TRANE™

Operation Maintenance

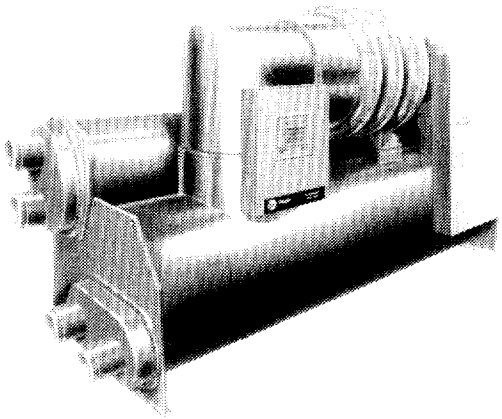
CVHE-M-7

Library	**Service Literature**
Product Section	**Refrigeration**
Product	**Centrifugal Liq. Chiller, Water-Cooled**
Model	**50/60 HZ CVHE, CVHF(Cooling-Only & Heat Recovery)**
Literature Type	**Operation/Maintenance**
Sequence	**7**
Date	**February 1, 1994**
File No.	**SV-RF-CTV-CVHE-M-7-2/94**
Supersedes	

Water-Cooled, Hermetic CenTraVac®

Models CVHE and CVHF 50 and 60 Hz

Cooling-Only and Heat-Recovery, Direct-Drive CenTraVacs with UCP2 Control Panels

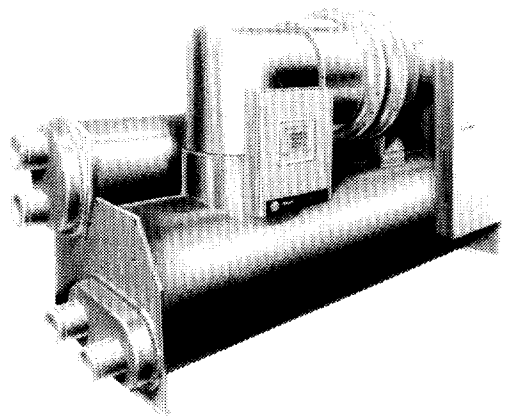


CVHE 230 thru CVHE-890, 1120, 1250

"1W" Design Sequences

CVHF 650, 770, 910 1060, 1280

"E0" Design Sequence



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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 manuals "CTV-SB-81", "CTV-SB-82" and CFC-Guide 2. Copies of these manuals may be obtained by contacting your local Trane commercial product representative.

Product Coding Definition

Introduction

The CVHE 230-1250 and the CVHF 650-1280 is defined using the product definition and selection (PDS) system. This system describes the product offerings in terms of a product coding block which is made up of feature categories and feature codes.

The operating components and options for any Model CVHE/ CVHF CenTraVac unit can be identified by referring to the alpha-numeric product identification coding block located on the name-plate for the unit. The coding block precisely identifies all characteristics of a unit. Be sure to refer to the service model number when ordering replacement parts or requesting service. An example of a typical product code is given on this page.

Note: Unit-mounted starters are identified by a separate number found on the starter.

Typical Product Description Block

MODL CVHE	**DSEQ 1W**	**NTON 500**	**VOLT 460**
HRTZ 50/60	**TYPE SNGL**	**CPKW 403**	**CPIM 253**
EVTM IECU	**EVTH 28**	**EVSZ 050L**	**EVBS 500**
EVWC STD	**EVWP 2**	**EVWT NMAR**	**EVPR 150**
EVCO FLNG	**EVWA RERE**	**CDTM IECU**	**CDTH 28**
CDSZ 050L	**CDBS 500**	**CDWC STD**	**CDWP 2**
CDWT NMAR	**CDPR 150**	**CDCO FLNG**	**CDWA RERE**
CDTY STD	**ORSZ 500**	**PURG HERM**	**HGBP W/O**
AGLT NONE	**CNIF MICR**	**SRTY RPIR**	

CVHE/CVHF Product Coding Explanation

MODL
Unit Model

CVHE = CenTraVac Direct Drive Hermetic Development Sequence "E"
CVHF = CenTraVac Direct Drive Hermetic Development Sequence "F"

DSEQ
Design Sequence

Factory Assigned
1W = UCP2

NTON
Unit Nominal Capacity (Tons)

CVHE Sequence E
230 = 230 Tons
250 = 250 Tons
280 = 280 Tons
300 = 300 Tons
320 = 320 Tons
360 = 360 Tons
400 = 400 Tons
450 = 450 Tons
500 = 500 Tons
560 = 560 Tons
630 = 630 Tons
710 = 710 Tons
800 = 800 Tons
890 = 890 Tons
1120 = 1120
1250 = 1250

CVHF Sequence F
650 = 650 Tons
770 = 770 Tons
800 = 800 Tons
890 = 890 Tons
910 = 910 Tons
1060 =1060 Tons
1120 =1120 Tons
1250 =1250 Tons
1280 =1250 Tons

VOLT
Unit Voltage

200 = 200/60/3
208 = 208/60/3
230 = 230/60/3
380 = 380/60/50/3
440 = 440/60/3
460 = 460/60/3
480 = 480/60/3
575 = 575/60/3
600 = 600/60/3
2300 = 2300/60/3
2400 = 2400/60/3
3300 = 3300/60/50/3
4000 = 4000/60/3
4160 = 4160/60/3
4800 = 4800/60/3
6600 = 6600/60/3

HRTZ
Unit Hertz

50 = 50 Hertz
60 = 60 Hertz

TYPE
Unit Type

SNGL = Single Condenser (Cooling Only)
HTRC = Heat Recovery
AUX = Auxiliary Condeser

TYPO
Unit Type

STD = Standard Shells
EXTD = Extended Surface Shells

CPKW
Compressor Motor Kilowatts

142 = 142 KW
154 = 154 KW
171 = 171 KW
187 = 187 KW
204 = 204 KW
231 = 231 KW
257 = 257 KW
287 = 287 KW
323 = 323 KW
361 = 361 KW
403 = 403 KW
453 = 453 KW
512 = 512 KW
588 = 588 KW
653 = 653 KW
361 = 361 KW
745 = 745 KW
856 = 856 KW
957 = 957 KW
1062 =1062 KW
1228 =1228 KW

CPIM
Compressor Impeller-Diameter

3-STAGE				2-STAGE	
220	22.0	22.0	22.0		
222	22.5	22.0	22.0		
223	22.5	22.5	22.0		
225	22.5	22.5	22.5		
227	23.0	22.5	22.5		
228	23.0	23.0	22.5		
230	23.0	23.0	23.0		
232	23.5	23.0	23.0		
233	23.5	23.5	23.0		
235	23.5	23.5	23.5		
237	24.0	23.5	23.5		
238	24.0	24.0	23.5		
240	24.0	24.0	24.0		
242	24.5	24.0	24.0		
243	24.5	24.5	24.0		
245	24.5	24.5	24.5		
247	25.0	24.5	24.5		
248	25.0	25.0	24.5		
250	25.0	25.0	25.0		
252	25.5	25.0	25.0		
253	25.5	25.5	25.0		
255	25.5	25.5	25.5		
257	26.0	25.5	25.5		
258	26.0	26.0	25.5		
260	26.0	26.0	26.0		
262	26.5	26.0	26.0		
263	26.5	26.5	26.0		
265	26.5	26.5	26.5		
267	27.0	26.5	26.5		
268	27.0	27.0	26.5		
270	27.0	27.0	27.0	27.00	27.00
271				27.25	27.00
272	27.5	27.0	27.0		
273	27.5	27.5	27.0	27.25	27.25
274				27.50	27.25
275	27.5	27.5	27.5	27.50	27.50
276				27.75	27.50
277	28.0	27.5	27.5		
278	28.0	28.0	27.5	27.75	27.75
279				28.00	27.75
280	28.0	28.0	28.0	28.00	28.00
281				28.25	28.00
282	28.5	28.0	28.0		
283	28.5	28.5	28.0	28.25	28.25
284				28.50	28.25
285	28.5	28.5	28.5	28.50	28.50
286				28.75	28.50
287	29.0	29.0	28.5		
288	29.0	29.0	28.5	28.75	28.75
289				29.00	28.75
290	29.0	29.0	29.0	29.0	29.0
291				29.25	29.0
292	29.5	29.5	29.0	29.0	
293	29.5	29.5	29.0	29.25	29.25
294				29.50	29.25
295	29.5	29.5	29.5	29.50	29.50
296				29.75	29.5
297	30.0	29.5	29.5		
298	30.0	30.0	29.5	29.75	29.75
299				30.00	29.75
300	30.0	30.0	30.0	30.00	30.00
301				30.25	30.00
302	30.5	30.0	30.0		
303	30.5	30.5	30.00	30.25	30.25
304				30.50	30.25
305	30.5	30.5	30.5	30.50	30.50
306				30.75	30.50
307	31.0	30.5	30.5		
308	31.0	31.0	30.5	30.75	30.75
309				31.00	30.75
310	31.0	31.0	31.0	31.00	31.00
311				31.25	31.00
312	31.5	31.0	31.0		
313	31.5	31.5	31.3	31.25	31.25
314				31.50	31.25
315	31.5	31.5	31.5	31.50	31.50
316				31.75	31.50
317	32.0	31.5	31.5		
318	32.0	32.0	31.5	31.75	31.75
319				32.00	31.75
320	32.0	32.0	32.0	32.00	32.00
321				32.25	32.00
322	32.5	32.0	32.0		
323	32.5	32.5	32.0	32.25	32.25
324				32.50	32.25
325	32.5	32.5	32.5	32.50	32.50
326				32.75	32.50
327	33.0	32.5	32.5		
328	33.0	33.0	32.5	32.75	32.75
329				33.00	32.75
330	33.0	33.0	33.0	33.00	33.00

EVTM
Evaporator Tube Material
IECU = Internally Enhanced CU -1"
SBCU = Smooth Bore CU 3/4"
SB91 = Smooth Bore CU/NI 90/10 3/4"
TECU = Internally Enhanced CU - 3/4"

EVTH
Evaporator Tube Wall Thickness
28 = .028 Wall Thickness
35 = .035 Wall Thickness

EVSZ
Evaporator Shell Size
032S = 300 Ton Short Shell
032L = 300 Ton Long Shell
050S = 500 Ton Short Shell
050L = 500 Ton Long Shell
080S = 800 Ton Short Shell
080L = 800 Ton Long Shell
125L = 1250 Ton Long Shell
140E = 1400 Extended Length Shell
142M = 1400 Ton Medium Shell
142L = 1400 Ton Long Shell
210M = 2100TonMediumShell
210L = 2100 Ton Long Shell

EVBS
Evaporator Tube Bundle Size
200 = 200 Nominal Tons
220 = 220 Nominal Tons
230 = 230 Nominal Tons
250 = 250 Nominal Tons
280 = 280 Nominal Tons
320 = 320 Nominal Tons
350 = 350 Nominal Tons
360 = 360 Nominal Tons
400 = 400 Nominal Tons
450 = 450 Nominal Tons
500 = 500 Nominal Tons
550 = 550 Nominal Tons
560 = 560 Nominal Tons
630 = 630 Nominal Tons
710 = 710 Nominal Tons
800 = 800 Nominal Tons
890 = 890 Nominal Tons
900 = 900 Nominal Tons
980 = 980 Nominal Tons
1000 = 1000 Nominal Tons
1080 = 1080 Nominal Tons
1120 = 1120 Nominal Tons
1220 = 1220 Nominal Tons
1250 = 1250 Nominal Tons
1400 = 1400 Nominal Tons
1420 = 1420 Nominal Tons
1450 = 1450 Nominal Tons
1610 = 1610 Nominal Tons
1760 = 1760 Nominal Tons
1900 = 1900 Nominal Tons
2100 = 2100 Nominal Tons

EVWC
Evaporator Waterbox Construction
STD = Standard Welded
ASME = ASME Welded Water-Side

EVWP
Evaporator Water Passes
1 = One Pass
2 = Two Pass
3 = Three Pass

EVWT
Evaporator Waterbox Type
MAR = Marine
NMAR = Non-Marine

EVPR
Evaporator Waterside Pressure
150 = 150 PSIG
300 = 300 PSIG

EVCO
Evaporator Waterbox Connection
VICT = Victaulic
FLNG = Flanged

EVWA
Evaporator Waterbox Arrangement
FRNT = In Front/Out Front
REAR = In Rear/Out Rear
LFRR = In LH Front/Out RH Rear
RRLF = In RH Rear/Out LH Front
LRRF = In Rear/Out RH Front
RFLR = In Front/Out LH Rear
LFLR = In LH Front/Out LH Rear
LRLF = In LH Rear/Out LH Front
RFRR = In RH Front/Out RH Rear
RRRF = In RH Rear/Out RH Front
END = In One End/Out the Other
RERE = In RH End/Out RH End
LELE = In LH End/Out LH End

CDTM
Condenser Tube Matertal
IECU = Internally Enhanced CU1"
SBCU = Smooth Bore CU 3/4"
SB91 = Smooth BoreCUNI 90/10 3/4"
SB73 = Smooth Bore CUNI 70/30 3/4"
SBT1 = Smooth Bore Titanium 3/4"
TECU = Internally Enhanced CU3/4"

CDTH
Condenser Tube Thickness
28 = .028 Wall Thickness
35 = .035 Wall Thickness
42 = .042 Wall Thickness
49 = .049 Wall Thickness

CDSZ
Condenser Shell Size
032S = 320 Ton Short Shell
032L = 320 Ton Long Shell
050S = 500 Ton Short Shell
050L = 500 Ton Long Shell
080S = 800 Ton Short Shell
080L = 800 Ton Long Shell
125L = 1250 Ton Long Shell
140L = 1400 Ton Long Shell
142S = 1400 Ton Short Shell
142L = 1400 Ton Long Shell
210S = 2100 Ton Short Shell
210L = 2100 Ton Long Shell

CDBS
Condenser Tube Bundle Size
200 = 200 Nominal Tons
220 = 220 Nominal Tons
230 = 230 Nominal Tons
250 = 250 Nom inal Tons
280 = 280 Nominal Tons
320 = 320 Nominal Tons
350 = 350 Nominal Tons
360 = 360 Nominal Tons
400 = 400 Nominal Tons
450 = 450 Nominal Tons
500 = 500 Nominal Tons
550 = 550 Nominal Tons
560 = 560 Nominal Tons
630 = 630 Nominal Tons
710 = 710 Nominal Tons
800 = 800 Nominal Tons
890 = 890 Nominal Tons
900 = 900 Nominal Tons
980 = 980 Nominal Tons
1000 = 1000 Nominal Tons
1080 = 1080 Nominal Tons
1120 = 1120 Nominal Tons
1220 = 1220 Nominal Tons
1250 = 1250 Nominal Tons
1400 = 1400 Nominal Tons
1420 = 1420 Nominal Tons
1610 = 1610 Nominal Tons
1760 = 1760 Nominal Tons
1900 = 1900 Nominal Tons
2100 = 2100 Nominal Tons

CDWC
Condenser Water Box Construction
STD = Standard Welded
ASME = ASME Welded - Water-Side

CDWP
Condenser Water Passes
2 = 2 Pass

CDWT
Condenser Waterbox Type
MAR = Marine
NMAR= Non-Marine

CDPR
Condenser Water Side Pressure
150 = 150 PSIG
300 = 300 PSIG

CDCO
Condenser Waterbox Connection
VICT = Victaulic
FLNG = Flanged

CDWA
Condenser Waterbox Arrangement
LFLF = In LH Front/Out LF Front
LRLR = In LH Rear/Out LH Rear
RFRF = In RH Front/Out RH Front
RRRR = In RH Rear/Out RH Rear
LFLR = In LH Front/Out LH Rear
LRLF = In LH Rear/Out LH Front
RFRR = In RH Front/Out RH Rear
RRRF = In RH Rear/Out RH Front
RERE = In RH End/Out RH End
LELE = In LH End/Out LH End

CDTY
Condenser Construction Refrigerant Side
STD = Standard Welded
ASME = ASME Welded

TSTY
Tube Sheet Construction
STD = Standard Welded
ASME = ASME Welded

CHTM
Heat Rec. Condenser Tube Material
IECU = Internal Enhance CU-1"
SBCU = Smooth Bore CU 3/4"
SB91 = Smooth Bore CU/NI 90/103/4"
SB73 = Smooth Bore CU/NI 70/30 3/4"
SBTI = Smooth Bore Titanium 3/4"
TECU = Internally Enhanced CU 3/4"

CHTH
Heat Rec. Condenser Tube Wall Thickness
28 = .028 Wall Thickness
35 = .035 Wall Thickness
42 = .042 Wall Thickness
49 = .049 Wall Thickness

CHSZ
Heat Rec. Condenser Shell Size
032S = 320 Ton Short Shell
032L = 320 Ton Long Shell
050S = 500 Ton Short Shell
050L = 500 Ton Long Shell
080S = 800 Ton Short Shell
080L = 800 Ton Long Shell
125L = 1250 Ton Long Shell
140L = 1400 Ton Long Shell
142S = 1400 Ton Short Shell
142L = 1400 Ton Long Shell
210S = 2100 Ton Short Shell
210L = 2100 Ton Long Shell

