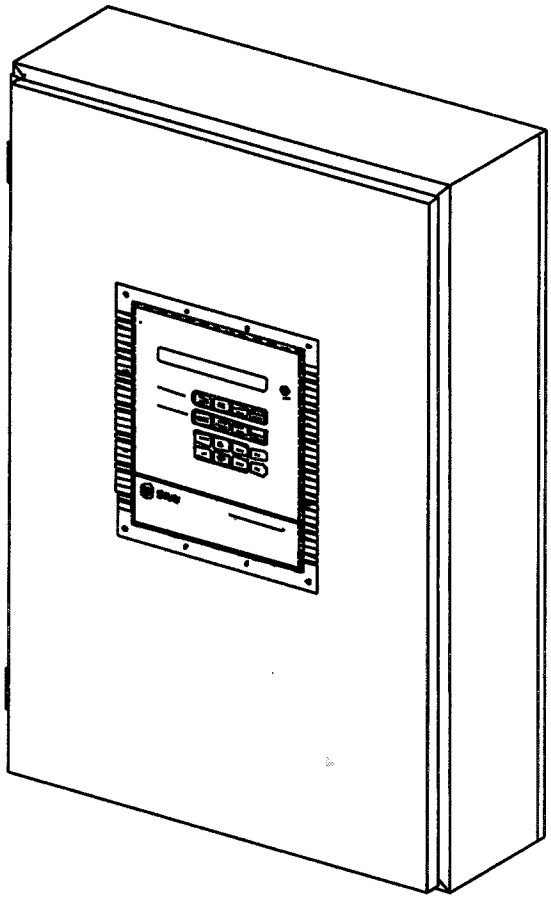
TRANE

Installation CVRB-IN-2A

Library	**Service Literature**
Product Section	**Commercial Aftermarket Products**
Product	**CenTraVac**
Model	**CVRB**
Literature Type	**Installation**
Sequence	**2A**
Date	**May 1996**
File No.	**SV-CAP-CTV-CVRB-IN-2A-596**
Supersedes	**CVRB-IN-2-595**

UCP2 Control Panel Conversion Package

Model CVRB



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.

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Notice

The Trane Company urges that all HVAC servicers working on Trane equipment, or any manufacturer's products, make every effort to eliminate, if possible, or vigorously reduce the emission of CFC, HCFC and HFC refrigerants to the atmosphere resulting from installation, operation, routine maintenance, or major service on this equipment. Always act in a responsible manner to conserve refrigerants for continued use even when acceptable alternatives are available. Conservation and emission-reduction can be accomplished by following recommended Trane service and safety procedures published in Trane General Service Bulletin CTB-SB-81. The information and procedures provided in CTV-SB-81 supersedes those published in this manual. Copies of this bulletin may be obtained by contacting your local Trane commercial representative.

Model Number Description

For service purposes, Trane Model CVRB Control Panel Conversion packages are assigned a multiple-character alphanumeric model number that precisely identifies each unit. An explanation of the identification code that appears on the unit nameplate is shown below.

Use of the service model number will enable the owner/operator, installing contractors and service technicians to define the operation, components and options for any specific unit.

Refer to the model number printed on the panel nameplate (mounted on the left-hand side of the UCP control panel enclosure) when ordering replacement parts or requesting service.

Sample Model Number

Model No.	C	V	R	B	1	A	0	A	0	C	0	0	0	0	0	0	0	A	0	0	0	0	0
Digit No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

Digits 1,2 - CenTraVac

Digit 3 - Retrofit

Digit 4 - "B" Development Sequence

Digit 5 - Starter Module Type
- 1 = With Starter Retrofit Panel
- 2 = With Adaptive Frequency Drive
- 3 = With Adaptive Frequency Drive and Starter Bypass

Digit 6 - Option Module
- 0 = No Option Module
- A = Option Module

Digit 7 - Tracer Communication Module
- 0 = No Module
- 1 = Tracer Communication Module Comm 3
- 2 = Tracer Communication Module Comm 4

Digit 8 - CT's

2 1/2" Wire Max
- A = 150/180/200:5
- B = 250/300/350:5
- C = 400/500/600:5
- D = 700/800/1000:5
- E = 1200/1500:5

4" Wire Max
- F = 1000/1200/1500:5
- G = 1800/2100/2500:5

Digit 9 - 3 Phase Voltage Kit
- 0 = None
- 1 = <600 Volt
- 2 =120:30 VAC Auxiliary PT
- 3 = 2300/2400 Volt
- 4 = 4200 Volt
- 5 = 3300 Volt/50 Hz
- 6 = 6600 Volt/50 Hz

Digits 10, 11 - Design Sequence

Digit 12 - Process Computer Interface Module
- 0 = No Module
- 1 = Process Computer Module

Digit 13 - Printer Interface Module
- 0 = No Module
- A = Printer Module

Digit 14 - Remote Human Int. Module & Buffer
- 0 = No Module
- 1 = Remote Human Interface Module

Digit 15 - HGBP
- 0 = No HGBP
- 1 = HGBP
- 2 = 3" Valve with HGBP
- 3 = 4" Valve with HGBP

Digit 16 - Remote Clear Lang. Display Panel
- 0 = No Remote Panel
- 1 = Remote Panel

Digit 17 - Water Pressure Transducer
- 0 = None
- 1 = <150 PSIG
- 2 = >150 PSIG

Digit 18 - IGV Actuator Type
- A = Stepper
- B = Pulse

Digit 19 - Not Used, Reserved for Future Use

Digit 20 - Compressor Discharge Temp. Sensor

0 = No A = Yes

Digit 21 - Heat Recovery/Aux. Heat Exchanger Temp. Sensor Kit

0 = No B = Yes

Digit 22 - Not Used, Reserved for Future Use

Digit 23 - Outside Air Temp. Sensor

0 = No D = Yes

General Information

Literature Change History

CVRB-IN-2 (May 1995)

Original issue of manual. Describes the conversion procedures required to retrofit an older, electrically or pneumatically controlled CenTraVac® with a microcomputer-based UCP2 chiller control panel for "B" design. Includes information about the Trane Adaptive Frequency Drives for UCP2.

CVRB-IN-2A (May 1996)

Manual revised to include changes incorporated in Design Sequence "C":

- Addition of Pulse IGV Actuator
- Variable setpoint for oil differential pressure cut-out
- R113 refrigerant map
- Differential Pressure Switch option for oil flow proving

Warnings and Cautions

Notice that warnings and cautions appear at appropriate intervals throughout this manual. Warnings are provided to alert installing contractors and other personnel to potential hazards that could result in personal injury or death, while cautions are designed to alert personnel to conditions that could result in equipment damage.

Your personal safety and the proper operation of this machine depend upon precautions. The Trane Company assumes no liability for installation or service procedures performed by unqualified personnel.

About This Manual

The instructions outlined in this booklet describe the procedures required to retrofit an older model chiller (e.g. CVHE, CVHB, CVHA or PCV) with a UCP2 based control system. This manual is intended for use by experienced Trane service personnel.

Note that the installation instructions in this manual are divided into three general topic areas:

1. Existing Control Panel Removal, including removal of the existing inlet vane actuator (if required).
2. UCP2 installation including the required control panel and optional actuator assembly (if required) on both CVHE and non-CVHE centrifugal chillers.
3. Starter Panel Conversion, including general directions for modifying Wye-Delta, Auto-Transformer, Primary Reactor and Across-the-Line starters for use with UCP2.

Note: Wiring diagrams are often referenced throughout this manual. Appropriate schematic and connection diagrams ship with each UCP2 conversion package and are also included in this manual.

The UCP2 installation and check-out must be performed by qualified personnel. The check-out procedure, located at the end of this manual, for the converted starter panel and newly installed UCP2 control panel is highly recommended.

Successful completion of this check-out procedure assures that the control panel is properly installed, that all required starter and unit modifications are complete and that the chiller is operating properly.

⚠ Caution:
To prevent machine damage, contact a Trane service organization to perform the check-out procedure described at the end of this manual!

Application Guidelines

While the UCP2 control panel conversion package is specifically designed for CVHE applications, it can be applied to other, older CFC-11 and HCFC-123 water-cooled CenTraVacs® (PCV, CVHA's) whether electrically or pneumatically controlled.

The instructions also apply when converting control systems on competitor-built centrifugal chillers. Verify that Trane control strategies can be used on the application.

Please note the following:

- When the UCP2 conversion package is applied to a pneumatic chiller control system, all pneumatically-actuated valves, such as for hot gas bypass, must be replaced with electric devices.
- The UCP2 conversion package is not designed to be applied to air-cooled CenTraVacs.
- The UCP2 conversion package cannot be used in conjunction with open-transition starters.

Contents of Kit/Options

Conversion Package Contents

Each UCP2 panel conversion "kit" includes the items described below.

Note: Some UCP2/CenTraVac® retrofit applications require additional field-supplied components.

- UCP2 Chiller Control Panel with two (2) mounting brackets - Includes the Local Clear Language Display and 16 Function Keypad, see Figure 1.
- Temperature Sensors and Pressure Transducers with installation hardware including applicable bulbwells and leads. See Table 1 for list of standard sensors. Figure 3 contains a complete list of available sensors and shows their location.
- Literature including CVRB-IN-2A and the current revisions of CVHE-M-7 and CVHE-CLD-1.
- Wiring schematics located in control panel
- Replacement nameplate and nameplate laminate
- Miscellaneous electrical and mounting hardware (screws, washers, etc.)

Inlet Guide Vane Actuator Output Option - The UCP2 conversion panel can be ordered to support either a stepper motor inlet guide vane actuator or a pulse type inlet guide vane actuator. The pulse type output option uses the machine's existing induction motor inlet guide vane actuator and requires no additional hardware. In addition to the items identified above, the stepper motor output option will include the following:

- Stepper Motor Inlet Guide Vane Actuator with brackets - Some field modification to fit specific applications may be required.

Note: In non-CVHE applications, three (3) adapter brackets are required to enable installation of the new stepper vane actuator. One bracket secures the actuator to the volute, while the other two link the actuator to the actuator arm. Field fabrication of these brackets may be required in some instances.

Available Optional Kits

In addition to the standard package, several optional kits can be ordered to give the UCP2 greater capability. Use Table 5 as well as Figures 11, 12, and 13 to determine connection points.

Starter Interface Module - Required on all UCP2 applications except those with variable speed inverters by Trane. The module includes a NEMA 1 style enclosure which is suitable for attachment to the chiller starter, terminal block and three auxiliary current transformers.

Table 1 - Standard Sensors With UCP2 Retrofit Kit

Sensor	Designation	Code Number
Evaporator Entering Water Temperature	4RT1	X13790159-04
Evaporator Leaving Water Temperature	4RT2	X13790159-04
Condenser Entering Water Temperature	4RT3	X13790159-04
Condenser Leaving Water Temperature	4RT4	X13790159-04
Saturated Evaporator Refrigerant Temp.	4RT5	X13790159-02
Bearing Temperature #1	4RT7	X13790159-03
Bearing Temperature #2	4RT8	X13790159-03
Saturated Condenser Refrigerant Temp.	4RT9	X13790159-01
Oil Temperature	4RT10	X13790159-03
Condenser Refrigerant Pressure	3R3	X13790142-01
Oil Sump Pressure	4R1	X13790142-01
Oil Pump Discharge Pressure	4R2	X13790142-01

Options Module
Required to implement any or all of the following UCP2 functions:

a. Chilled Water Setpoint by External/Remote Source (e.g. Generic BAS) - Allows a remote source to set the chilled water setpoint via a 4-20 mA or 2-10 vdc signal. Range is 0 to 65° F.

b. Current Limit Setpoint (Demand Limit) by External/Remote Source (e.g. Generic BAS) - Allows a remote source to set the current limit setpoint via a 4-20 mA or 2-10 vdc signal. Range is 40 to 100%.

c. Compressor Percent (%) RLA Output - Allows a remote system (e.g. generic BAS) to receive a 2-10 vdc signal proportional to the chiller's % RLA. Range is 0 to 120% RLA.

d. Head Relief Request Output - Allows a remote system (e.g. Generic BAS) to receive a binary signal for use with compressor surge protection and condenser limit by requesting lower condenser water temperature.

e. Maximum Capacity Output - Allows a remote system (e.g. Generic BAS) to receive a binary signal indicating that the chiller is at maximum capacity.

Note: The maximum capacity relay is suppressed when the inlet guide vane actuator output is the pulse type.

f. Input for accessory sensors; which must be ordered separately.

- condenser differential water pressure transducer
- evaporator differential water pressure transducer
- heat recovery or auxiliary heat exchanger temperature sensors.

g. Ice making input/output

h. Tracer Relay, Tracer Temperature Output/Inputs

i. Free Cooling.
The module is field installed in UCP2.

Tracer Comm3 Communications Module
Required for interface between UCP2 and Tracer 100/1001/CPM panel style systems. The module is field installed in UCP2. Tracer Comm3 communications module is not compatible with SCP bi-directional communications and/or Tracer Summit systems.

Tracer Comm4 Communications Module
Required for communication between the UCP2 and Tracer Summit. The module is field installed in UCP2. Tracer Comm4 communications module will not enable communications to Tracer 100/1001/CPM panel.

Remote Clear Language Display Communications Module
Required for communications between UCP2 and the UCP2 Remote Clear Language Display Panel. The module is field installed in UCP2.

Remote Clear Language Display Panel Provides a remote clear language interface for up to four chillers equipped with UCP2 and the Remote Clear Language Display Communications Module. All functions available to the operator at the chiller are available to the user of a Remote Clear Language Display Panel. Two distinctions can be made regarding the remote display.

- The local display STOP command function has precedence over the remote display AUTO command function.
- The custom report function at the local display is separate and independent from the custom report function at the remote display.

Current Transformers
Kits have three (3) current transformers—donut type—one on each phase of line voltage, suitable for field installation in the chiller starter panel. The current transformers are inputs to the UCP2 starter module. Note that auxiliary current transformers come with required starter interface module.

Use Table 7 to determine the acceptable current transformer tap ratio(s) based upon the chiller's rated load amps (RLA). If the desired motor RLA allows the selection of multiple ratio taps, always select the transformer with the numerically smallest ratio tap. If the chiller motor RLA is less than 66% of the maximum amps for the current ratio tap selected, multiple primary turns are required. The motor rated load amps should not exceed 100% of the maximum amps of the tap selected.

If there are three current transformers in the existing starter with the desired ratio tap, they may be reused for the current transformer inputs to UCP2. If the existing current transformers are unusable, see Table 7 for proper selection.

<600 Volt Phase Voltage Kit
Includes three (3) potential transformers (transforms line voltage to 30 volts) suitable for field installation in the chiller starter. The kit is for starters with 600 volts or less and is input to the UCP2 starter module. It gives a display of phase voltage and provides under/over voltage protection (auto restart when voltage is corrected). Displayed are:

- Compressor phase voltage (a-b, b-c, c-a)
- Kilowatt usage
- Power factor

>600 Volt High Voltage Adapter Kit
Comes with three (3) 120-30 VAC potential transformers. For use on starters with existing line to 120 VAC transformers.

2300/2400 Volt Phase Voltage Kit*
Provides one (1), 3 phase transformer, line to 120 VAC.

4200 Volt Phase Voltage Kit*
Provides one (1), 3 phase transformer, line to 120 VAC.

3300 Volt Phase Voltage Kit*
Provides one (1), 3 phase transformer, line to 120 VAC.

6600 Volt/50 HZ Phase Voltage Kit*
Provides three (3), single phase transformer, line to 120 VAC

* Requires >600 Volt High Voltage Adapter Kit.

Water Pressure Transducer
The two available options are:

- <150 psig operating pressure—Includes two pressure transducers, two three-way valves and a mounting plate. Kit monitors the evaporator and condenser entering and leaving water pressures.
- >150 psig operating pressure—Includes two differential pressure transducers and mounting plate. Requires Options Module.

Compressor Discharge Temperature Sensor
Measures the compressor discharge gas temperature and provides a safety cutout on high compressor discharge temperature.

Heat Recovery/Auxiliary Heat Exchanger Sensor Kit Includes two (2) sensors for monitoring the entering and leaving water temperatures of an auxiliary heat exchanger. The kit includes wells for mounting in the heat exchanger shell. UCP2 will display the values of the entering and leaving water in the heat recovery bundle but does not provide control strategy for heat recovery. The sensor kit requires the use of an Options Module for interface to UCP2.

Outside Air Temperature Sensor
Measures outside air temperature. It is required on applications using outside air temperature based chilled water reset.

Hot Gas Bypass

Hot gas bypass with UCP2 assumes that in a retrofit situation, hot gas bypass exists on the current chiller. The necessary piping and valve are already there. UCP2 provides a new control scheme. The following are required:

- IO Module
- New 3" or 4" valve if old valve is pneumatic or not compatible with UCP2

Note: Hot gas bypass and pulse type output for the IGV actuator are mutually exclusive.

Printer Interface Module

The printer interface module provides a pre-formatted chiller log to a printer. The printer interface can be programmed via the human interface to print a chiller log on command, at the time of a diagnostic, and/or on a periodic basis. The printer interface module output is 9 pin RS-232. Maximum transmission is 50′ (15.2m) to a remote printer.

Pulse Output

Required for a Pulse Type Inlet Guide Vane Actuator. IO Module is field installed in UCP2.

Note: Pulse type output for the IGV Actuator and the Hot Gas Bypass Option are mutually exclusive.

Conversion Package Inspection

Before installing the UCP2 panel, compare the data on the panel nameplate with the corresponding ordering and shipping information to verify that the proper UCP2 conversion package was shipped.

If a thorough inspection of the conversion package reveals damage or material shortages, immediately file these claims with the carrier. Specify the extent and type of damage found, and notify the appropriate Trane sales representative. Do not install a damaged component or panel without the sales representative's approval!

Control Panel Layout

See Figures 1 and 2 for illustrations of the UCP2 chiller control panel and its component layout, respectively. Tables 2 and 3 list module and equipment designations.

The installation of a UCP2 panel requires connection to devices on the chiller (see Figure 3), to external devices such as a starter (Figures 20 and 21), purge (see Figure 17), refrigerant monitor (see "Refrigerant Monitor" section) and to other miscellaneous system components (see Figure 4).

Figure 1 -
Clear Language Display

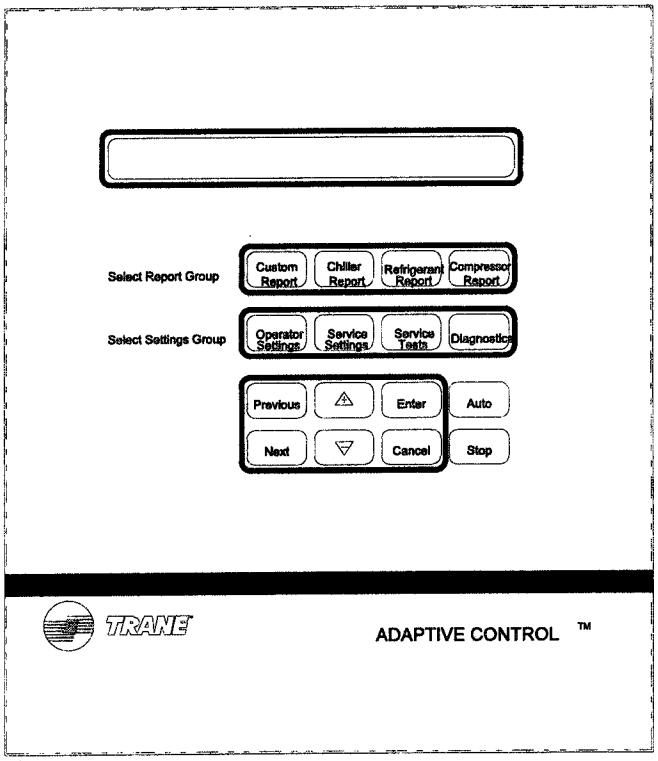


Figure 2 -
UCP2 Control Panel -
Preferred Module Locations

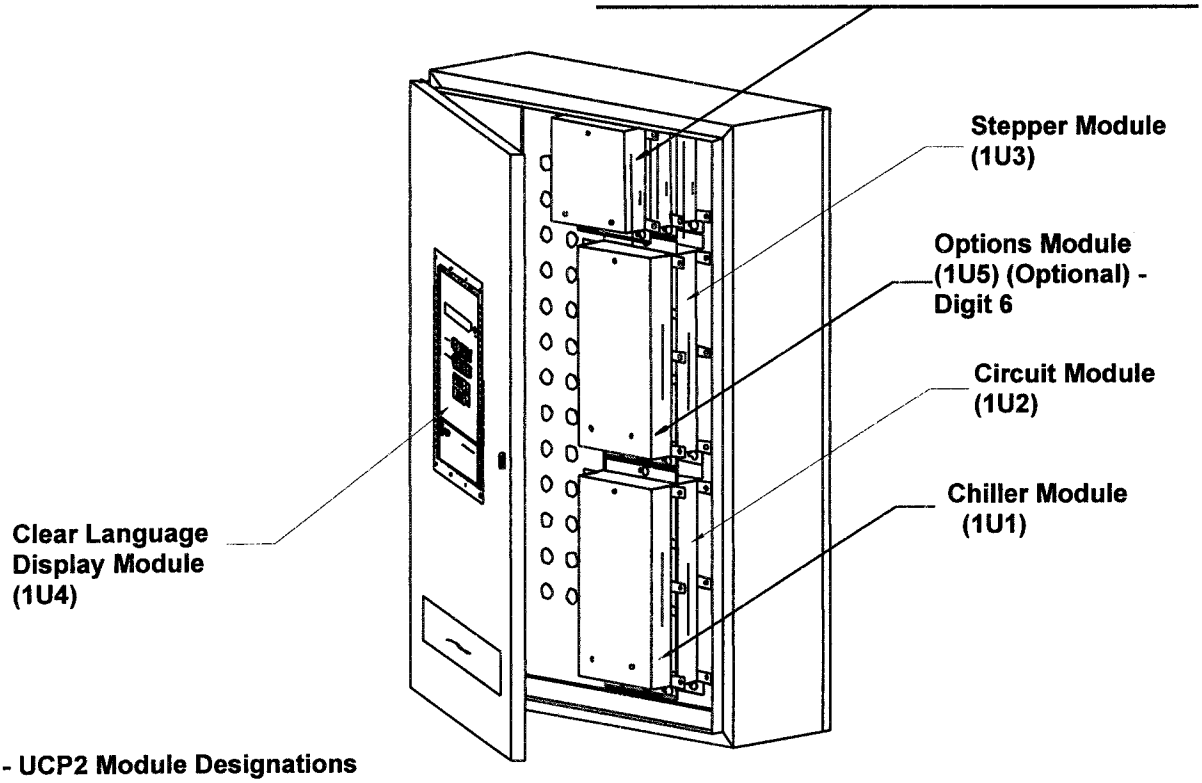


Table 2 - UCP2 Module Designations

Standard Modules		Optional Modules		
1U1	Chiller Module	1U5	Options Module	Digit 6
1U2	Circuit Module	1U6	Process Computer Module	Digit 12
1U3	Stepper Module	1U7	Printer Module	Digit 13
1U4	Clear Language Display Module	1U8	Tracer Interface Module	Digit 7
		1U9	IPCB Remote Interface Module	Digit 14
		1U10	IO Module	Digit 15 or Digit 18

Table 3 - UCP2 Equipment Designations

Device Desig.	Description	Device Desig.	Description
2U1	Starter Module	4L1	Vent Line Solenoid
3U1	Purge Module (Optional)	5S3	External Auto-Stop (Optional)
4U1	Evap. Diff. Water Press. X-Ducer (Optional)	5S4	Emergency Stop (Optional)
4U2	Cond. Diff. Water Press. X-Ducer (Optional)	5S5	Heat Pump Control Switch (Optional)
4B1	Compressor Motor	5S1	Chilled Water Flow Switch
4L2	Evap. Water Press. Solenoid (Optional)	5S2	Condenser Water Flow Switch
4L3	Cond. Water Press. Solenoid (Optional)	1T1	Control Transformer
4R3	Evap. Ent. & Lvg. Water Press. (Optional)		
4R4	Cond. Ent. & Lvg. Water Press. (Optional)		

Existing Control Panel Removal

For complete descriptions of UCP2 chiller control panel features, clear language display, control options and electrical sequence(s) of operation, refer to the current revision of CVHE-M-7. A copy is included in this retrofit kit. Additional copies may be obtained by contacting the local Trane office.

