

Wire the auxiliary contacts of the evaporator water pump contactor (5K1) in series with the flow switch (5S1) installed in the evaporator supply pipe. Use 14 AWG, 600-volt copper wire.

Connect this circuit to UCP terminals 1TB1-10 and 12.

When installed properly, the chilled water interlock circuit will only allow compressor operation if the evaporator pump is running and providing at least the minimum water flow required.

Condenser Water Flow. Wire the condenser water pump contactor (5K2) to a separate 120-volt, single-phase power supply with 14 AWG, 600-volt copper wire; then connect this circuit to UCP terminals 1U1-J14-1 and 2.

Next, use 14 AWG, 600-volt copper wire to connect the auxiliary contacts of the condenser water pump contactor (5K2) in series with the flow switch (5S2) installed in the condenser supply pipe.

Connect this circuit to UCP terminals 1TB-11 and -13.

When installed properly, the condenser water lock circuit will only allow the compressor to operate if the condenser pump is running and providing at least the minimum water flow required.

Temperature Sensor Circuits

1. All temperature sensors are factory installed except the optional outdoor air temperature sensor. Mount this sensor in the fresh air intake, or on a wall of the building out of direct sunlight.

2. If the leads on the sensor do not reach all the way back to the UCP:

   a. Route the sensor leads to a junction box mounted in a convenient location.

   b. Splice the leads to 14-18 AWG, 600 V wire of sufficient length inside the junction box.

   c. Route the added length of wire to the UCP in conduit (unless it is shielded).

3. Attach the outdoor air temperature sensor wires at 1U1-J5-5 and -6.

Note: If shielded cable is used to extend the sensor leads, be sure to tape off the shield wire at the junction box and ground it at the UCP. If the added length is run in conduit, do not run them in the same conduit with other circuits carrying 30 or more volts.

⚠ CAUTION

DO NOT ROUTE LOW-VOLTAGE SENSOR LEADS WITH OTHER CONDUCTORS CARRYING 30 OR MORE VOLTS. Failure to do so can result in sensor malfunction due to electrical noise.

4. All of the water temperature sensors used in the UCP control system are accurate to within ± 1.0°F, and are "matched" pairs.

The term "matched sensor pair" indicates that both sensors in a given pair, have the same accuracy. For example, a sensor that registers a temperature that is 0.5°F higher than the "actual" value is paired with another sensor that also registers 0.5 high.

If entering and leaving water temperature sensors are not "matched", the accuracy of the temperature readings displayed on the face of the UCP is reduced.

Optional Relay Circuits

Optional Control/Output Circuits: Install various optional wiring as required by the owner's specifications.

Optional Tracer Communication Interface

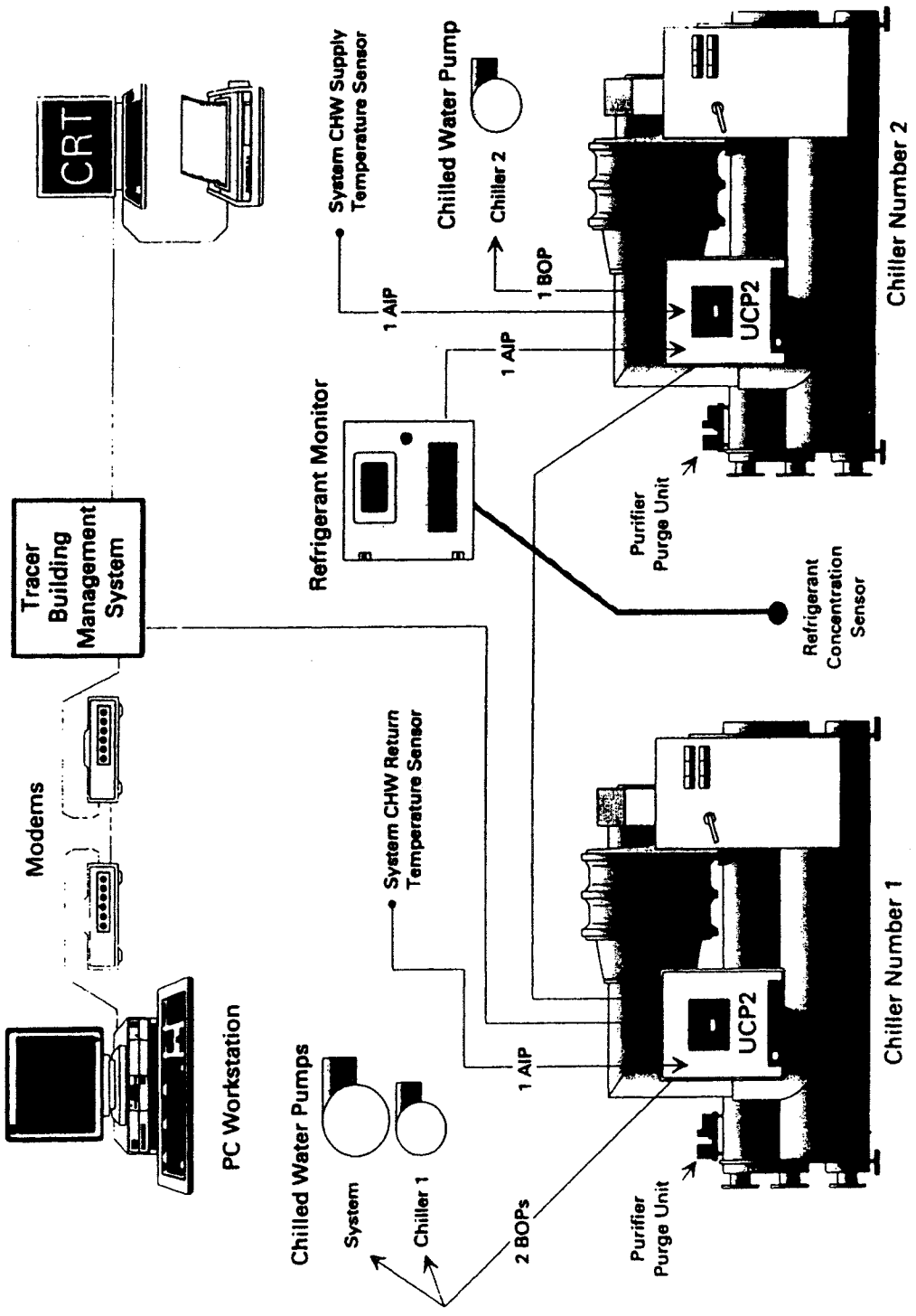
This control options allows the UCP to exchange information such as chiller status and operating set points with a Tracer system.

Figure 8 illustrates how such a communication/control network might appear.

Note: The circuit must be run in separate conduit to prevent electrical noise interference.

Additional information about the TCI option is published in the installation manual and operator's guide that ships with the Tracer.

Figure 8
Illustrates Communication/Control Network to Chiller Units with UCP2



Unit Start-Up

All phases of initial unit start-up must be conducted under the supervision of a qualified local service engineer. This includes pressure testing, evacuation, electrical checks, refrigerant charging, actual start-up and operator instruction.

Advance notification is required to assure that initial start-up is scheduled as close to the requested date as possible.

Forms Information

Samples of start-up and operating forms such as 1-27.08-6 and 1-27.90-5 along with other helpful forms are found in the CVHE-OM-8C or latest revision which can be obtained from the nearest Trane office.

It is recommended that the serviceman contact the local Trane office to obtain the most recent revision of a form. The forms in the operation and maintenance manual are only current at the date of printing of the manual.

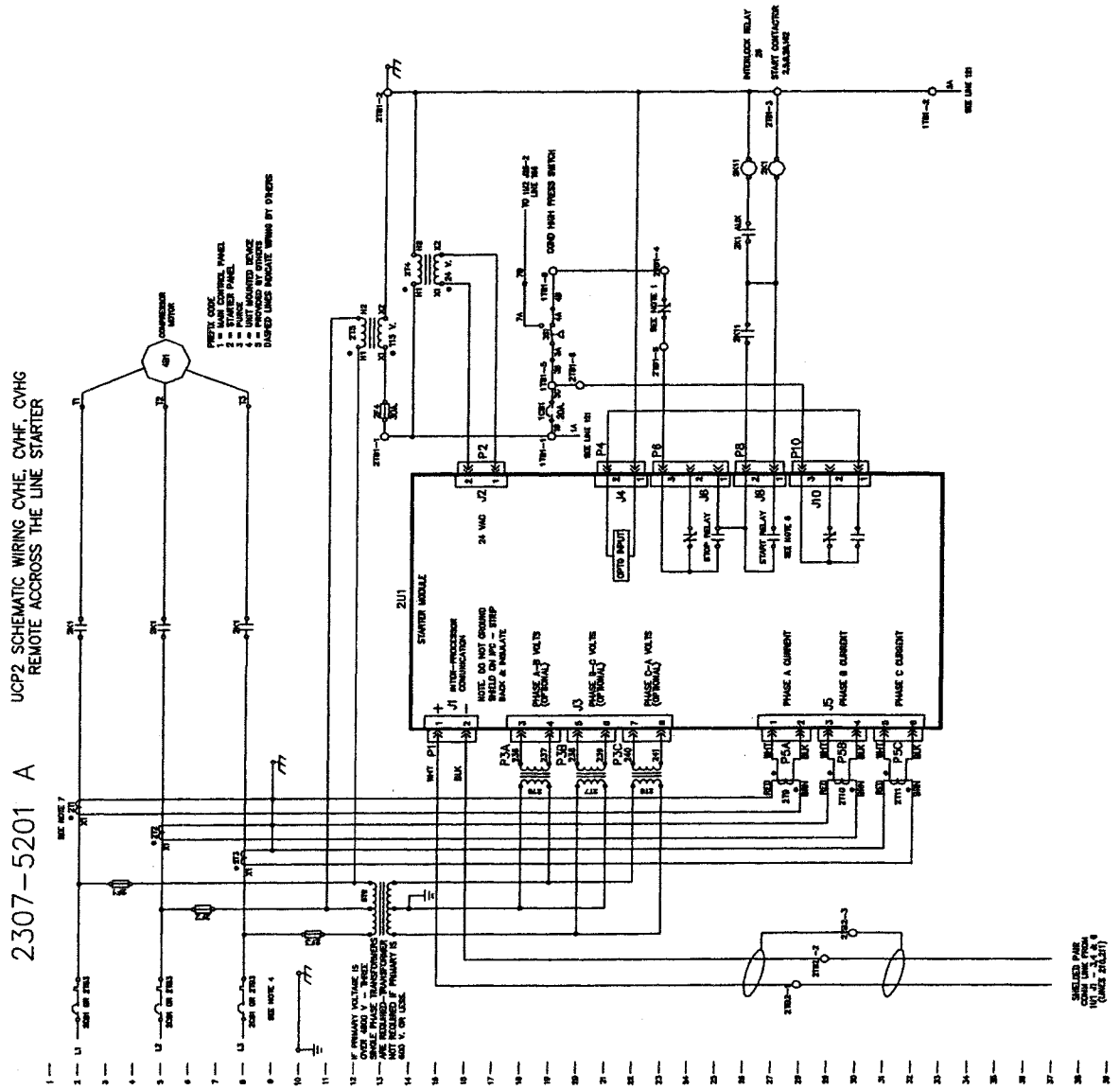
After obtaining the most recent form, complete all the information and forward it to your local Trane Company.