CHBS
Heat Rec. Condenser Tube Bundle Size
200 = 200 Nominal Tons
230 = 230 Nominal Tons
250 = 250 Nominal Tons
280 = 280 Nominal Tons
320 = 320 Nominal Tons
360 = 360 Nominal Tons
400 = 400 Nominal Tons
450 = 450 Nominal Tons
500 = 500 Nominal Tons
560 = 560 Nominal Tons
630 = 630 Nominal Tons
710 = 710 Nominal Tons
800 = 800 Nominal Tons
900 = 900 Nominal Tons
1000 = 1000 Nominal Tons
1120 = 1120 Nominal Tons
1220 = 1220 Nominal Tons
1250 = 1250 Nominal Tons
1400 = 1400 Nominal Tons
1420 = 1420 Nominal Tons
1610 = 1610 Nominal Tons
1760 = 1760 Nominal Tons

1900 = 1900 Nominal Tons
2100 = 2100 Nominal Tons

CHWC
Heat Rec. Condenser Waterbox Construction
STD = Standard Welded
ASME = ASME Welded - Water Side

CHWP
Heat Rec. Condenser Water Passes
2 = 2 Pass

CHWT
Heat Rec. Condenser Waterbox Type
MAR = Marine
NMAR = Non-Marine

CHPR
Heat Rec. Condenser Waterbox Side Pressure
150 = 150 PSIG
300 = 300 PSIG

CHCO
Heat Rec. Condenser Waterbox Connections
VICT = Victaulic
FLNG = Flanged

CHWA
Heat Rec. Condenser Waterbox Arrangement
LFLF = In LH Front/Out LF Front
LRLR = In LH Rear/Out LH Rear
RFRF = In RH Front/Out RH Front
RRRR = In RH Rear/Out RH Rear
LFLR = In LH Front/Out LH Rear
LRLF = In LH Rear/Out LH Front
RFRR = In RH Front/Out RH Rear
RRRF = In RH Rear/Out RH Front
RERE = In RH End/Out RH End
LELE = In LH End/Out LH End

CABS
Auxiliary Condenser Nominal Tonnage
80 = 80 Nominal Tons
130 = 130 Nominal Tons

CAWC
Auxiliary Condenser Waterbox Construction
STD = Standard Welded
ASME = ASME Welded - Water Side

CATM
Auxiliary Condenser Tube Material
IECU = Internal Enhance CU-1"
SBCU = Smooth Bore CU 3/4"
SB91= Smooth Bore CU/NI 90/10 3/4"
SB73 = Smooth Bore CU/NI 70/30 3/4"
SBT1 = Smooth Bore Titanium 3/4"
TECU = Internally Enhanced CU -3/4"

CATH
Auxiliary Condenser Tube Wall Thickness
28 = .028 Wall Thickness
35 = .035 Wall Thickness
42 = .042 Wall Thickness

CACO
Auxiliary Condenser Waterbox Connection
VICT= Victaulic
FLNG =Flanged

CAPR
Auxiliary Condenser Water Side Pressure
150 = 150PSIG
300 = 300 PSIG

CAWT
Auxiliary Condenser Waterbox Type
MAR = Marine
NMAR = Non-Marine

CAWA
Auxiliary Condenser Waterbox Arrangement
LFLF = In LH Front/Out LF Front
LRLR = In LH Rear/Out LH Rear
RFRF = In RH Front/Out RH Front
RRRR = In RH Rear/Out RH Rear
LFLR = In LH FrontOut LH Rear
LRLF = In LH Rear/Out LH Front
RFRR = In RH Front/Out RH Rear
RRRF = In RH Rear/Out RH Front
RERE = In RH End/Out RH End
LELE = In LH End/Out LH End

ECTY
Economiser Orifice Type
WEOR = Welded
REOR= Bolted Removable

ORSZ
Orifice Size
130 = Orifice Size
140 = Orifice Size
160 _ Orifice Size
180 = Orifice Size
200 = Orifice Size
230 = Orifice Size
250 = Orifice Size
280 = Orifice Size
320 = Orifice Size
360 = Orifice Size
375 = Orifice Size
400 = Orifice Size
415 = Orifice Size
450 = Orifice Size
460 = Orifice Size
500 = Orifice Size
510 = Orifice Size
560 = Orifice Size
585 = Orifice Size
630 = Orifice Size
650 = Orifice Size
710 = Orifice Size
790 = Orifice Size
800 = Orifice Size
900 = Orifice Size
990 = Orifice Size
1000 = Orifice Size
1100 = Orifice Size
1120 = Orifice Size
1250 = Orifice Size
1265 = Orifice Size
1400 = Orifice Size
1540 = Orifice Size
1660 = Orifice Size
1800 = Orifice Size
1810 = Orifice Size
1970 = Orifice Size
2150 = Orifice Size

PURGE
Purge Unit
PURE = Purifier Unit

SPKG
Shipping Package
DOM = Domestic
EXP = Export
FULL = Export

OPTI
Unit Options
INSL = Insulation Package
CPDW = Compressor Doweling
FRCL = Free Cooling
SPSH = Separable Shells

COPT
Control Options
ACOS = H.R./Aux. Cond. Temp. Sensors
BRTS = Bearing Temperature Sensor
CLCT = Enhanced Condenser Limit Control
CWR = Chilled Water Reset - Outdoor Air Temp Based
DIST = Discharge Temp Sensor
MONP = Monitoring Package
OPTM = Options Module
PNCH = Printer Interface Module
RCLP = Remote Clear Language Display Panel
RHIN = Remote Clear Language Display Module
TRMI = Tracer Communications Interface Module
TRMS = Tracer Summit Communications Interface Module
WFCH = Water Pressure Sensors, Evap. or Cond > 150 psig
WFCL = Water Pressure Sensors, Evap. or Cond.
WVUO = Phase Voltage Sensors

HGBP
Hot Gas ByPass
With = With
W/O = Without

AGLT
Agency Listing
NONE = No Agency Listings
UL = Underwriter Laboratory
CSA = Canadian Standard Assoc.

CNIF
Control Interface
UCP2 = UCP2 Control Panel

SRTY
Starter Type
USTR = Unit Mounted StarDelta
USOL = Unit Mounted Solid State
RSTR = Remote Mounted StarDelta
RXL = Remote Mounted XLine
RATR = Remote Mounted Auto Transformer
RPIR = Remote Mounted Primary Reactor
CSTR = Customer Supplied Star-Delta
CXL = Customer Supplied X-Line Full V
CATR = Customer Supplied Autotransformer
CPIR = Customer Supplied Primary Reactor

SRRL
Starter (Nameplate) RLA

PNCO
Starter Panel Connection
TERM = Terminal Block
DISC = Disconnect Switch (Non-Fused)
CB = Circuit Breaker
CBIC = Circuit Breaker High Interupting Capcity
CBHC = Circuit Breaker - Higher Interrupting Capacity
CBCL = Circuit Breaker - Current Limiting

SRPO
Electrical Protection
SPLA = Surge Protection Plus Lighting Arrestors
UVR = Undervolt Relay with Reset
AUVR = Adjustable Undervoltage Relay Reset Overvoltage Relay
OVR = Overvoltage Relay
GRDF = Ground Fault

SROP
Starter Options
CLCA = California Code
CSA = Canadian Standards Assoc.
CTRV = Control Meter (Volt)
CTRA = Control Meter (AMP)
IQD = I.Q Data
IQDP = I.Q. Data Plus II
TDRC = Transducer Current
TDRV = Transducer Volt
TDRW = Transducer Watt
UL = Underwriters Laborator
WTTM = Watt Meter
WHM = Watt Hour Meter
WHMD = Watt Hour Meter with Demand Register
WHMP = Watt Hour Meter with Pulse Initiator
WHMB = Watt Hour Meter with both Demand Register Pulse Initiator

SRFC
Starter PowerFactor Correction Capacitors
10 = 10 KVAR
15 = 15 KVAR
20 = 20 KVAR
25 = 25 KVAR
30 = 30 KVAR
35 = 35 KVAR
40 = 40 KVAR
45 = 45 KVAR
50 = 50 KVAR
60 = 60 KVAR
70 = 70 KVAR
75 = 75 KVAR
80 = 80 KVAR
90 = 90 KVAR
100 = 100 KVAR
120 = 120 KVAR
125 = 125 KVAR
150 = 150 KVAR
200 = 200 KVAR
225 = 225 KVAR

ACCY
Unit Accessory
ISLS = Isolator Spring
FS1 = (1) Flow Switch 150 PSI NEMA 1
2FS1 = (2) Flow Switchs 150 PSI NEMA 1
3FS1 = (3) Flow Switches 150 PSI NEMA 1
FS2 = (1) Flow Switch 300 PSI NEMA 1
2FS2 = (2) Flow Switches 300 PSI NEMA 1
3FS2 = (3) Flow Switches 300 PSI NEMA 1
FS3 = (1) Flow Switch 150 PSI Vaporproof
2FS3 = (2) Flow Switches 150 PSI Vaporproof
3FS3 = (3) Flow Switches 150 PSI Vaporproof
FS4 = (1) Flow Switch 300 PSI Vaporproof
2FS4 = (2) Flow Switches 300 PSI Vaporproof
3FS4 = (3) Flow Switches 300 PSI Vaporproof
TME = (1) Thermometer 10 In Extended Well
2TME = (2) Thermometer 10 In Extended Well
3TME = (3) Thermometers 10 In Extended Well
TMS = (1) Thermometer 10 In Standard Well
T5R = TR5 Timer
2TMS = (2) Thermometers 10 In Standard Well
3TMS = (3) Thermometers 10 In Standard Well
OR01- OR28 = Extra Set of Orifice Plates (OR01 thru OR28)
OR30 - OR47 = Extra Set of Orifice Plates (OR30 thru OR47)

General Information

Literature Change History

CVHE-M-7 (February 1994)

Original issue of manual; describes proper operation and maintenance of 50 Hz. or 60 Hz. CVHE units of "1W" design sequences with UCP2 micro-computer-based control systems and CVHF 650-1280 "E0 " design sequences with UCP2 micro-computer-based control systems.

About this manual

This booklet describes the operation and maintenance of 50 Hz. or 60 Hz. Model CVHE and CVHF CenTraVac chillers equipped with micro-computer-based control systems, whether standard (cooling) or heating-recovery. By carefully reviewing this information and following the instructions given, the owner/ operator can successfully operate and maintain a CVHE or CVHF unit.

Diagnostic information is provided at the end of this manual to allow the operator to identify a number of system malfunctions, should any develop. (If mechanical problems do occur, however, contact a qualified service organization to ensure proper diagnosis and repair of the unit.)

Commonly Used Acronyms

For convenience, a number of acronyms are used throughout this manual. These acronyms are listed alphabetically below, along with the "translation" of each:

AFD = Adjustable Frequency Drive
ASME = American Society of Mechanical Engineers
ASHRAE = American Society of Heating, Refrigerating and Air Conditioning Engineers

BAS = Building Automation System
CABS = Auxiliary Condenser Tube-Bundle Size
CDBS = Condenser Bundle Size

CDSZ = Condenser Shell Size
CLD = Clear Language Display
CWR =Chilled Water Reset

DTFL = Design Delta-T at Full Load (i.e., the difference between entering and leaving chilled water temperatures)
ENT = Entering Chilled Water Temperature
FC = Free Cooling

GPM = Gallons-per-minute
HGBP = Hot Gas Bypass
HVAC = Heating, Ventilating, and Air Conditioning

IE = Internally-Enhanced Tubes
IPC = Interprocessor Communication
LBU = La Crosse Business Unit

LCD = Liquid Crystal Display
LED = Light Emitting Diode
PFCC = Power Factor Correction Capacitor

PSID = Pounds-per-Square-Inch (differential pressure)
PSIG = Pounds-per-Square-Inch (gauge pressure)
RCLD = Remote Clear Language Display

UCP2 = Chiller Control Panel for CenTraVacs

Warnings and Cautions

Notice that warnings and cautions appear at appropriate intervals throughout this manual. Warnings are provided to alert installing contractors 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.

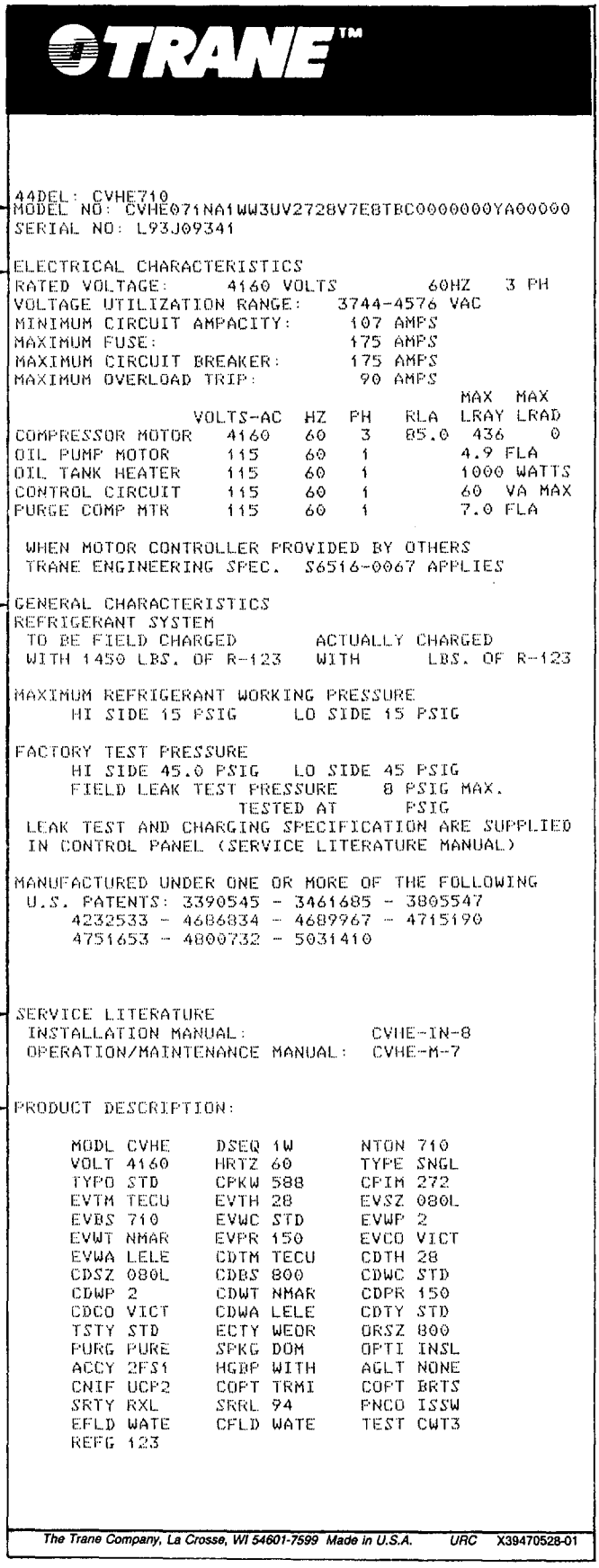
Your personal safety and the proper installation of this machine depend upon the strict observance of these precautions.

Unit Nameplate

The CVHE or CVHF unit nameplate is located on the left side of the unit control panel (UCP). A typical unit nameplate is illustrated in Figure 1. The following information is provided on the unit nameplate.

- Service model and size descriptor.
- Unit serial number
- Identifies unit electrical requirements
- List correct operating charges and type of refrigerant
- Lists unit test pressures and maximum operating pressures.
- Identifies unit Installation and Operation and Maintenance manual
- Product description block (identifies all unit components and unit "design sequence" (used to order literature and make other inquiries about the unit).
- Lists drawing numbers for unit wiring diagrams.