To ensure that the chiller control system retrofit procedure is performed properly, carefully review the instructions in this section, and, if necessary, contact a Trane service organization before beginning the conversion process.

1. Identify all field modifications made to the existing chiller control scheme and remove or disable; then label all field-installed wiring entering the control panel.

Important! Record a detailed description of all electrical changes made during the UCP2 retrofit process. Add a copy of this report to the chiller record file for future reference.

   Look for field-installed circuits that serve as evaporator and condenser flow interlocks, as well as those that provide the following control functions: remote current limiting, remote on/off, "proof-of- running", interface with a building automation system (BAS), etc.

2. Determine how each of the field-adapted control functions identified in Step 1 will be handled by the new UCP2 chiller control panel.

Remember the UCP2 panel:

a. provides all of the control and protection capabilities previously supplied by the AGM capacity control module (U1) and Cutler-Hammer solid state overload (U2) in pre-micro electronic control systems.

b. includes isolated contacts to operate all chiller mounted devices as well as the starter control circuit.

c. requires 115 VAC control circuit power from the starter panel. (The oil pump, oil heater, vane actuator and purge compressor are all 115-volt devices.)

Note: All CVHE control circuits, whether in the starter panel or chiller control panel, are 115-volt systems.

3. Open all starter and control panel disconnect switches and secure them in that position.

⚠ WARNING!
To prevent injury or death due to electrical shock, verify that all power supply disconnect switches are locked in the OFF position before opening control panel door or disconnecting any wires.

4. Disconnect the leads from the oil heater and relabel the oil heater leads with the equivalent wire number designations in the UCP2 control scheme. The wire numbers for the UCP2 control system can be found on the connection diagrams in this manual.

5. If installing a stepper inlet guide vane actuator, determine the inlet guide vane stroke by closing and opening the vanes and accurately measuring the length of travel. Record this length because it will be used when installing the stepper actuator.

6. Disconnect all field-installed wiring entering the control panel (identified in Step 1) from the control panel terminal strips; then detach the field-installed conduit from the control panel enclosure.

7. Remove all sensors.
8. Identify all factory-installed wiring between the unit-mounted components (e.g., vane actuator, oil sump, purge, etc.) and the control panel; make sure that the existing wire numbers on these leads are readable.

Then:

a. Relabel each of these leads with its equivalent wire number designation in the UCP2 control scheme. Use the wiring diagrams that shipped with the UCP2 panel to assure that you assign the proper wire numbers.

b. Disconnect each of these wires from the control panel terminal strip.

c. Detach the existing, factory-installed machine conduit from the control panel enclosure. This conduit will be reused, wherever possible, when the new control panel is installed.

9. Disconnect the panel pressure gauge lines (if applicable) where they enter the chiller, then valve off or plug each unit opening.

   If the refrigerant is in the chiller, the pressure must be raised to 0 psig using a means, such as heat, that will not result in excessive purging. The use of nitrogen is not acceptable and violates Federal Anti-Venting Regulations.

10. Disconnect the opposite ends of any pressure gauge lines at the control panel.
11. Cut wire ties, and unbolt conduit connections, as necessary to allow removal of the control panel.
12. Unbolt the control panel from its mounting brackets and remove it from the unit.
13. Remove the chiller nameplate from the control panel enclosure and secure it to the outside of the UCP2 control panel. If the nameplate cannot be removed, transcribe the nameplate data, using a permanent marker, on the supplied additional nameplate.

Important! The information on this original chiller nameplate is required to allow proper part identification of components not affected by the UCP2 conversion.

14. If installing a stepper inlet guide vane actuator, remove the existing vane actuator. Keep all of the connecting hardware and four of the five 115 VAC actuator leads. These will be reused when the new vane actuator is installed.

Replacing an existing CVHE control system with one based on the UCP2 control panel requires a number of wiring and hardware changes. Additional modifications are needed when this conversion is made on Model CVHB, CVHA or PCV CenTraVacs® and all competitor built chillers.

UCP2 Installation

Module Installation

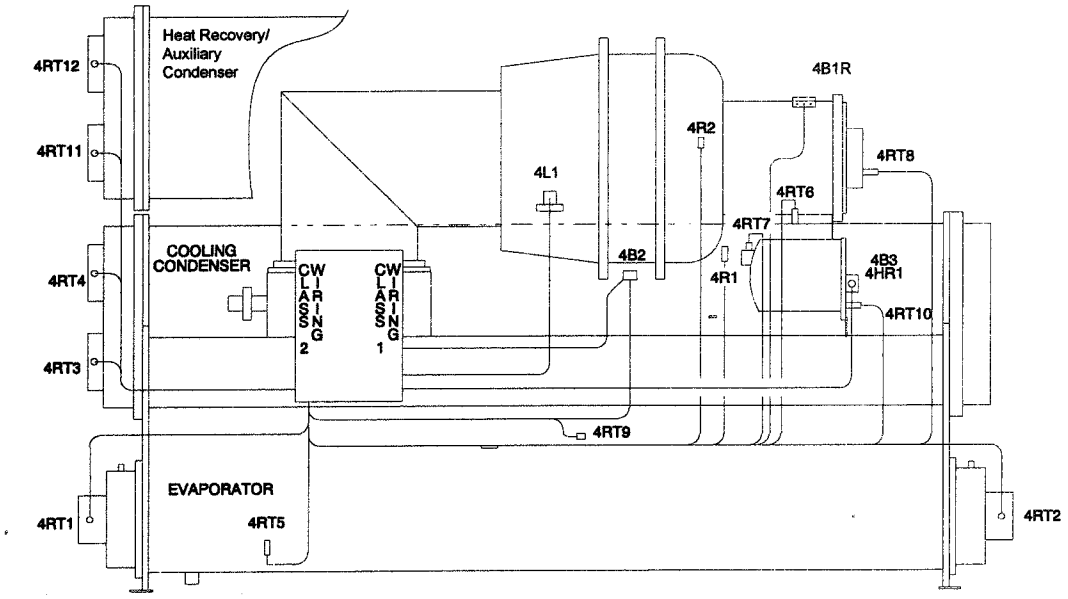
All optional modules must be field installed with the supplied hardware and connected to the other modules via the Inter-Processor Communications (IPC). The IPC is a 19,200 baud asynchronous communications link.

Stack the modules as shown in Figure 2 using provided brackets.

Connect the IPC and 24 VAC between modules as shown in Figures 11, 12 and 13. Each link must have the shield connected to ground on one end and cut off and taped back on the other end.

Note: All wiring must comply with NEC guidelines as well as local codes. The Trane Company takes no responsibility for improper wiring practices.

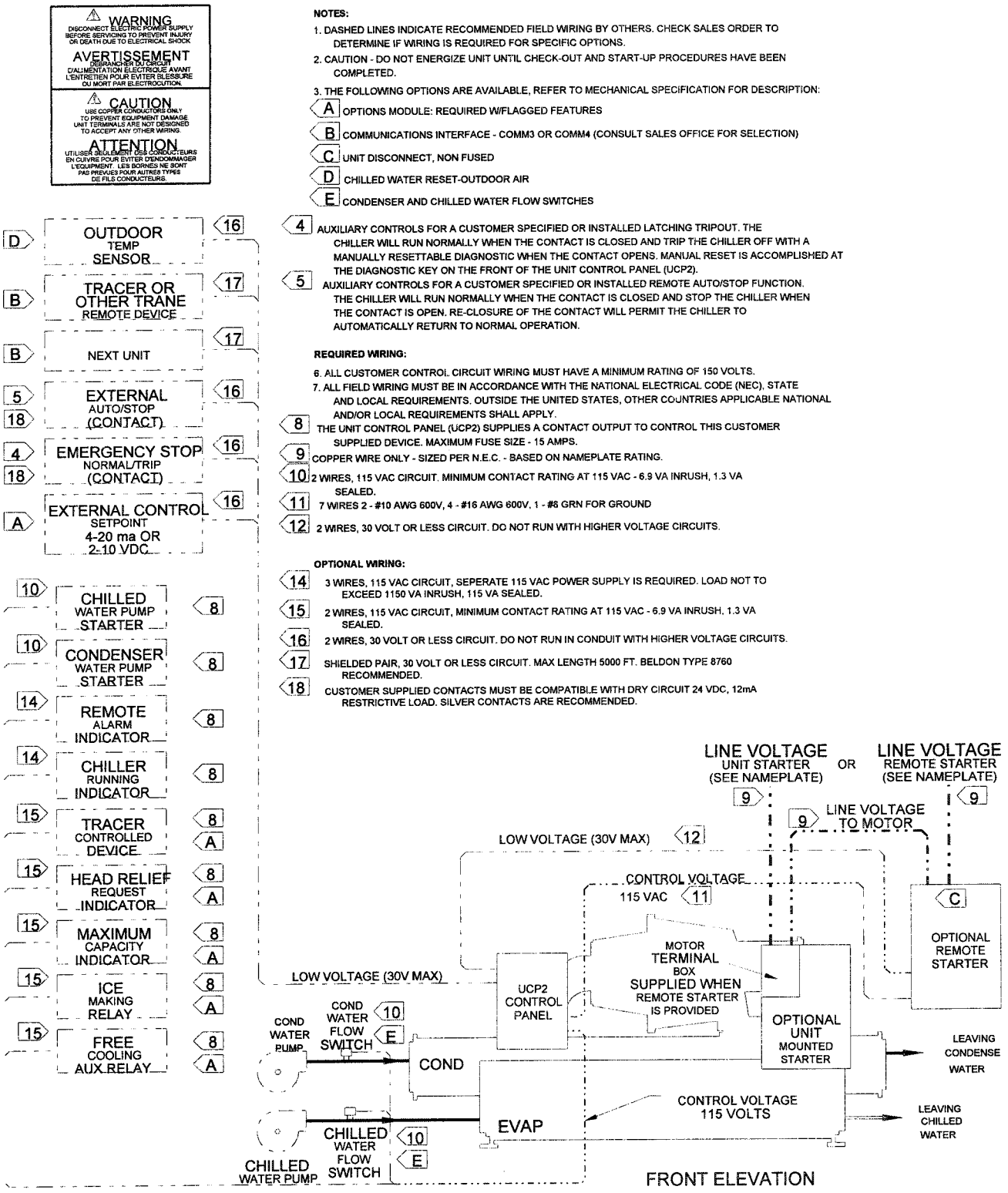
Figure 3 -
Sensor Location



Device Desig.	Description
3R3	Condenser Refrig. Pressure Transducer (Not Shown)
4B1R	Motor Winding Temperature Sensor
4B2	Vane Actuator Motor (Stepper)
4B3	Oil Pump Motor
4HR1	Oil Tank Heater
4L1	Vent Line Solenoid
4R1	Low Pressure Oil Sensor (Oil Vent Line)
4R2	High Pressure Oil Sensor (Oil Feed Line)
4RT1,2	Entering & Leaving Evaporator Water Temperature Sensors

Device Desig.	Description
4RT1,2	Ent. & Lvg. Evaporator Water Temperature Sensors
4RT3,4	Ent. & Lvg. Condenser Water Temperature Sensors
4RT5	Saturated Evap. Ref. Temperature Sensor
4RT6	Compressor Discharge Temperature Sensor
4RT7	Bearing Temperature Sensor #1
4RT8	Bearing Temperature Sensor #2
4RT9	Saturated Condenser Refrig. Temperature Sensor
4RT10	Oil Temperature Sensor
4RT11,12	Ent. & Lvg. Heat Recovery/Aux. Cond. Water Temperature Sensors

Figure 4 -
UCP2 Field External Devices Wiring Layout Diagram



Module Dip Switch Settings

The Options module has dip switch settings used to set up the board for 2-10 VDC or 4-20 mA signal inputs. The switch settings for external current limit setpoint and external chilled water setpoint are listed below:

Options Module

	Switch	2-10V	4-20 mA
External Current Limit	SW2-1	Off	On
External Chilled Water	SW3-1	Off	On

Likewise, the TCI modules require that their boards be configured per the following dip switch settings.

Module	Switch SW1 Position		
	1	2	3
Tracer COM 3	Off	Off	Off
Tracer COM 4	Off	On	Off
IPC Buffer	Off	Off	On
Printer	Off	Off	On

TCI Printer Interface to Printer Setup

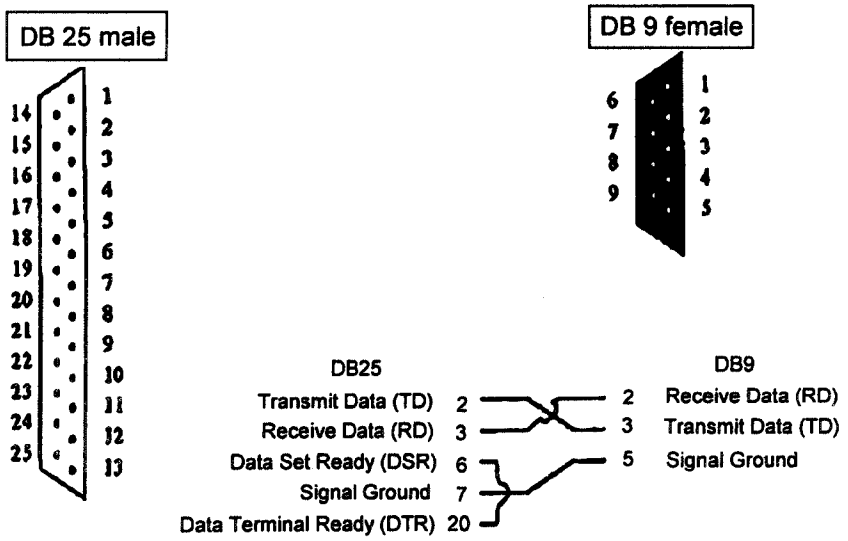
A dedicated serial printer such as Trane part number PTR0001 is recommended.

Suggested Serial Communications Settings for Printer Interface	
Baud Rate	4800
Data Bits	8
Stop Bits	1
Parity	None
Hand Shaking	Xon - Xoff

Enter these settings in the UCP2 Clear Language Display (CLD). Also enter the same settings in the printer (typically dip switches, see printer manual for details). **It is very important that the Serial Communication Settings on the CLD and the printer are exactly the same!**

See Figure 4a for printer cable connections. The pin6-pin20 connection on the DB25 is required for Trane serial printer part number PTR0001.

Figure 4 a - Serial Printer Connections



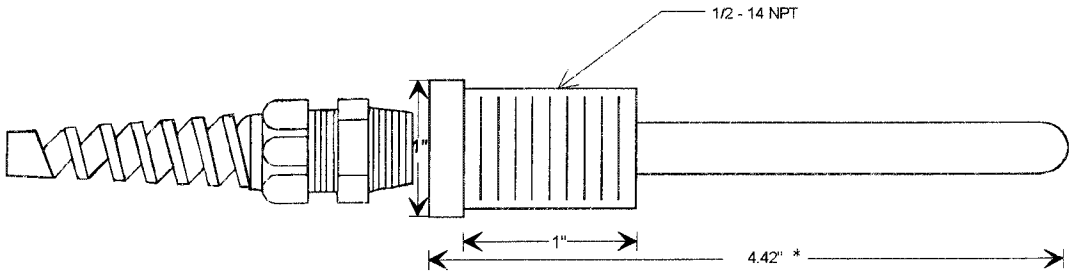
Temperature Sensor Installation

The UCP2 temperature sensors require a 1/2" bulbwell (See Figure 5 for details). When the sensor is installed in a bulbwell:

- add thermastic paste to each bulbwell before inserting the sensor
- ensure that the sensor "bottoms out" at the base of the bulbwell.

See Figure 3 for the sensors' locations. Additional instructions for installation follow.

Figure 5 -
Thermistor Bulbwell



*For Saturated Evaporator Refrigerant Temperature, the dimension is 6.62".

Standard Sensors Included in UCP2 Retrofit Kit

- **Entering Evaporator Water Temperature Sensor (4RT1)** - Install the bulbwell where the start-stop switch sensor was located; or replace the current bulbwell with the new one provided in the UCP2 Retrofit Kit. See Note 1 for external mounting information.

Note 1 - For external sensor mounting see section titled "Externally Mounted Temperature Sensors" .

- **Leaving Evaporator Water Temperature Sensor (4RT2)** - Replace the existing bulbwell or mount externally. See Note 1 for external mounting information.

Note: Mount 4RT2 in a bulbwell for proper control performance on systems with short loop times.

- **Entering Condenser Water Temperature Sensor (4RT3)** - Replace the existing bulbwell or mount externally. See Note 1 for external mounting information.
- **Leaving Condenser Water Temperature Sensor (4RT4)** - Replace the existing bulbwell. Sensor may be externally mounted. See Note 1 for external mounting information.

Note: 4RT1 and 2 as well as 4RT3 and 4 must be matched pairs of sensors. Make sure they are not separated.

⚠ Caution:
If drilling into the bottom of the Evaporator or Condenser is necessary, the refrigerant charge must be removed. Failure to do so could result in avoidable refrigerant leakage to the atmosphere and a violation of the Federal Anti-Venting Laws.

- **Saturated Evaporator Refrigerant Temperature Sensor (4RT5)** - Remove the 1/4" angle valve located near the bottom of the evaporator and install the bulbwell.
- **Bearing Temperature Sensors #1 & #2 (4RT7,8)** - Read the section titled "Externally Mounted Temperature Sensors" and mount each of these sensors on the underside of the bearing oil return lines. Locate each sensor beneath the section of line that angles downward at 45°.
- **Saturated Condenser Refrigerant Temperature Sensor (4RT9)** - 4RT9 must be exposed to the leaving liquid at the bottom of the condenser upstream of any orifices or float valves. If the Condenser Refrigerant Pressure Transducer (3R3) is installed, this sensor may be externally mounted. See Section "Externally Mounted Temperature Sensors".
- **Oil Temperature Sensor (4RT10)** - Install the bulbwell in the oil sump well.

Optional Temperature Sensors

- **Compressor Discharge Temperature Sensor (4RT6)** - Replaces the High Temperature Limit Switch for Hot Gas Bypass. Generally located inside the volute.
- **Auxiliary/Heat Recovery Entering Temperature Sensor (4RT11)** - Use with heat exchangers.
- **Auxiliary/Heat Recovery Leaving Temperature Sensor (4RT12)** - Use with heat exchangers.
- **Outdoor Air Temperature Chilled Water Reset Sensor (RT1)** - Mount this sensor in the fresh air intake, or on the north wall of the building out of direct sunlight.
- **Tracer Temperature Sensor (5RT1)** - Input for a customer-supplied thermistor to monitor temperatures at a Tracer Building Automation System. Monitors ambient temperature.
- **Motor Winding Temperature Sensors 1, 2, & 3 (4B1R2,3,4)** - Uses existing motor temperature sensors. If RTD sensor is used, wire directly to terminals. If a motor temperature thermostat is currently installed, refer to the Motor Temperature Interface Section for additional wiring instructions.