Wiring Addendum

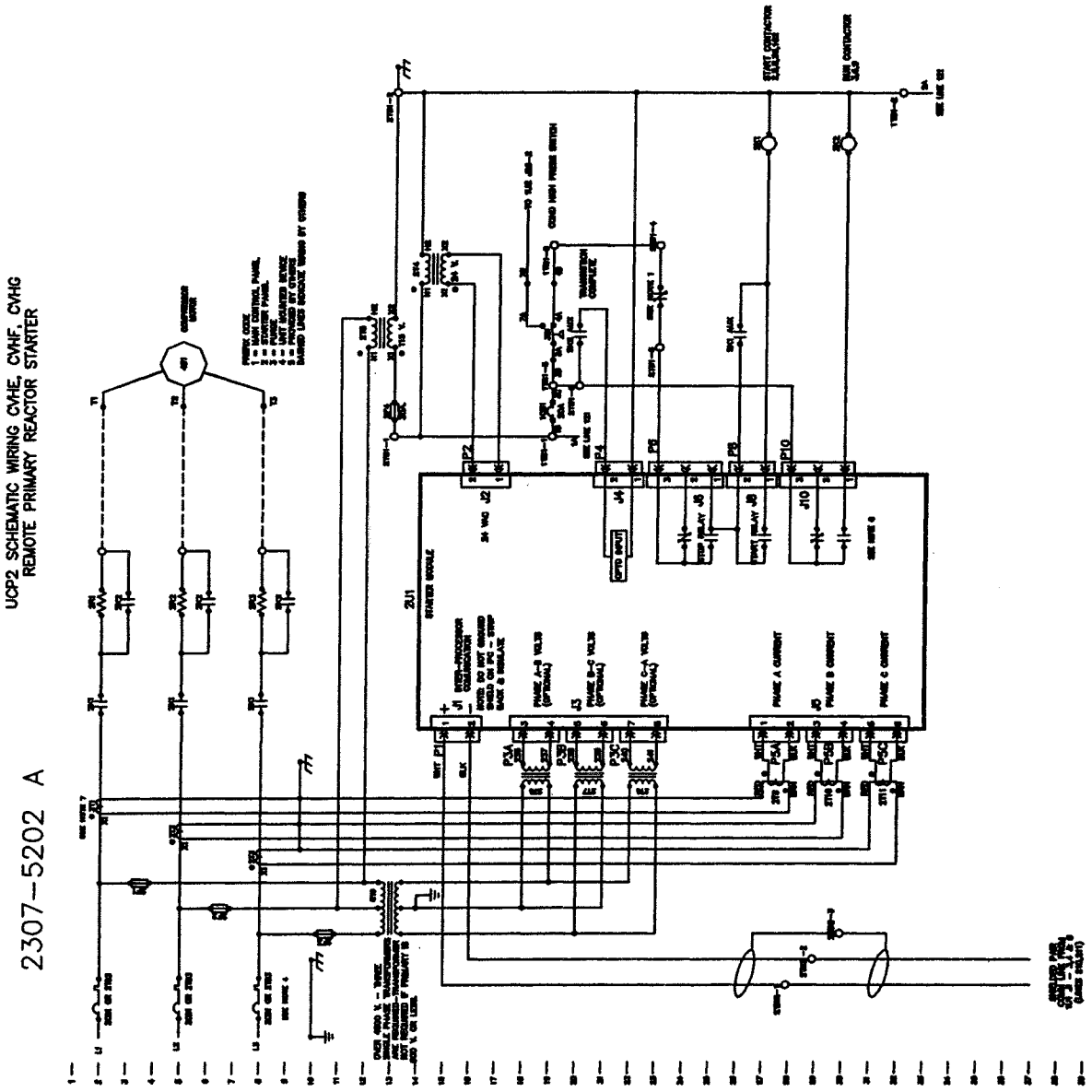
Type of Drawing	Drawing Number	Page Number
2307-5201-A	UCP2 Remote Across the Line Starter	16
2307-5202-A	UCP2 Remote Primary Reactor Starter	17
2307-5203-A	UCP2 Remote Auto Transformer Starter	18
2307-5204-A	UCP2 Remote Wye-Delta Starter	19
2307-5205-B	UCP2 Remote Adaptive Frequency Drive	20
2307-5206-B	UCP2 Customer Supplied Across the Line Starter	21
2307-5207-A	UCP2 Remote Mounted Solid State Starter	22
2307-5208-A	UCP2 Unit Mounted Solid State Starter	23
2307-5209-B	UCP2 Unit Mounted Wye-Delta Starter	24
2307-5210-B	UCP2 Customer Supplied Solid State Starter	25
2307-5211-B	UCP2 Customer Supplied Remote Mounted, Wye-Delta Starter, Primary Reactor or Auto Transformer Starter	26
2307-5212-A	UCP2 Purge Module	28 - 29
2307-5213-D	UCP2 Extended Capacity	30 - 31
2307-5214-C	UCP2 Chiller and Communications Modules	32 - 33
2307-5215-A	UCP2 Options, I.O. Module and Refrigerant Module	34 - 35
2307-5239A	UCP2 Connection Diagram w/Dual Actuators	36
2307-5239-B	UCP2 Connection Diagram w/Dual Actuators 1470, 1720	37

Important Note:
Always refer to the submittals and drawings that actually ship with the unit.