Figure 1
Typical Unit Nameplate



TRANE™

44DEL: CVHE710
MODEL NO: CVHE071NA1WW3UV2728V7E8TBC0000000YA00000
SERIAL NO: L93J09341

ELECTRICAL CHARACTERISTICS
RATED VOLTAGE: 4160 VOLTS 60HZ 3 PH
VOLTAGE UTILIZATION RANGE: 3744-4576 VAC
MINIMUM CIRCUIT AMPACITY: 107 AMPS
MAXIMUM FUSE: 175 AMPS
MAXIMUM CIRCUIT BREAKER: 175 AMPS
MAXIMUM OVERLOAD TRIP: 90 AMPS

	VOLTS-AC	HZ	PH	RLA	MAX LRAY	MAX LRAD
COMPRESSOR MOTOR	4160	60	3	85.0	436	0
OIL PUMP MOTOR	115	60	1		4.9 FLA	
OIL TANK HEATER	115	60	1		1000 WATTS	
CONTROL CIRCUIT	115	60	1		60 VA MAX	
PURGE COMP MTR	115	60	1		7.0 FLA	

WHEN MOTOR CONTROLLER PROVIDED BY OTHERS
TRANE ENGINEERING SPEC. S6516-0067 APPLIES

GENERAL CHARACTERISTICS
REFRIGERANT SYSTEM
TO BE FIELD CHARGED WITH 1450 LBS. OF R-123 ACTUALLY CHARGED WITH LBS. OF R-123

MAXIMUM REFRIGERANT WORKING PRESSURE
HI SIDE 15 PSIG LO SIDE 15 PSIG

FACTORY TEST PRESSURE
HI SIDE 45.0 PSIG LO SIDE 45 PSIG
FIELD LEAK TEST PRESSURE 8 PSIG MAX.
TESTED AT PSIG
LEAK TEST AND CHARGING SPECIFICATION ARE SUPPLIED IN CONTROL PANEL (SERVICE LITERATURE MANUAL)

MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 3390545 - 3461685 - 3805547
4232533 - 4686834 - 4689967 - 4715190
4751653 - 4800732 - 5031410

SERVICE LITERATURE
INSTALLATION MANUAL: CVHE-IN-8
OPERATION/MAINTENANCE MANUAL: CVHE-M-7

PRODUCT DESCRIPTION:

MODL CVHE	DSEQ 1W	NTON 710
VOLT 4160	HRTZ 60	TYPE SNGL
TYPO STD	CPKW 588	CPIM 272
EVTM TECU	EVTH 28	EVSZ 080L
EVBS 710	EVWC STD	EVWP 2
EVWT NMAR	EVPR 150	EVCO VICT
EVWA LELE	CDTM TECU	CDTH 28
CDSZ 080L	CDBS 800	CDWC STD
CDWP 2	CDWT NMAR	CDPR 150
CDCO VICT	CDWA LELE	CDTY STD
TSTY STD	ECTY WEOR	ORSZ 800
PURG PURE	SPKG DOM	OPTI INSL
ACCY 2FS1	HGBP WITH	AGLT NONE
CNIF UCP2	COPT TRMI	COPT BRTS
SRTY RXL	SRRL 94	PNCO ISSW
EFLD WATE	CFLD WATE	TEST CWT3
REFG 123		

The Trane Company, La Crosse, WI 54601-7599 Made in U.S.A. URC X39470528-01

Unit Model and Size Descriptor

Unit and Motor Electrical Data

Unit Refrigerant Charge Information

Unit Service Literature

Product Description Block

Mechanical Operation - CVHE

Overview

The following description applies to the Trane Model CVHE centrifugal chiller only. Refer to the appropriate operation manual for refrigeration cycle descriptions of other models.

Each CVHE unit is composed of 5 basic components.

--the evaporator;
--3-stage compressor;
--water-cooled condenser,
--2-stage economizer,
--related interconnecting piping.

A heat-recovery or auxiliary condenser can be factory-added to the basic unit assembly to provide a heat-recovery cycle.

Figure 2 illustrates the general component layout of a typical CVHE chiller.

CVHE cooling-only and heat recovery modes of operation are described in the following sections. A pressure enthalpy diagram (shown in Figure 3) is provided to further illustrate unit operation.

Cooling-Only Cycle

When the CVHE is functioning in the cooling mode, liquid refrigerant is distributed along the length of the evaporator and sprayed through small holes in a distributor (i.e., running the entire length of the shell) to uniformly coat each evaporator tube. Here, the liquid refrigerant absorbs enough heat from the system water circulating through the evaporator tubes to vaporize.

The gaseous refrigerant is then drawn through the eliminators (which remove droplets of liquid refrigerant from the gas) and first-stage variable inlet guide vanes, and into the first stage impeller.

Note: Inlet guide vanes are designed to modulate the flow of gaseous refrigerant to meet system capacity requirements; they also prerotate the gas, allowing it to enter the impeller at an optimal angle that maximizes efficiency at all load conditions.

Compressed gas from the first-stage impeller flows through the fixed, second-stage inlet vanes and into the second-stage impeller. Here, the refrigerant gas is again compressed, and then discharged through the third-stage variable guide vanes and into the third-stage impeller.

Once the gas is compressed a third time, it is discharged into the condenser. Baffles within the condenser shell distribute the compressed refrigerant gas evenly across the condenser tube bundle. Cooling tower water circulated through the condenser tubes absorbs heat from the refrigerant, causing it to condense. The liquid refrigerant then passes through orifice plate "A" and into the economizer.

The economizer reduces the energy requirements of the refrigeration cycle by eliminating the need to pass all gaseous refrigerant through 3 stages of compression. See Figure 4. Notice that some of the liquid refrigerant flashes to a gas because of the pressure drop created by the orifice plates, thus further cooling the liquid refrigerant. This flash gas is then drawn directly from the first (Chamber A) and second (Chamber B) stages of the economizer into the third- and second-stage impellers of the compressor, respectively.

All remaining liquid refrigerant flows through another orifice plate "C" to the evaporator.

Figure 2
Typical CVHE Unit Assemblies

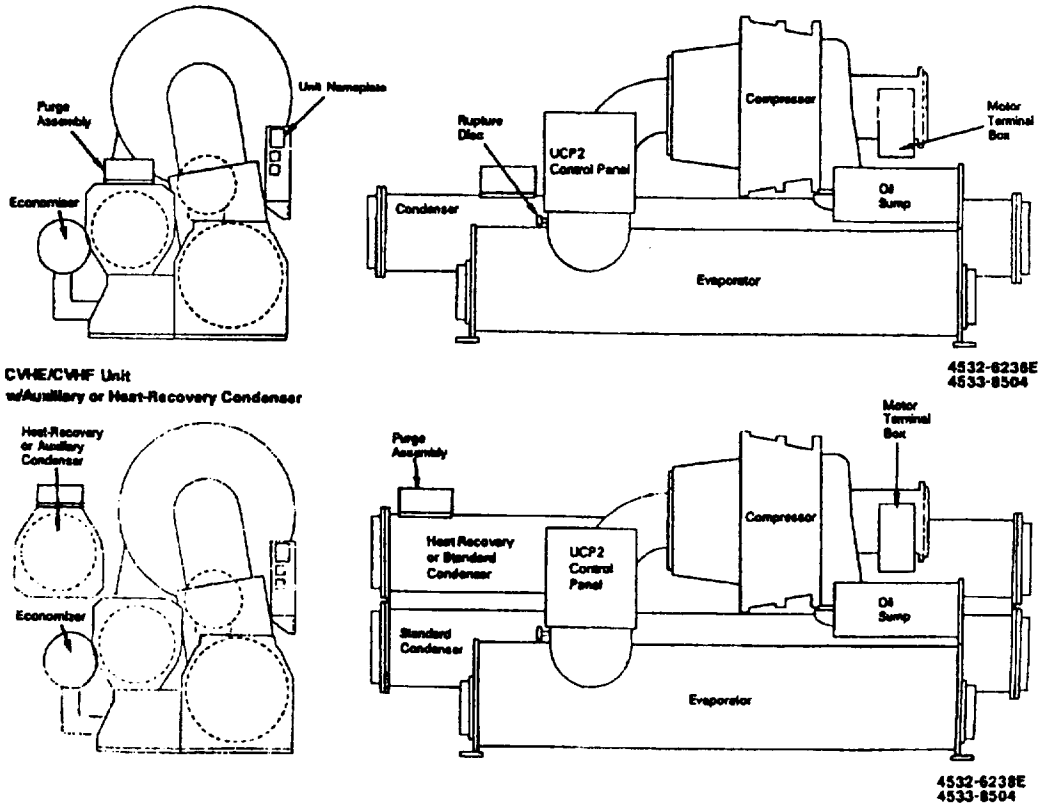


Figure 3
CVHE Pressure/Enthalpy Curve

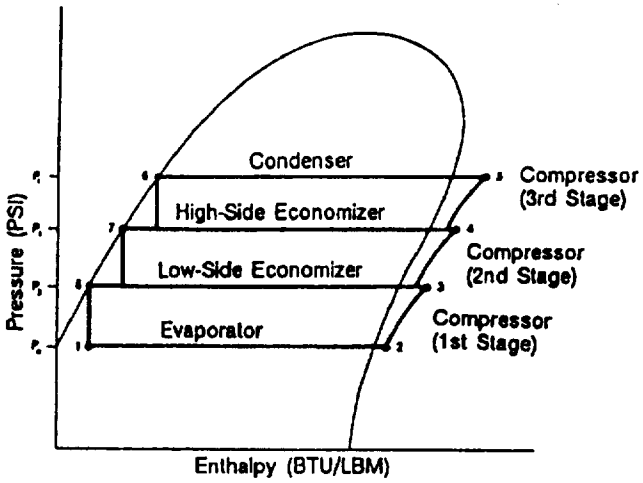
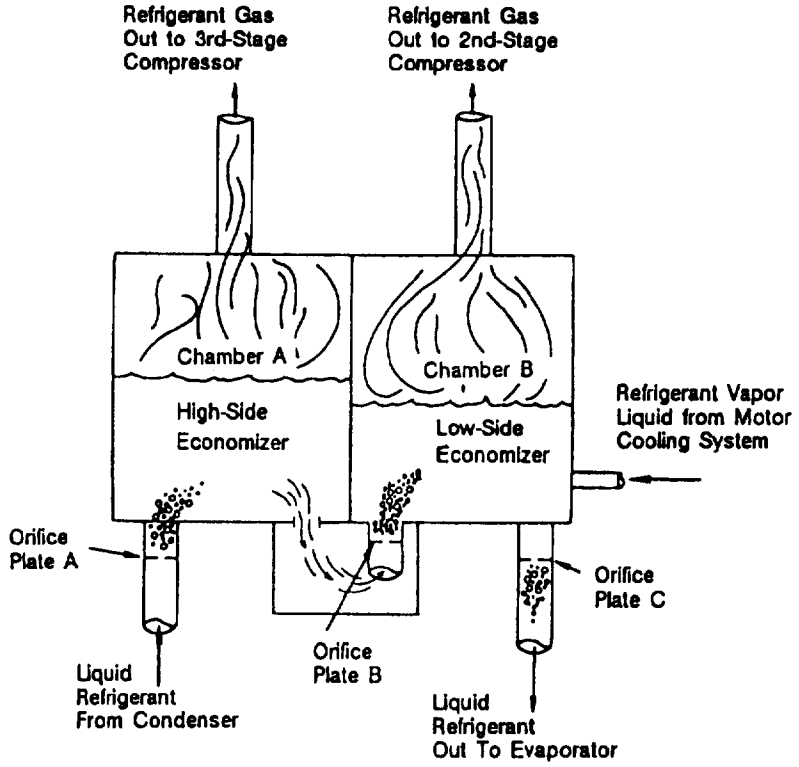


Figure 4
CVHE 2-Stage Economizer



Compressor Lubrication System - CVHE

A schematic diagram of the compressor lubrication system is illustrated in Figure 5; this system supplies oil to the compressor motor bearings.

Oil is pumped from the oil tank (i.e. by a pump and motor located within the tank) through an oil pressure-regulating valve designed to maintain a net oil pressure of 12 to 18 psid. It is then filtered and sent to the compressor motor bearings. The oil filter assembly is equipped with refrigeration valves to isolate the filter during filter replacement.

From the bearings, the oil drains back to the oil tank through return lines.

WARNING:
Use caution while working on certain areas of the unit. Surface temperatures may exceed 150°F on the compressor discharge, oil tank (heater), oil filter, and oil lubrication lines.

To ensure proper lubrication and prevent refrigerant from condensing in the oil tank, a 750-watt heater is immersed in the oil tank exterior. Operating in response to a signal from the UCP, this heater energizes as needed to maintain 140° to 145 °F (60-63 C) when the chiller is not running. When the chiller is operating, the temperature of the oil tank is typically 115° to 160° F (46-72 C).

Refer to Figure 5; notice that the oil tank is vented between the compressor inlet vanes and the first-stage impeller suction cover. During normal system operation, motor barrel pressure is greater than that of the oil tank. Therefore, any gaseous refrigerant that enters the motor bearing cavities is drawn toward the oil tank where it is removed by the vent line.

A dual eductor system is used to reclaim oil from the suction cover and from the evaporator, and deposits it back into the oil tank. These eductors use high pressure condenser gas to draw the oil from the suction cover and evaporator back to the eductors, from the eductors the oil is discharged to the top of the oil tank.

Note: CVHEs utilize a circuit module control relay and solenoid valve that temporarily close the oil sump vent line during the chiller start sequence. This prevents the loss of oil pressure that can occur during start-up by isolating the oil sump from the low-pressure cavity at the opposite end of the sump vent line.

Liquid refrigerant is used to cool the oil supply to the inboard motor bearing on larger units (360-1250). Oil entering the oil cooler assembly from the oil tank (via the regulating valve and filter) flows into a coil inside the cooler shell. See Figure 6. As the oil passes through this coil, it is cooled by a mixture of gaseous and liquid refrigerant that surround the coil exterior.

Once the cooled oil leaves the cooler shell, it flows directly to the inboard motor bearing, and eventually returns to the oil tank.

The oil cooler is piped into the return circuit of the motor cooling system. Part of the refrigerant that is used to cool the compressor motor passes through the oil cooler shell on its way to the economizer.

Motor Cooling System

CVHE compressor motors are cooled with liquid refrigerant; see Figure 5 for a schematic illustration of this pressurized system.

Liquid refrigerant flows from the condenser sump to the bottom of the compressor motor, Figure 7, where it enters the motor chamber through a control orifice. As the liquid refrigerant touches the warmer motor components, a portion of it flashes to a gas and cools the motor. This "flash" gas, along with any excess liquid refrigerant, then drains to the second-stage of the economizer.

Because of the positive pressure differential between the condenser and economizer, proper refrigerant flow through the motor is maintained at all load conditions.

Figure 5 - CVHE
Compressor Lubrication and
Motor-Cooling Systems

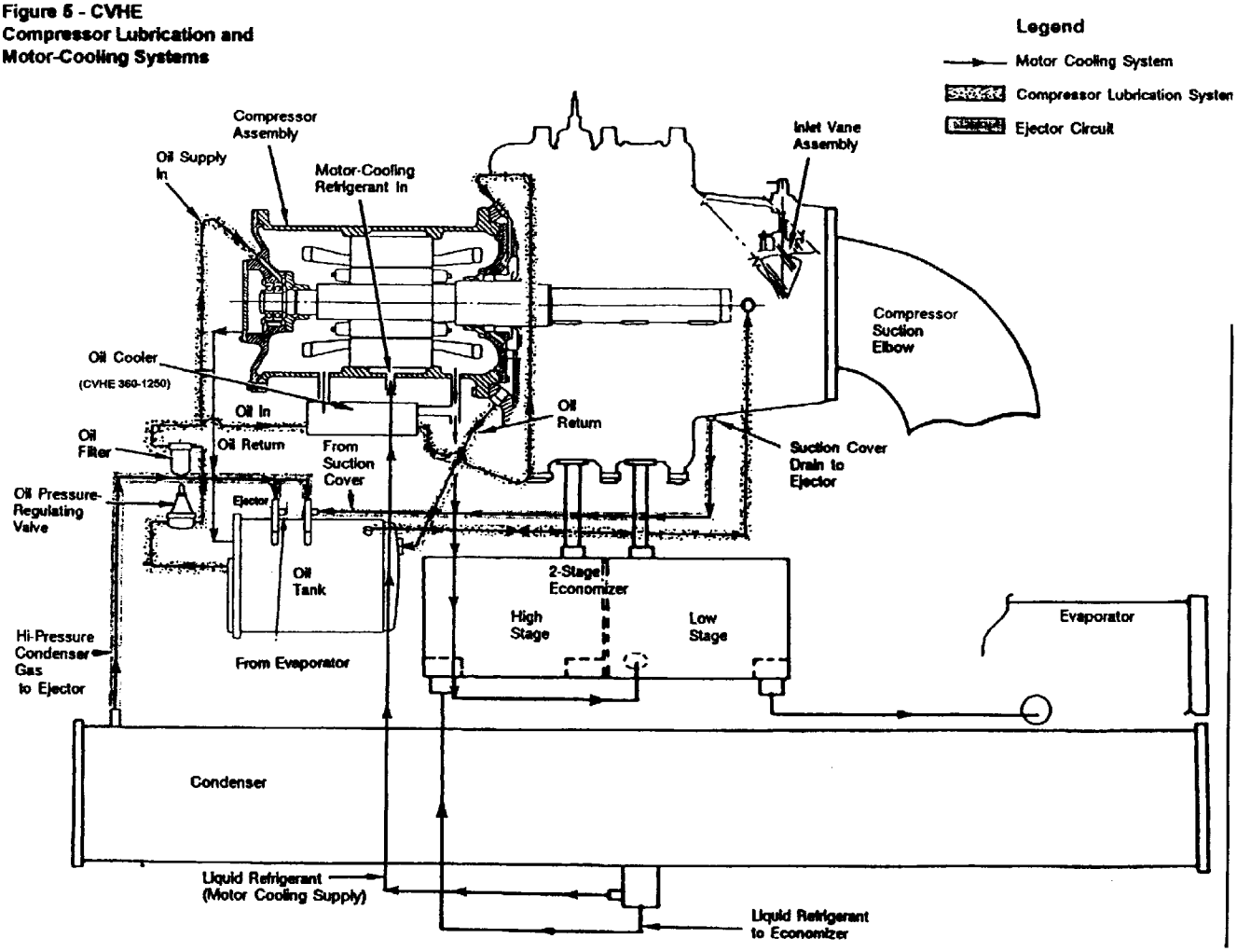


Figure 6
CVHE/CVHF Oil Cooler Assembly

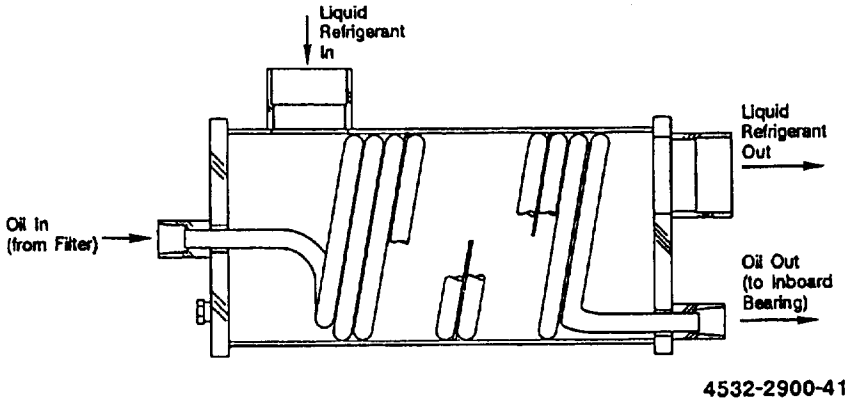
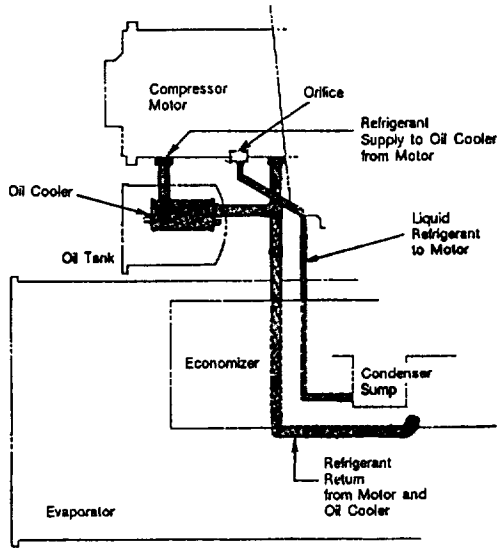