Externally Mounted Temperature Sensors

To mount sensors externally:

1. Remove the paint, rust and other material from the pipe surface; then use an emery cloth to expose bare metal.

2. Secure the sensor to the pipe surface with thermally conductive, high strength, room temperature curing adhesive which bonds to most material found in the electronics industry. Make sure that the sensor retains contact with the pipe for accurate measurement.

3. Wrap the sensor with Armaflex insulation.

⚠ WARNING!
High strength adhesives typically are an eye irritant and may irritate sensitive skin. If adhesive comes in contact with skin, flush affected area with water for 15 minutes and seek medical attention. Refer to the package for additional information.

Refrigerant and Oil Pressure Transducer Installation

Install the following pressure transducers supplied with the UCP2 Retrofit Kit, see Figure 6. Connect the transducers to the UCP2 at the terminals identified in Figure 11:

- **Oil Sump Pressure Transducer (4R1)** - Installed in the vapor space for the oil sump.
- **Oil Pump Discharge Pressure Transducer (4R2)** - Installed in the supply oil line after the filter or any shut-off valves.

Note: The oil pressure transducers (4R1, 4R2) are used to prove oil flow. Competitive chillers may operate at oil pressures higher than that found on CenTraVacs®. If installing a UCP2 conversion package on a competitive chiller, determine the oil sump and oil pump pressures of the machine. The working pressure of the transducers is between -15 and +35 psig. If oil pressures exceed the limits of the working pressure range or if the variable oil differential pressure cutout setpoint (adjustable between 6 and 35 psid) is not suitable for detecting oil flow, UCP2 will accept a binary input from a differential pressure switch. Install a field supplied oil differential pressure switch across the oil sump and oil supply line.

- **Condenser Refrigerant Pressure Transducer (3R3)** - Although installation of this supplied sensor is optional, Trane recommends installing it to improve the condenser pressure limiting function. 3R3 must be installed for proper control if the Saturated Condenser Refrigerant Temperature Sensor (4RT9) is externally mounted, due to the slow response time of an externally mounted 4RT9.

Water Pressure Transducer Installation

The Water Pressure Transducer Option monitors the condenser and evaporator water flow rate in gallons per minute (GPM) and monitors the tons of cooling produced by the evaporator at the UCP2 display.

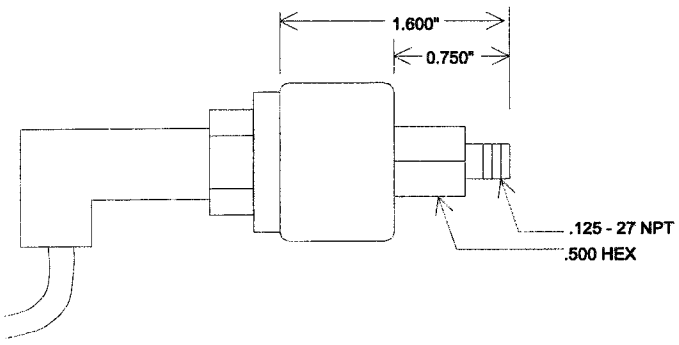
There are two available Water Pressure Transducer Kits which require field assembly. See Figures 8 and 9 for details.

- **The <150 psig kit** is for use with Water Boxes under 150 psig. The 4L2 and 4L3 solenoid valves alternate the input to the 4R3 and 4R4 pressure transducers between the entering and leaving water lines for the shell.
- **The >150 psig kit** uses 4U1 and 4U2 differential pressure transducers and two pressure relief valves to protect the differential pressure transducers.

Note: Trane suggests attaching the mounting bracket for the water pressure transducers under the suction elbow bolts.

- **Evaporator Entering/Leaving Water Pressure Transducer (4R3)** - Use 0.25 OD tube to connect to the appropriate water box. See Figures 7 and 8 for mounting/ piping instructions.
- **Condenser Entering/Leaving Water Pressure Transducer (4R4)** - Use 0.25 OD tube to connect to the appropriate water box. See Figures 7 and 8 for mounting/ piping instructions.
- **Evaporator Differential Water Pressure Transducer (4U1)** - Use 0.25 OD tube to connect to the appropriate water box. See Figures 7 and 9 for mounting/ piping instructions.
- **Condenser Differential Water Pressure Transducer (4U2)** - Use 0.25 OD tube to connect to the appropriate water box. See Figures 7 and 9 for mounting/ piping instructions.

Figure 6 - Pressure Transducer



Water Pressure Transducers Setup

Before the UCP2 can convert the pressures into GPM's and tons, five constants must be set in the Field Startup group as listed below. Note the screens to input these constants are available only after installing the Water Pressure Transducer Option in the Service Settings - Machine Configuration.

To determine these constants, the pressure drop (Δ P) for two different flow rates (GPM) must be known. One of these points can be the design GPM and Δ P as shown on the chiller's submittal. The other point must come from the chiller sales selection information which shows Δ P versus GPM for given condensers and evaporators in various chiller sizes. Select a second point on the same line as defined by the design submittal. These points are now defined as GPM1, Δ P1, GPM2 and Δ P2 and are used in the steps listed below. Refer to the example calculation that follows.

Note: A scientific calculator is required for the following calculations. Functions must be available to take the natural log (ln) of a number and also raise a number to a power $(\Delta P1)^n$.

1. Evaporator Flow Equation Exponent:

$$n = \frac{\ln\left(\frac{GPM1}{GPM2}\right)}{\ln\left(\frac{\Delta P1}{\Delta P2}\right)} = \mathbf{0.5XXX}$$

The result of this equation, **n**, will be a number in the form of 0.5XXX. The digits **XXX** are entered into the UPC2 under the Evaporator Flow Equation Exponent.

2. Evaporator Flow Coefficient:

$$c = \frac{GPM1}{(\Delta P1)^n}$$

Note: n was determined in Step 1.

The result (c) should be rounded to the nearest 5 and entered into the UCP2 under the Evaporator Flow Coefficient.

3. Condenser Flow Equation Exponent:

Use the same equation as in Step 1, but with the condenser data. Enter into the UCP2 under the Condenser Flow Equation Exponent.

4. Condenser Flow Coefficient:

Use the same equation as in Step 2, but with the calculated result for **n** from Step 3. The result should be rounded to the nearest 5 and entered into the UCP2 under the Condenser Flow Coefficient.

5. Evaporator Fluid Coefficient:

Use the Table 4 to determine the Fluid Coefficient "D" and enter into the UCP2 under the Evaporator Fluid Coefficient.

Table 4 - Fluid Coefficient "D" for 40° F

Fluid	%	D
Water		418
Calcium Chloride Solution	11	386
	20	364
	30	354
Sodium Chloride Solution	5	406
	15	392
	25	392
Ethylene Glycol Solution	10	401
	30	378
	50	347
Polyethylene Glycol Solution	16	410
	30	393
	50	364

⚠ Caution:
Use of impure fluids will display incorrect data. Pressure Transducer lines may plug which can damage the transducers.

Example for Set-up

For a standard length evaporator shell with internally enhanced tubes for a CVHE 500 with evaporator bundle size of 550, contact the Sales Office for **Pressure Drop Curves** information to determine the second point. The design point is 880 GPM at a 10 ft. pressure drop.

Design:

GPM1 = 880
Δ P1 = 10

From Selection Program :

GPM2 = 1000
Δ P2 = 12.5

1. Determine Evaporator Flow Equation Exponent

$$n = \frac{\ln\left(\frac{GPM1}{GPM2}\right)}{\ln\left(\frac{\Delta P1}{\Delta P2}\right)} = \frac{ln\left(\frac{880}{1000}\right)}{ln\left(\frac{10}{12.5}\right)}$$

$$= \frac{-.1278}{-.2231} = .5729$$

729 = Exponent

2. Determine Evaporator Flow Coefficient:

$$c = \frac{GPM1}{(\Delta P1)^n} = \frac{880}{(10)^{.5729}} = 235.29$$

235 = Coefficient

3. Repeat Step 1 for the Condenser Flow Equation Exponent using condenser data.

4. Repeat Step 2 for the Condenser Flow Coefficient using condenser data.

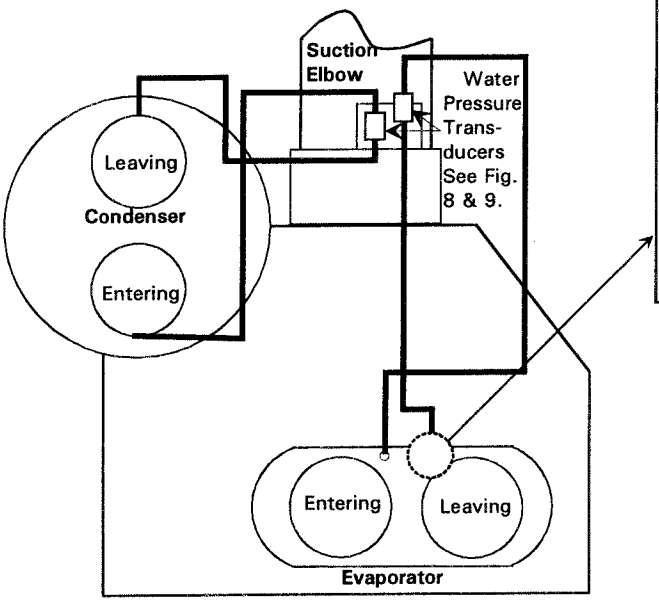
5. Determine Evaporator Fluid Coefficient. (Water in this example.)

418 = Coefficient

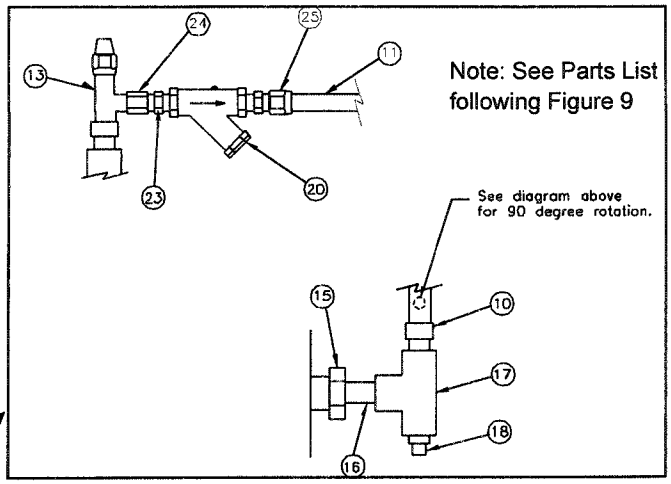
These five constants are now set in the field startup group.

Figure 7 - Water Pressure Transducer Tubing
See Figure 8 for <150 PSIG
See Figure 9 for >150 PSIG

Field Tubing of Water Pressure Transducers
Note: Use copper lines
Use Teflon tape for all threaded connections

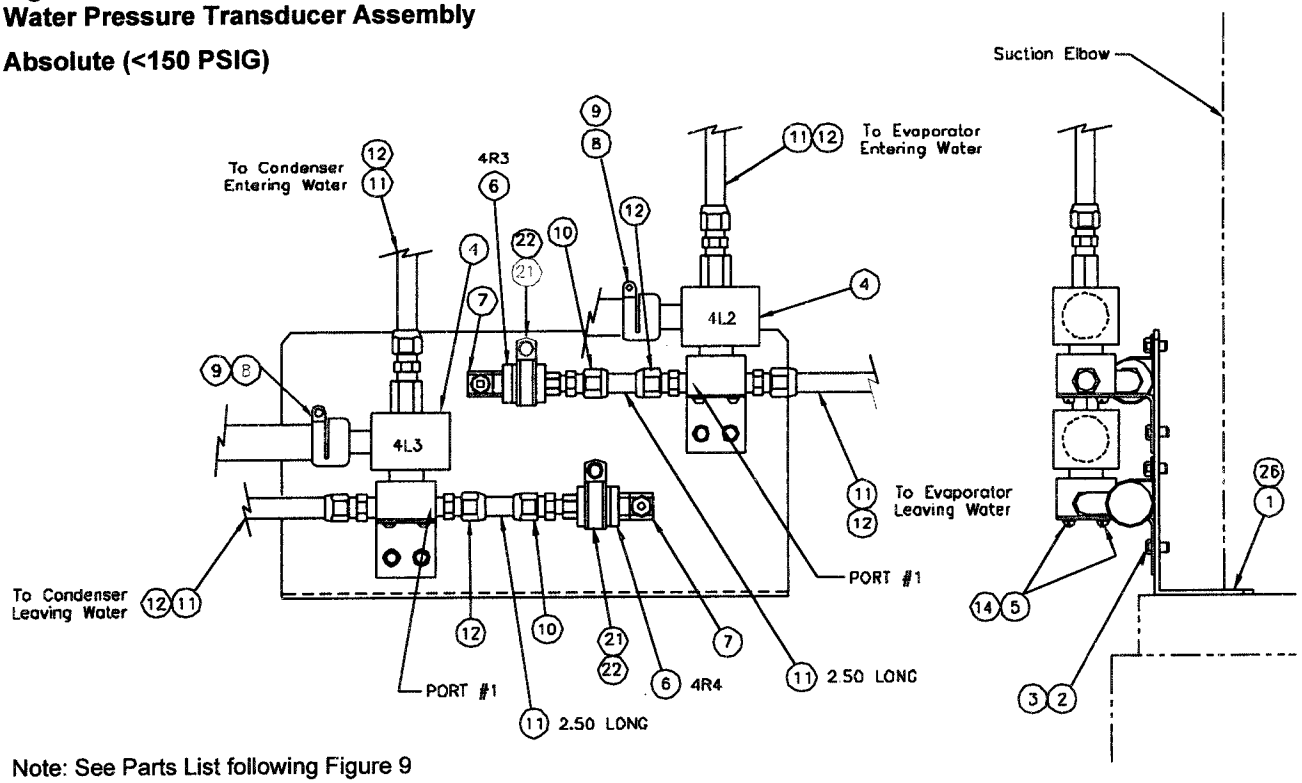


Water Box Assemblies



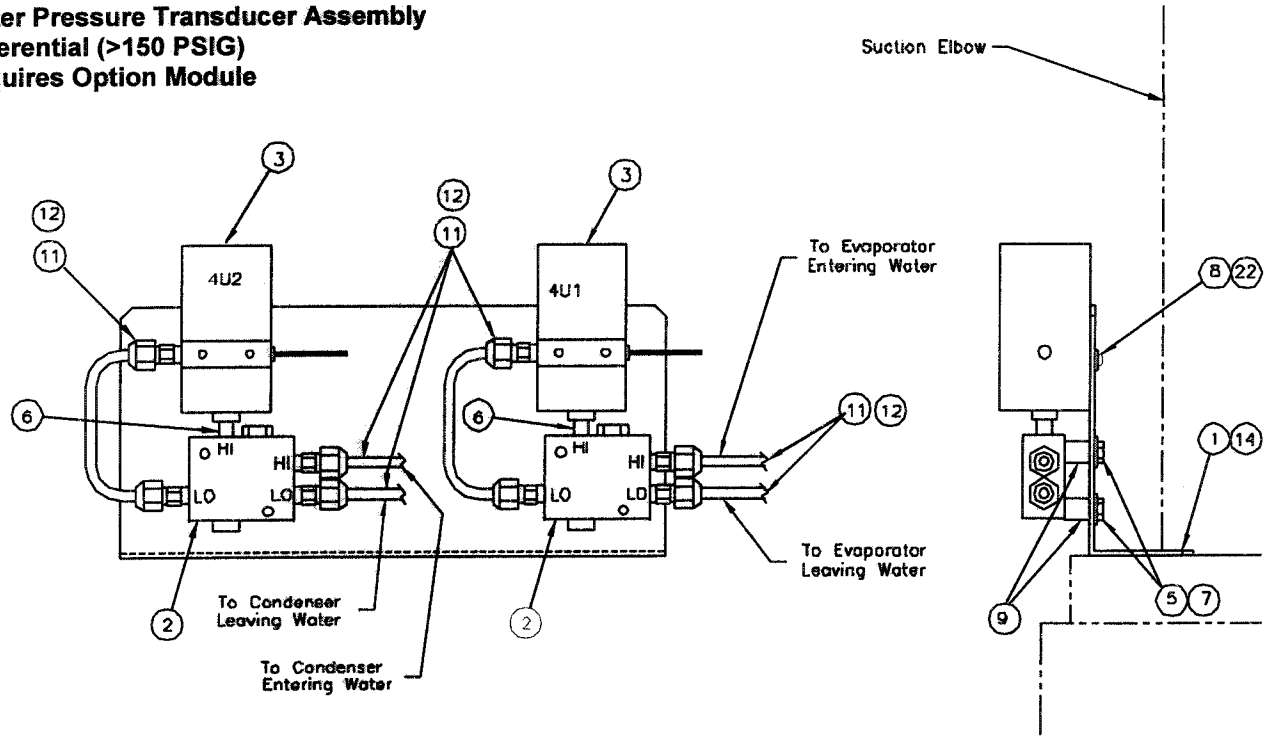
⚠ Caution:
Do not close the valve for prolonged periods. Increased temperature could result in expansion of liquid in the copper tubing which can damage the pressure transducers.

Figure 8 -
Water Pressure Transducer Assembly
Absolute (<150 PSIG)



Note: See Parts List following Figure 9

Figure 9 -
Water Pressure Transducer Assembly
Differential (>150 PSIG)
Requires Option Module



Note: See Parts List below

Water Pressure Transducers Parts Lists

<150 psig Water Pressure Assemblies			>150 psig Water Pressure Assemblies			Water Box Assemblies		
#	Description	Qty	#	Description	Qty	#	Description	Qty
1	Support, Compr 032-127	1	1	Support, Compr 032-127	1	10	Connector, .25 OD x .12 NPT	4
2	Bracket, Solenoid Valve UCP-2	2	2	Valve, Relief	2	11	Tube, .25 OD x .040W Nylon	4
3	Screw, .25-20 x .50 Thd	4	3	Transducer, Pressure 0-150	2	13	Valve, .25 NPTE X .25 MFL	4
4	Valve, .125 NPTI Solenoid	2	5	Washer, .26 ID x .62 OD PL	4	15	Bushing, .75 x .25 NPS Hex	4
5	Screw, 8-32 x.38 RDH Mach	4	6	Nipple, .12 NPS x .75 BLK	2	16	Nipple, .25 NPS x 1.50 BLK	4
6	Transducer, Pressure 0-150	2	7	Screw, .25-20 x 1.25 Hex Cap	2	17	Tee, .25 NPS 300# MI	4
7	Cable, Assembly Transducer	2	8	Washer, .15 ID x .37 OD	4	18	Plug, .25 NPFT	4
8	Conduit, .50 NOM (#)	4	9	Pipe, .25 NPS x .199	4	20	Strainer, .25 NPT	4
9	Squeeze, Conn., .50 NOM Strt.	4	11	Tube, .25 OD x .040W Nylon (#)	4	23	Adapter, .25 MFL X .25 NPTE	4
10	Connector, .25 OD x .12 NPT	4	12	Adapter, .25 OD x .12 NPTE	6	24	Union	4
11	Tube, .25 OD x .040W Nylon (#)	4	14	Lk Wash, .164 Nom HLCL Spr	4	25	Connector, .25 OD X .25 NPT	4
12	Adapter, .25 OD x .12 NPTE	6	22	Screw, 10-32 x .38	2	26	Plug, .50 NPTF	1
14	Lk Wash, .164 Nom HLCL Spr	4	*	Plug, .50 NPTF	1			
21	Clamp, 1.00 Dia	2	*	STL .121 Min x 41 x 90				
22	Screw, 10-32 x .38	2	*	Angle	2			
26	Washer, .53 ID x 1.06 OD	2	*	Bag, 9 x 12.5 x 3 Mil w/Trane	1			
*	STL .121 Min x 41 x 90							
*	Angle	2						
*	Bag, 9 x 12.5 x 3 Mil w/Trane	1						

* Not Illustrated

(#) Field Supplied

Condenser High Pressure Switch

The supplied switch must be installed instead of the existing switch. It is typically mounted inside the UCP2 panel. The two dry contacts on the new switch will be used with the Circuit Module (Figure 11) and the Starter Module (Figures 20 and 21). The normally open contact goes to the circuit module (1U2 pin J26-2) and the normally closed contact goes to terminal 1TB1-9 in the main control panel.

Refrigerant Monitor

There are two options:

- The 4-20 mA analog output from a refrigerant monitor can be connected to the UCP2 circuit Module, 1U2. This will allow the proportional output of the monitor to be communicated to a Tracer BAS.

  Monitors which source the 4-20 mA current, such as the Trane Model RMWC, should be connected to J5-5 (+) and J5-6 (-). Monitors which do not source their own current would connect to J5-4 (source), J5-5 (+) and J5-6 (-). See Figure 11.

  Note: Select analog for refrigerant monitor type in UCP2 menu service settings - machine configuration.

- Trane RMWD refrigerant monitors with Version two software will communicate directly to UCP2 via the interprocessor communication link (IPC).
  The connection should be made to the UCP2 stepper module 1U3 at J1-3 (+), J1-4 (-) and J1-6 (Shield to GND).