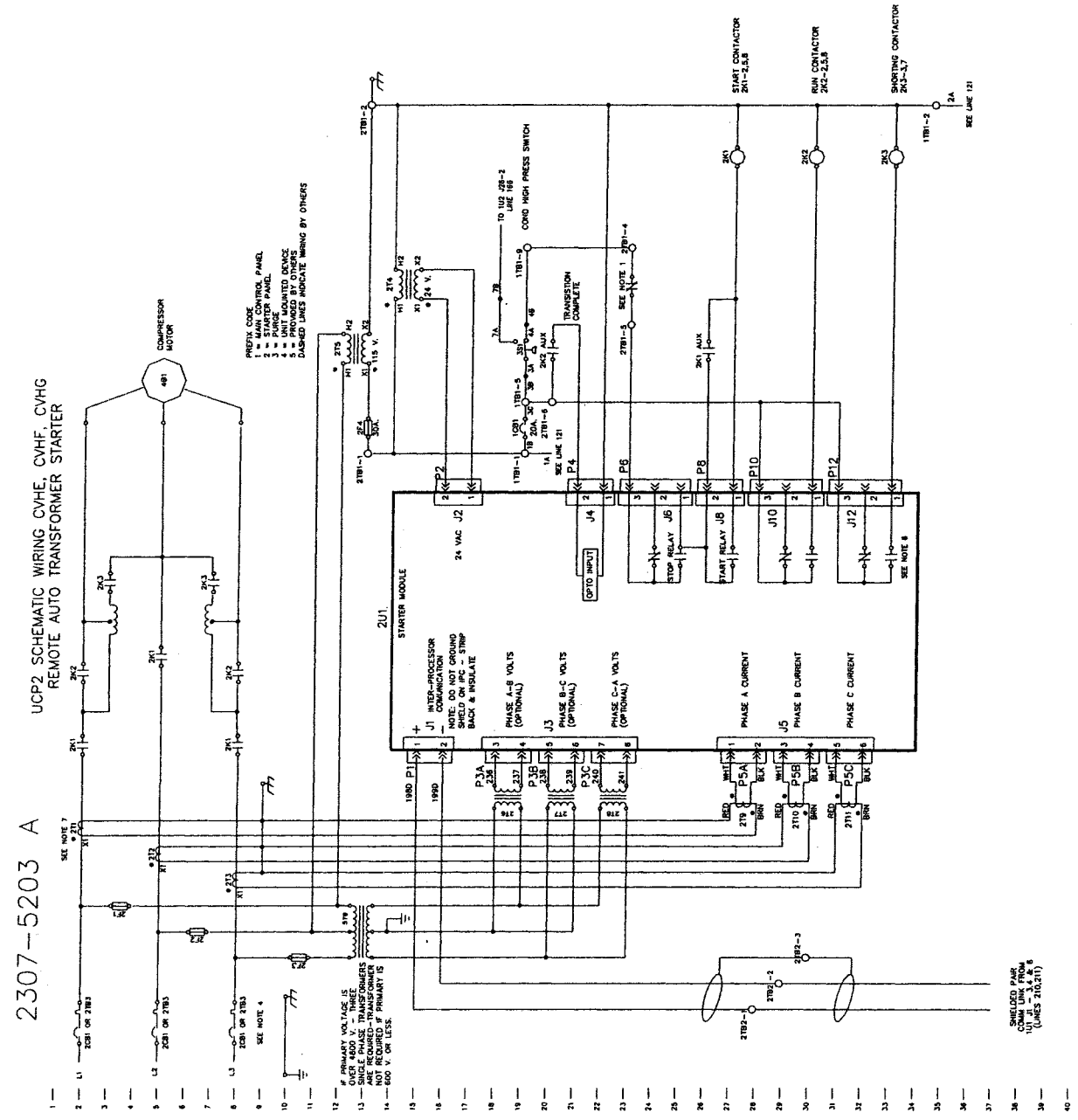
Wiring Drawing



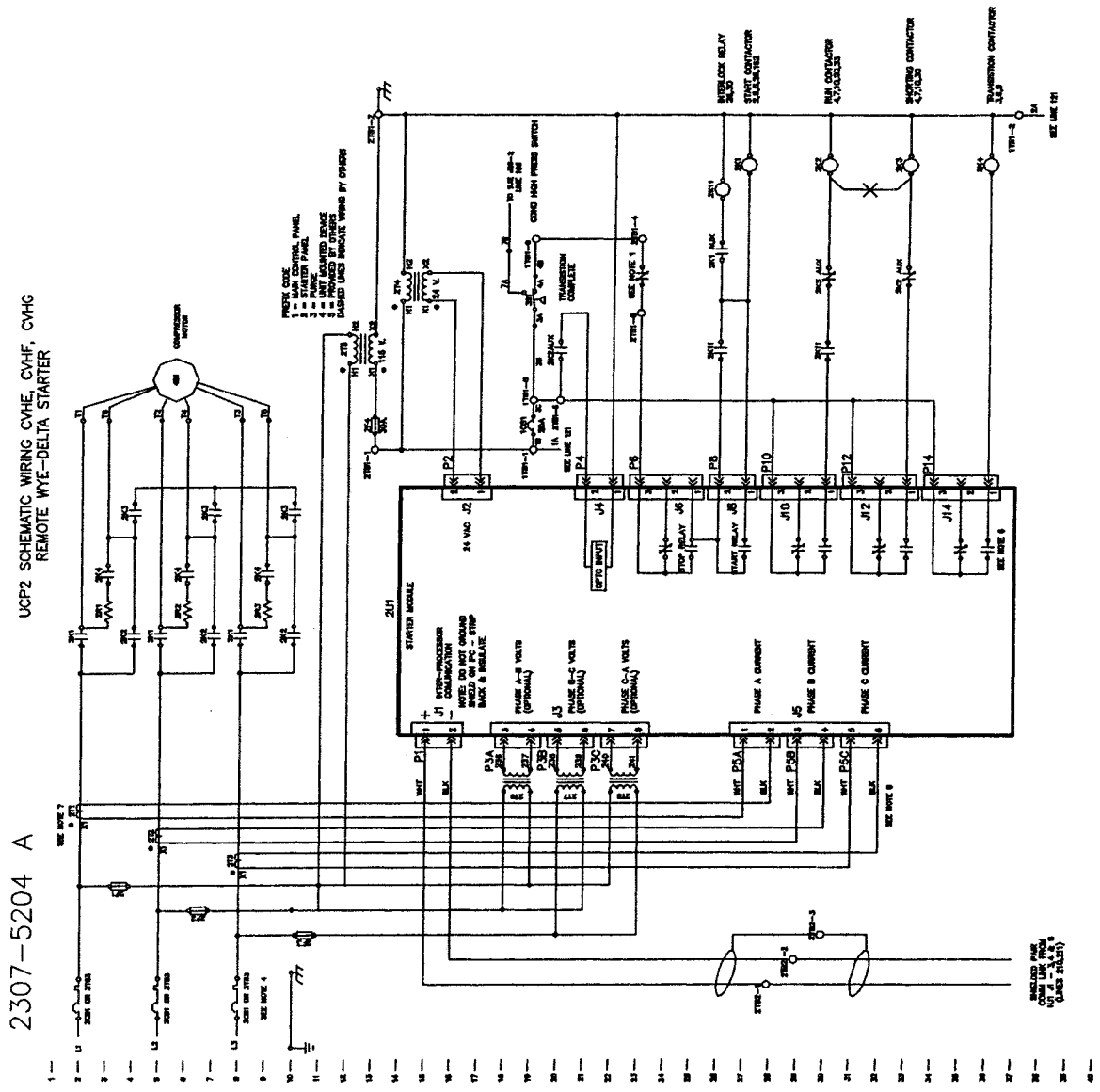
Wiring Drawing



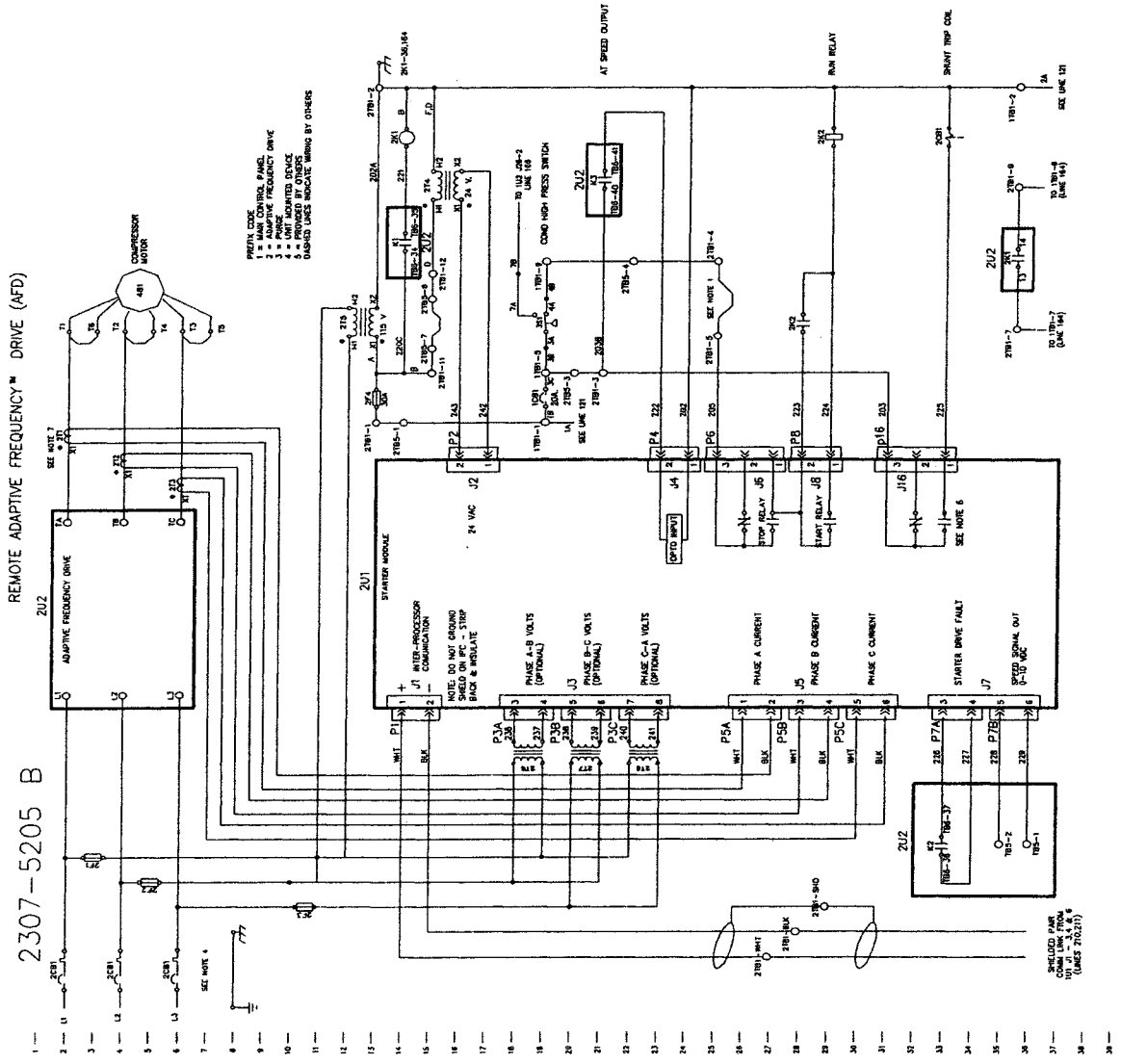
Wiring Drawing



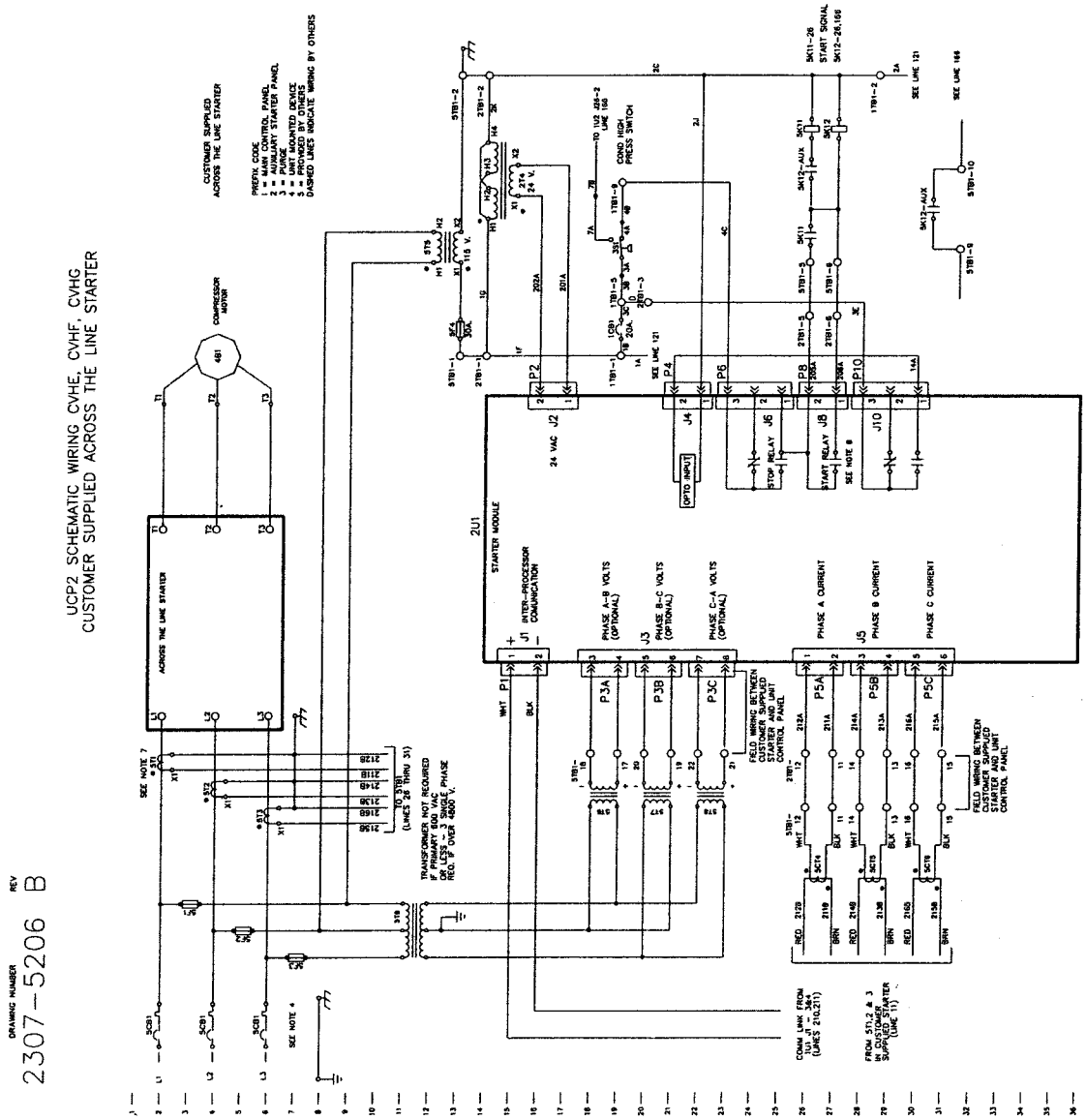
Wiring Drawing



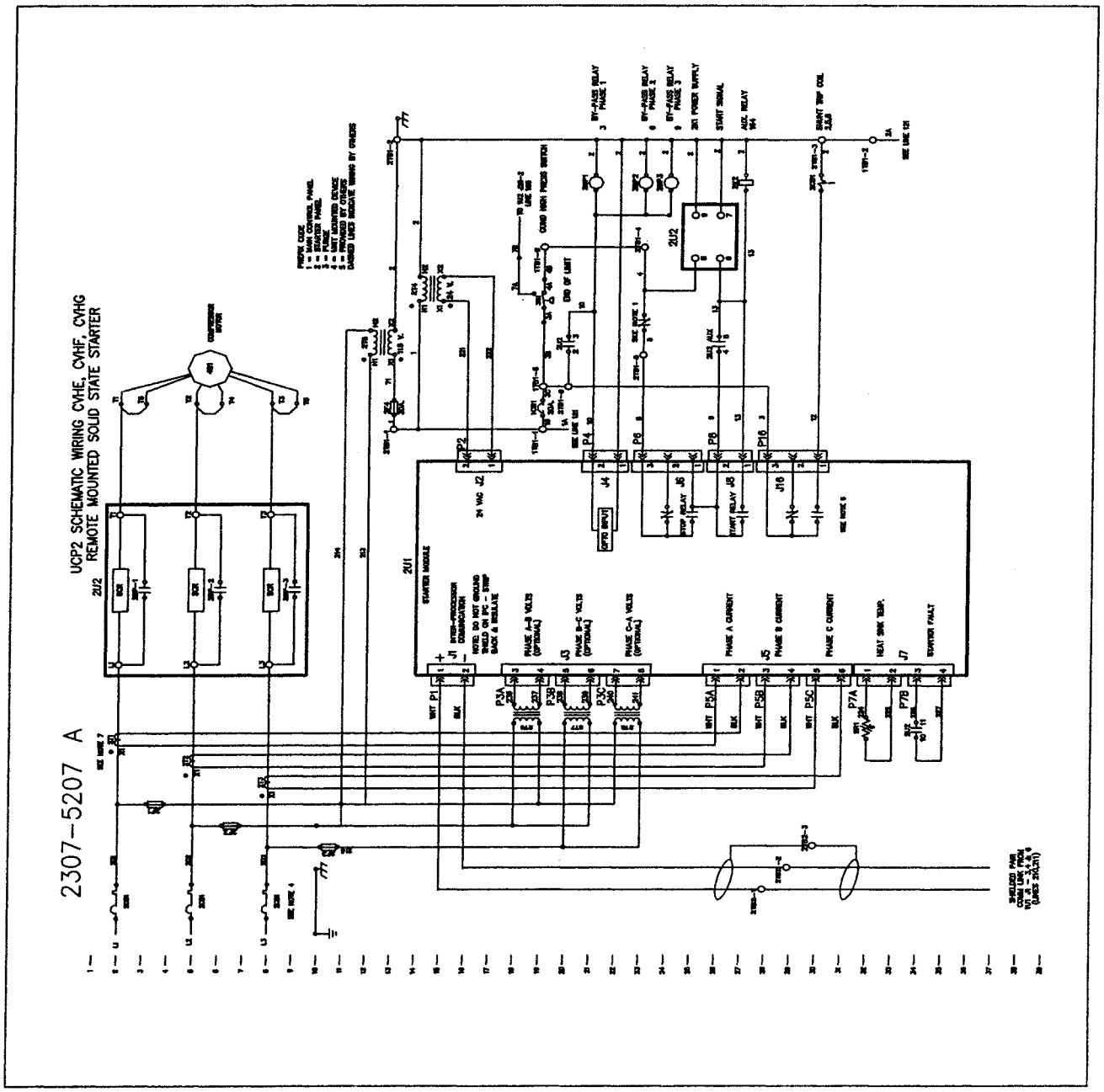
Wiring Drawing