Figure 7
CVHE Motor Cooling System



Mechanical Operation - CVHF

Overview

The following description applies to the Trane Model CVHF centrifugal chiller only. Refer to the appropriate operation manual for refrigeration cycle descriptions of other models.

Each CVHF unit is composed of 5 basic components:

— the evaporator;
— 2-stage compressor ;
— water-cooled condenser;
— single-stage economizer,
— related interconnecting piping.

A heat-recovery or auxiliary condenser can be factory-added to the basic unit assembly to provide a heat-recovery cycle.

Figure 8 illustrates the general component layout of a typical CVHF chiller.

CVHF cooling-only and heat re-recovery modes of operation are described in the following sections. A pressure/enthalpy diagram (shown in Figure 9) is provided to further illustrate unit operation.

Cooling-Only Cycle

When the CVHF is functioning in the cooling mode, liquid refrigerant is distributed along the length of the evaporator and sprayed through small holes in a distributor (i.e., running the entire length of the shell) to uniformly coat each evaporator tube. Here, the liquid refrigerant absorbs enough heat from the system water circulating through the evaporator tubes to vaporize.

The gaseous refrigerant is then drawn through the eliminators (which remove droplets of liquid refrigerant from the gas), first-stage variable inlet guide vanes, and into the first-stage impeller.

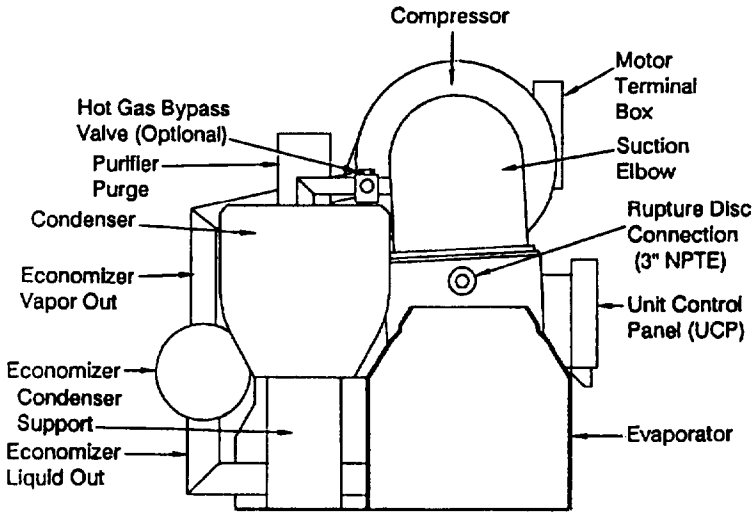
Note: Inlet guide vanes are designed to modulate the flow of gaseous refrigerant to meet system capacity requirements; they also prerotate the gas allowing it to enter the impeller at an optimal angle that maximizes efficiency at all load conditions.

Compressed gas from the first-stage impeller is discharged through the second-stage variable guide vanes and into the second-stage impeller. Here, the refrigerant gas is again compressed, and then discharged into the condenser.

Baffles within the condenser shell distribute the compressed refrigerant gas evenly across the condenser tube bundle. Cooling tower water, circulated through the condenser tubes, absorbs heat from the refrigerant, causing it to condense. The liquid refrigerant then flows out of the bottom of the condenser, passing through an orifice plate and into the economizer.

The economizer reduces the energy requirements of the refrigeration cycle by eliminating the need to pass all gaseous refrigerant though both stages of compression. See Figure 10. Notice that some of the liquid refrigerant flashes to a gas because of the pressure drop created by the orifice plate, thus further cooling the liquid refrigerant. This flash gas is then drawn directly from the economizer into the second-stage impellers of the compressor. All remaining liquid refrigerant flows out of the economizer, passes through another orifice plate and into the evaporator.

Figure 8
General Component Identification - Trane CVHF



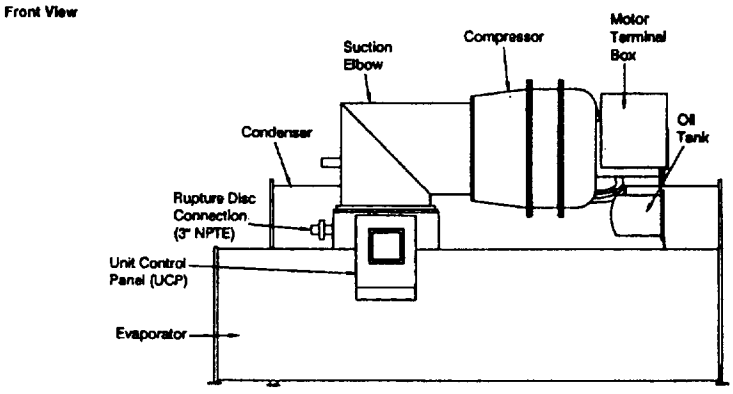


Figure 9
CVHF Pressure/Enthalpy Curve

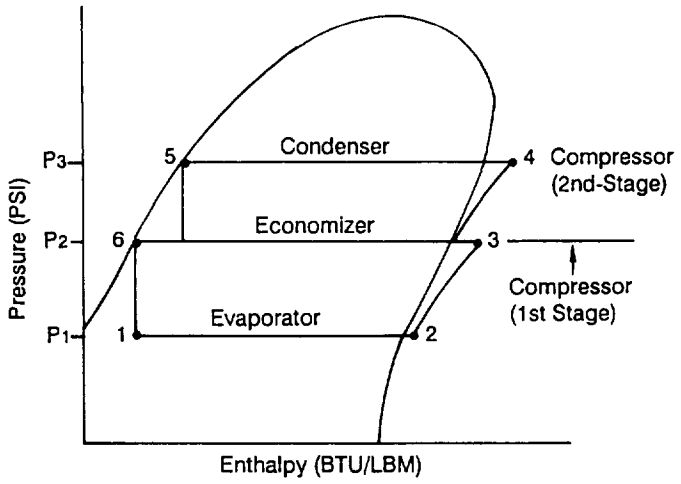
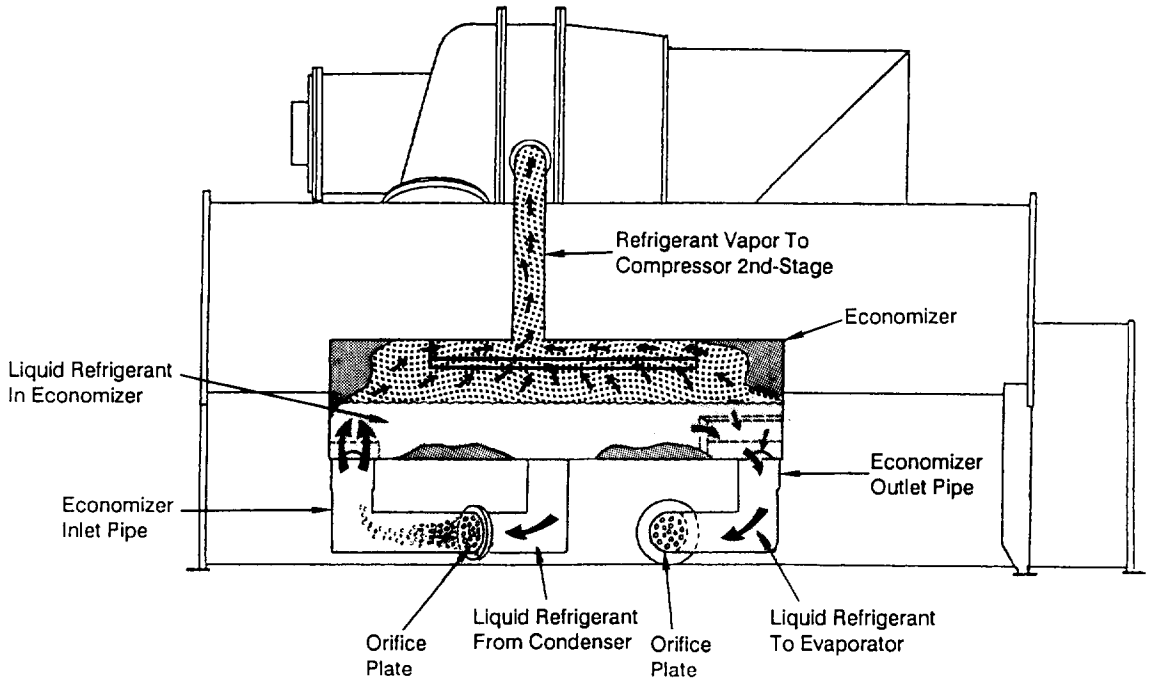


Figure 10
CVHF Economizer Operation



Compressor Lubrication System - CVHF

The CVHF compressor lubrication system, which supplies oil to the compressor motor bearings, is illustrated in Figure 11.

Oil is pumped from the oil tank (i.e., by a pump and motor located within the tank) through an oil pressure-regulating valve designed to maintain a net oil pressure of 12 to 18 psid. It is then filtered and sent to the compressor motor bearings. The oil filter assembly is equipped with refrigeration valves to isolate the filter during filter replacement.

From the bearings, the oil drains back to the oil tank through return lines.

To ensure proper lubrication and prevent refrigerant from condensing in the oil tank, a 750-watt heater is immersed in the oil tank. Operating in response to a signal from the UCP, this heater energizes as needed to maintain an oil tank temperature of 140 to 145 F (60-63 C) when the chiller is not running. When the chiller is operating, the temperature of the oil tank is typical 115 to 160 F (46-72 C).

WARNING:

Use caution while working on certain areas of the unit. Surface temperatures may exceed 150° F on the compressor discharge, oil tank (heater), oil filter, and oil lubrication lines.

The oil tank is vented between the compressor inlet vanes and the first-stage impeller suction cover. During normal system operation, motor barrel pressure is greater than that of the oil tank. Therefore any gaseous refrigerant that enters the motor bearing cavities is drawn toward the oil tank where it is removed by the vent line.

A dual eductor system is used to reclaim oil from the suction cover and from the evaporator, and deposits it back into the oil tank. These eductors use high pressure condenser gas to draw the oil from the suction cover and evaporator back to the eductors, from the eductors the oil is discharged to the top of the oil tank.

Note: CVHFs utilize a circuit module control relay and solenoid valve that temporarily close the oil sump vent line during the chiller start sequence. This prevents the loss of oil pressure that can occur during start-up by isolating the oil sump from the low-pressure cavity at the opposite end of the sump vent line.

Liquid refrigerant is used to cool the oil supply to the inboard motor bearing. Oil entering the oil cooler assembly from the oil tank (via the regulating valve and filter) flows into a coil inside the cooler shell. As the oil passes through this coil, it is cooled by a mixture of gaseous and liquid refrigerant that surround the coil exterior. Once the cooled oil leaves the cooler shell, it flows directly to the inboard motor bearing, and eventually returns to the oil tank. The refrigerant-side of the oil cooler is piped into the return circuit of the motor cooling system. Part of the refrigerant that is used to cool the compressor motor passes through the oil cooler shell on its way to the economizer.

Motor Cooling System

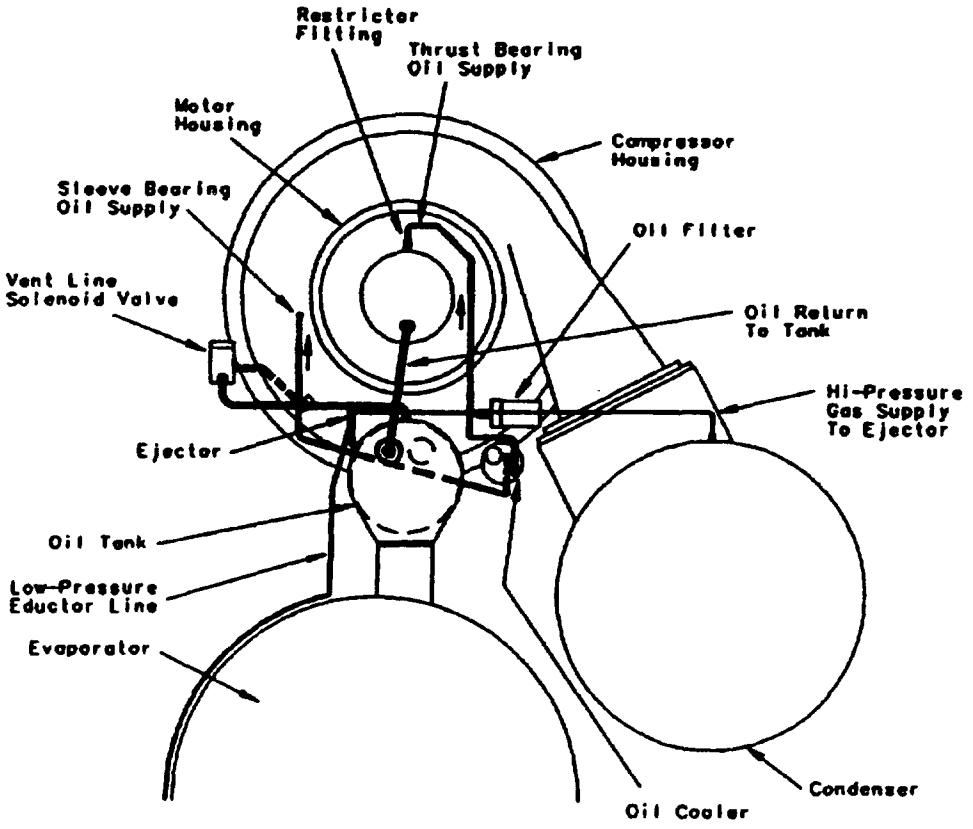
CVHF compressor motors are cooled with liquid refrigerant. This pressurized cooling system is illustrated in Figure 12.

Liquid refrigerant flows from the condenser sump to the bottom of the compressor motor where it enters the motor chamber through a control orifice. When the liquid refrigerant contacts the warmer motor components, a portion of it flashes to a gas and cools the motor. This "flash" gas, along with any excess liquid refrigerant, then drains to the evaporator sump.

Because of the positive pressure differential between the condenser and evaporator, proper refrigerant flow through the motor is maintained at all load conditions.