  Note: Select IPC for refrigerant monitor type in UCP2 menu service settings - machine configuration.

Stepper Actuator Binary Position Indicator (BPI)

If installing a stepper inlet guide vane actuator, the BPI must be installed on the stepper actuator. To install the BPI, set the actuator to a 90° vane position (fully open) and place the BPI in the slide track of the Inlet Guide Vane (IGV) actuator. See Figure 10. Connect ohm meter leads to the BPI wires and slide the switch from the front of the track toward the back until the ohm meter indicates switch closure (approx. 46 ohms). Mark a spot adjacent to the leading edge of the switch. Starting from the back of the track, move the switch forward until the switch closes again and mark the spot adjacent to the leading edge of the BPI switch. Move switch to the midpoint of the two marks and firmly secure with the two setscrews provided.

Figure 10 -
Typical BPI Switch Installation

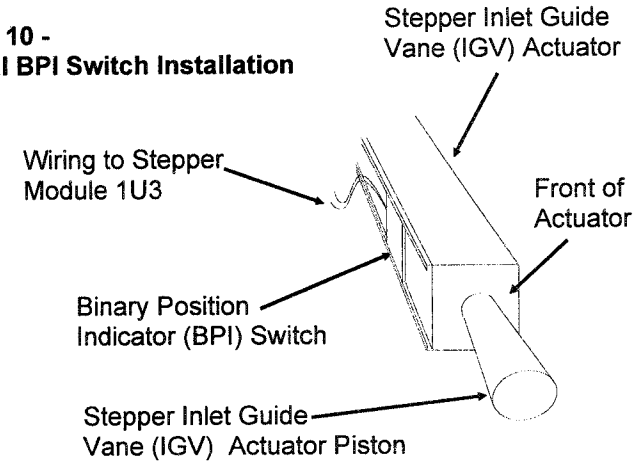


Table 5 -
UCP2 Retrofit Field Wiring

Description of Wiring	Required/ Optional	UCP2 Terminations	Other Termination	Wire #'s
Chiller Module (1U1)	**R**	**Figure 12**		
Communication Link from Purge	O	J1C-3,4,6 (Lower Plug)	3U1-J1-1,2	70,71
Communication Link from Starter	R	J1D-3,4,6 (Upper Plug)	2U1-J1-1,2	15,16
Evap Entering Water Temperature	R	J3-1,2	4RT1	
Evap Leaving Water Temperature	R	J3-3,4	4RT2	
Cond Entering Water Temperature	R	J3-5,6	4RT3	
Cond Leaving Water Temperature	R	J3-7,8	4RT4	
Evap Water Pressure Solenoid	O	J4-2,1	1TB1-14,4L2,1TB1-4	5M,21A,2G
Ext. Auto Stop (jumpered if not used)	O	J5-1,2	5S3	
Emergency Stop (jumpered if not used)	O	J5-3,4	5S4	
Outdoor Air Temp Ambient CWR	O	J5-5,6	RT1	
Cond Water Press Solenoid	O	J6-2,1	1TB1-14,4L3,1TB1-4	5J,22A,2H
Heat Pump Control	O	J7-5,6	5S5	
Evap Ent & Lvg Wtr Press	O	J9-1,2,3,4,5	4R3	
Cond Ent & Lvg Wtr Press	O	J9-6,7,8,9,10	4R4	
Chilled Water Pump Relay	O	J12-2,1	115 VAC,5K1	
Cond Water Pump Relay	R	J14-2,1	115 VAC,5K2	
Comp Running Relay	O	J16-3,2,1	115 VAC,5K3-NC,5K3-NO	
Alarm Relay, MMR (Latching)	O	J18-3,2,1	115VAC,5K4,DS1	
Limit Warning Relay	O	J20-2,1	115VAC,5K5	
Alarm Relay, MAR (Non-Latching)	O	J22-2,1	115VAC, 5DS2	
Chilled Water Flow Switch	R	J26-2,1	1TB1-12,3,10,5K1	12A,2D
Cond Water Flow Switch	R	J28-2,1	1TB1-13,3,11,5K2	13A,2E
Circuit Module(1U2)	**R**	**Figure 11**		
Comm Link from Options Module	O	J1D-3,4	1U5-J1-1,2	198D,199D
Motor Winding Temps 1,2,3	R	J3-1,3,5,6	4B1R2,3,4,Common	
Oil Temperature	R	J3-7,8	4RT10	
Oil Diff. Pressure Switch	R[1]	J5-1,2	Switch	
Refrigerant Monitor	O	J5-4,5,6	Monitor	
Cond Press/Rfgt Diff Pressure	O	J7-1,2		
Cond Refrigerant Pressure	O	J7-8,9,10,11,12	3R3	
Oil Sump Pressure	R	J9-1,2,3,4,5	4R1	
Oil Pump Discharge Pressure	R	J9-6,7,8,9,10	4R2	
Vent Line Solenoid	R	J16-3,2,1	1TB1-3,4L1-NC,4L1-NO	41B,2X
Oil Tank Heater	R	J20-2,1	4HR1,1TB1-4	42A,N
Oil Pump Motor	R	J22,2,1	1TB1-7,4K8,1TB1-8	9B,9A
Cond High Pressure Switch	R	J26-2,1	3S1-NO,1TB1-4	7B,2B
Stepper Module (1U3)	**R**	**Figure 11**		
Comm Link from RMWD RFGT. Monitor	O	J1-3,4,6	Monitor	
Saturated Evap Refrigerant Temp	R	J5-1,2	4RT5	
Compressor Discharge Temp (HGBP)	O	J5-3,4	4RT6	
Bearing Temp 1	O	J5-5,6	4RT7	
Bearing Temp 2	O	J5-7,8	4RT8	
Stepper Motor Vane Actuator	R[2]	J8-1,2,3,4	4B2	
IGV Actuator BPI	R[2]	J11-1,2	BPI from 4B2	
Saturated Cond Refrigerant Temp	R	J11-3,4	4RT9	
Clear Language Display Mod. (1U4)	**R**	Figure 11		

1 Required only if oil sump and oil pump pressure transducers can not be used.
2 Required only if IGV actuator type is stepper motor.

Table 5 - Continued
UCP2 Retrofit Field Wiring

Description of Wiring	Required/ Optional	UCP2 Terminations	Other Termination	Wire #'s
Options Module (1U5)	**O**	**Figure 13**		
Comm Link from Circuit Module	O	J1-1,2	1U2-J1-3,4	198D,199D
Comm Link from Com4,Com3,IPCB or Printer Module	O	J1-3,4	1U7,8,9,11-J1-1,2	198,199
24 VAC	O	J2-2,1	1U10-J2-1,2	101F,102F
24 VAC	O	J2-3,4	1U1-J2-1,2	101E,102E
Auxiliary Heat Recovery Entering	O	J3-1,2	4RT11	
Auxiliary Heat Recovery Leaving	O	J3-3,4	4RT12	
External Free Cooling Switch	O	J3-5,6	5S6	
Ice Making	O	J3-7,8	5S7	
Free Cooling Actuator Closed	O	J5-1,2	4B12,13	118A,119A,120A
Evaporator Differential Water Press.	O	J5-4,5	4U1	
% RLA Compressor	O	J7-3,4	External Output	
Tracer Temperature Sensor	O	J7-7,8	5RT1	
External Current Limit Setpoint	O	J7-11,12	External Input[3]	
Ice Making Relay	O	J8-2,1	115 VAC,5K6	
External Chilled Water Setpoint	O	J9-4,5	External Input[3]	
Cond Differential Water Pressure	O	J9-9,10	4U2	
Head Relief Request Relay	O	J12-2,1	115VAC,5K7	
Maximum Capacity Relay	O	J14-2,1	115VAC,5K8	
Free Cooling Actuator Relay #1	O	J16-3,2,1	1TB1-11,4B12,1TB1-3	5G,34A,45A, 2
Tracer Controlled Relay	O	J18-3,2,1	115 VAC	5K9
Free Cooling Auxiliary Relay	O	J20-2,1	115VAC,Coil-NO	
Free Cooling Actuator Relay #2	O	J24-3,2,1	1TB1-11,4B13,1TB1-3	5H,46A,37A, 2A
IPC Buffer Module (1U9)	**O**	**Figure 12**		
Comm Link to Stepper or Options Module	O	J1-1,2	1U3,5-J1-3,4	198,199
24 VAC	O	J2-1,2,3,4	1U1-J2-3,4 or 1U5-J2-3,4	101,102
Buffered IPC	O	J3A-1,2	Remote CLD	
Printer Com Module (1U7)	**O**	**Figure 12**		
Comm Link to Stepper or Options Module	O	J1-1,2	1U3,5-J1-3,4	198,199
24 VAC	O	J2-1,2	1U1-J2-3,4 or 1U5-J2-3,4	101,102
Printer Com	O	J4	Printer	
Tracer Com3 Module (1U8)	**O**	**Figure 12**		
Comm Link to Stepper or Options Module	O	J1-1,2	1U3,5-J1-3,4	198,199
24 VAC	O	J2-2,1	1U1-J2-3,4 or 1U5-J2-3,4	101,102
Isolated Bi-directional Communications Link	O	J3-1,2	Tracer 100	
Tracer Com4 (1U11)	**O**	**Figure 12**		
Comm Link to Stepper or Options Module	O	J1-1,2	1U3,5-J1-3,4	198,199
24 VAC	O	J2-2,1	1U1-J2-3,4 or 1U5-J2-3,4	101,102
Isolated Bi-directional Communications Link	O	J3A-1,2	Tracer Summit	
IO Module (HGBP) (1U10)	**O**	**Figure 13**		
Comm Link from Stepper Module	O	J1-1,2	1U3- J1-3,4	198,199
24 VAC	O	J2-3,4	1U1-J2-1,2 or 1U5-J2-1,2	101F,102F
HGBP End Switch	O	J6-1,2	1TB1-3,4B5,1TB1-11	5L,32A,2F
HGBP Valve	O	J8-1,2,3	1TB1-11,4B5,1TB1-3	5F,35A,36A,2
IO Module (Pulse Output) (1U10)	**R[4]**	**Figure 13**		
Comm Link from Stepper Module	R	J1-1,2	1U3- J1-3,4	198,199
24 VAC	R	J2-3,4	1U1-J2-1,2 or 1U5-J2-1,2	101F,102F
Induction Motor Vane Actuator End Switch	R	J6-1,2	1TB1-3,4B5, 1TB1-11	5L,32A,2F
Induction Motor Vane Actuator	R	J8-1,2,3	1TB1-11,4B5, 1TB1-3	5F,35A,36A,2

3 External Inputs are 2-10 VDC/4-20 mA selectable, note polarity on wiring diagram.
4 Required only if IGV actuator type is induction motor.

Figure 11 - UCP2 Schematic Wiring for Clear Language Display, Stepper and Circuit

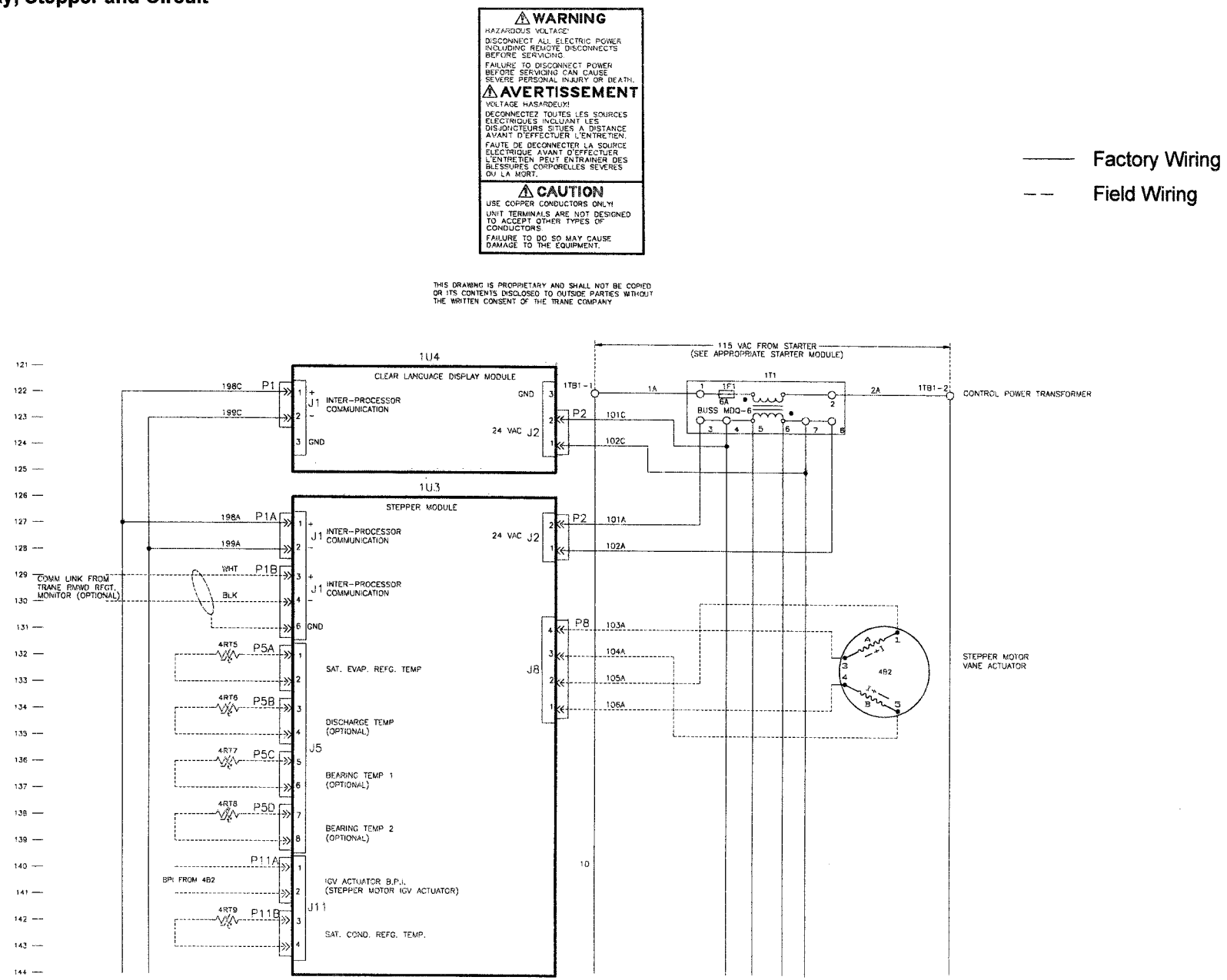


Figure 11 - (Continued)
UCP2 Schematic Wiring for Clear Language Display, Stepper and Circuit Modules

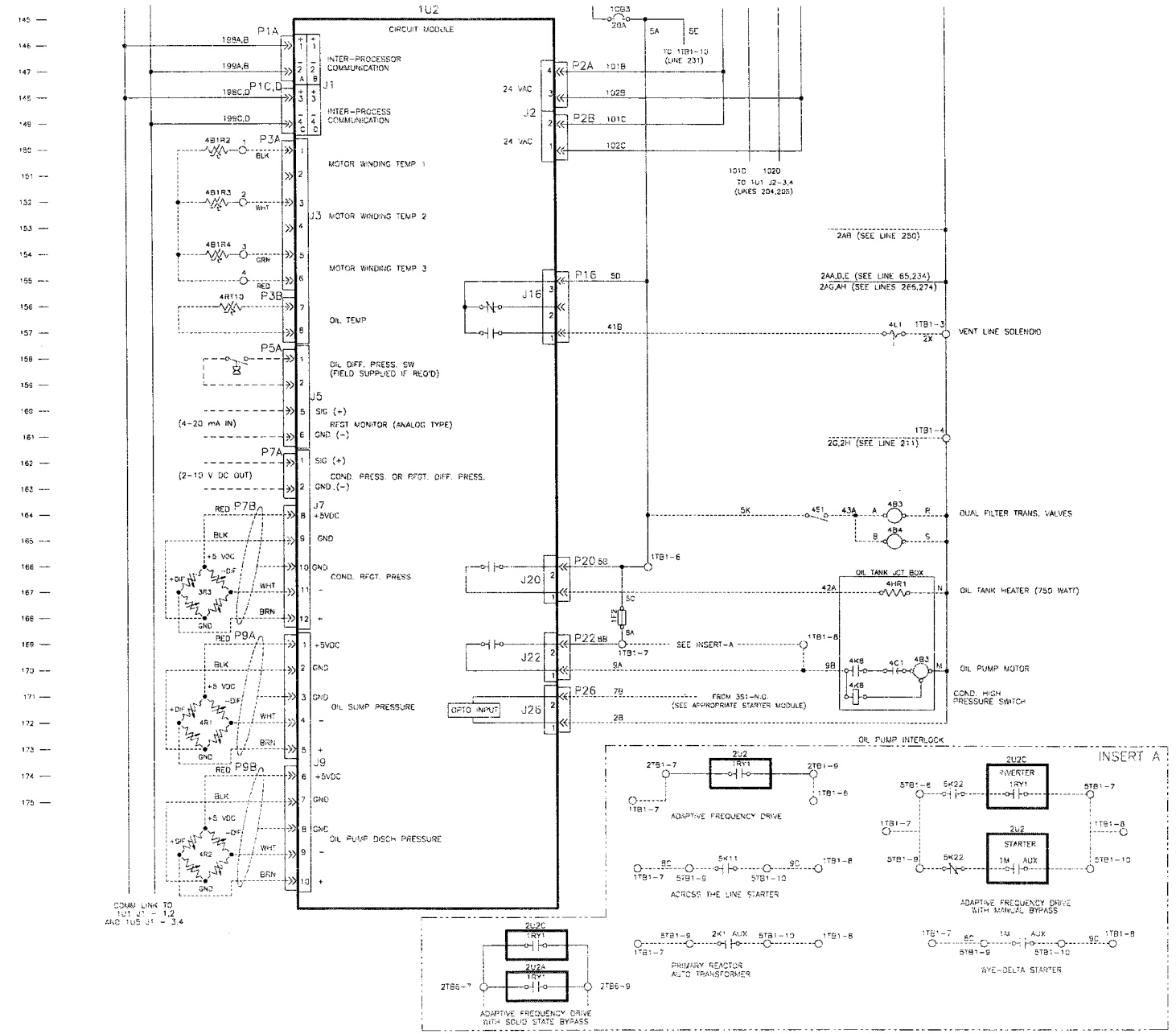


Figure 12 - UCP2 Schematic Wiring Diagram for Chiller, Tracer Comm, Printer, and IPCB

⚠ 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

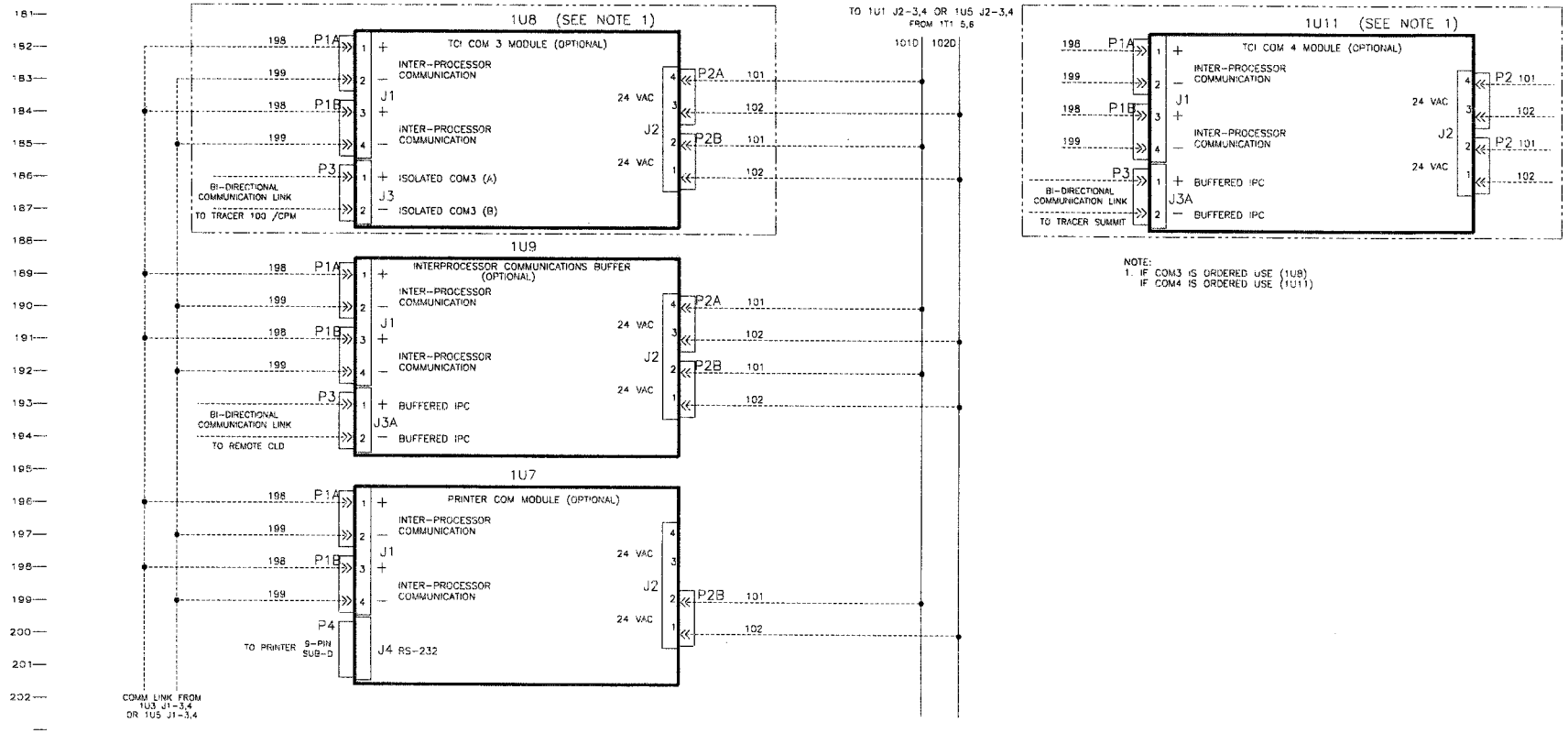
USE COPPER CONDUCTORS ONLY!

UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.

FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

——— Factory Wiring

– – – Field Wiring



NOTE:
1. IF COM3 IS ORDERED USE (1U8)
   IF COM4 IS ORDERED USE (1U11)

Figure 12 - (Continued) UCP2 Schematic Wiring Diagram for Chiller, Tracer Comm, Printer, and IPCB

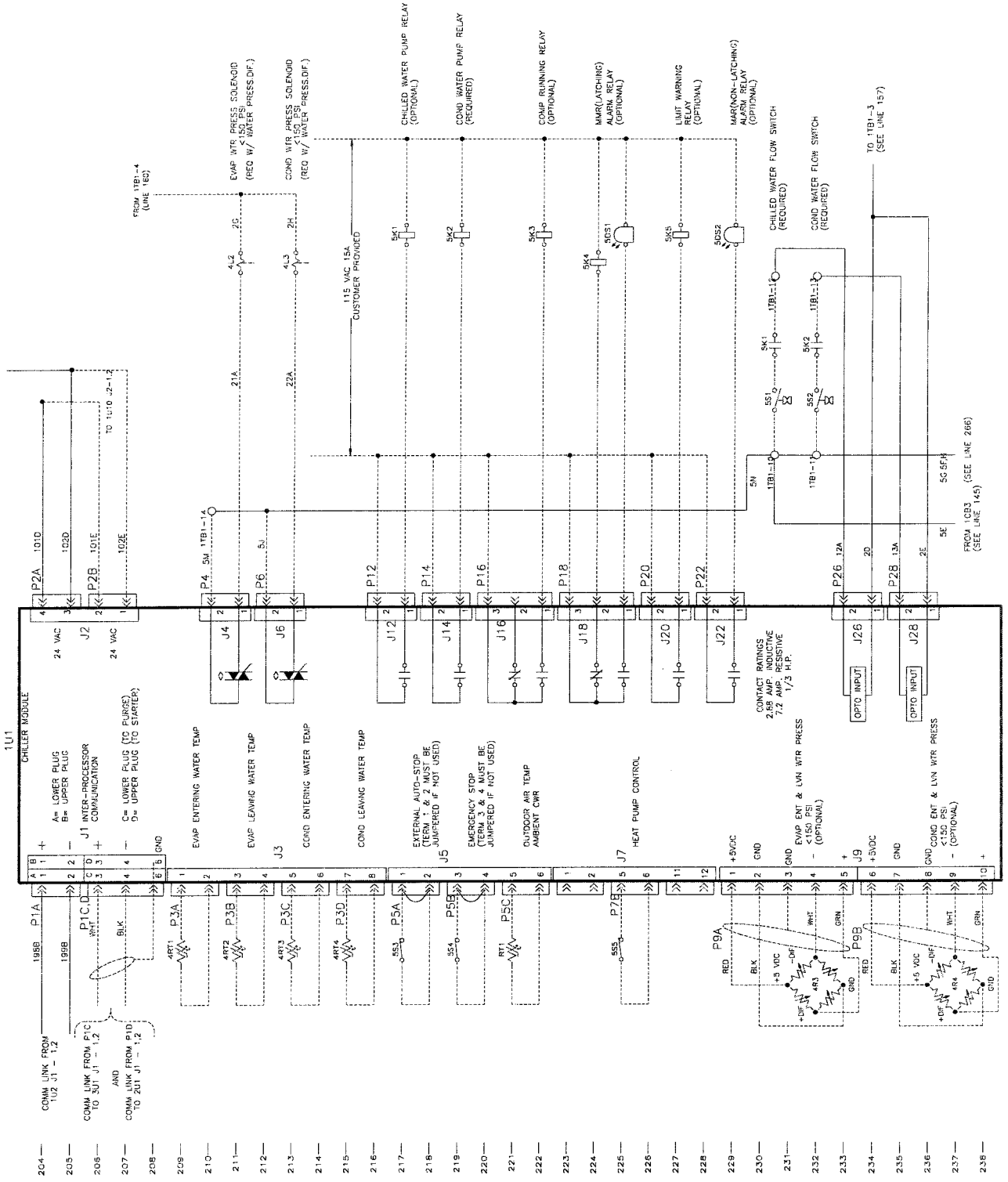


Figure 13 - UCP2 Schematic Wiring for IO and Option Modules

⚠ 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.

——— Factory Wiring

– – Field Wiring

NOTES:

1. I.O. MODULE IS USED FOR HGBP OPTION OR FOR THE PULSE OUTPUT REQUIRED WITH AN INDUCTION MOTOR VANE ACTUATOR. ITEMS ARE MUTUALLY EXCLUSIVE.

   IF HGBP OPTION HAS BEEN ORDERED, I.O. MODULE SHIPS LOOSE. MOUNT MODULE IN PANEL AND WIRE AS SHOWN.

   IF PULSE TYPE ACTUATOR WAS SPECIFIED, I.O. MODULE SHIPS LOOSE. FIELD WIRE THE INDUCTION MOTOR VANE ACTUATOR AND END SWITCH AS SHOWN FOR THE HGBP VALVE.

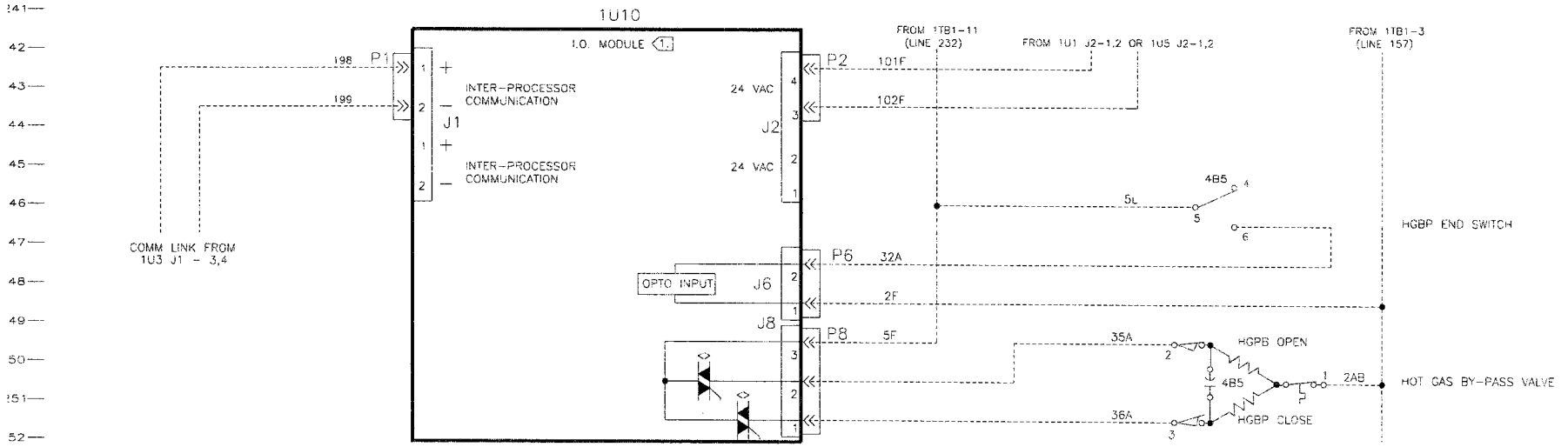
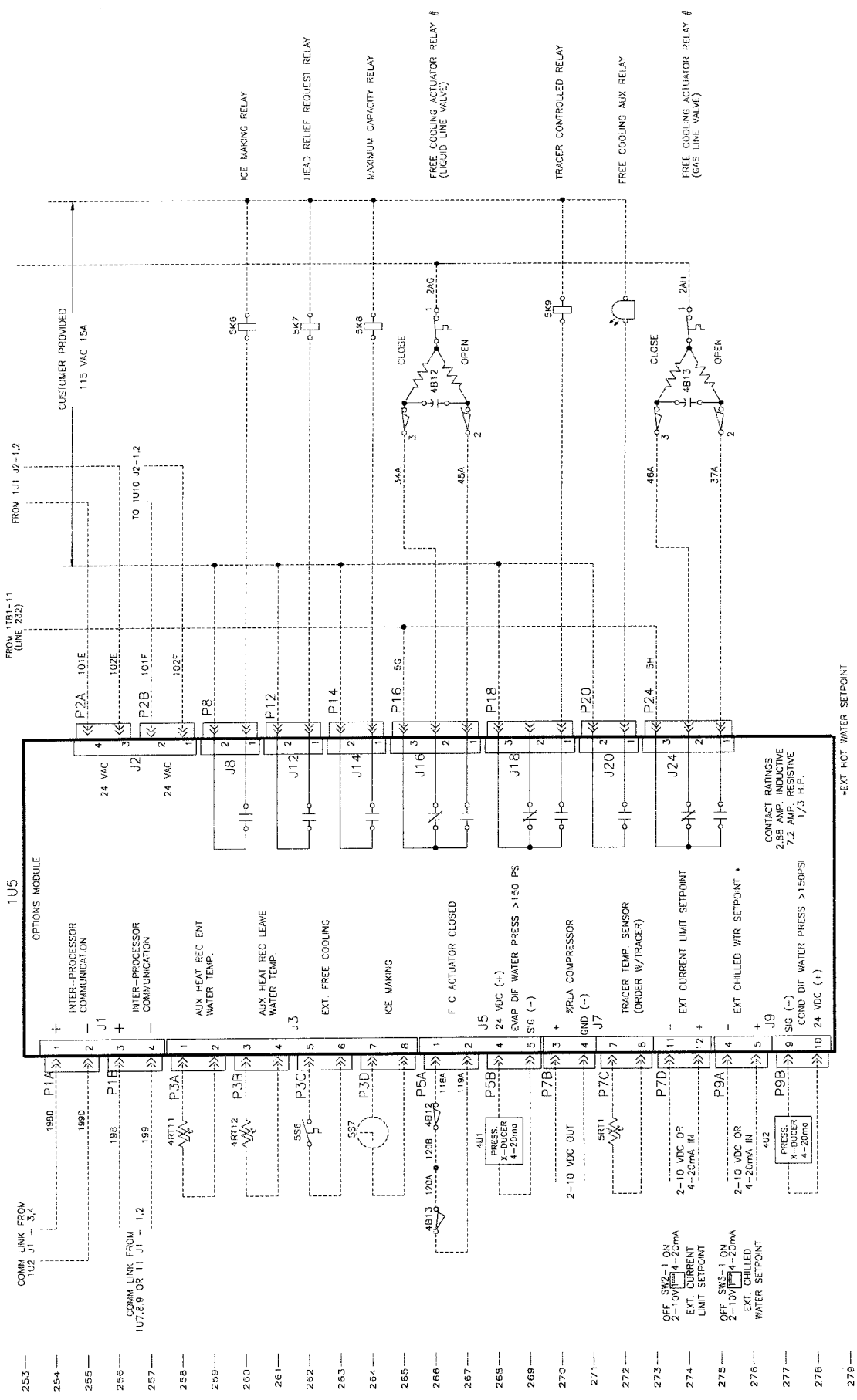


Figure 13 - (Continued) UCP2 Schematic Wiring for IO and Option Modules



Oil Pump Control

If the existing oil pump contactor coil is:

- 115 VAC—connect the existing contactor coil between Terminals 1TB1-8 and 1TB1-4. See Figure 14a.
- not 115 VAC but can be converted—adapt the contactor coil for 115V applications and complete as above, shown in Figure 14a.
- not 115 VAC and can not be converted—wire the coil of a field- supplied "line-to-115V interface relay" between Terminals 1TB1-8 and 1TB1-4, as shown in Figure 14b.

Wire the normally open "interface relay" contacts in series with, and upstream of, the existing oil pump contactor coil. See Figure 14b.

Note: With all oil pump contactor voltage, connect an auxiliary set of "start" contactor (1M) contacts between UCP2 Terminals 1TB1-7 and 1TB1-8 to assure that the oil pump is on whenever the compressor is operating.

Figure 14 a - Electrical Interface for Existing Oil Pump Motor Contactor

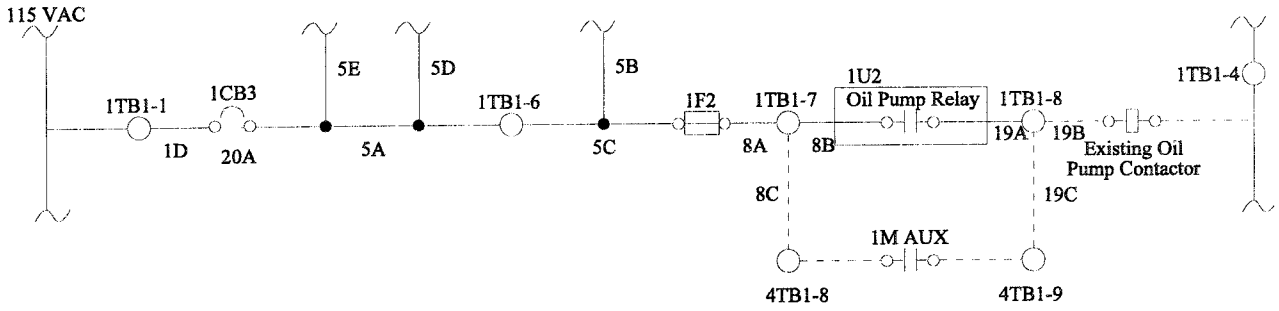
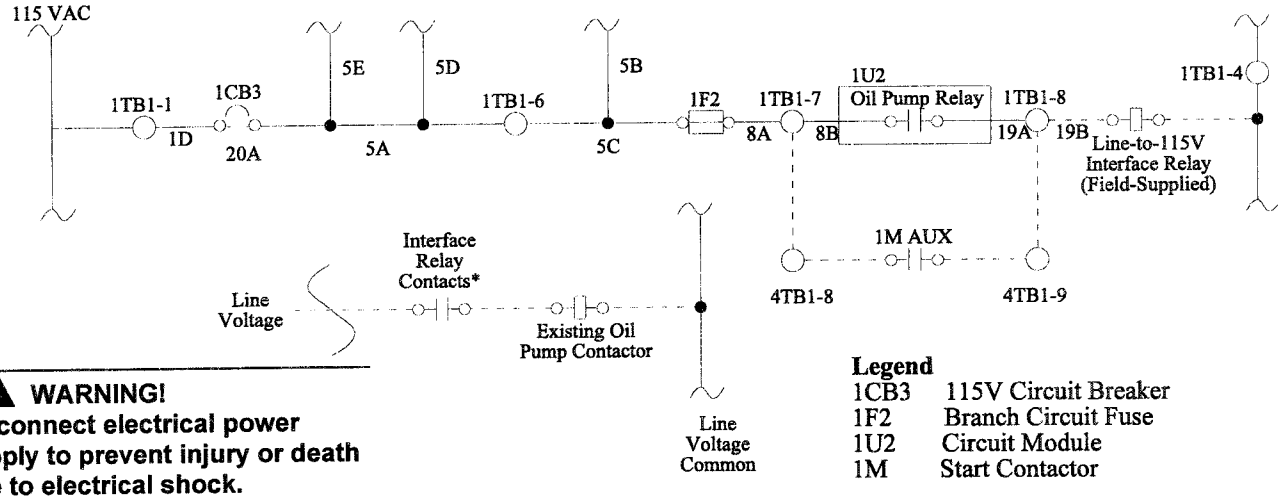


Figure 14b - Existing Oil Pump Contactor without 115V Coil



Legend

1CB3	115V Circuit Breaker
1F2	Branch Circuit Fuse
1U2	Circuit Module
1M	Start Contactor

⚠ WARNING!
Disconnect electrical power supply to prevent injury or death due to electrical shock.

⚠ Caution:
Use copper conductors only to prevent equipment damage (unless otherwise specified).

*When coil is not 115 volts, wire a set of normally-open contacts in a series with the existing oil pump motor contactor coil.

Note: The Oil Pump Relay coil is not shown, since closure of the Oil Pump Relay contacts is governed by Circuit Module (1U2) control logic.

Motor Temperature Interface

There are two motor temperature interface options:

- To convert a chiller with the Robertshaw module and RTD sensors, connect Circuit Module Terminals 1U2-J3-1,3,5 and 6 directly to the RTD terminals on the motor.

Note: These circuits are low voltage (i.e., less than 30 volts), and must be separated from higher voltage circuits.

⚠ Caution:
To prevent possible control malfunction due to electrical noise, never route low-voltage circuits with other conductors carrying 30V or more!

- If the chiller's motor temperature sensing device is a thermostat, connect it to an isolation relay and resistors (all field-supplied) that simulate the three RTD sensors presently used for motor temperature protection. The resistor in the common leg is brought into series with the other three resistors by CR-1. This causes an increased voltage drop which the UCP2 recognizes as a high temperature. See Figure 15.

Note: To assure proper operation, the thermostat's contacts must be normally closed and open on a rise in motor temperature.

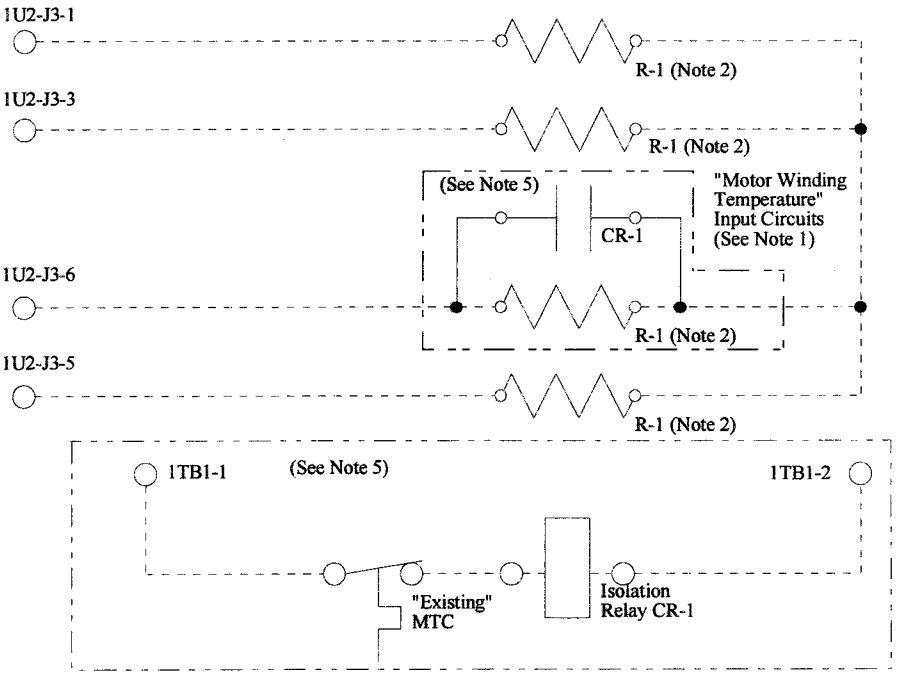


Figure 15 - Interfacing Existing Motor Temperature Thermostat w/UPC2 Control Panel (See Note 3)

⚠ WARNING!
Disconnect electrical power supply to prevent injury or death due to electrical shock.

⚠ Caution:
Use copper conductors only to prevent equipment damage (unless otherwise specified).

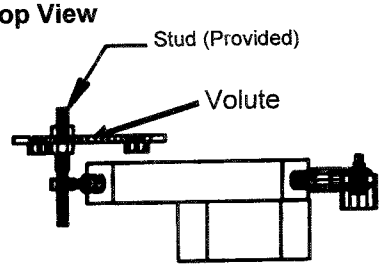
Notes:

1. Wiring to micro module 1U2's terminal strip is low voltage (i.e. less than 30 volts).
2. "R-1" resistors are of carbon composition, and are rated at 75 ohms/0.5 watt.
3. This electrical configuration must be used whenever the existing motor temperature control (MTC) is a thermostat. Notice that the thermostat must include normally-closed contacts that open on a rise in temperature.
4. The "CR-1" isolation relay and 4 "R-1" resistors must be field-supplied.
5. Required to simulate three RTD sensor motor protection.