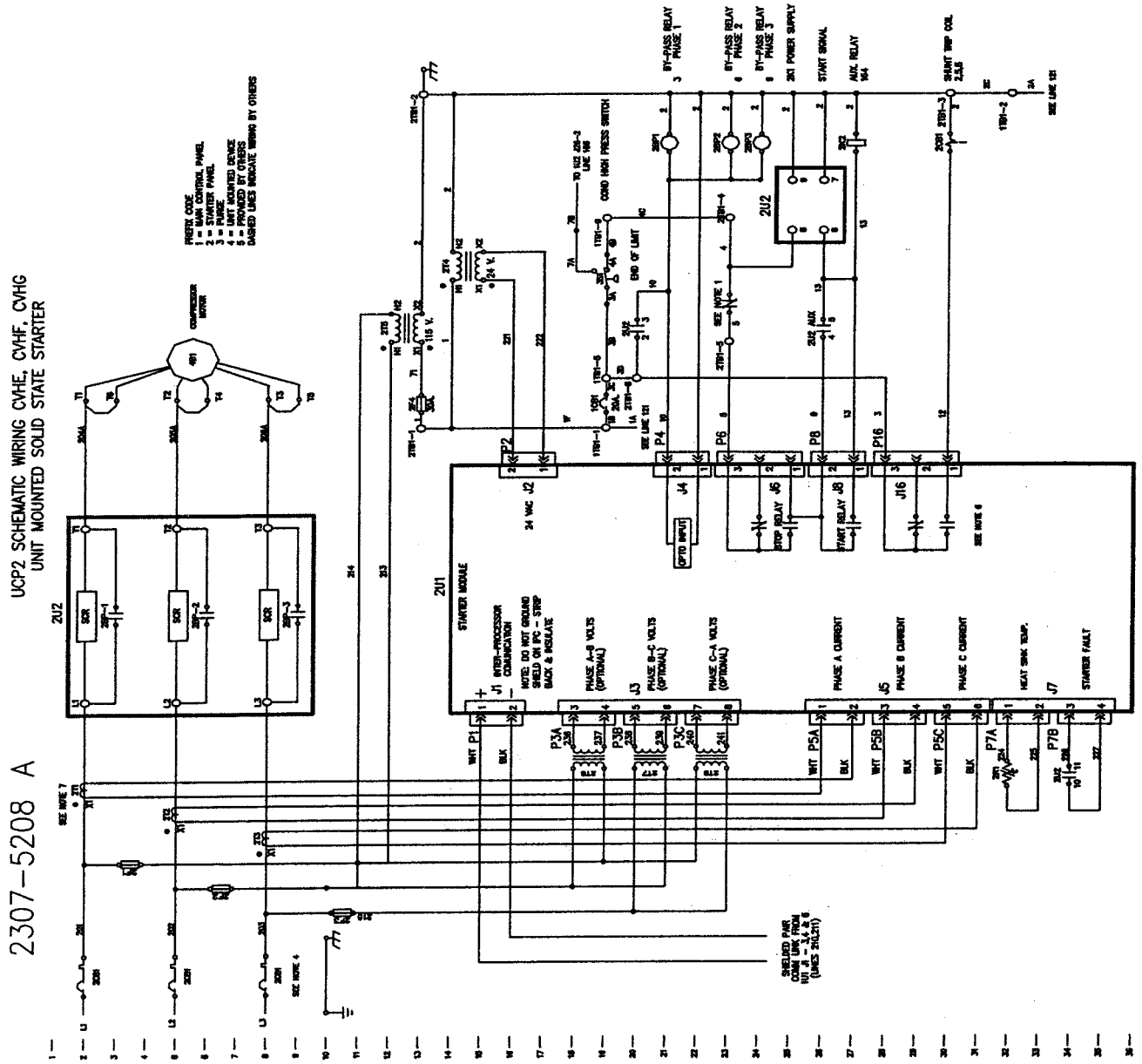
Wiring Drawing



Wiring Drawing



Wiring Drawing



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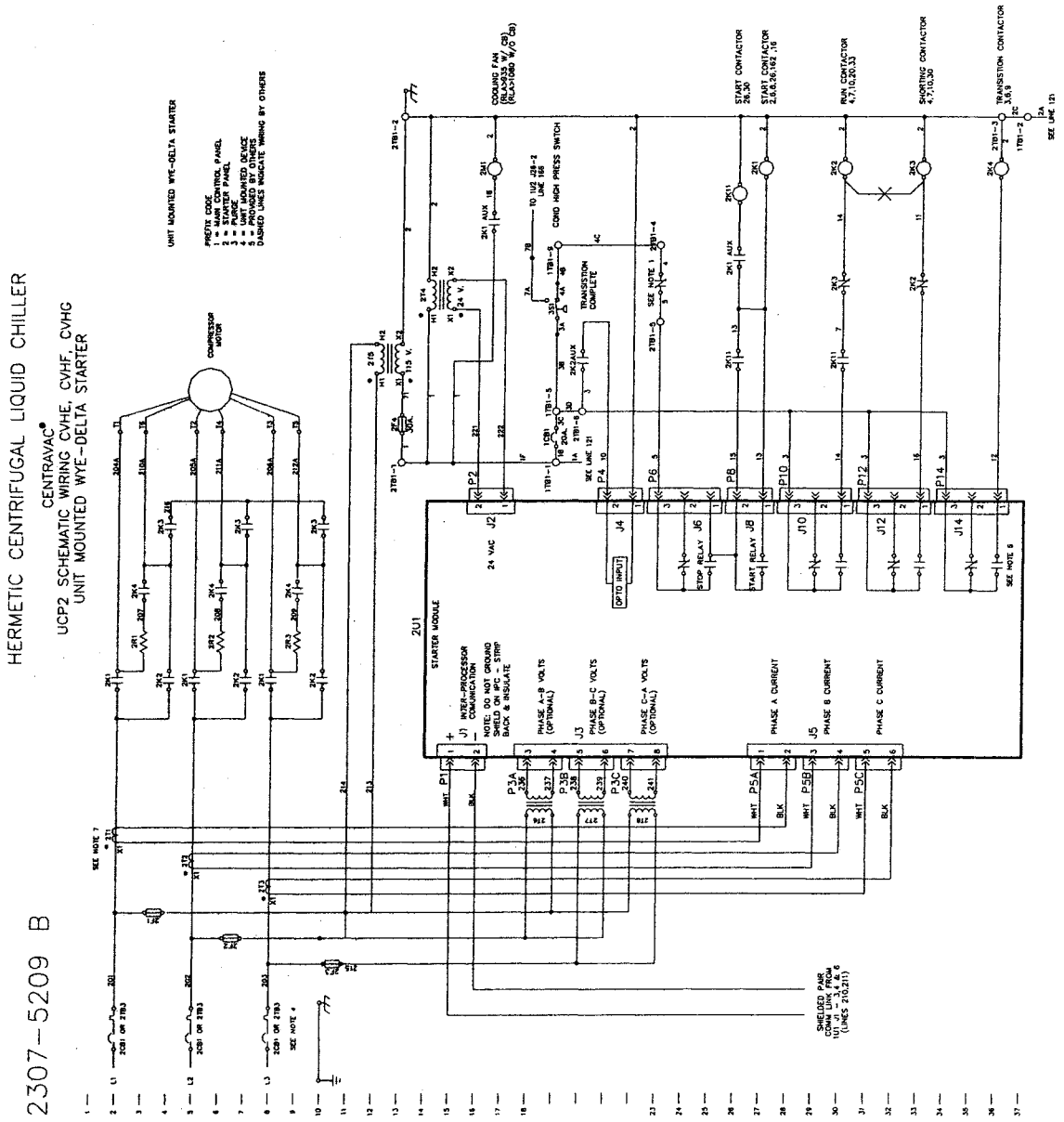
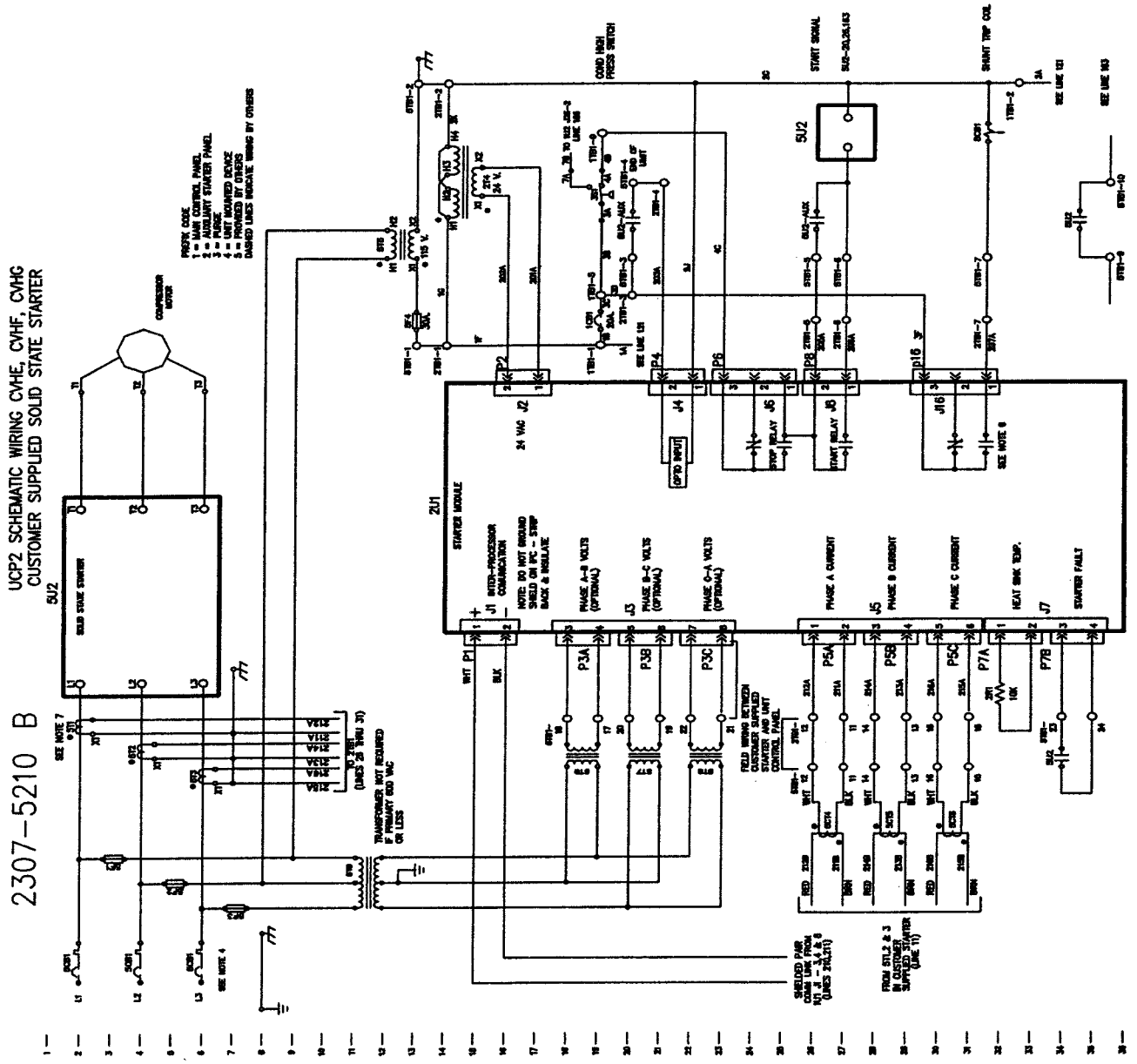
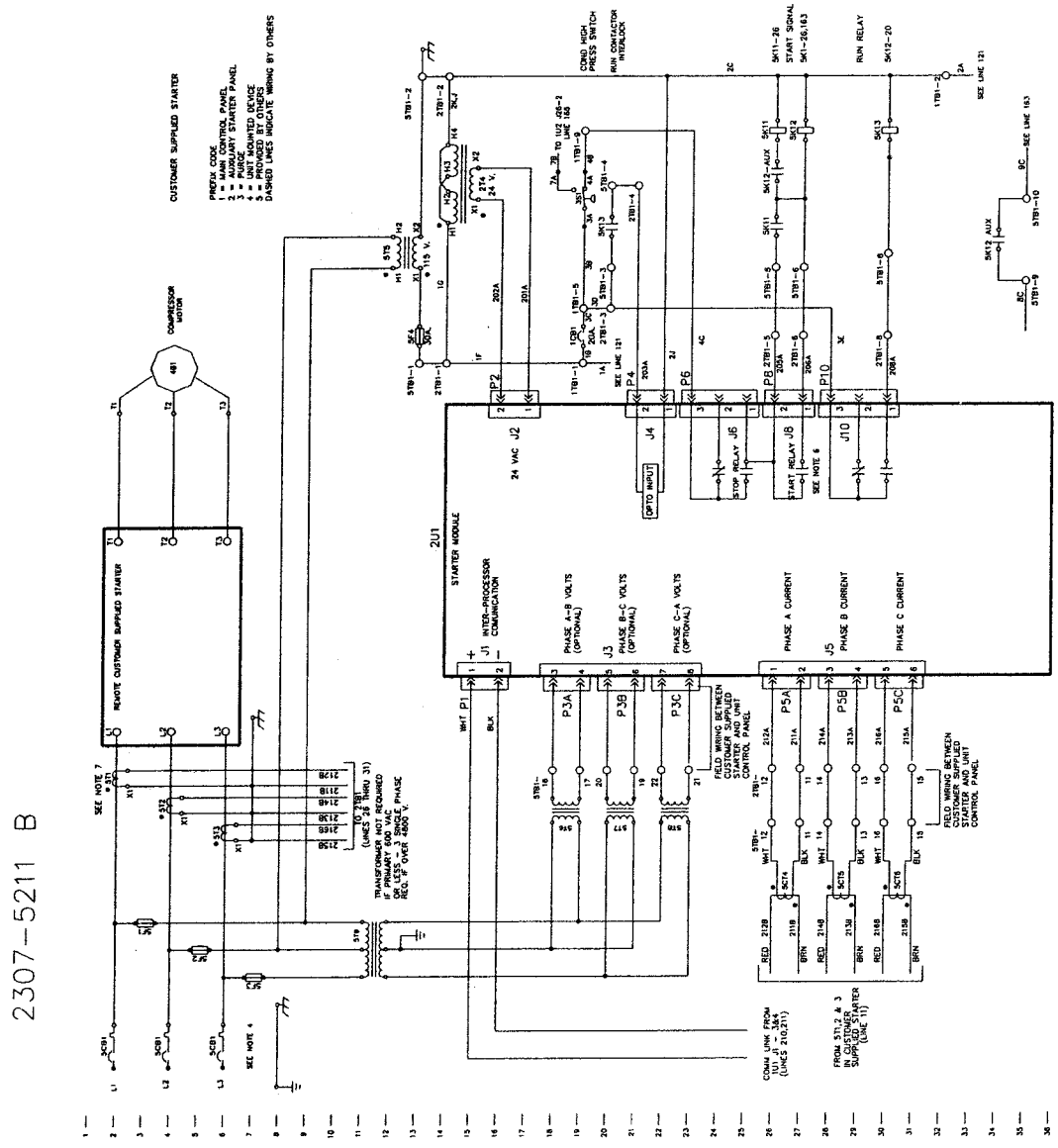


Wiring Drawing



Wiring Drawing