Figure 11
CVHF Motor Lubrication

Left End View



Back View

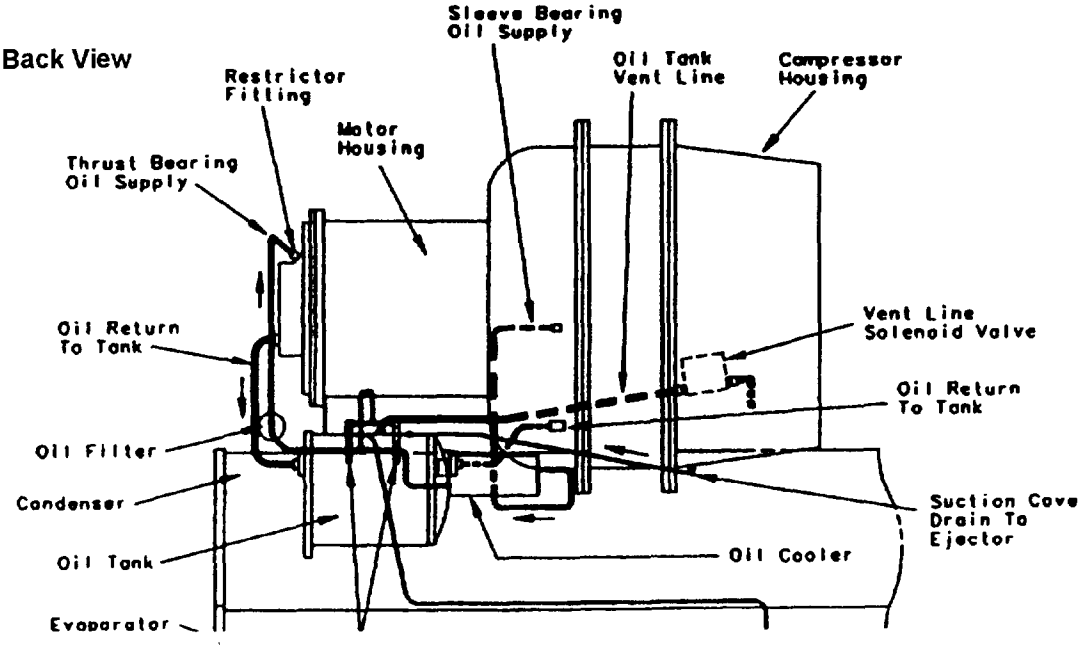
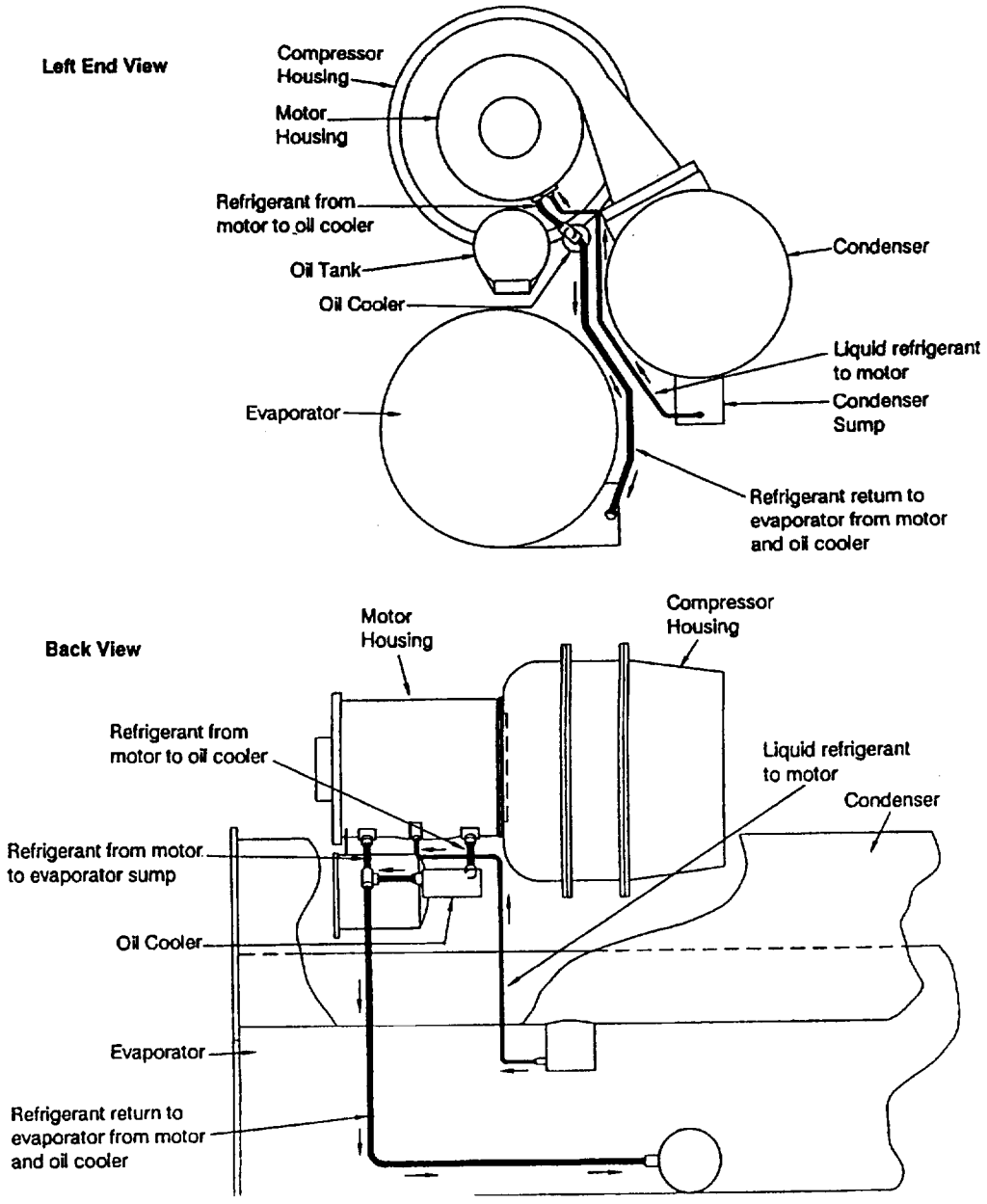


Figure 12
CVHF Motor Cooling System



Free Cooling Cycle (Optional)- CVHE/CVHF

Based on the principle that refrigerant migrates to the coldest area in the system, the free cooling option adapts the basic chiller to function as a simple heat exchanger. However, it does not provide control of the leaving chilled water temperature.

If condenser water is available at a temperature lower than the required leaving chilled water temperature, the operator manually stops the compressor and starts the free cooling cycle by enabling the Free cooling mode in the "Operator Settings" Group of the Human Interface.

Several components must be factory-supplied or field-installed to equip the unit for free cooling operation:

— options module 1U5
— a refrigerant gas line, including an electrically-actuated shutoff valve, between the evaporator and condenser;

— a valved liquid return line, including an electrically-actuated shutoff valve, between the condenser sump and the evaporator;

— a liquid refrigerant storage vessel; and,

— additional refrigerant.

When the chiller operator initiates changeover to the free cooling mode, the compressor will shut down if running, the shutoff valves in the liquid and gas lines open; UCP (i.e., unit control panel) control logic prevents the compressor from energizing during free cooling. Liquid refrigerant then drains (by gravity) from the storage tank into the evaporator and floods the tube bundle. See Figure 4.

Since the temperature and pressure of the refrigerant in the evaporator are higher than in the condenser (i.e., because of the difference in water temperature), the refrigerant in the evaporator vaporizes and travels to the condenser. Cooling tower water causes the refrigerant to condense, and it flows (again, by gravity) back to the evaporator.

This compulsory refrigeration cycle is sustained as long as a temperature differential exists between condenser and evaporator water. The actual cooling capacity provided by the free cooling cycle is determined by the difference between these temperatures which, in tum, determines the rate of refrigerant flow between the evaporator and condenser shells.

If the system load exceeds the available free cooling capacity, the operator must manually initiate changeover to the mechanical cooling mode by disabeling the free cooling mode in the"Operator Settings" Group of the Human Interface. The gas and liquid line valves then close and compressor operation begins. Refrigerant gas is drawn out of the evaporator by the compressor, where it is then compressed and discharged to the condenser.

Most of the condensed refrigerant initially follows the path of least resistance by flowing into the storage tank. This tank is vented to the economizer sump through a small bleed line; when the storage tank is full, liquid refrigerant must flow through the bleed line restriction. Because the pressure

drop through the bleed line is greater than that of the orifice flow control device, the liquid refrigerant flows normally from the condenser through the orifice system and into the economizer.

Note: During changeover from free cooling to mechanical cooling, the refrigerant transfer process is completed within 3 minutes. The micro-computer- based control system prevents carry-over by not allowing the unit to load for a period of two minutes.

Heat Recovery Cycle (Optional)

"Heat recovery" is designed to salvage the heat that is normally rejected to the atmosphere through the cooling tower, and put it to beneficial use.

For example, a high-rise office building may require simultaneous heating and cooling during the winter months. With the addition of a heat recovery cycle, heat removed from the building cooling load can be transferred to areas of the building that require heat. (Keep in mind that the heat recovery cycle is only possible if a cooling load exists to act as a heat source.)

To provide a heat recovery cycle, a heat-recovery condenser is added to the unit; see Figure 2. Though physically identical to the standard cooling condenser, the heat-recovery condenser is piped into a heating circuit rather than to the cooling tower.

During the heat recovery cycle, the unit operates just as it does in the "cooling only" mode except that the cooling load heat is rejected to the heating water circuit rather than to the cooling tower water circuit.

When hot water is required, the heating water circuit pumps energize. Water circulated through the heat-recovery (or auxiliary) condenser tube bundle by the pumps absorbs cooling-load from the compressed refrigerant gas discharged by the compressor. The heated water is then used to satisfy heating requirements.

Auxiliary Condensers (Optional)

Unlike the heat-recovery condenser (which is designed to satisfy comfort heating requirements), the auxiliary condenser serves a preheat function only, and is used in those applications where hot water is needed for use in kitchens, lavatories, etc. While the operation of the auxiliary condenser is physically identical to that of the heat-recovery condenser, it is comparatively smaller in size, and its heating capacity is not controlled.

Trane does not recommend operating the auxiliary condenser alone because of its small size.

Chiller Control System

Unit Control Panel

Safety and operating controls are housed in the UCP 2 unit control panel, the starter panel and the purge control panel (Control Panel layout is illustrated in Figure 13.)

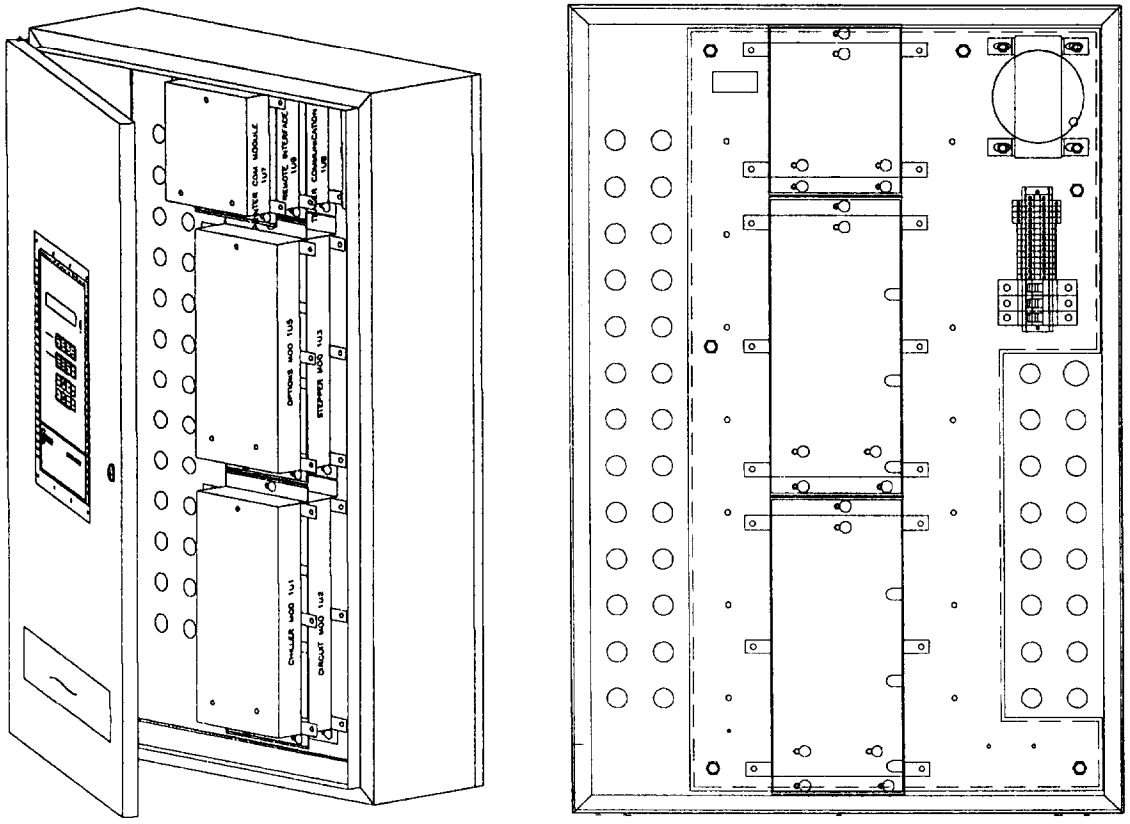
The UCP2 control consists of a modular design partitioned by major function or group of functions. All modules communicate with each other thru the IPC circuit.

Major components within each of these control groups are described below.

Unit-mounted temperature sensors, pressure transducers and functional switches provide analog and binary inputs to the various modules.

The "microcomputer-based" modules are described below. All wiring to the modules are to pluggable terminal blocks.

Figure 13
UCP2 Control Panel

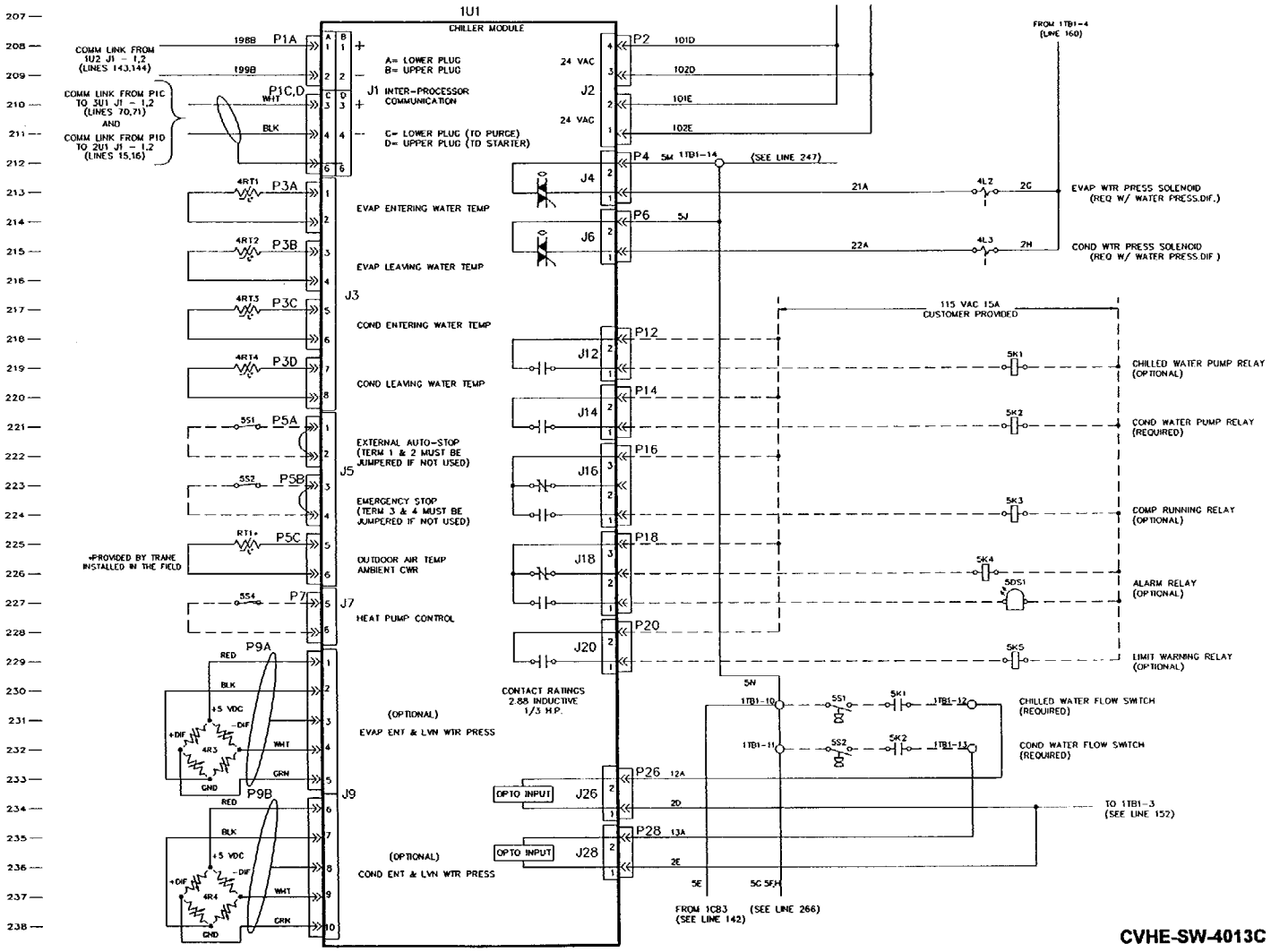


X13650485C

Chiller Module (1U1)

The Chiller Module, located in the UCP2 control panel, is the Master-of-the-Chiller communicating commands to other modules and collecting data/status/diagnostic information from other modules over the IPC (Inter Processor Communications Link). The Chiller Module performs the Leaving Chilled Water Temperature and Limit Control Algorithms arbitrating capacity against any operating limit the chiller may find itself working against. the Chiller module contains non-volatile memory both checking for valid set points and retaining them on any power loss. Inputs and Outputs are chilled water system level I/O including evaporator and condenser water temperatures, outdoor air temperature, evaporator and condenser water pump control, status and alarm relays, external Auto-Stop, emergency stop, external condenser heating (heat pump), evaporator and condenser water pressure drops and evaporator and condenser water flow switches. Connection points of standard and optional inputs and outputs for the chiller module (1U1) are shown in Figure 14.