Figure 16 -
Mounting Stepper Vane Actuator Motor

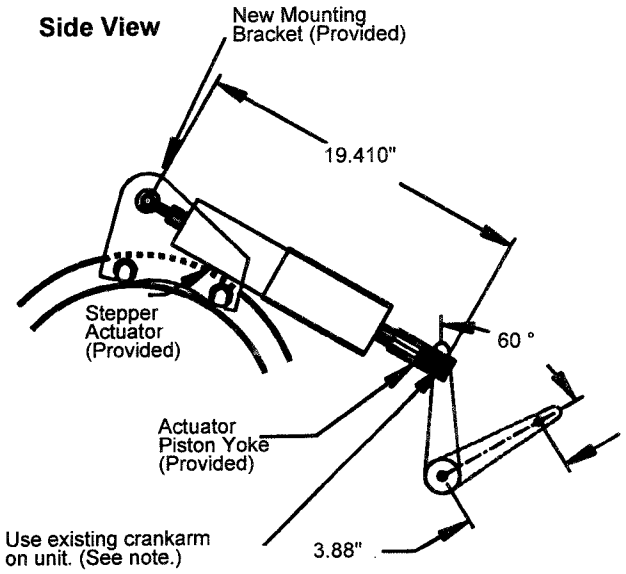
for PCV-2C thru -3J, and CVHA-022 thru -038

Top View



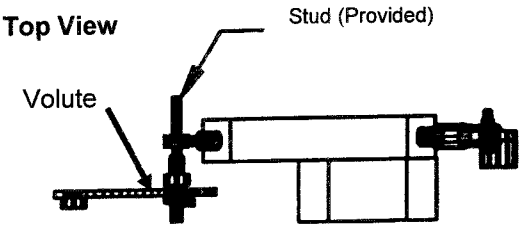
Note: Refer to check-out, for stroke adjustment required for all units.

Side View



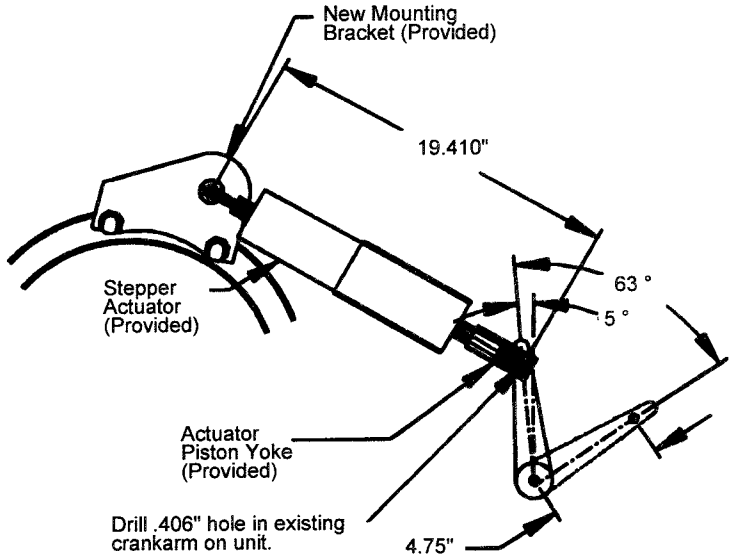
for CVHA-044 thru -055

Top View



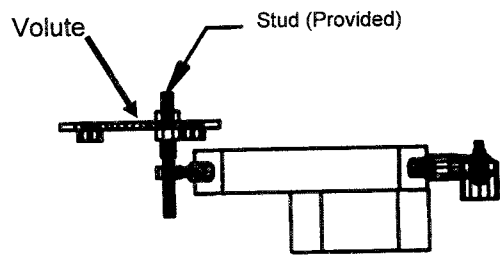
Notice that actuator is mounted on "**outside**" of volute.

Side View



for PCV-4F thru -5D

Top View



Stepper Inlet Guide Vane Actuator Installation

If installing a stepper inlet guide vane actuator, use the provided mounting brackets and the existing connecting hardware to mount the actuator.

Note: Do not connect the guide vanes at this time! Vane motor travel must be checked before the guide vanes are connected to the actuator; see "Post-Conversion UCP2 Panel/Chiller Check-out".

The vane motor leads and the Binary Position Indicator (BPI) must be wired to the UCP2 Panel, as shown in Figure 11, and connected to the Stepper Module (1U3).

The stepper actuator provided in the UCP2 conversion package is 1-3/8" longer, when fully retracted, than the pneumatic actuator used on "older" CenTraVacs®. Therefore, the existing linkage must be modified to ensure that the vanes are closed when the actuator is retracted.

Use the actuator mounting plate, piston yoke and mounting hardware provided to install the new electric actuator as shown in Figure 16.

The motor can be rotated 180° to accommodate existing hardware. Additional hardware may be field fabricated if necessary.

⚠ Caution:
When mounting the actuator, make sure that the 0° vane position corresponds with the actuator fully closed. Failure to do so could result in severe damage to the machine.

Note: When the new stepper actuator is installed on either PCV-2C through PCV-3J units, or CVHA-022 through CVHA-038 units, change the motor stroke from 5" to 4". (See Step 2 of "UCP2 Panel/Chiller Check-out" for instructions.) Also, the stroke of the actuator will be toward the compressor. Note the orientation shown in Figure 16.

Purge Control

The Purifier Purge™ model PRGC contains a Purge Module (3U1) that requires connection to the IPC and 115VAC. Refer to Figure 17a for connection diagrams. Older model Purifier Purges (PRGA and PRGB) as well as most competitor built purges require connections similar to Figure 17b. Trane PRGB terminal designations are used for convenience. If installing a non-Trane purge, refer to manufacturer's literature to determine connection points.

When using a PRGC, check that J1-5 and J1-6 on the Purge Module are not jumpered. The UCP2 controls the purge in this configuration.

Note: The purge type must be selected from the UCP2 menu screen in the field Start-up Service Setup Group Purge Control/Type. Only the PRGC Purifier Purge can communicate with the UCP2.

Figure 17a -
PRGC - Purifier Purge™

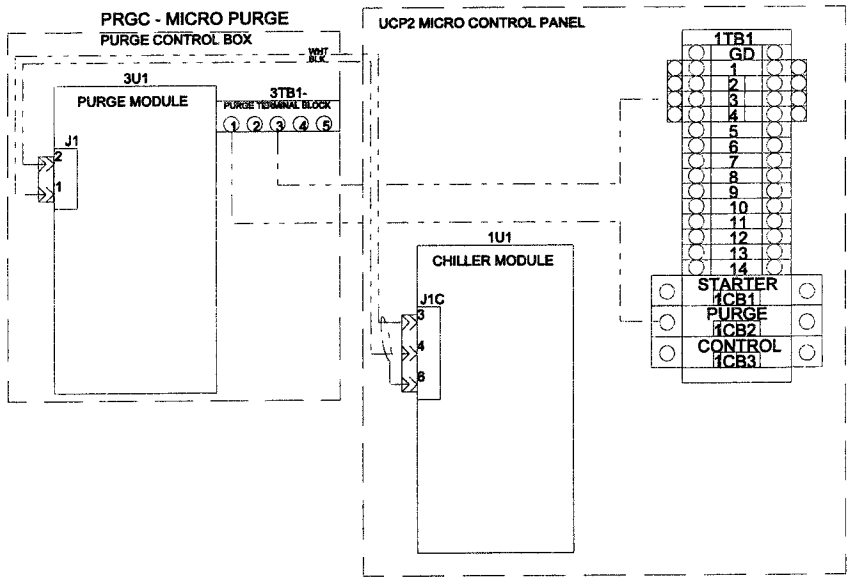
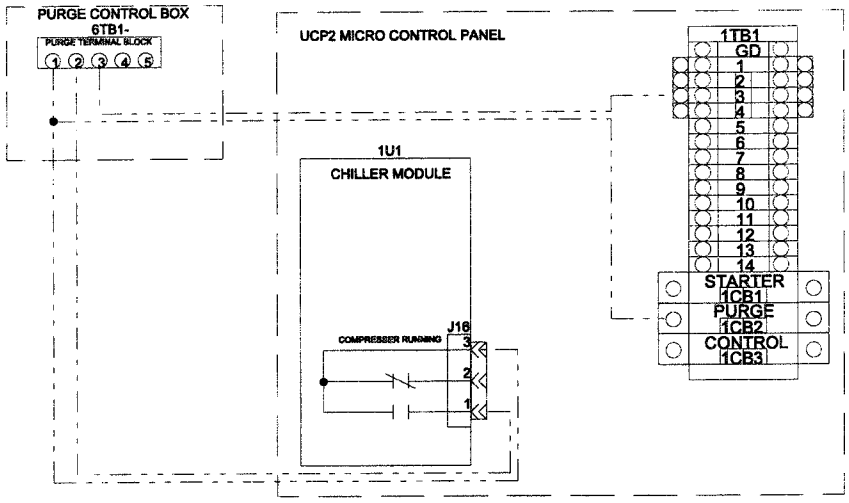


Figure 17b -
Models PRGA & PRGB - Purifier Purge™



Starter Panel Conversion

Starter panel conversion varies with existing starter type and starter control voltage.

To ensure that the starter panel retrofit procedure is performed properly, carefully review the instructions in this section; and, if necessary, contact a Trane service organization for assistance before beginning the conversion process.

Important! Record a detailed description of all electrical changes made during the UCP2 starter retrofit process. Keep a copy of this report in the chiller record file for future reference.

Starter and Auxiliary Starter Panel Connections

The starter panel must be rewired as shown in the diagrams in Figures 20 and 21. The schematics in Figures 20 and 21 show typical wiring for Wye-Delta, Auto Transformer, Primary Reactor and Across-the-Line starters. Use Figures 20 and 21 and the starter manufacturer's drawings to determine the proper connection points in the starter.

It is important to determine proper connections to the start relay (5K1), transition relay (5K2), proof of transition (2M Aux) and condenser high pressure switch functions.

A start and transition relay is recommended for retrofit applications since it is not possible to predetermine control voltages.

Table 6 lists equivalent contactor designations for Trane supplied Wye-Delta starters. For other starter types and manufacturers, the function of each contactor must be determined and the equivalent Trane contactor identified **before** beginning the wiring.

Current Transformers (CT) must be installed at this time:

- See Table 7 for correct selection
- See Figure 20 for the two-stage CT arrangement for retrofit applications
- See Post Conversion Section for setup

Important! To maintain correct polarity, wire CT's exactly as shown in Figures 20 and 21.

The following connect to the Starter Module in the Auxiliary Starter Box, as shown in Figures 20 and 21:

- Inter-Processor Communication
- Line to auxiliary Current Transformers
- 24 VAC Power
- Transition Complete Signal (except for Across-the-Line)

See Potential Transformer Installation Section for information on optional transformers.

Table 6 -
Typical Wye-Delta Starter Designations

Control Type	Shorting Contactor	Transition Contactor	Start Contactor	Run Contactor	Pilot Relay	Transition Relay	Transition Complete
Generic	S	1A	1M	2M	1CR	1CR/T.C.	T.C.
AGM	K25	K26	K27	K28	K23 & K24	A1	K27 Aux
UCP1	2K3	2K4	2K1	2K2	2K5	K5	2K2 Aux
UCP2	2K3	2K4	2K1	2K2	5K1	5K2	2M Aux

Adaptive Frequency Drives for UCP2

The drive should be mounted according to the manufacturer's instructions. These instructions are detailed in Westinghouse Instruction Manual Part No. 9075A05 for the Accutrol 700. If this manual did not ship with the drive, contact ABU Technical Service. Follow all installation procedures for mounting and power wiring to the drive.

All control wiring field connections to the drive are made to the factory installed Starter Module inside the Adaptive Frequency Drive enclosure. See Figure 22 for non-bypass, Figures 23 and 24 for manual bypass, or Figures 25 and 26 for Solid State bypass.

With all bypass installations, the starter type on the UCP2 must be selected in the machine configuration menu as Adaptive Frequency Drive. Additional relays are used to transfer control from one starter module to the other by disconnecting the IPC, 24 VAC module power supply and 115VAC control power supply to the Starter Module not in use. The normally closed contacts on the Condenser High Pressure cutout are switched to the appropriate Starter Module.

On manual bypass, two additional relays are used. One transfers the Oil Pump Interlock from the existing Wye-Delta starter to the AFD. The other relay brings in the 1M and 2M power contactors configuring the starter in the three-lead Delta configuration.

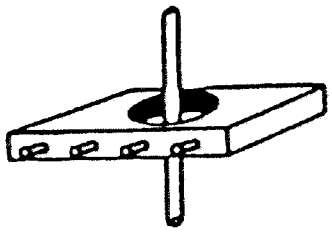
Note: Check schematics that ship with the drive for unlabeled terminal designation for the bypass relay.

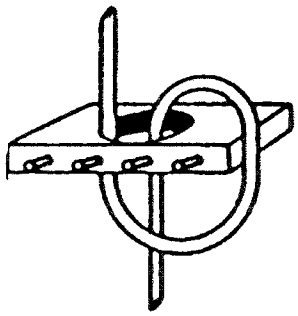
Table 7 - Current Transformer Selection
See Note Below

Line CT Part No.	Ext.	Line CT Ratio	CT Terminal Connections	No. of Primary Turns *	RLA Ranges	Meter Scale
X13580048	-01	150:5	X1 to X2	3	24.0 to 36.0	50
				2	36.0 to 54.0	75
(2-1/2" Dia. Hole)				1	72.0 to 108.0	150
		180:5	X1 to X3	3	28.8 to 43.2	60
				2	43.2 to 64.8	90
				1	86.4 to 129.6	180
		200:5	X1 to X4	2	48.0 to 72.0	100
				1	96.0 to 144.0	200
	-02	125:5	X1 to X2	2	60.0 to 90.0	125
		250:5		1	120.0 to 180.0	250
		300:5	X1 to X3	1	144.0 to 216.0	300
		350:5	X1 to X4	1	168.0 to 252.0	350
	-03	400:5	X1 to X2	1	192.0 t0 288.0	400
		500:5	X1 to X3	1	240.0 to 360.0	500
		600:5	X1 to X4	1	288.0 to 432.0	600
	-04	700:5	X1 to X2	1	336.0 to 504.0	700
		800:5	X1 to X3	1	384.0 to 576.0	800
		1000:5	X1 to X4	1	480.0 to 720.0	1000
	-05	1200:5	X1 to X2	1	576.0 to 864.0	1200
		1500:5	X1 to X3	1	720.0 to 1080.0	1500
X13580047	-01	1800:5	X1 to X2	1	864.0 to 1296.0	1800
		2100:5	X1 to X3	1	1008.0 to 1512.0	2100
(4" Dia. Hole)		2500:5	X1 to X4	1	1200.0 to 1800.0	2500
	-02	1000:5	X1 to X2	1	480.0 to 720.0	1000
		1200:5	X1 to X3	1	576.0 to 864.0	1200
		1500:5	X1 to X4	1	720.0 to 1080.0	1500

Note: See Post-Conversion Check-Out, Step 4.
* See Figure 18 for examples.

Figure 18 - Example of One and Two Turns





⚠ WARNING!
Disconnect electrical power supply to prevent injury or death due to electrical shock.

⚠ Caution:
Use copper conductors only to prevent equipment damage (unless otherwise specified).

Potential Transformer Installation for 3 Phase Voltage Monitoring (Optional)

The potential transformers (PT's) are used to measure line voltage:

- Less than 600 VAC line— a single PT per phase is used to step the signal down to a proportional 30 VAC for input into the starter module (2U1).
- Greater than 600 VAC line—a large PT is used to step from line to 120 VAC and a smaller PT steps the voltage to 30 VAC. The large PT is a three phase type except for the 6600 VAC/50 Hz where three single phase PT's are used.

a. <600 Volt (Digit 9 = 1) -
The black leads are connected to the line from Phase A-B, B-C and C-A. The green ground wire is connected to chassis ground. Field provided wires connect the 2U1 Module to the spade terminals on the P.T.'s. See Figures 20 and 21.

b. >600 Volt (Digit 9 = 2) -
The line-to-120 VAC transformer's secondaries are connected to the primary (black) leads of the provided transformer. If the line-to-120 P.T. is a three phase type, the Phase A-B, B-C and C-A connections must be made similar to Figures 20 and 21. If the line-to-120 VAC P.T. is a single phase type, ensure that the proper phasing is maintained similar to Figure 19. The green wire is connected to ground and the white wires to the 2U1 module.

c. 2300/2400 VAC, 4200 VAC, or 3300 VAC/50 Hz P.T.'s (Digit 9 = 3, 4 or 5) -
The primaries (A, B and C) of the three phase P.T. are connected to the >600 volt 120:30 P.T. as described above.

d. 6600 VAC/50 Hz P.T.'s -
The H1-H2 terminals of the single phase P.T.'s are connected to phases A-B, B-C and C-A respectively. The secondaries connect to the >600 volt generic P.T.'s primaries directly. See Figure 19.

Note: The <600 volt transformer as well as the 120:30 VAC potential transformer may be mounted in the auxiliary starter box.

Use Table 8 for fusing information for 5F1, 5F2 and 5F3.

⚠ DANGER!
Do NOT connect the primary (black leads) of the 120:30 VAC Potential Transformer to line. Doing so could cause an explosion resulting in severe injury or death.

⚠ Caution:
Do NOT connect the secondaries of the line-to-120 VAC potential transformer to the UCP2 starter module. Doing so will cause damage to the module.

Figure 19 -
Potential Transformer Installation
6600 VAC/50 Hz

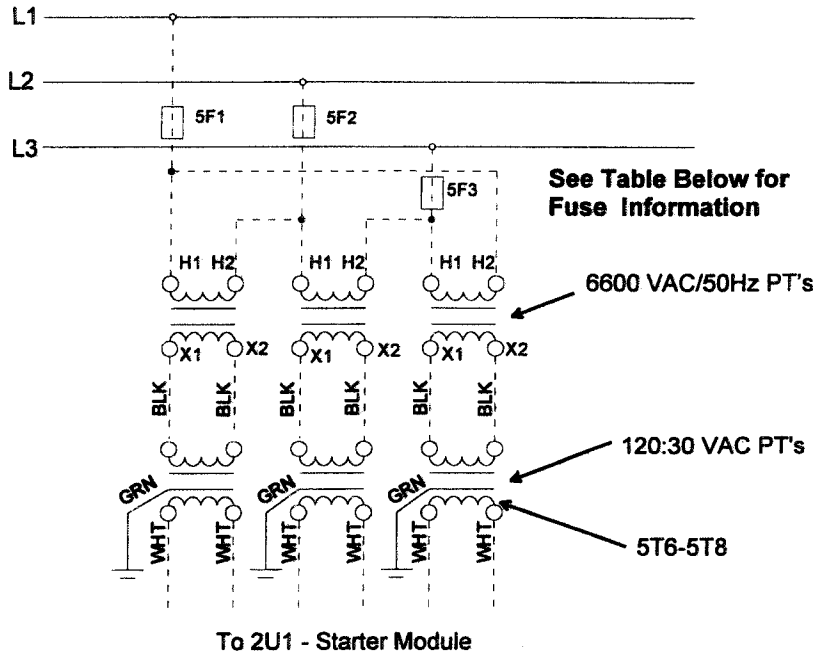
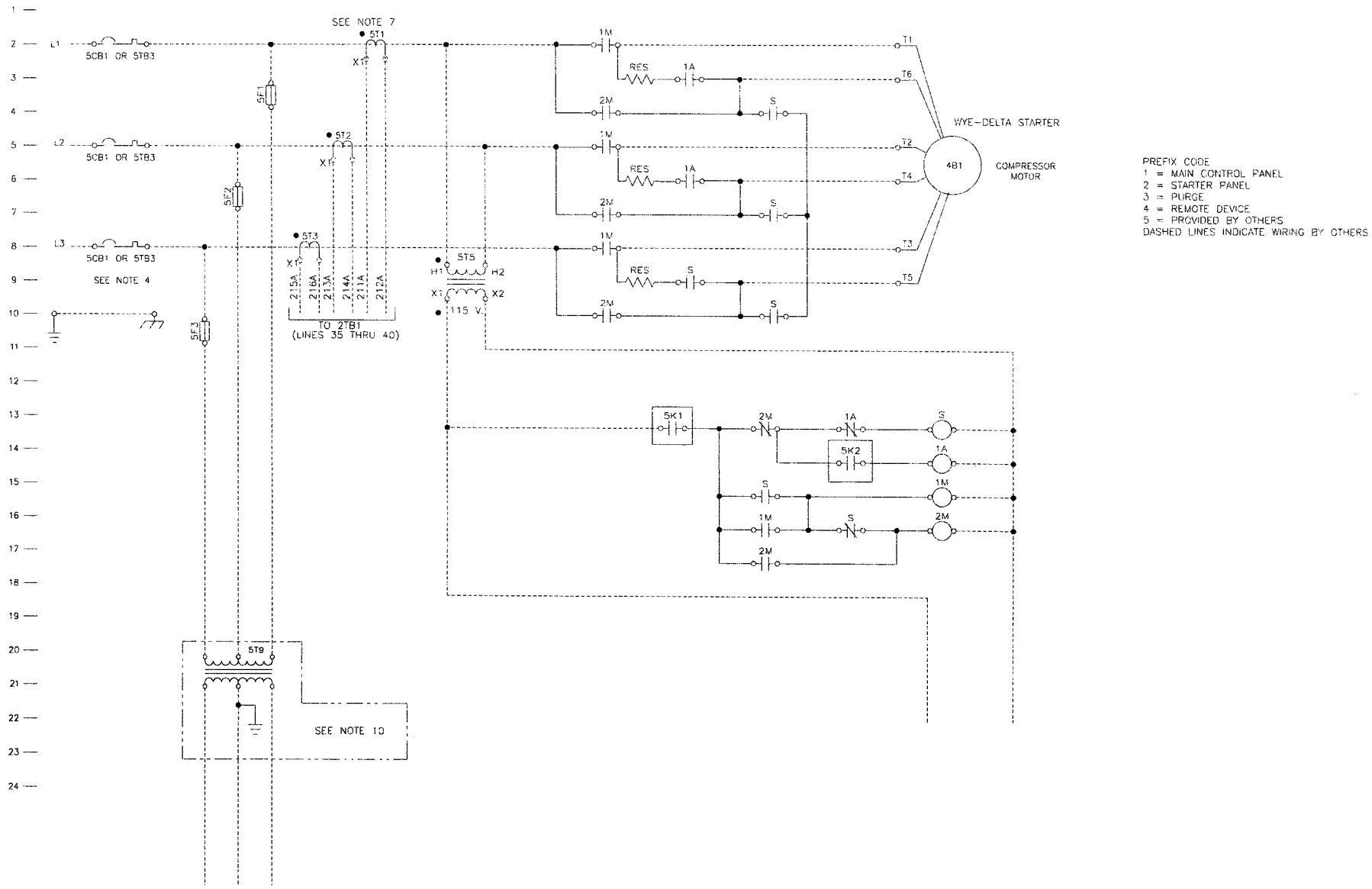