2307-5211B for UCP2 Customer Supplied Remote Mounted , Wye-Delta, Primary Reactor or Auto Transformer Starter



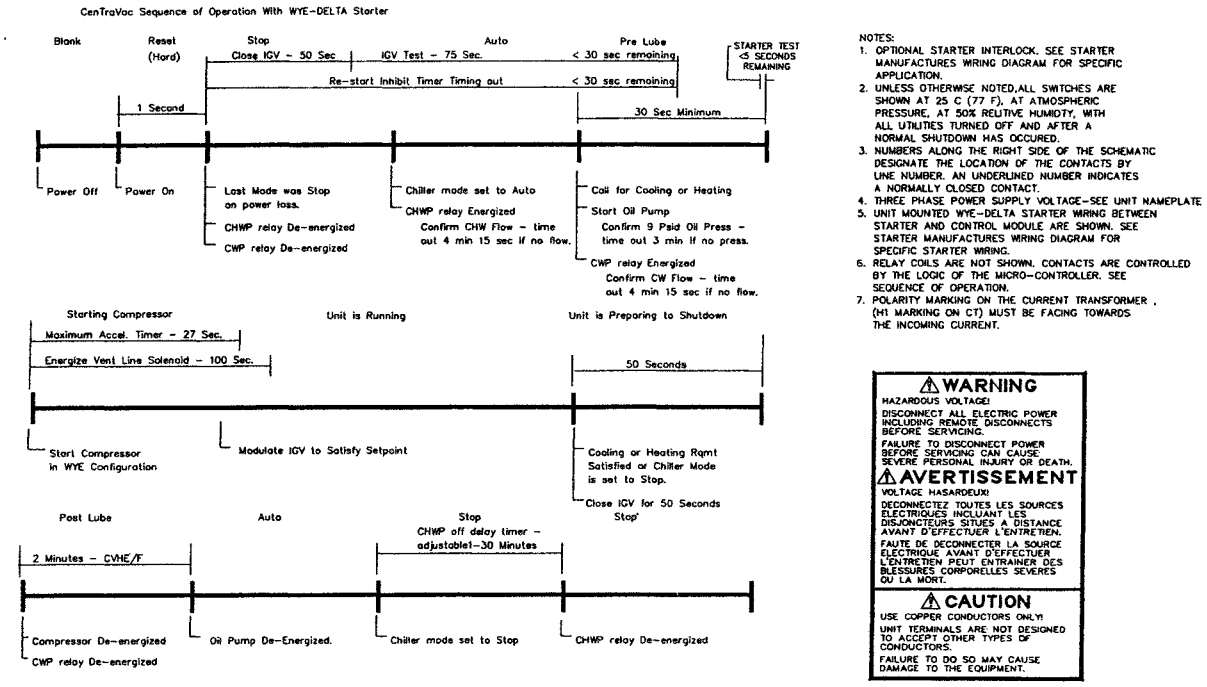
Wiring Drawing

Refer to Figure 9 below which shows an example of a typical sequence of operation for a Unit Mounted Wye-Delta Starter.