Figure 14
Chiller Module - CVHE/CVHF



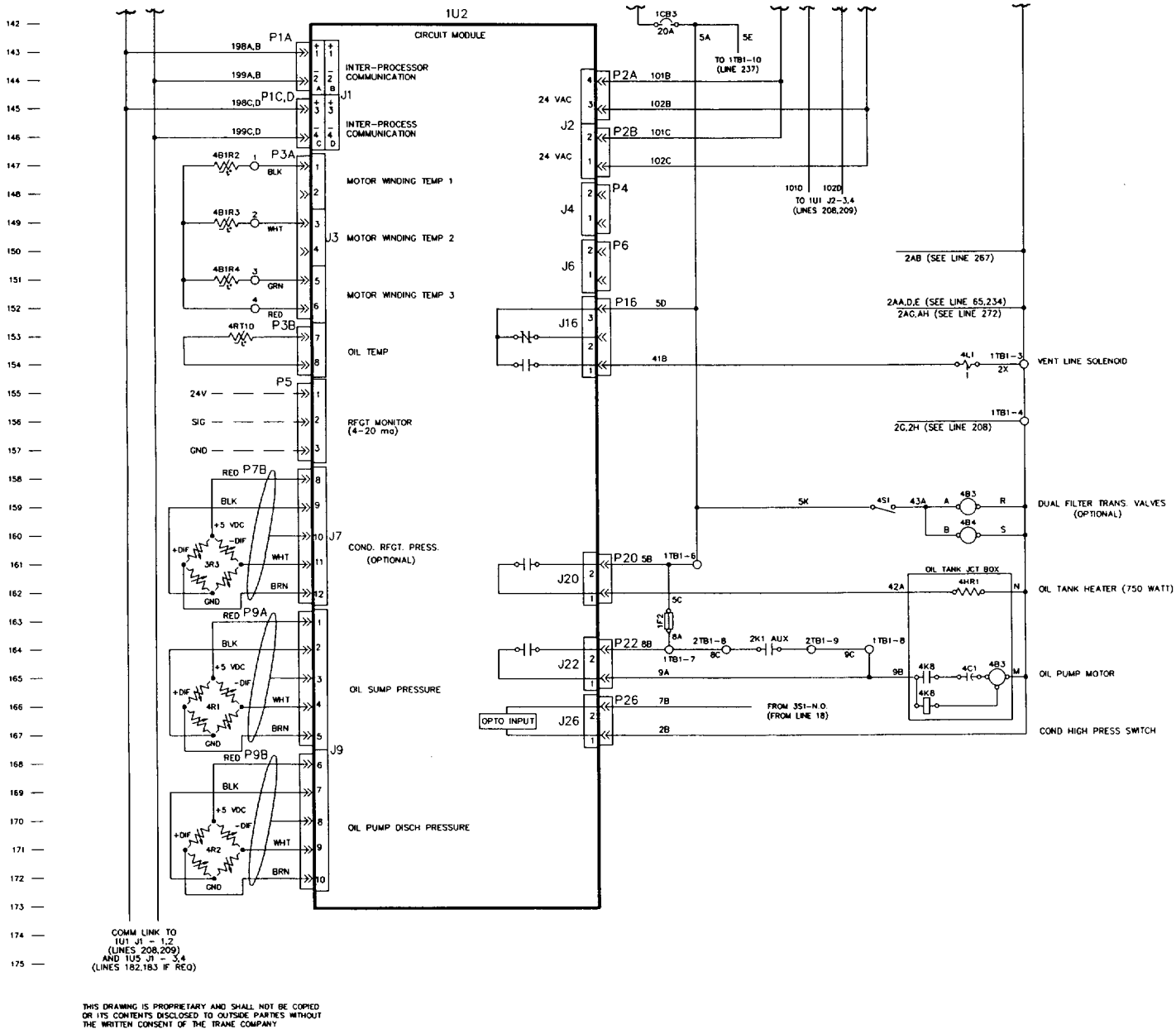
Circuit Module (1U2)

The Circuit Module serves as an input/output expander and has inputs and outputs associated with motor, refrigerant, and lubrication, functions.

These include, motor winding temperatures, oil temperature, RFGT Monitor Connection, optional condenser refrigerant pressure, oil sump pressure, oil pump discharge pressure, valve control vent line valve operation, oil tank heater operation. Connection points of inputs and outputs for the Circuit Module (1U2) are shown in Figure 15.

Figure 15
Circuit Module - CVHE/CVHF

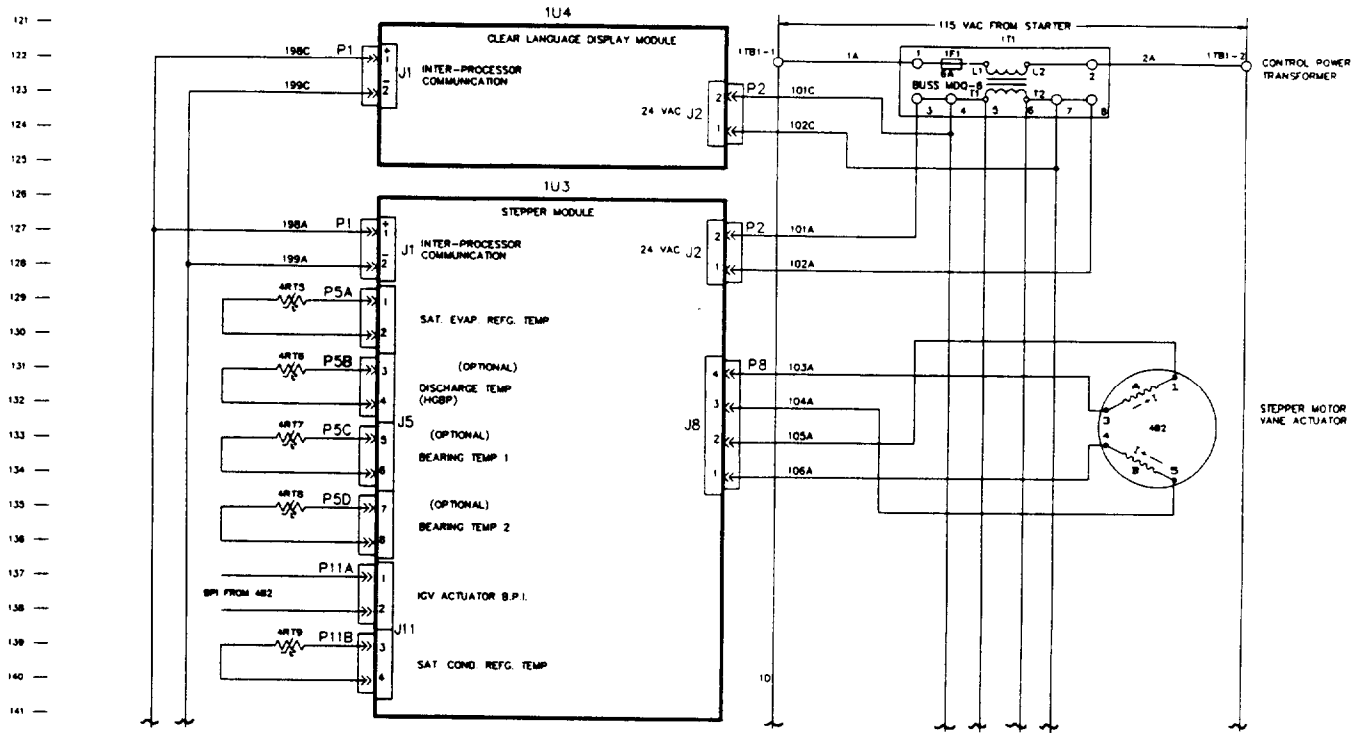
CVHE-SW-4012C



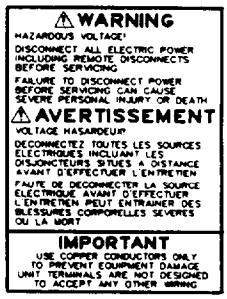
Stepper Module (1U3)

The Stepper Module drives the stepper motor Inlet Guide Vane Actuator on CenTraVac Chillers. The Stepper Module receives from the Chiller Module the direction and distance to drive the inlet guide vanes and then generates the appropriate signals to operate the stepper motor. The Stepper Module has inputs and outputs used to support functions on the stepper module. These include saturated evaporator refrigerant temperature, bearing temperatures, compressor discharge temperature, inlet guide vane binary position indicator (B.P.I.), and saturated condenser refrigerant temperature. Connection points of inputs and outputs of the Stepper Module (1U3) are shown in Figure 16.

Figure 16
Stepper Control Module and Clear Language Display Module



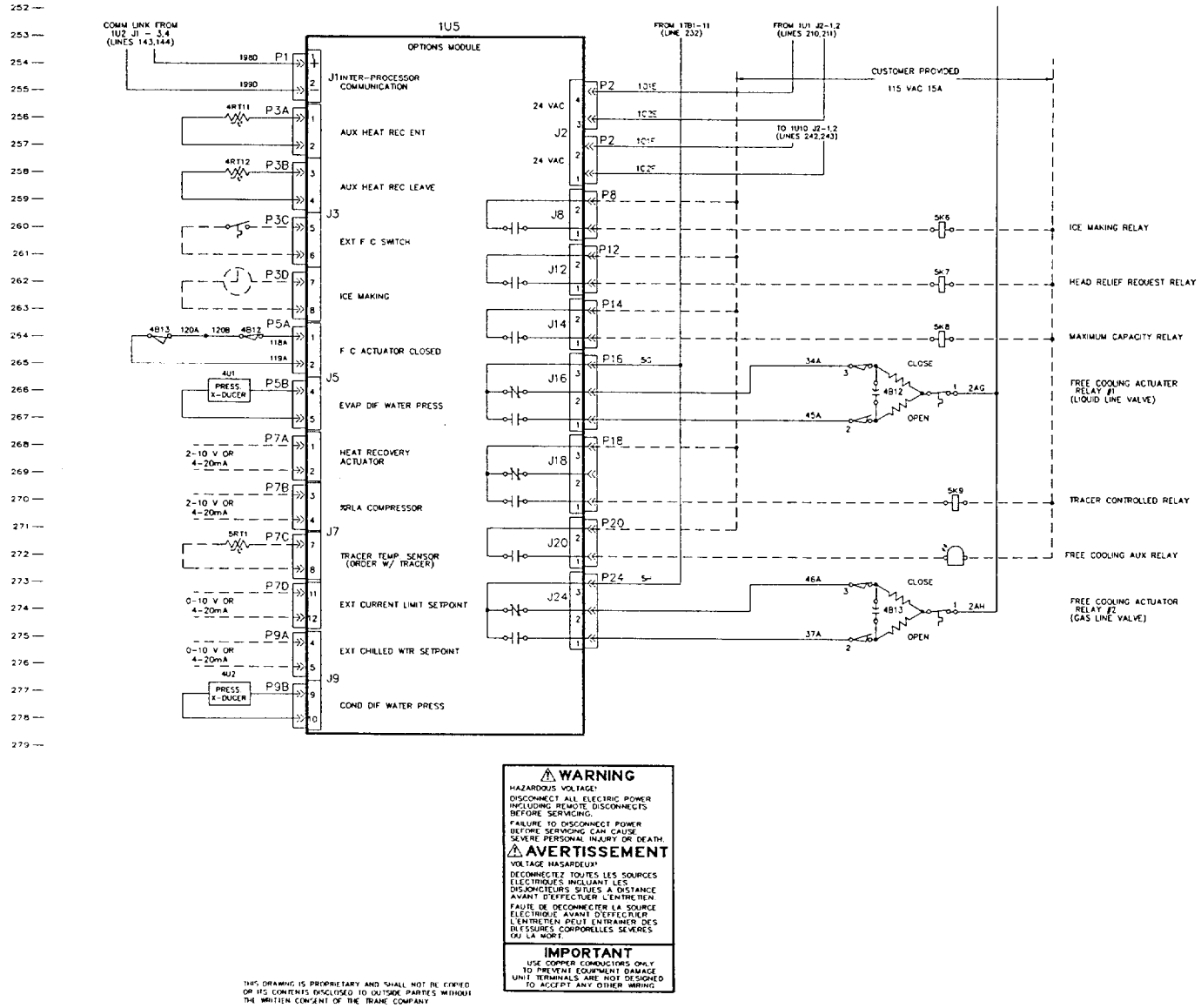
PREFIX CODE
1 = MAIN CONTROL PANEL
2 = STARTER PANEL
3 = PURGE
4 = UNIT MOUNTED DEVICE
5 = PROVIDED BY OTHERS
DASHED LINES INDICATE WIRING BY OTHERS



Options Module (1U5)

The Options Module provides control or interface requirements for a number of options. Features supported by the options Module include Ice-Making, Heat Recovery, External Chilled Water Setpoint, External Current Limit Setpoint, Free Cooling, Evaporator Differential Water Pressure Drop, Condenser Differential Water Pressure Drops Percent RLA of Compressor, Tracer Temperature Sensor, Head Relief Request, Maximum Capacity Relay, and Tracer Controlled Relay. Connection points of inputs and outputs of the Option Module (1U5) are shown in Figure 17.

Figure 17
Options Control Module CVHE/CVHF



PREFIX CODE
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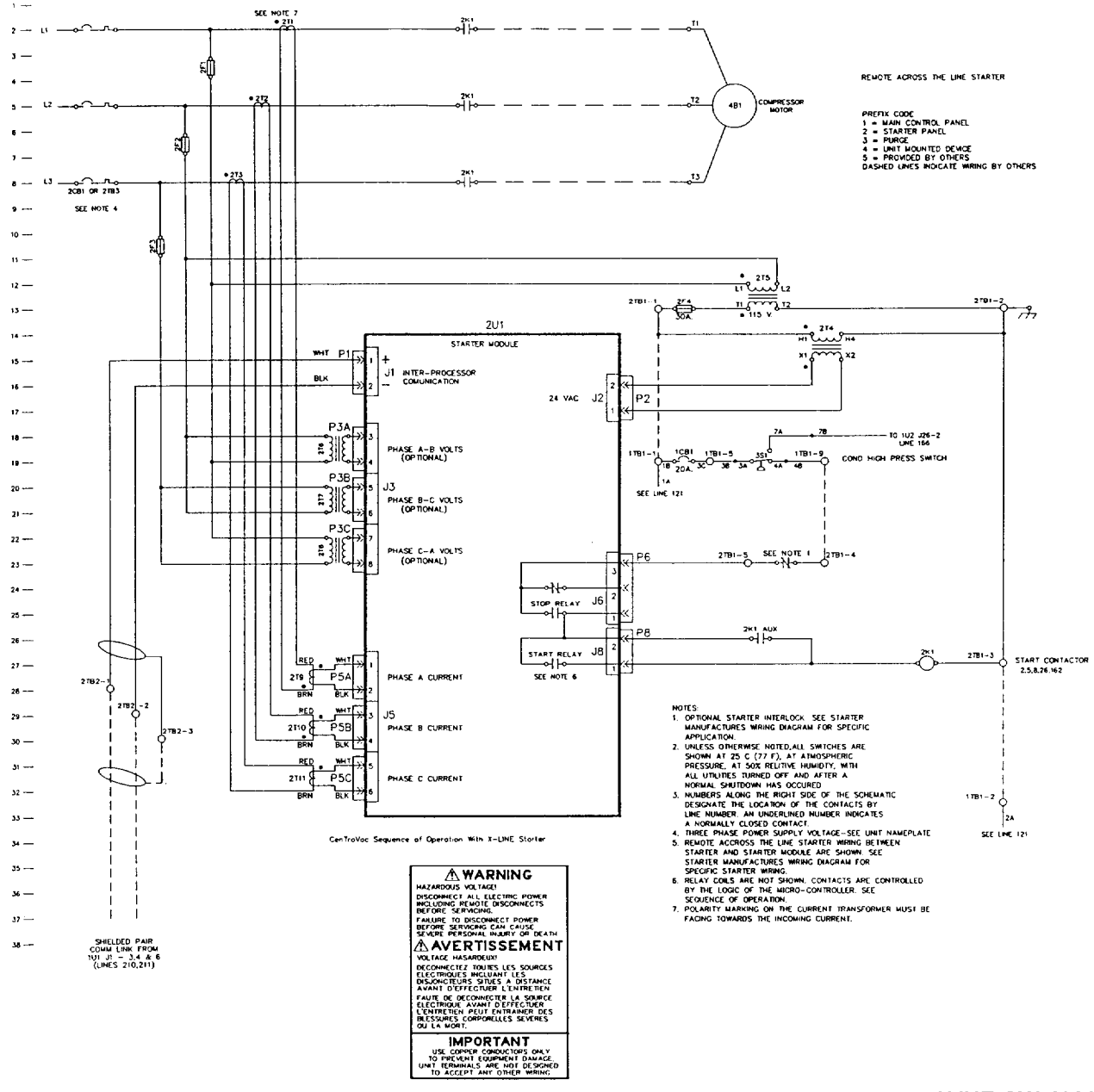
DASHED LINES INDICATE WIRING BY OTHERS