Table 8 -
Fusing for 5F1, 5F2 and 5F3

Voltage (V)	Fuse (A)	Voltage (V)	Fuse (A)
200	25	600	8
208	20	2400	3
230	17.5	4200	3
380	15	3300 *	5
460	10	6600 *	1
575	8		

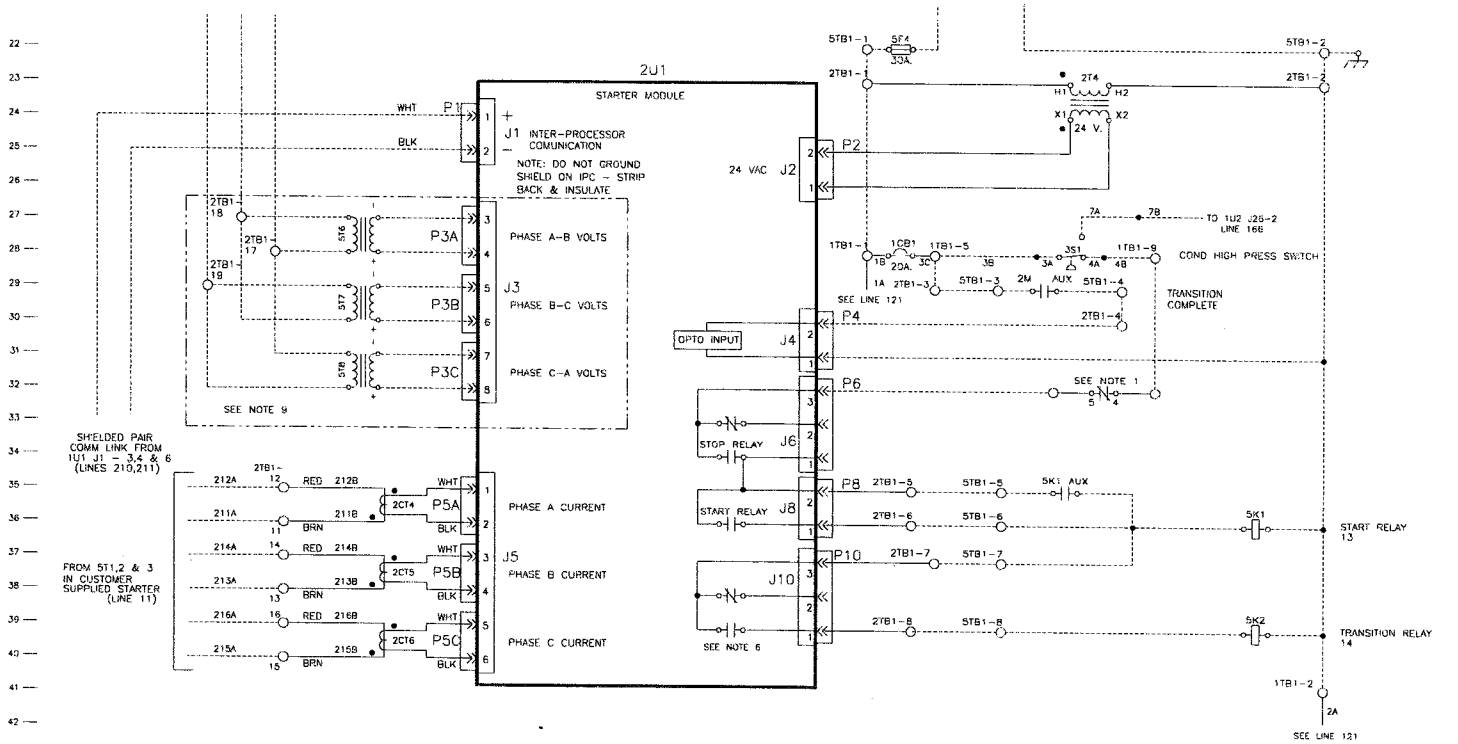
* 50 Hz

Figure 20 -
Typical Wye-Delta Starter



Note: Refer to Table 8 for fuse selection of 5F1-F3.

Figure 20 - (Continued)
Typical Wye-Delta Starter



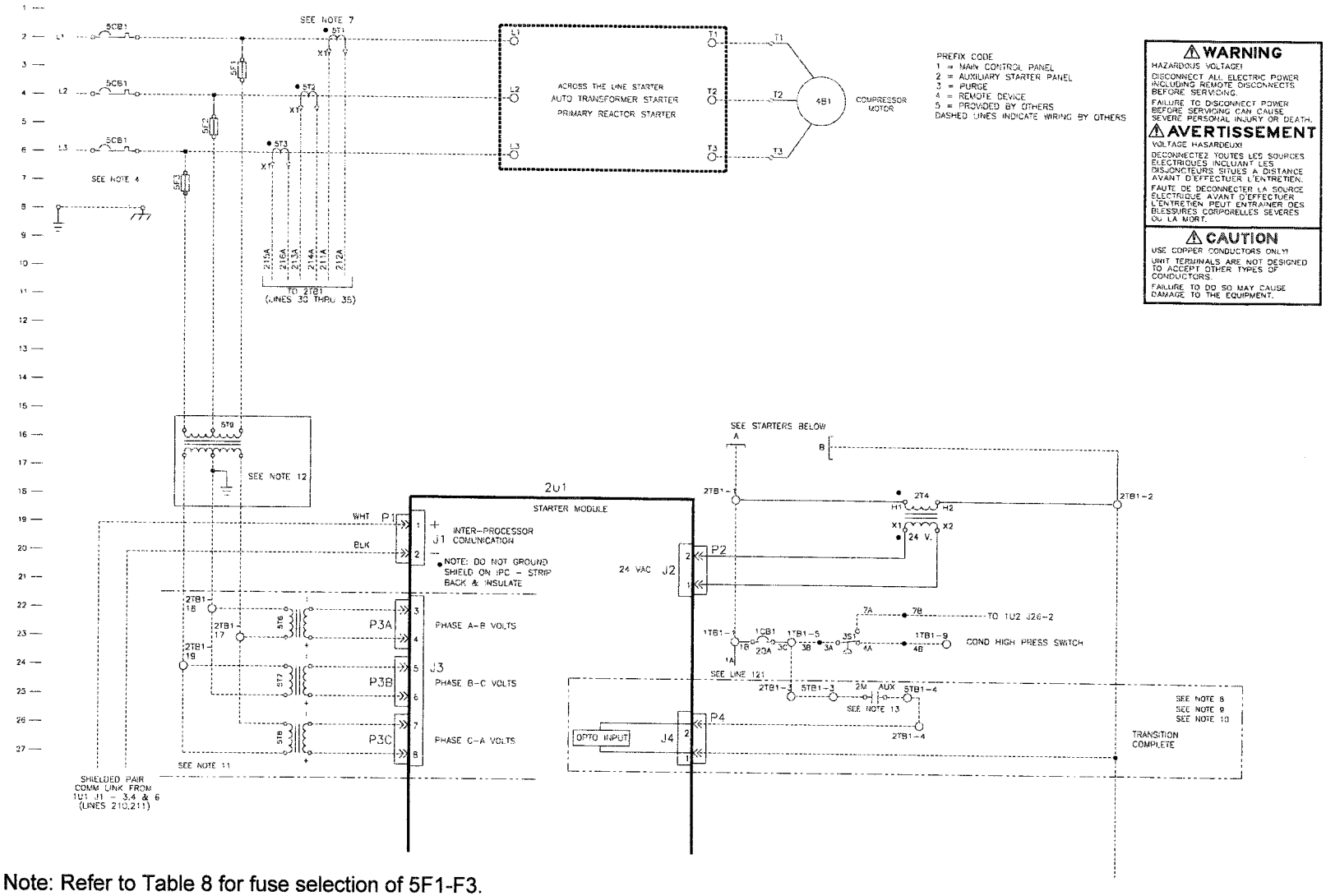
NOTES:
1. OPTIONAL STARTER INTERLOCK. SEE STARTER MANUFACTURERS WIRING DIAGRAM FOR SPECIFIC APPLICATION.
2. UNLESS OTHERWISE NOTED,ALL SWITCHES ARE SHOWN AT 25 C (77 F), AT ATMOSPHERIC PRESSURE, AT 50% RELATIVE HUMIDITY, WITH ALL UTILITIES TURNED OFF AND AFTER A NORMAL SHUTDOWN HAS OCCURED.
3. NUMBERS 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. REMOTE WYE-DELTA STARTER WIRING BETWEEN STARTER AND CONTROL MODULE ARE SHOWN. SEE STARTER MANUFACTURERS 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.
8. FOR REMOTE Y-D STARTERS RATED GREATER THAN 935 RLA, SEE STARTER MANUFACTURERS WIRING DIAGRAM FOR SPECIFIC CURRENT TRANSFORMER WIRING.
9. >600 120-30VAC PT'S
   <600 LINE TO 30VAC PT'S
10. >600 120-30VAC PT'S
    EXCEPT FOR 6600VAC 50HZ SEE INSTALLATION MANUAL

⚠ 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 ÉLECTRIQUES INCLUANT LES DISJONCTEURS SITUÉS À DISTANCE AVANT D'EFFECTUER L'ENTRETIEN.
FAUTE DE DECONNECTER LA SOURCE ÉLECTRIQUE AVANT D'EFFECTUER L'ENTRETIEN PEUT ENTRAINER DES BLESSURES CORPORELLES SEVERES OU LA MORT.

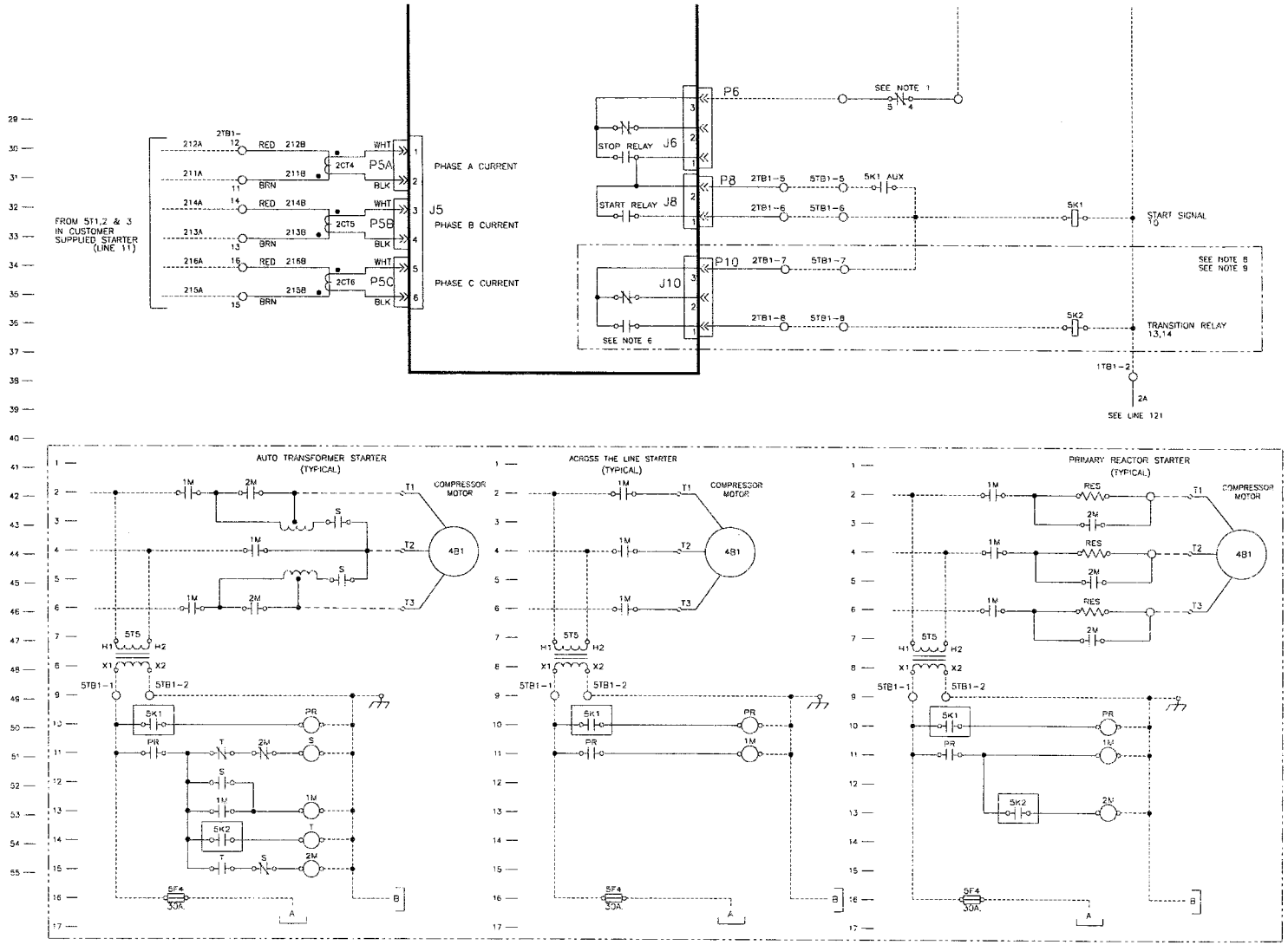
⚠ CAUTION
USE COPPER CONDUCTORS ONLY!
UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT OTHER TYPES OF CONDUCTORS.
FAILURE TO DO SO MAY CAUSE DAMAGE TO THE EQUIPMENT.

Figure 21 -
Typical Across the Line Starter, Auto Transformer Starter and Primary Reactor Starter



Note: Refer to Table 8 for fuse selection of 5F1-F3.

Figure 21 - (Continued)
Typical Across the Line Starter, Auto Transformer Starter and Primary Reactor Starter



NOTES:
1. OPTIONAL STARTER INTERLOCK. SEE STARTER MANUFACTURERS WIRING DIAGRAM FOR SPECIFIC APPLICATION.
2. UNLESS OTHERWISE NOTED,ALL SWITCHES ARE SHOWN AT 25 C (77 F), AT ATMOSPHERIC PRESSURE, AT 50% RELATIVE HUMIDITY, 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. SEE STARTER MANUFACTURERS 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 FOWARDS THE INCOMING CURRENT.
8. USED WITH CUSTOMER PRIMARY REACTOR STARTER
9. USED WITH AUTO TRANSFORMER STARTER
10. USED WITH ACROSS THE LINE STARTER
11. >600 120-30VAC PT'S
<600 LINE TO 30VAC PT'S
12. >600 120-30VAC PT'S
EXCEPT FOR 6600VAC 50HZ SEE INSTALLATION MANUAL
13. ON ACROSS THE LINE 2M IS 1M

Figure 22 -
Remote Adaptive Frequency Drive

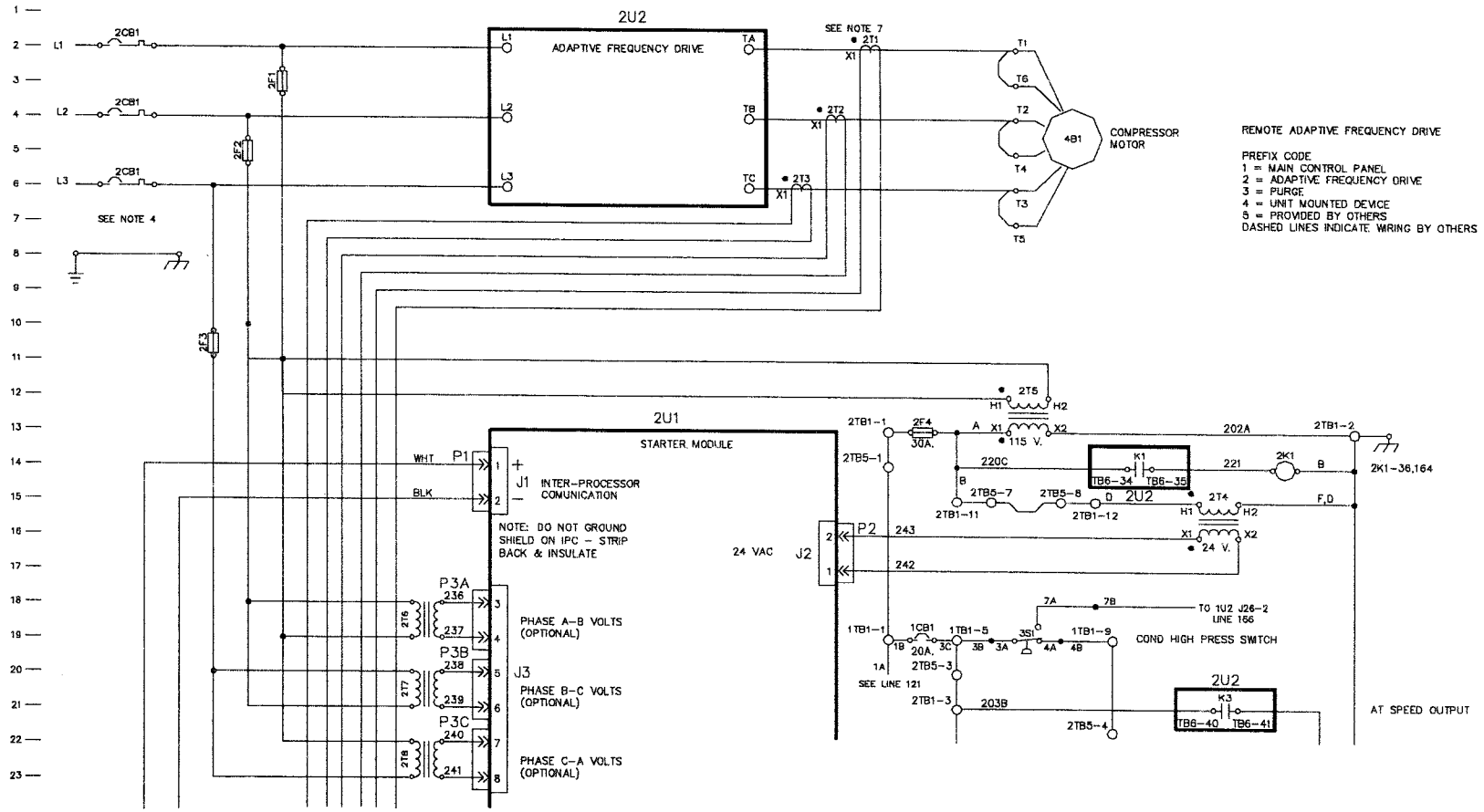
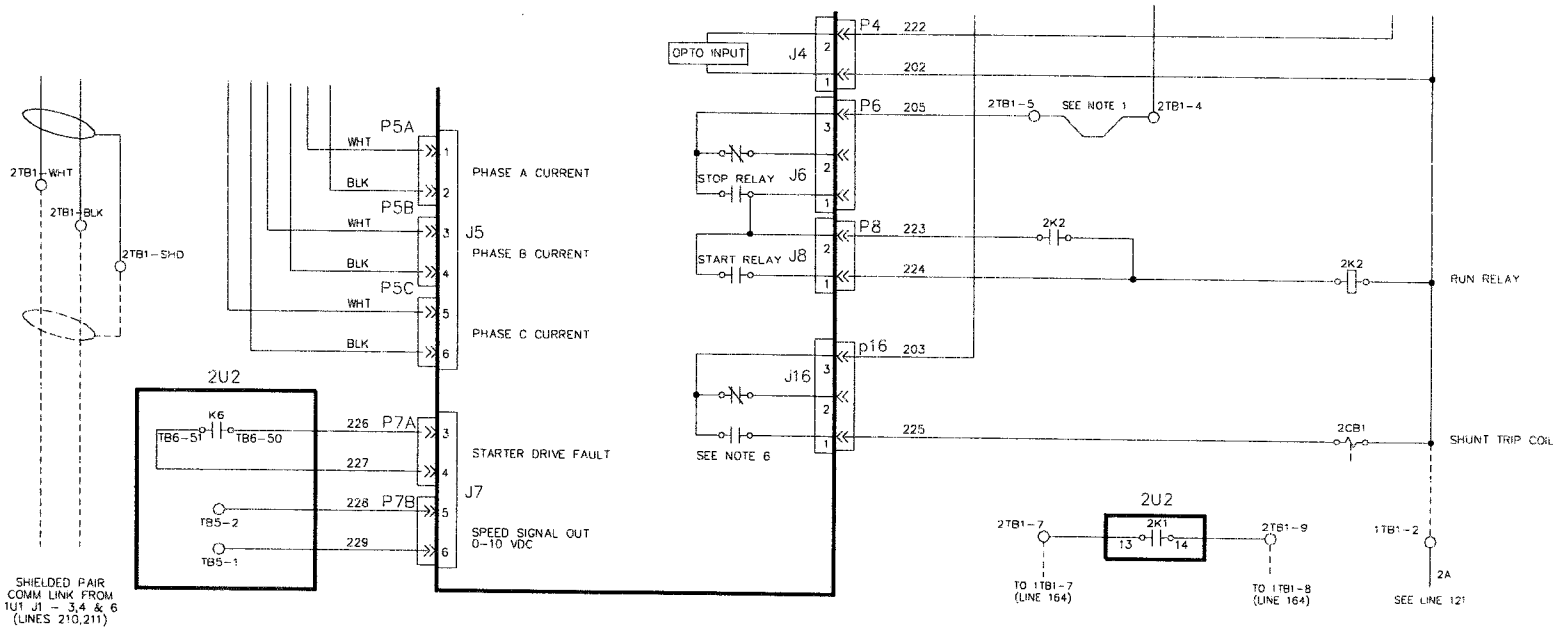


Figure 22 - (Continued)
Remote Adaptive Frequency Drive



NOTES:
1. OPTIONAL ADAPTIVE FREQUENCY DRIVE (AFD) INTERLOCK. SEE AFD 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. REMOTE AFD WIRING BETWEEN AFD AND CONTROL MODULE ARE SHOWN. SEE AFD MANUFACTURES WIRING DIAGRAM FOR SPECIFIC AFD 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.