In the starter drawings, shown in this manual, all starter variables are the same in the Sequence of Operation except the *Maximum Acceleration Time*.

Below is a table which shows variables of the *Maximum Acceleration Time* for all starter drawings in this manual.

Figure 9 - Example of a Typical Sequence of Operation for a Unit-Mounted Wye-Delta Starter



NOTES:
1. OPTIONAL STARTER INTERLOCK. SEE STARTER MANUFACTURES WIRING DIAGRAM FOR SPECIFIC APPLICATION.
2. UNLESS OTHERWISE NOTED,ALL SWITCHES ARE SHOWN AT 25 C (77 F), AT ATMOSPHERIC PRESSURE, AT 50% RELITIVE HUMIDTY, WITH ALL UTILITIES TURNED OFF AND AFTER A NORMAL SHUTDOWN HAS OCCURED.
3. NUMBERS ALONG THE RIGHT SIDE OF THE SCHEMATIC DESIGNATE THE LOCATION OF THE CONTACTS BY LINE NUMBER. AN UNDERLINED NUMBER INDICATES A NORMALLY CLOSED CONTACT.
4. THREE PHASE POWER SUPPLY VOLTAGE-SEE UNIT NAMEPLATE
5. UNIT MOUNTED WYE-DELTA STARTER WIRING BETWEEN STARTER AND CONTROL MODULE ARE SHOWN. SEE STARTER MANUFACTURES WIRING DIAGRAM FOR SPECIFIC STARTER WIRING.
6. RELAY COILS ARE NOT SHOWN. CONTACTS ARE CONTROLLED BY THE LOGIC OF THE MICRO-CONTROLLER. SEE SEQUENCE OF OPERATION.
7. POLARITY MARKING ON THE CURRENT TRANSFORMER , (H1 MARKING ON CT) MUST BE FACING TOWARDS THE INCOMING CURRENT.

⚠WARNING
HAZARDOUS VOLTAGE!
DISCONNECT ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING.
FAILURE TO DISCONNECT POWER BEFORE SERVICING CAN CAUSE SEVERE PERSONAL INJURY OR DEATH.

⚠AVERTISSEMENT
VOLTAGE HASARDEUX!
DECONNECTEZ TOUTES LES SOURCES ELECTRIQUES INCLUANT LES DISJONCTEURS SITUES A DISTANCE AVANT D'EFFECTUER L'ENTRETIEN.
FAUTE DE DECONNECTER LA SOURCE ELECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN PEUT ENTRAINER DES BLESSURES CORPORELLES SEVERES OU LA MORT.

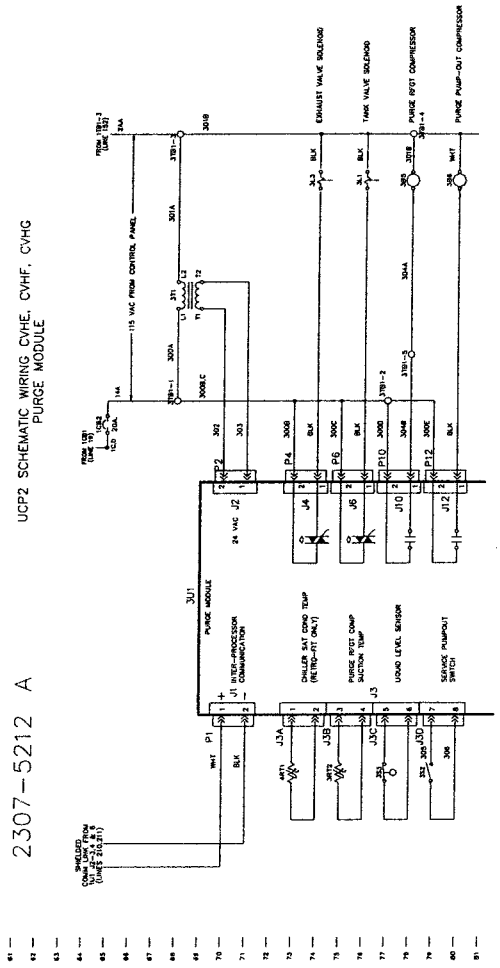
⚠CAUTION
USE COPPER CONDUCTORS ONLY!
UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.
FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

Table 3 - Maximum Accel. Time

Sequence of Operation for UCP2 CVHE, CVHF, CVHG Starters Maximum Accel. Time		
Starter Drawing Number	**Type of Starter**	Maximum Accel Time
2307-5201 A	Remote Accross the Line	6 Seconds
2307-5202 A	Remote Primary Reactor	11 Seconds
2307-5203 A	Remote and Auto Transformer	11 Seconds
2307-5204 A	Remote Wye Delta	27 Seconds
2307-5205 B	Remote Adaptive Frequency Drive	12 Seconds
2307-5206 B	Customer Supplied Across the Line	6 Seconds
2307-5207 A	Remote Mounted Solid State	15 Seconds
2307-5208 A	Unit Mounted Solid State	15 Seconds
2307-5209 B	Unit Mounted Wye-Delta	27 Seconds
2307-5210 B	Customer Supplied Solid State	20 Seconds
2307-5211 B	Customer Supplied Remote Mounted, Wye-Delta, Primary Reactor or Auto Transformer	11 Seconds **27 Seconds if Wye-Delta*