CVHE-SW-4014B

Starter Module (2U1)

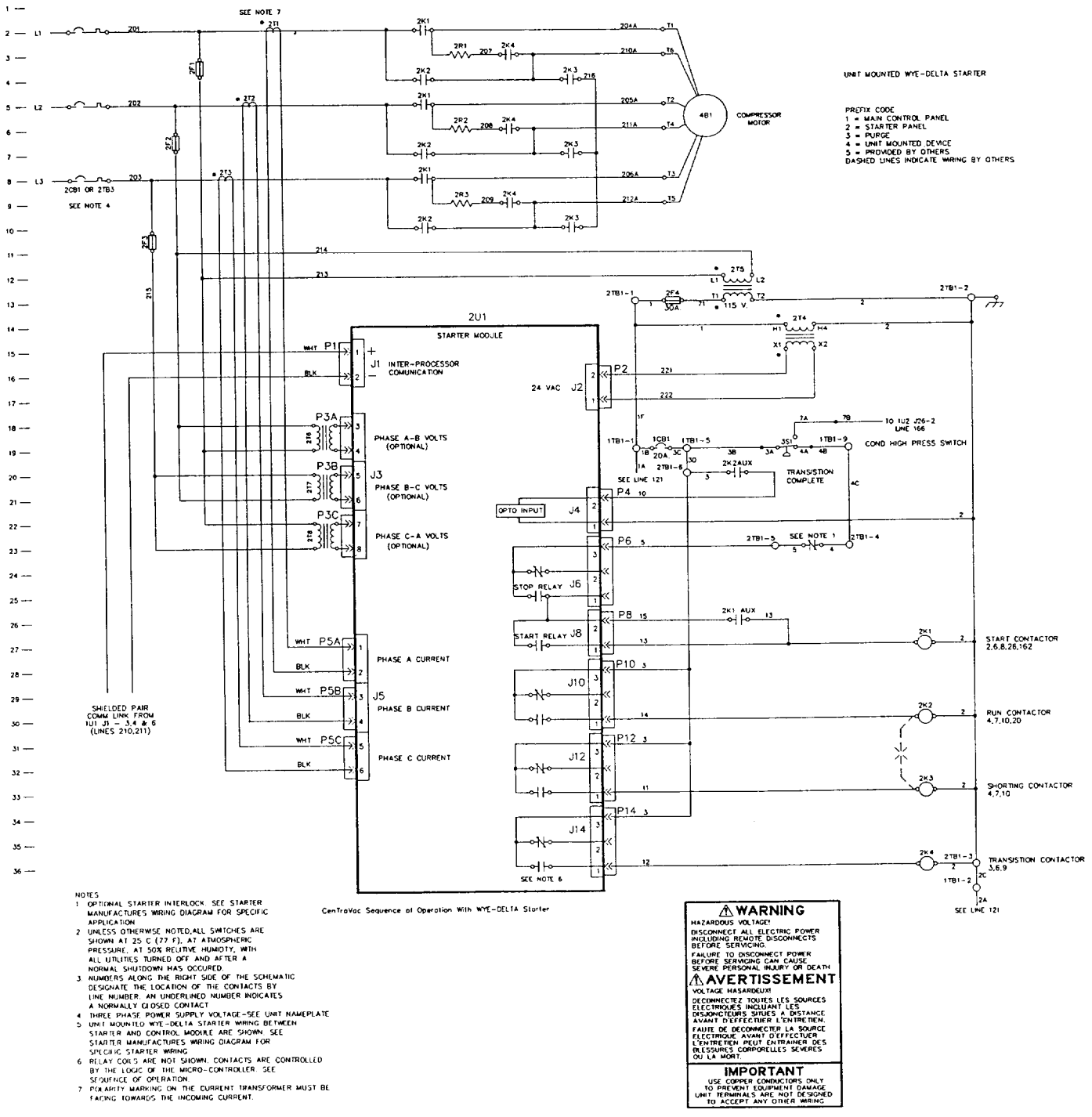
The Starter Module located in the Compressor Motor Starter Panel provides control of the starter when starting, running and stopping the motor. The Starter Module provides interface to and control of Y-Delta, X-Line, P- Reactor, A-Transformer, and Solid State Starters; interface to and control of Adjustable Speed Drives is also supported. The Starter Module also provides protection to both the motor and the compressor in the form of starting and running overload, phase reversal, phase loss, phase unbalance, momentary power loss, and compressor surge. Typical wiring connections to the starter module are shown in Figure 18 and 19. See "as built" wiring diagrams that ship with the unit for specific details and trouble shooting for the type of starter on the unit.

Figure 18
Starter Module - CVHE/CVHF with Remote Across the Line Starter



CVHE-SW-4000C

Figure 19
Starter Module - CVHE/CVHF with Factory 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% 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. 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 MUST BE FACING TOWARDS THE INCOMING CURRENT.

CenTraVac Sequence of Operation With WYE-DELTA Starter

⚠ 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.

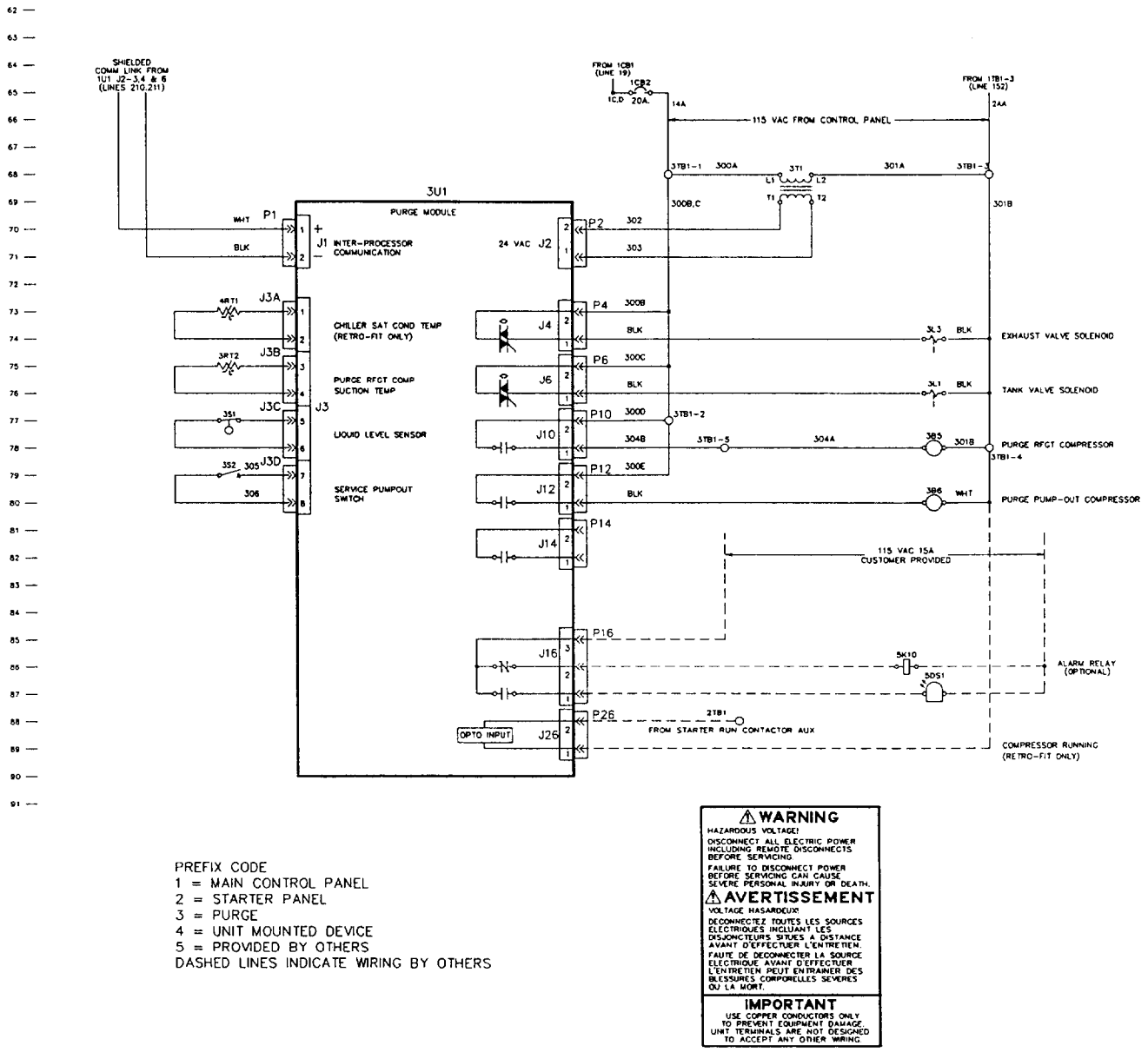
IMPORTANT

USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING

Purge Module (3U1)

The Purge Module provides control of the Purge used on CVHE and CVHF units. The Purge Module provides all the inputs and outputs to control the purge, optimizing both purge and chiller efficiency. The Purge Module resides in the purge control panel and communicates with the Chiller Module over the IPC (Inter Processor Communications Link) uploading set points and down loading data and diagnostics. Connection points of the input and outputs to the Purge Module are shown in Figure 20.

Figure 20
Purge Module - CVHE/CVHF



PREFIX CODE
1 = MAIN CONTROL PANEL
2 = STARTER PANEL
3 = PURGE
4 = UNIT MOUNTED DEVICE
5 = PROVIDED BY OTHERS
DASHED LINES INDICATE WIRING BY OTHERS

⚠ 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.

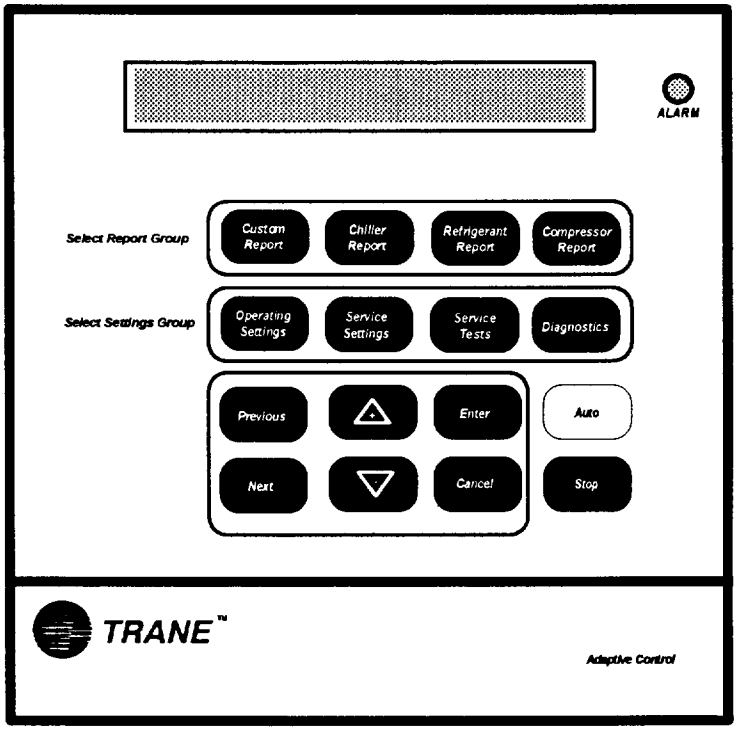
IMPORTANT
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.

Clear Language Display Module(1U4)

The Clear Language Display Module, located on the UCP2 control panel door, provides display of chiller data and access to operator/ serviceman controls, set points and chiller setup information. All information is stored in non-volatile memory in the Chiller Module; the Clear Language Display and the Chiller Module work together to display and store information requiring non-volatility. The connections to the Clear Language Display Module (1U4) are shown in Figure 21.

The front face of the Clear Language Display Module consists of a LCD Display, an LED, and a keypad. The LCD Display presents the operating status of the unit, operating set points,operating conditions, unit configurations, purge operating conditions, service test, unit configuration, and diagnostics in a clear language display. The LED is red and will only be "ON" when a manual reset is required to restore the unit to full operation. The keypad has 16 keys arranged in a 4 x 4 matrix.

Figure 21
Clear Language Display Module -



Operator Interface

All operator interface is through the keypad/display on the front of the unit control panel as shown in Figure 21. The keypad consists of four selectable Report Group keys, four Settings Group keys, six keys to change setpoints, unit configuration and variables, the Auto key, and the Stop key.

Report Group Keys

The four Report Group keys for CVHE/CVHF units are:

- Custom Report Group
- Chiller Report Group
- Refrigerant Report Group
- Compressor Report Group

Selecting and pressing a Report Group key will display, the header display for that Report Group showing the title of the Report Group and a summary of the reports in a Report Group.

The NEXT and PREVIOUS keys cause the display to step through the displays in a Report Group. The Report Group display will wrap around top to bottom as the display is scrolled through the sequence using the NEXT or PREVIOUS keys.

Custom Report

The Custom Report Group can be programmed by the operator and can contain a maximum of 20 reports. To add a report to the Custom report Group, press the + key when the desired report is being displayed from its normal report location. To remove a report from the Custom Report Group, press the - key when the desired report is being displayed in the Custom Report

Report heading:

User Define Custom Report
Press(Next)(Previous)to Continue

Followed by selected reports. If no reports are selected to be in the Custom Report Group, the second entry is:

See Operators Manual to select entries.

Chiller Report

The Chiller Report Group Sequence is a follows:

Report heading:

Chiller Status, Wtr Temps & Setpts
Press (Next) Previous) to Continue

Chiller Operating Mode

Friendly mode line 1
Friendly mode line 2

Friendly mode line 1 is indicative of a unit mode. Friendly mode line 2 is usually a verbal continuation of line 1 and can be viewed as a continuous message along with line 1. In some cases Friendly mode line 2 is the display of an associated timer or system parameter.

[Friendly mode] will be one of the following:

FRIENDLY MODES

FRIENDLY MODE (First Line/Second Line)
Display is Blank
Resetting
Local Stop: Cannot be overridden by any External or Remote Device
Remote Display Stop: Chiller may be set to Auto by any Ext or Rmt Device
Remote Run Inhibit From Remote Computer
Remote Run Inhibit From External Source
Remote Run Inhibit From Tracer
Heat Sink Temperature Start Inhibit
Diagnostic Shutdown Stop
Diagnostic Shutdown Auto
Auto Waiting For Evaporator Water Flow
Auto Waiting For a Need To Cool
Auto Waiting For a Need To Heat
Waiting For Tracer Communications To Establish Operating Status
Starting Is Inhibited By Stagered Star: Time Remaining: MIN: SEC
Transitions To Free Cooling Waiting For Cond Water Flow
Opening Free Cooling Valves Cond Water Is Flowing
Closing Free Cooling Valves
Unit Running: Low Evap/Cond Diff Limit Time Remaining To End Of Limit: MIN:SEC
Transitioning To Free Cooling Waiting For IGV Positioning To Complete
Unit Is Free Cooling

Starting Is Inhibited By Restart Inhibit Timer: Time Remaining [Min: SEC]
Establishing Cond Water Flow Establishing Oil Pressure
Establishing Cond Water Flow PreLubrication - [XX] Sec Remaining
Establishing Cond Water Flow PreLubrication - [XX] Sec Remaining
Cond Water Is Flowing Establishing Oil Pressure
Starting

Unit Is Running
Unit Is Running Capacity Limited By High Current
Unit Is Running Capacity Limited By Phase Unbalance
Unit Is Running Capacity Limited By High Cond Press
Unit Is Running Capacity Limited By Low Evap Temp

Unit Is Running Capacity Limited By Vane Open Travel Stop
Unit Is Running Limited by Capacity Limited By Vane Closed Travel Stop
Unit Is Running Unit Is Running In Surge Condition
Unit Is Running Capacity Limited By Pulldown Rate Based Soft Loading
Unit Is Running Capacity Limited By Current Based Soft Loading

Unit Is Running; Hot Water Control
Unit Is Running; Hot Water Control Capacity Limited By High Current
Unit Is Running; Hot Water Control Capacity Limited By Phase Unbalance
Unit Is Running; Hot Water Control Capacity Limited By High Cond Press
Unit Is Running; Hot Water Control Capacity Limited By Low Evap Temp
Unit Is Running; Hot Water Control At Vane Open Travel Stop
Unit Is Running; Hot Water Control At Vane Closed Travel Stop
Unit Is Running; Hot Water Control In Surge Condition
Unit Is Running; Hot Water Control Pulldown Rate Based Soft Loading
Unit Is Running; Hot Water Control Current Based Soft Loading

Unit Is Running; Base Loaded
Unit Is Running; Base Loaded Capacity Limited By High Current
Unit Is Running; Base Loaded Capacity Limited By Phase Unbalance
Unit Is Running; Base Loaded Capacity Limited By High Cond Press
Unit Is Running; Base Loaded Capacity Limited By Low Evap Temp
Unit Is Running; Base Loaded At Vane Open Travel Stop
Unit Is Running; Base Loaded At Vane Closed Travel Stop
Unit Is Running; Base Loaded In Surge Condition
Unit Is Running; Base Loaded Pulldown Rate Based Soft Loading
Unit Is Running; Base Loaded Current Based Soft Loading

Unit Is Running in Hot Gas ByPass

Unit Is Preparing to Shut Down

Unit Is Building Ice; Capacity Is Limited By Vane Open Travel Stop
Unit Is Building Ice
Unit Is Building Ice; Capacity Limited By High Current
Unit Is Building Ice; Capacity Limited By High Cond Press
Unit Is Building Ice; Capacity Is Ltd By Low Evap Temp
Unit Building Is Complete;
Unit Is Building: Transitioning Ice Building To Normal XX:XX

Panic Shutdown
Post Lubrication Time Remaining: [XX]
** Combine with Reset Inhibit**
Starter Dry Run
Inlet Guide Vane Actuator Test/Opening Inlet Guide
Inlet Guide Vane Actuator Test/Closing Inlet Guide

Settings Source

Set points are from [settings source]
[reset condition]

Settings source will be one of the following:

1. Tracer
2. Remote Computer
3. External Source
4. Manual Control

Reset condition will be one of the following:

1. Blank
2. Reset by Outdoor Temperature
3. Reset by Return Water Temperature

Chiller Report

The Chiller Report Group sequence is as follows.