Note: Drawings Not Yet Released

Figure 23 -
Adaptive Frequency Drive with Manual Bypass —
AFD Starter Module

Figure 23 - (Continued)
Adaptive Frequency Drive with Manual Bypass —
AFD Starter Module

Note: Drawings Not Yet Released

Note: Drawings Not Yet Released

Figure 24 -
Adaptive Frequency Drive with Manual Bypass —
Wye-Delta Starter Module

Figure 24 - (Continued)
Adaptive Frequency Drive with Manual Bypass —
Wye-Delta Starter Module

Note: Drawings Not Yet Released

Figure 25 -
Adaptive Frequency Drive with Solid State Bypass

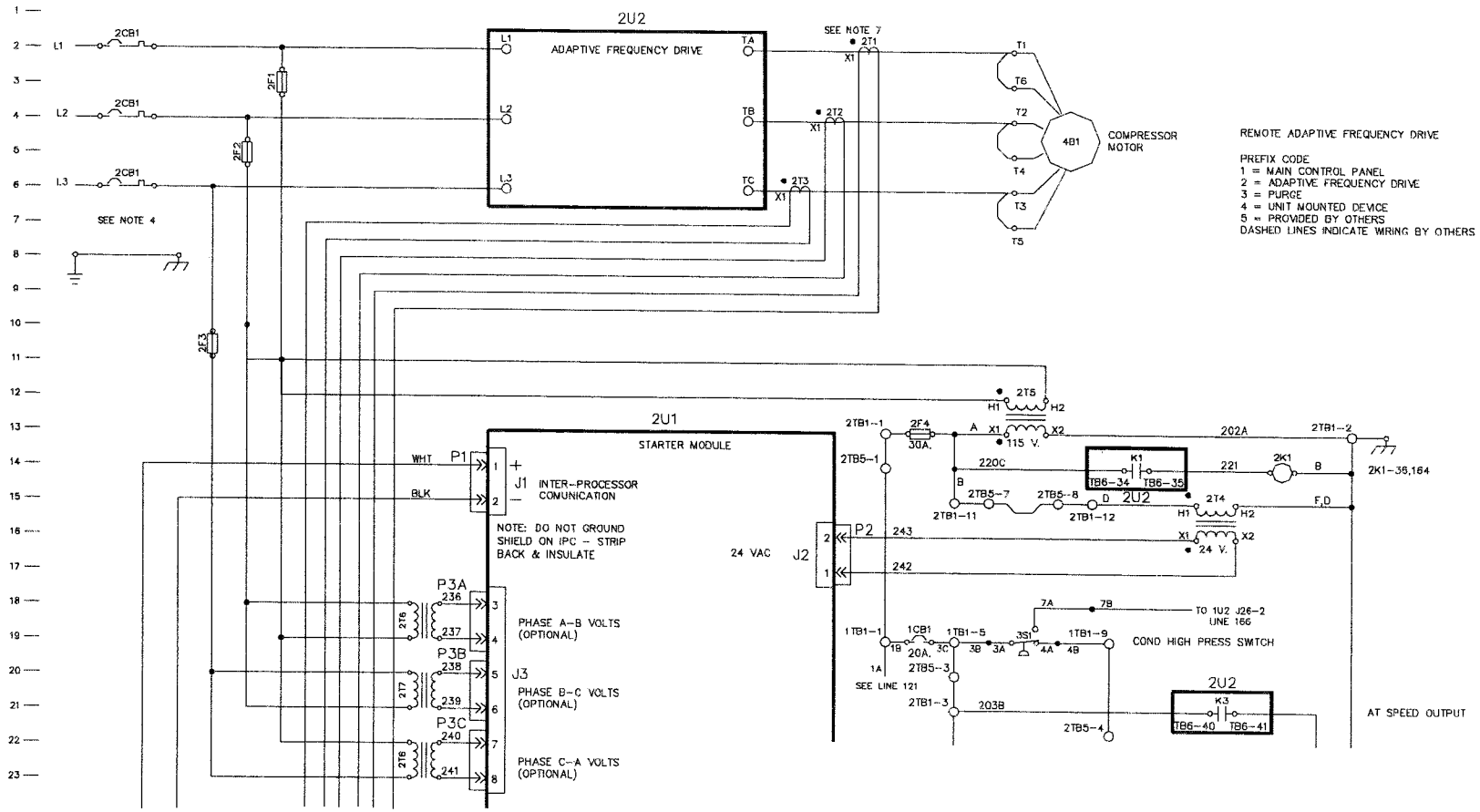
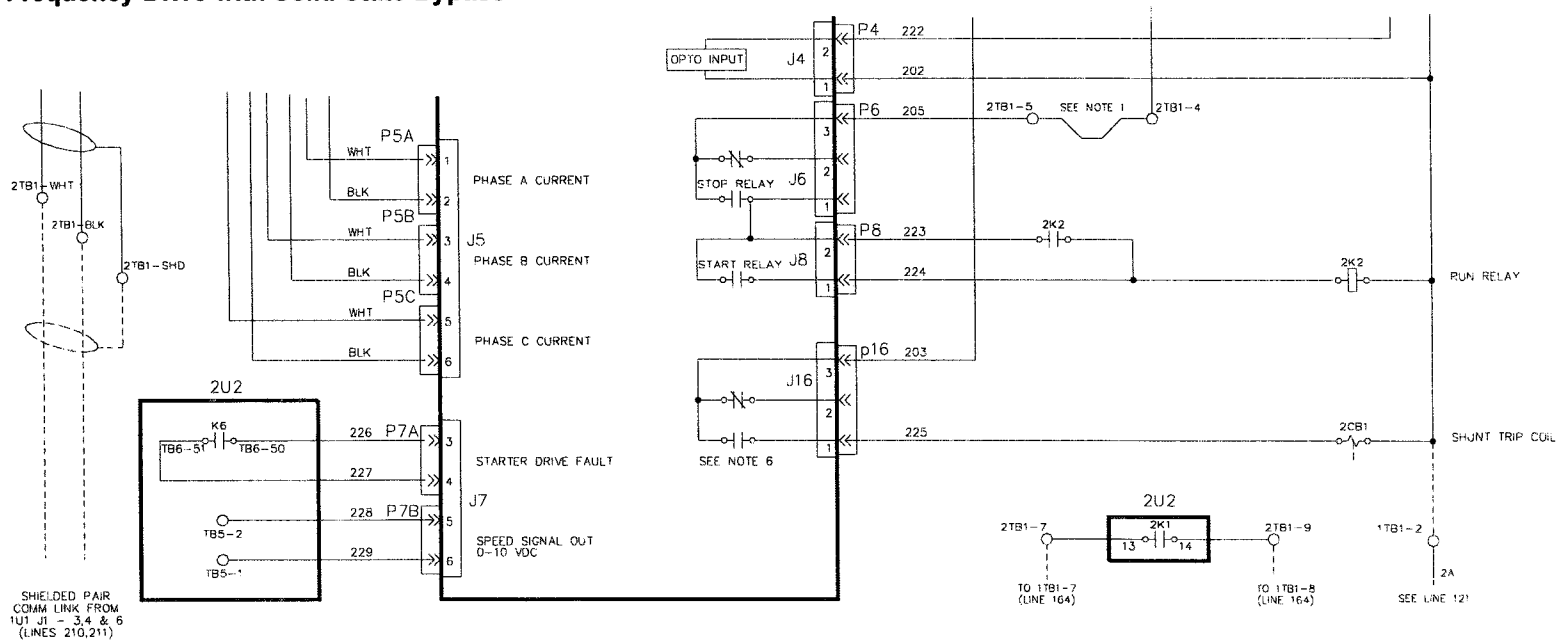


Figure 25 - (Continued)
Adaptive Frequency Drive with Solid State Bypass



NOTES:
1. OPTIONAL ADAPTIVE FREQUENCY DRIVE (AFD) INTERLOCK. SEE AFD 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. REMOTE AFD WIRING BETWEEN AFD AND CONTROL MODULE ARE SHOWN. SEE AFD MANUFACTURES WIRING DIAGRAM FOR SPECIFIC AFD 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.

Figure 26 -
Adaptive Frequency Drive with Solid State Bypass

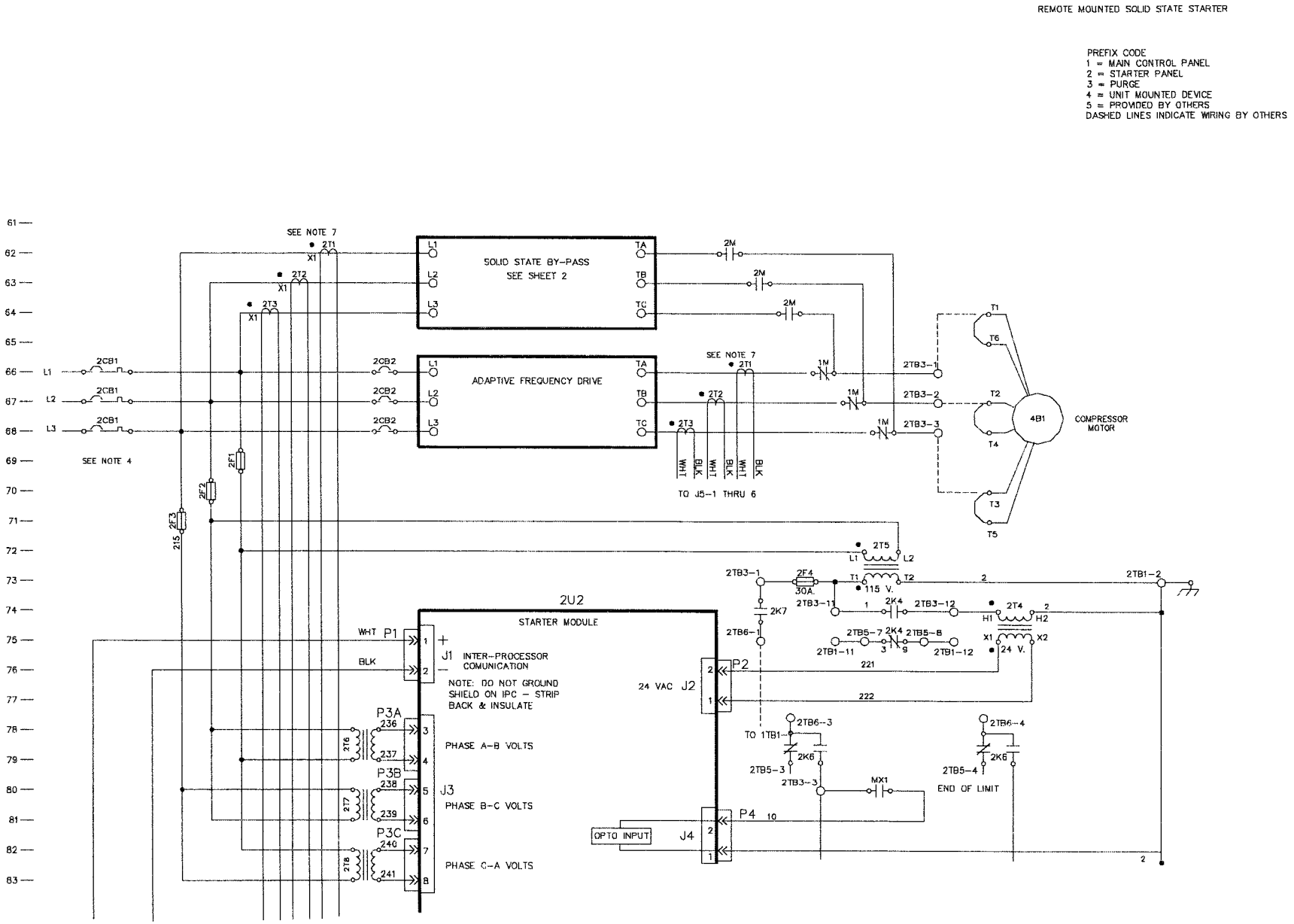
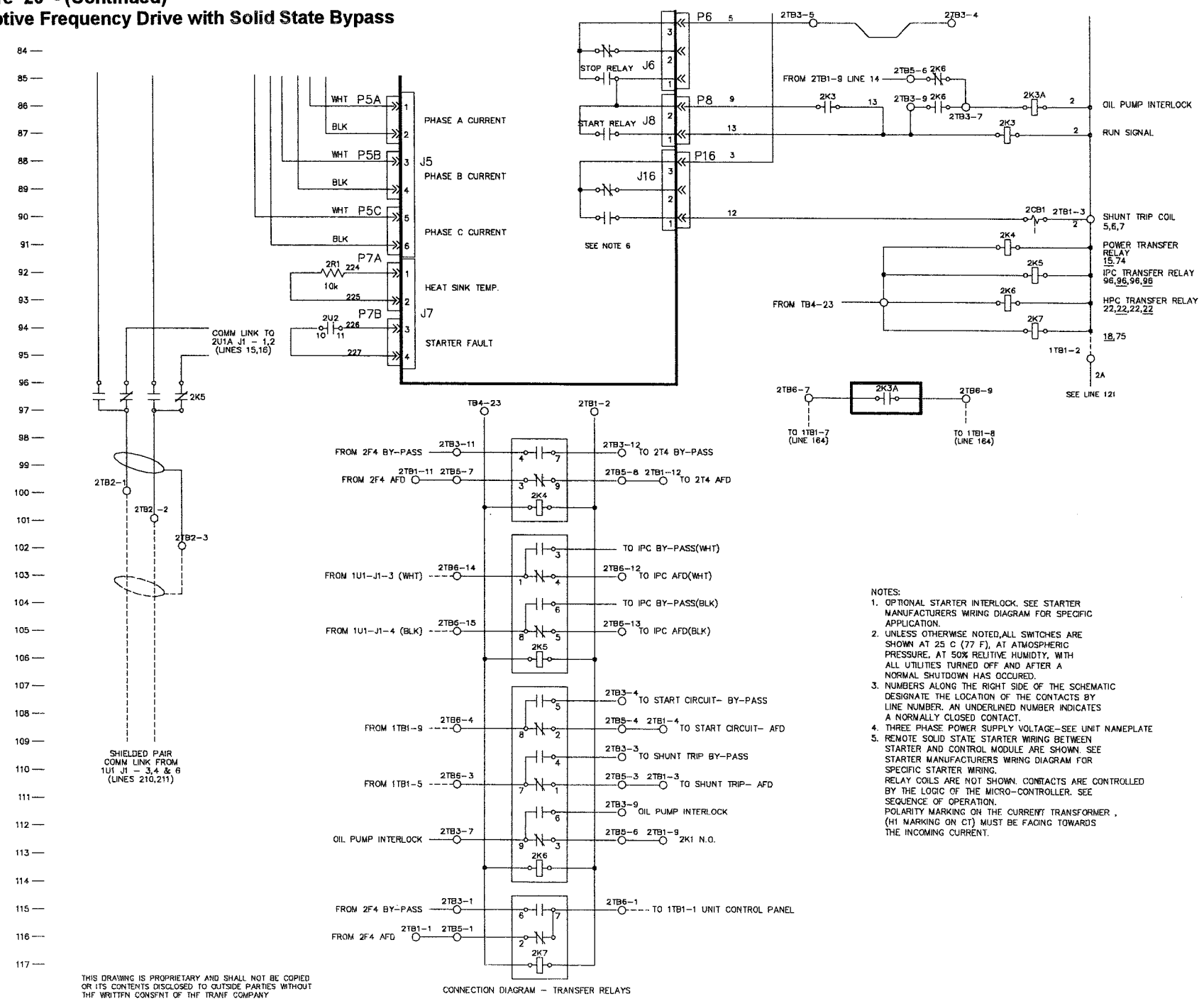


Figure 26 - (Continued)
Adaptive Frequency Drive with Solid State Bypass



CONNECTION DIAGRAM - TRANSFER RELAYS

NOTES:
1. OPTIONAL STARTER INTERLOCK. SEE STARTER MANUFACTURERS 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. REMOTE SOLID STATE STARTER WIRING BETWEEN STARTER AND CONTROL MODULE ARE SHOWN. SEE STARTER MANUFACTURERS WIRING DIAGRAM FOR SPECIFIC STARTER WIRING.
   RELAY COILS ARE NOT SHOWN. CONTACTS ARE CONTROLLED BY THE LOGIC OF THE MICRO-CONTROLLER. SEE SEQUENCE OF OPERATION.
   POLARITY MARKING ON THE CURRENT TRANSFORMER , (H1 MARKING ON CT) MUST BE FACING TOWARDS THE INCOMING CURRENT.

Post-Conversion Check-out

⚠ Caution:
To prevent machine damage, contact a Trane service organization to perform the check-out procedures described in this section.

Starter Panel

All wiring in the starter must be re-checked and the contactor logic verified before starting the unit.

UCP2 Panel / Chiller

1. Verify all wiring is connected correctly and that all wires are numbered properly. Make sure all -piping is completed.
2. Perform the following steps only if a stepper inlet guide vane actuator has been installed.
   a. Check and adjust vane travel before connecting the actuator to the guide vanes. Power up the UCP2 and choose Inlet Guide Vane Output Type <Stepper Motor> from the Machine Configuration menu and Vane Control <Manual> from the Service Tests menu. Verify that the actuator operates from 0-100% (0-5" stroke) open.
   b. Connect the guide vane to the actuator.
   c. Connect the vane linkage to the actuator motor.
   d. In the Field Start-up Service Settings group, set the Inlet Guide Vane (IGV) Maximum Travel Setpoint to the previously measured stroke (in the Existing Control Panel Removal Section) X 11,000 steps (i.e., a 5" stroke equals 55,000 steps).
   e. In the Service Tests Group, change the vane control status to manual, go to the next menu and increase vane position slowly until the vanes are physically open 100%. If the vanes are not open, increase the IGV Maximum Travel Setpoint by 1,000 steps. Repeat this process as often as necessary. The vane position will not correspond to the percentage shown on the screen.

⚠ Caution:
The Inlet Guide Vane Actuator may go beyond the designed travel limits of the linkage. Failure to properly identify the fully open position can cause the actuator to over travel and break the vane linkage.

   f. When the vanes are fully open, press <Next> until the screen showing IGV actuator steps is displayed. The number of steps should be recorded and entered as the new IGV Maximum Travel setpoint.
3. Perform the following steps only if a pulse inlet guide vane actuator is installed.
   a. Power up the UCP2 and choose Inlet Guide Vane Output Type <Pulsed> from the Machine Configuration menu.
   b. In the Service Test menu, choose Manual Loading/Unloading Duty Cycle <50%>.
   c. Next, choose IGV Control <Load> or <Unload> in the Service Test menu. Measure the duty cycle (full open to full close or vice versa) in seconds.

d. Divide this number by 2 to obtain stroke time. Input this value at Inlet Guide Vane Stroke Time in the Field Start-up menu.

4. Configure all settings in the Operator Settings, Service Settings, Service Tests, and Diagnostics groups as required in CVHE-M-7.

Note: In the Service Test Group - Starter Dry Run should be disabled since this does not apply to retrofit installations using pilot relays to control the starter.

Note: In order to calculate the Current Transformer Factor, evaluate the following formula:

CT Factor = (Actual Motor RLA)/ (CT Meter Scale from Table 7) x 138.89%

Use the CT Factor to determine the current Overload Settings #1 and #2 on Table 9.

5. Run the chiller through the normal operating range to determine that the controls are properly configured and installed.

This completes the retrofit installation procedure. Proper configuration of the UCP2 for optimal performance is covered in CVHE-M-7.

Table 9 -
Current Overload Setting Selection

CT Factor	Current Overload Setting #1	Current Overload Setting #2	CT Factor	Current Overload Setting #1	Current Overload Setting #2
66	00	255	84	19	236
67	01	254	85	20	235
68	02	253	86	21	234
69	03	252	87	22	233
70	04	251	88	22	233
71	06	249	89	23	232
72	07	248	90	24	231
73	08	247	91	25	230
74	09	246	92	25	230
75	10	245	93	26	229
76	11	244	94	27	228
77	12	243	95	28	227
78	13	242	96	28	227
79	14	240	97	29	226
80	15	240	98	30	225
81	16	239	99	30	225
82	17	238	100	31	224
83	18	237			