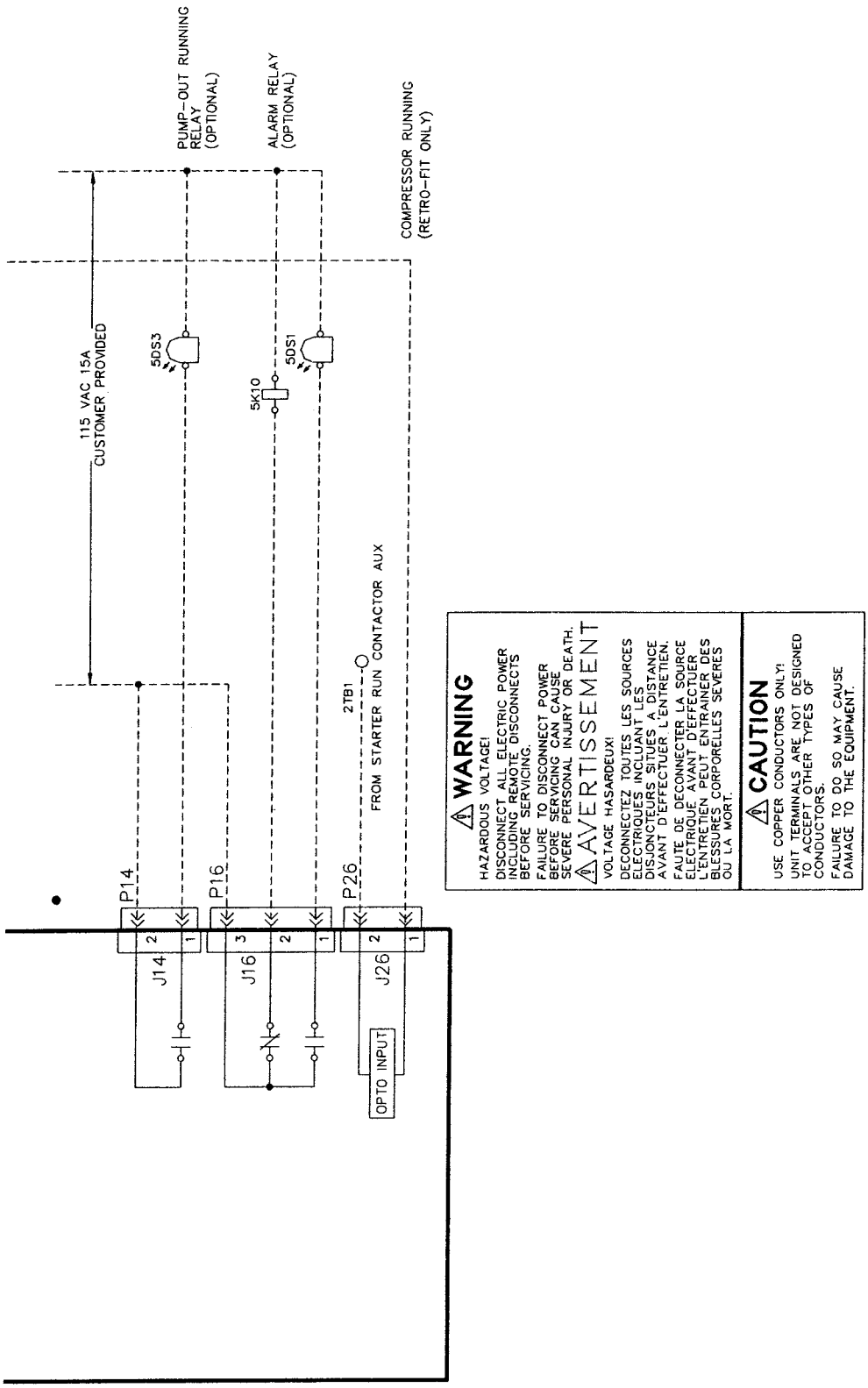
Wiring Drawing

2307-5212A - UCP2 Schematic Wiring CVHE, CVHF, CVHG Purge Module



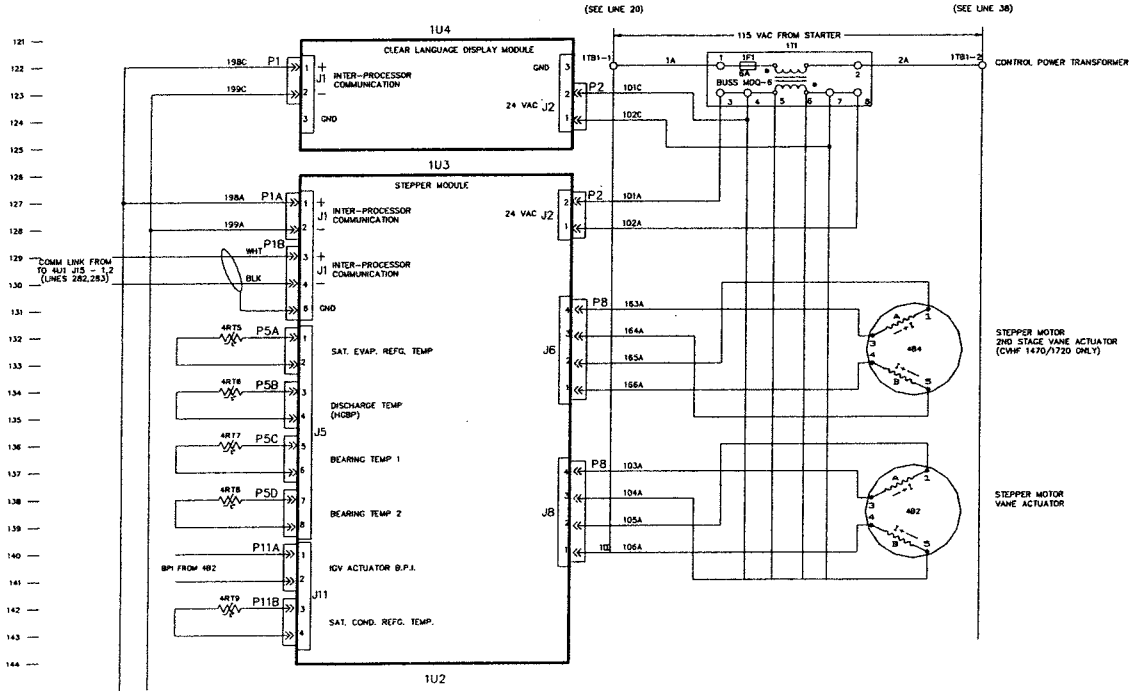
Wiring Drawing

2307-5212A - UCP2 Schematic Wiring CVHE, CVHF, CVHG Purge Module



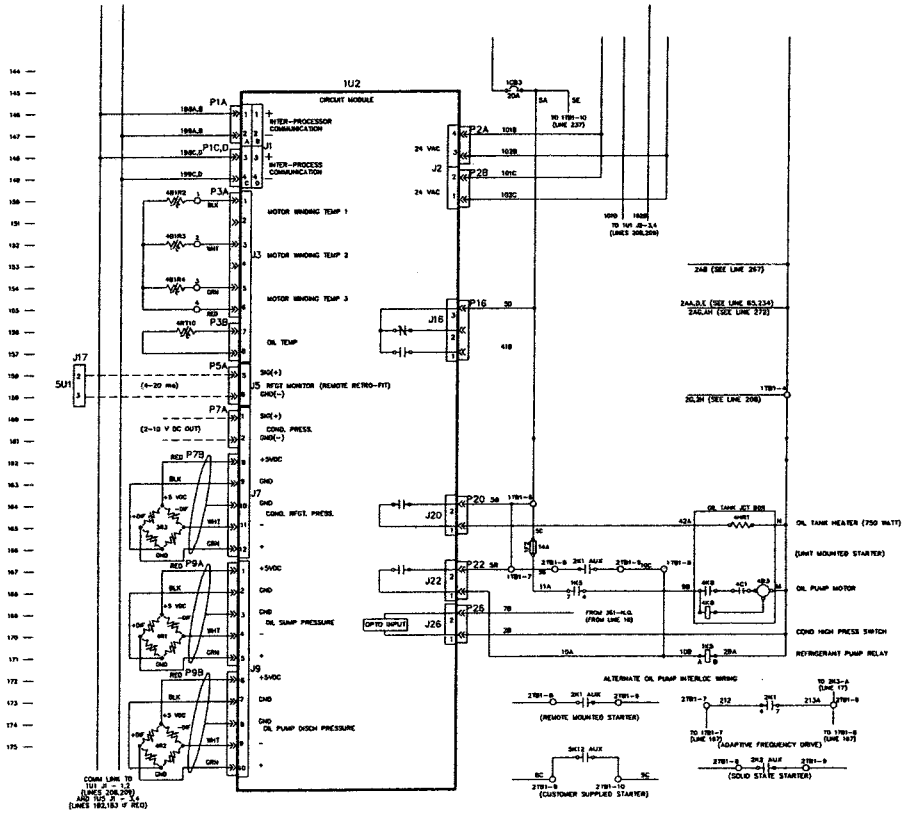
Wiring Drawing

2307-5213D - Schematic, Wiring CVHE, CVHF, CVHG Human Interface, Stepper and Circuit Modules

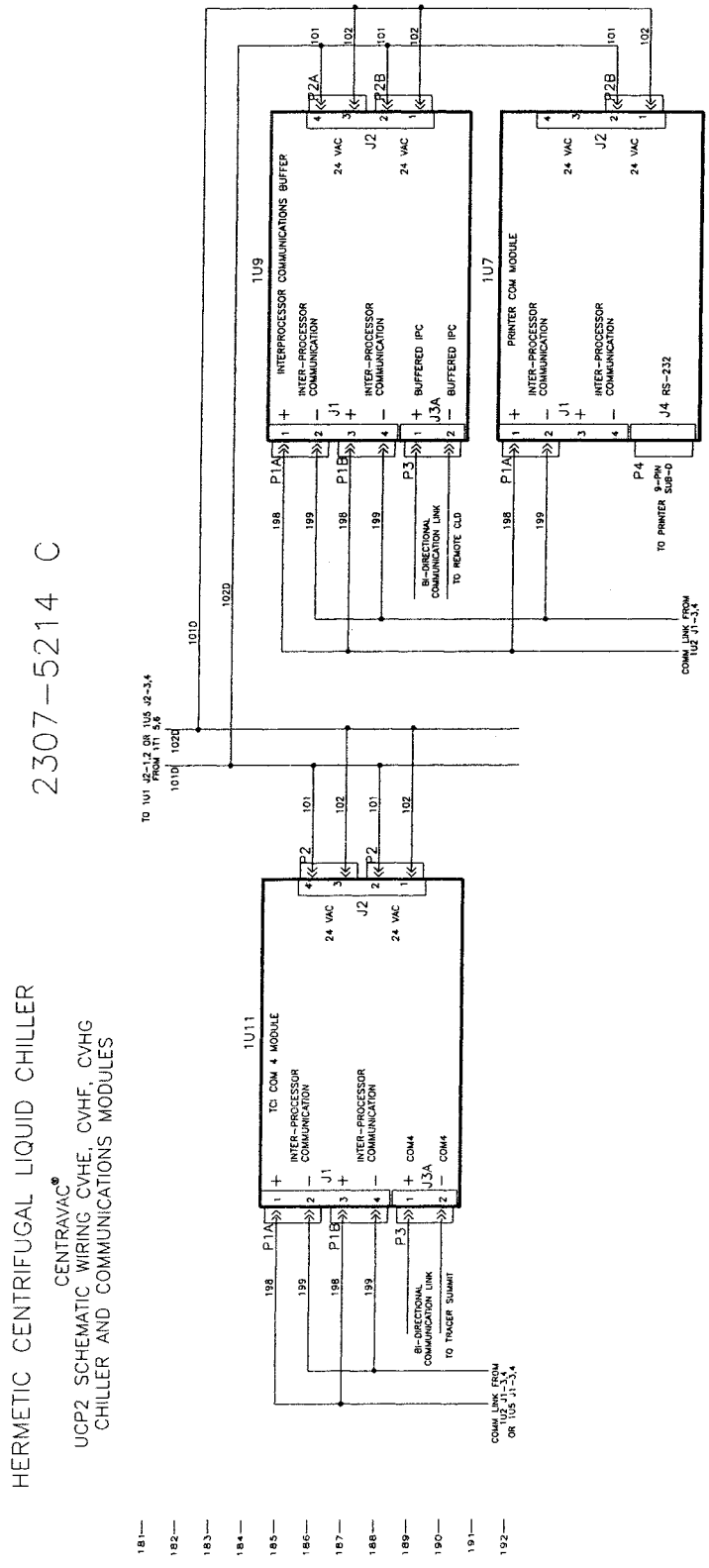


Wiring Drawing

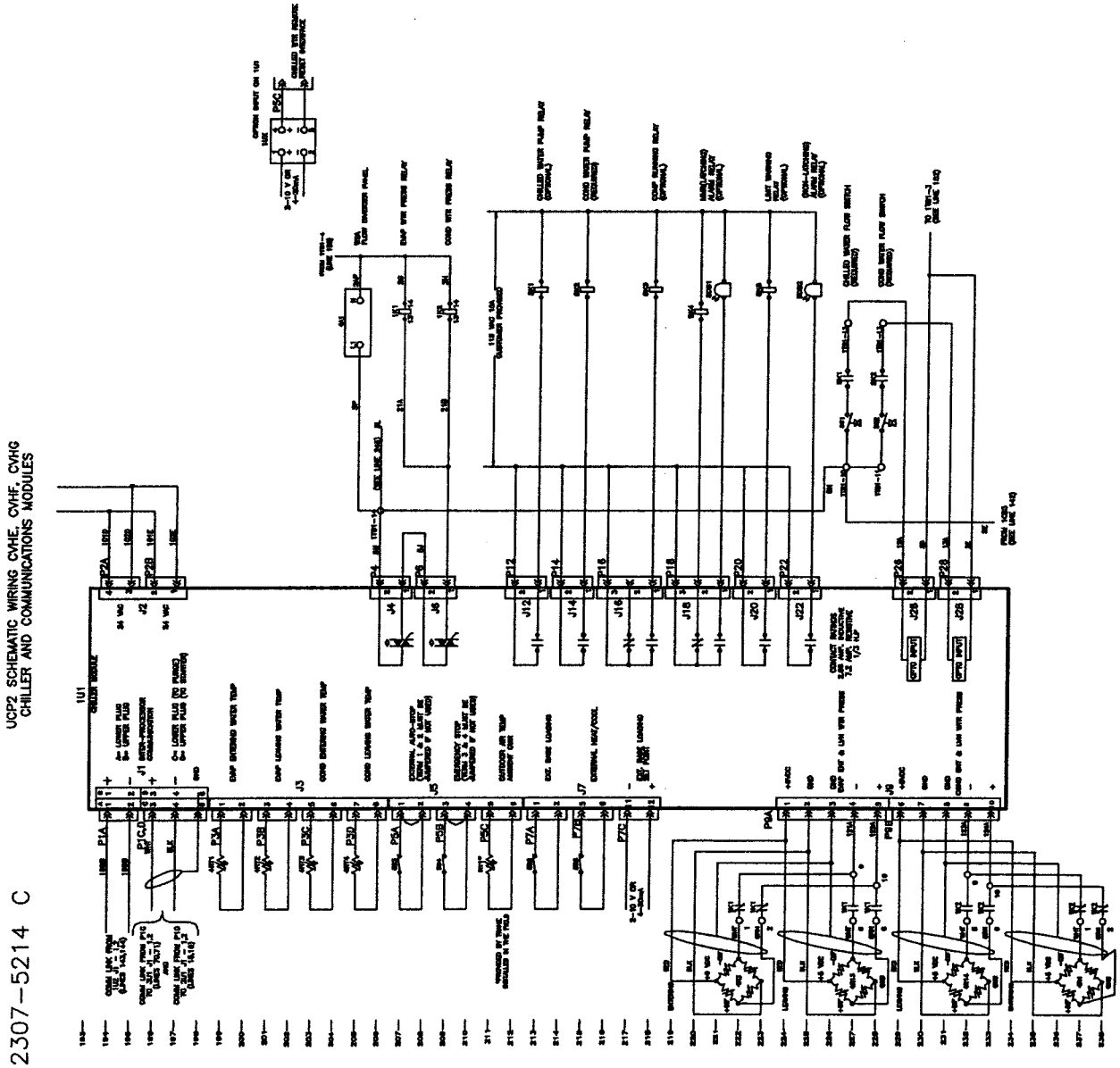
2307-5213D - Continued



Wiring Drawing



Wiring Drawing



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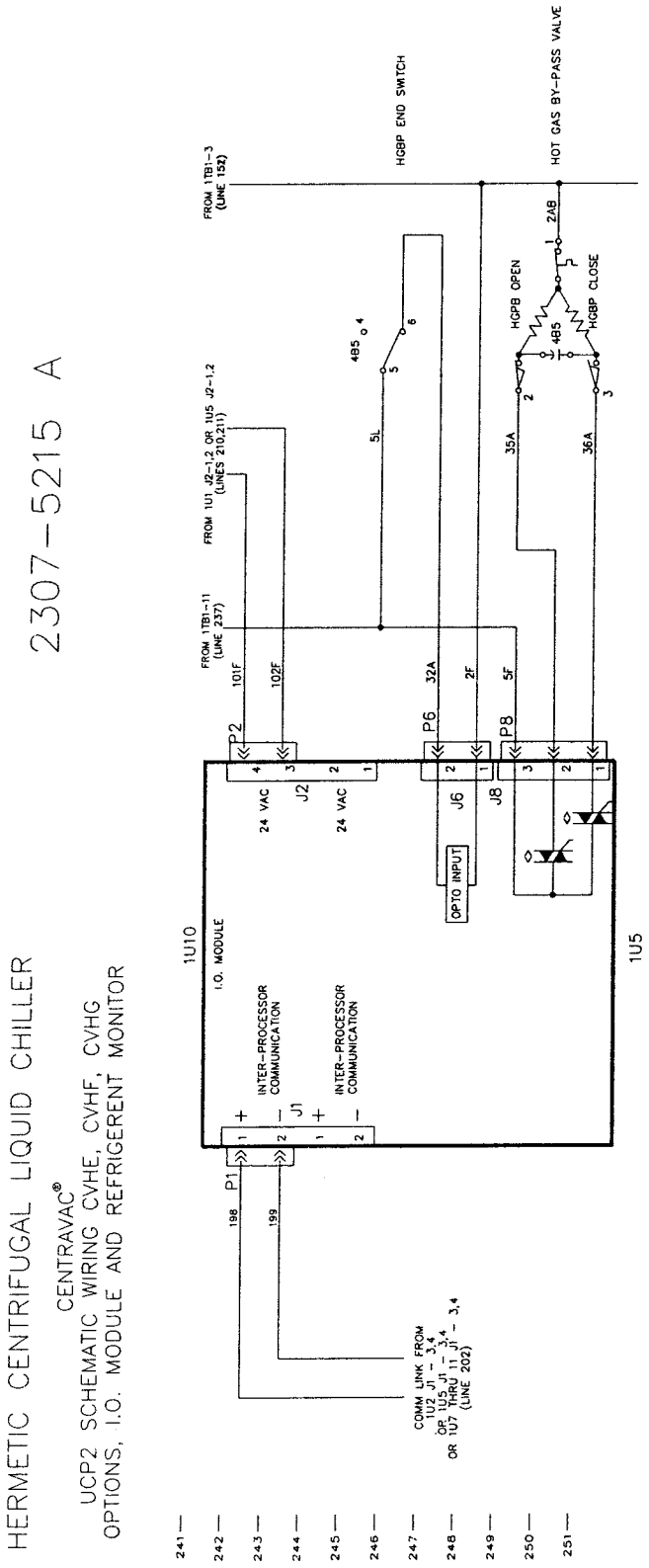
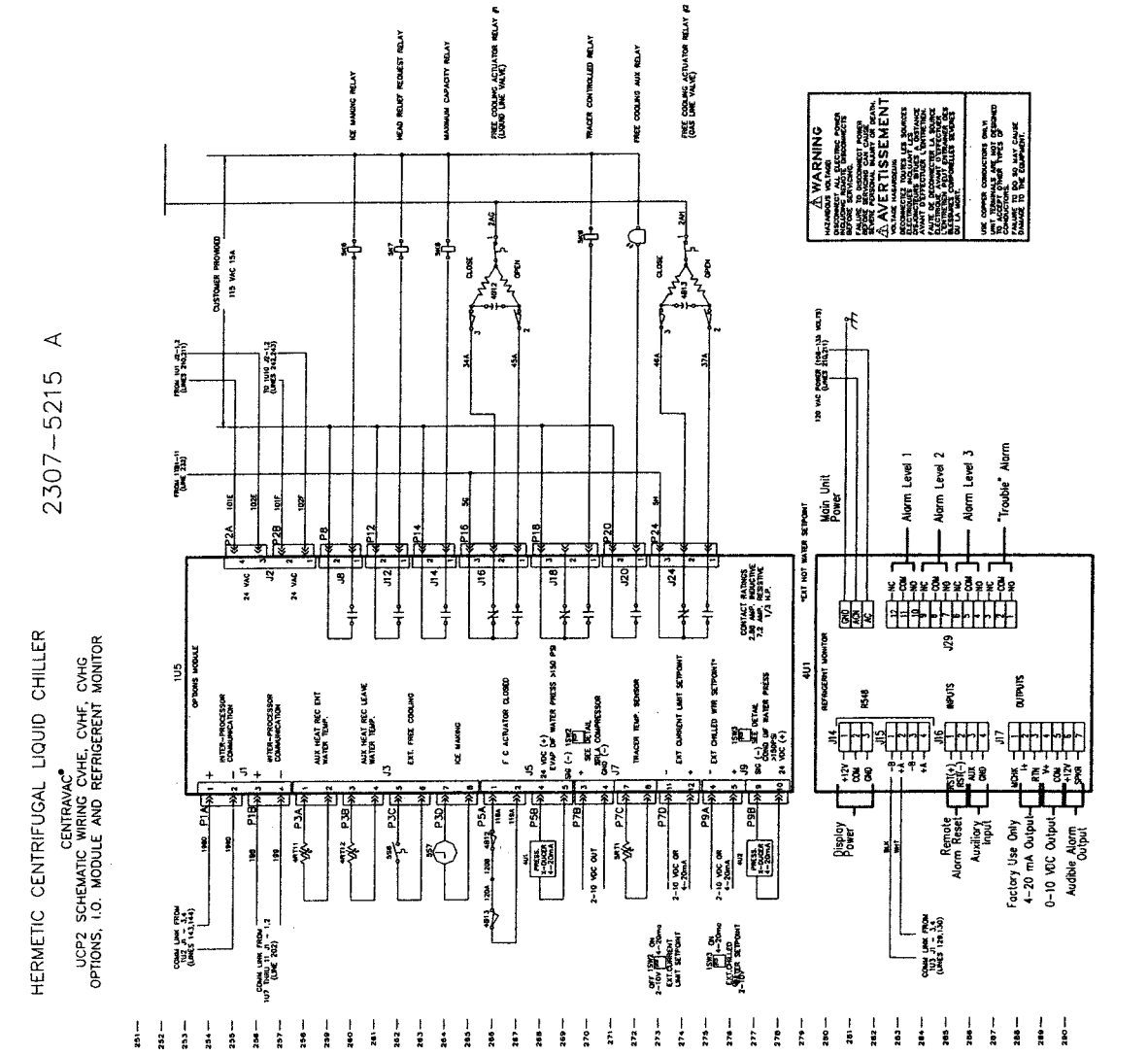
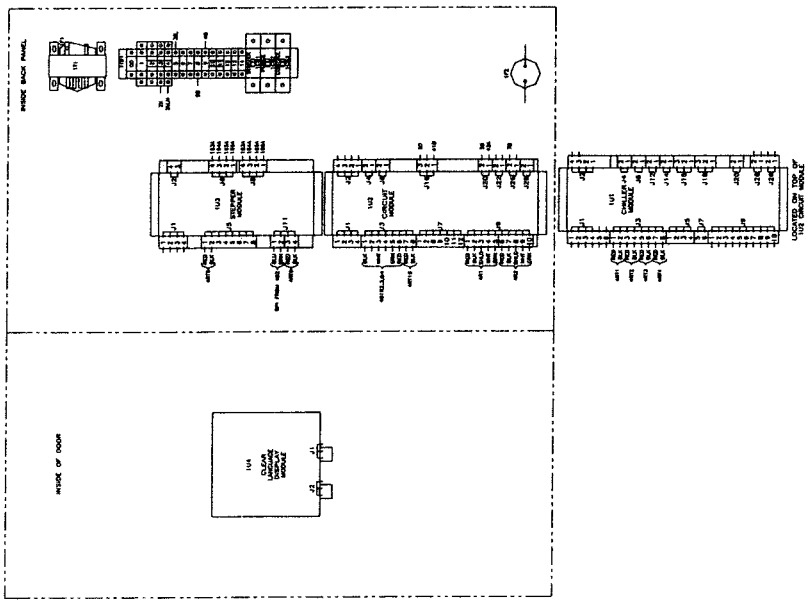


Wiring Drawing



Wiring Drawing

2307-5239A - Connection Diagram w/Dual Actuators 1470, 1720



Wiring Drawing