Active Chilled Water Setpoint/Evap Leaving Water Temp

```
Active Chilled Water Setpoint:  XXX.X F/C
Evap Leaving Water Temp:        XXX.X F/C
```

If the chiller is in the Ice Making or Ice Making Complete state, the following display is substituted for the above display:

```
Active Ice Termination Setpoint:XXX.X F/C
Evap Return Water Temp:         XXX.X F/C
```

If the chiller is in the hot water control state, the following display is substituted for the above display:

```
Active Hot Water Setpoint:      XXX.X F/C
Cond Entering Water Temp:       XXX.X F/C
```

Active Chilled Water Setpoint/Chilled Water Setpoint Source Setpoint

```
Active Chilled Water Setpoint:  XXX.X F/C
Front Panel                CWS: XXX.X F/C
```

Settings source will be one of the following: Front Panel, Tracer, External source,

Active Ice Termination Setpoint/Ice Termination Setpoint Source Setpoint

The following will be displayed only if the Ice Building Option is installed.

```
Active Ice Termination Setpoint:     XXX%
[settings source]          ITS:      XXX%
```

Settings source will be one of the following: Front Panel, Tracer

Evaporator Entering and Leaving Water Temperatures

```
Evap Entering Water Temp:       XXX.X F/C
Evap Leaving Water Temp:        XXX.X F/C
```

Condenser Entering and Leaving Water Temperatures

Dashes will be displayed for condenser entering or leaving water temperature if the corresponding input is open or shorted.

```
Cond Entering Water Temp:       XXX.X F/C
Cond Leaving Water Temp:        XXX.X F/C
```

Active Current Limit Setpoint

```
Active Current Limit Setpoint:      XXX %
```

Active Current Limit Setpoint/Current Limit Setpoint Source Setpoint

```
Active Current Limit Setpoint:      XXX %
[settings source]          CLS:     XXX %
```

Settings source will be one of the following: Front Panel, Tracer, External Source, Ice Building.

Evaporator Water Flow/Condenser Water Flow

The following will be displayed only if the Differential Water Sensing Option is installed:

```
Evaporator Water Flow:      XXX.X gpm/lps
Condenser Water Flow:       XXX.X gpm/lps
```

The possible values for units are "gpm" or "lps"

Chiller Tons

The following will be displayed only if the Differential Water Sensing Option is installed:

```
Chiller Tons:                    XXXX Tons
```

Outdoor Temperature

If the outdoor air temperature input is open or shorted and Outdoor Air Reset is not enabled, display "----" in place of "XXX.X F". Otherwise display the temperature received from the CHILLER MODULE.

```
Outdoor Air Temperature:         XXX.X F/C
```

Auxiliary Bundle or Heat Recovery Temperatures

The following will be displayed only if either the Heat Recovery Option or Aux Condenser Option is installed:

```
Aux/Heat Rcvy Entrg Wtr Temp:    XXX.X F/C
Aux/Heat Rcvy Lvg Wtr Temp:      XXX.X F/C
```

Chilled Water Setpoint Source

```
Chld Wtr Setpt Source:  [settings source]
Reset Condition:        [reset condition]
```

Settings Source will be one of the following: Front Panel, Tracer, External Source.
Reset Condition will be one of the following: None, Outdoor Temp, Return Wtr Temp.

Current Limit Setpoint Source

```
Cur Lim Setpt Source:   [settings source]
   Press <Next> <Previous> to Continue
```

Settings source will be one of the following: Front Panel, Tracer, External Source, Ice Building.

Hot Water Setpoint Source

The following will be displayed only if Heat Pump Control is Enabled:

```
Hot Wtr Setpt Source:   [settings source]
   Press <Next> <Previous> to Continue
```

Settings source will be one of the following: Front Panel, Tracer, External Source.

Ice Termination Setpoint Source

The following will be displayed only if the Ice Building Option is installed.

```
Ice Termn Setpt Source: [settings source]
   Press <Next> <Previous> to Continue
```

Settings source will be one of the following: Front Panel, Tracer.

Refrigerant Report

The Refrigerant Report Group sequence is as follows:

Report Heading

```
   Refrigerant Temp & Pressure Report
  Press <Next> <Previous> to Continue
```

Evaporator and Condenser Refrigerant Pressure

```
Evap Rfgt Pressure:              XXX.X psig
Cond Rfgt Pressure:              XXX.X psig
```

Saturated Evaporator Temperature/Evaporator Refrigerant Pressure

This screen was added for CTV UCP2 Phase C Release.

```
Saturated Evap Temp:              XXX.X f/c
Evap Rfgt Pressure:               XXX.X f/c
```

Saturated Condenser Temperature/Condenser Refrigerant Pressure

```
Saturated Cond Temp:              XXX.X F/C
Cond Rfgt Pressure:              XXX.X psig
```

Saturated Evap Temp. and Discharge Temp.

```
Sat Evap Rfgt Temp:               XXX.X F/C
Press <Next> <Previous> to Continue
```

Purge Operating Mode/Purge Status

```
Purge Operating Mode:                [mode]
Purge Status:                      [status]
```

Possible values of [mode] are: Auto, Stop, On and Adaptive.
Possible values of [status] are:

Idle	(Condensing Unit is Off)
Running	(Condensing Unit is On)
Pumpout	(Temperature initiated pumpout)
Service Pumpout	(Pumpout initiated by the service switch)
Running - Pumpout Inhibited by low Temp.	(Pumpout inhibited by low liquid temp)
Pumpout Maximum Rate Disabled	(Max. Pumpout Rate alarm disabled)

Purge Alarm Message:

```
Purge Alarm Msg:                     [status]
              [Help Message]
```

Possible values for [status] are:

No Diagnostics Exist	The [Help Message] is: Press <Next> <Previous> to Continue
Diagnostic Alarm	The [Help Message] is: Go to Diag, Menu for Description/Reset

Purge Suction Temperature/Purge Liquid Temp.

```
Purge Suction Temp:               XXX.X F/C
Purge Liquid Temp:                XXX.X F/C
```

Purge Pumpout Rate/Purge Max Pumpout Rate

```
Purge Pumpout Rate:       XXX.X Min/24 Hrs
Purge Max Pumpout Rate:   XXX.X Min/24 Hrs
```

Purge Total Pumpout Time/Purge Total Run Time.

```
Purge Total Pumpout Time:     XX,XXX.X Min
Purge Total Run Time:         XX,XXX.X Hrs
```

Purge Adaptive Cycle Time w/Chiller On/Time to Purge Remaining

```
Prg Adaptive Cycle Time w/Chlr On: XXX.X Hrs
Time To Purge Remaining:           XXX.X Hrs
```

Purge Adaptive Cycle Time w/Chiller Off/Time to Purge Remaining

```
Prg Adaptive Cycle Time w/Chlr Off: XXX.X Hrs
Time To Purge Remaining:            XXX.X Hrs
```

Purge Service Log

```
Service Log:     Rst Log at Service Setups
Purge Pumpout Time:     X,XXX Pumpout Min
```

The maximum value for X,XXX is 9,999 minutes.

```
 Service Log: "Rst Log at Service Setups"
Time Since Last Rst:        X,XXX Cal Days
```

The maximum value for X,XXX is 9,999 days.

Pumpout Avg. Last 30 Days

```
30 Day Purge Pumpout Avg:        XXX.X Min
Chiller Average Run Time:        XXX.X Day
```

```
            30 Day Pumpout Avg,
Chiller Running:                     XXX.X
```

```
Last 5 Cycle Pumpout Avg, Interval From
Shtdn to 3 Hrs After Shtdn:      XXX.X Min
```

```
 30 Day Pumpout Avg, Interval From 3 Hrs
after Shtdn to Next start:  XXX.X Min/Day
```

Refrigerant Monitor

The following will be displayed only if the Rfgt Monitor Option is installed:

```
Refrigerant Monitor:                XXX.X PPM
   Press <Next> <Previous> to Continue
```

Compressor Report

The Compressor Report Group sequence is as follows:

Report Heading

```
    Compressor Hours, Starts & Amps
  Press <Next> <Previous> To Continue
```

Differential Oil Pressure, Oil Temperature

```
Differential Oil Pressure:  XXX.X [units]
Oil Tank Temperature:            XXX.X F/C
```

The possible value for [units] is "psid" or "kPa" dependent upon whether English or SI units are selected.

Compressor Speed Command

The following will be displayed only if the Starter Type is Adjustable Frequency

```
Compressor Speed Command:          XX.X Hz
Compressor Speed Command:          XXX.X %
```

Discharge Oil Pressure, Oil Tank Pressure

```
Discharge Oil Pressure:         XXX.X psig
Oil Tank Pressure:              XXX.X psig
```

Inlet Guide Vane Position

This screen was addes for CTV UCP2 Phase B Release.

```
Inlet Guide Vane Position:     XXX.X Open
Inlet Guide Vane Position:  XXX.X Degrees
```

Compressor Phase Currents % RLA

```
    Compressor Phase Currents - % RLA
A XXXX.X %      B XXXX.X %      C XXXX.X %
```

Compressor Phase Currents Amps

```
     Compressor Phase Currents - Amps
A XXXX %          B XXXX %         C XXXX %
```

Compressor Phase Voltages

The following will be displayed only if the Line Voltage Sensing Option is installed.

```
         Compressor Phase Voltages
AB XXXX v        BC XXXX v        CA XXXX v
```

Compressor Power Factor and Watts

The following will be displayed only if the Line Voltage Sensing Option is installed.

```
Compressor Power Factor:                XX %
Compressor KiloWatts:               XXXXX KW
```

Compressor Winding Temperatures

```
     Compressor Winding Temperatures
 W1 XXX F/C      W2 XXX F/C      W3 XXX F/C
```

Compressor Starts and Running Time

The starts and hours counters are displayed as follows:

```
Compressor Starts:                    XXXXX
Compressor Running Time:        HRS:MIN:SEC
```

Bearing Temperatures #1 and #2

The following will be displayed only if the Bearing Temp Sensors option is installed.

```
Bearing Temperature 1:              XXX.X F/C
Bearing Temperature 2:              XXX.X F/C
```

Solid State Starter Heat Sink Temp

The following will be displayed only if the Solid State Starter is installed

```
Solid State Starter Heat Sink:  XXX.X F/C
   Press <Next> <Previous> to Continue
```

HGBP Time

The following will be displayed only If HGBP is installed in the unit.

```
HGBP Time:                          HRS:MIN:SEC
   Press <Next> <Previous> to Continue
```

Settings Group Keys

The 4 Settings Group keys for CVHE/CVHF are:

- Operator Settings
- Service Settings
- Service Tests
- Diagnostics

Operator Settings Group

The Operator Setting Group sequence is as follows:

Report Heading

```
Chilled Water & Current Limit Setpts
Press <Next> <Previous> to Continue
```

Following proper password entry or suppression the remaining sequence will follow:

If the Menu Settings Password is Enabled in the Service Setup Group, following each setting group heading the follwoing will be displayed:

```
Settings In This Menu Are [status]
        [password message]
```

Likewise, if the Menu Settings Password is Disabled in the Service Setup Group, the above screen will be suppressed.

The possible values for status are "Locked" or "Unlocked". If the password status is locked, the password message will be "Enter Password to Unlock". The user will then depress ▽△-▽△-▽△ followed by the <Enter> key. The password keystrokes will be echoed to the screen as a visual aide. The last six keystrokes represent the current password and up to twenty keystrokes can be entered. An incorrect password or the twenty-first keystroke will result in the password message "Invalid Password".

If the password status is unlocked, the password message will be "Press <Enter> to Lock". Pressing <Enter> locks the settings in ALL menus. If the password is entered to unlock the settings, this unlocks the settings in ALL menus.

Whenever a password is in use the "Press<+><-> to change setting" message will suppressed on setpoint screens. Any attempt to change the setting will result in the message "Setting is Locked". The password once entered will remain valid until canceled.

Purge Operating Mode

```
Purge Operating Mode:              [mode]
     Press <+> <-> to Change Setting
```

Possible values of (mode) are: Off, On, Adaptive, Factory Default is Auto.

Time Of Day Setting

```
Current Time/Date    HH:MM Xm Mon, XX XXXX
<Enter> to Change    :  <Next> to Continue
```

The top level "Current Time/Date" will be displayed when this screen is first selected. Pressing the <Next> or <Previous> key will go to the next or previous screen as usual.

If the <Enter> key is selected, five separate screens can be displayed with which the time may be set. The "Current Time/Date" will be displayed on line one of each of these screens. Each of these screens will change one element of the current time/date. The second line of each screen will indicate which element of the current time/data is being changed as well as it's current value. The instructional messages which are normally displayed on line two will not be present although the instructions which would normally be displayed are still valid ...i.e. if the setpoint has been changed, <Enter> or <Cancel> must be pressed to continue. If the first time changing screen is being displayed and the <Previous> key is pressed, the top level "Current Time/Date" screen will be displayed and the <Enter> key will have to be selected to re-enter the time changing screens. If the fifth time changing screens is being displayed and the <Next> key is pressed, the next screen will be displayed. If <Previous> is selected at this point, the top level "Current time/Date" screen will be displayed and the <Enter> key will have to be selected to re-enter the time changing screens.

In order to change an element of the current time/date, select <Enter> from the top level "Current Time/Date' screen to enter the time changing screens. Hit <Next> or <Previous> to get to the proper screen. Press the <+> <-> keys to change the element to it's proper value and press the <Enter> key to store the new time/date. A message "Updating Chiller Clock. Please Wait" is displayed for two seconds after the <Enter> key is pressed.

The five time changing screens are as follows:

```
Current Time/Date HH:MM xm Mon     XX,XXXX
Change Hour: <+> <-> and <Enter>        HH
```

```
Current Time/Date HH:MM xm Mon     XX,XXXX
Change Minute: <+> <-> and <Enter>      MM
```

```
Current Time/Date HH:MM xm Mon     XX,XXXX
Change Month: <+> <-> and <Enter>     MON
```

```
Current Time/Date HH:MM xm Mon     XX,XXXX
Change Day: <+> <-> and <Enter>         HH
```

```
Current Time/Date HH:MM xm Mon     XX,XXXX
Change Year: <+> <-> and <Enter>        XX
```

Front Panel Chilled Water Setpoint

```
Front Panel Chilled Wtr Setpt:  XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of Values is 0 to 65 F (-17.8 to 18.3C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory default is 44.0 F (6.7 C).

As shown above, the second line of a setting display normally says:
"Press <+> <-> to Change Setting"

The following is displayed as the second line of the display if an attempt is made to increment the setpoint above the end of the setpoint range:

"Top of Range, Press <-> to Change"

The following is displayed as the second line of the display if an attempt is made to decrement the display below the end of the setpoint range:

"Bottom of Range, Press <+> to Change"

The following is displayed as the second line of the display if a key other then <+>, <->, <Enter>, or <Cancel> is pressed after <+> or <-> is pressed:

"Press <+> <-> <Enter> <Cancel> to Advance"

The exception to the above message is when the <Stop> key is depressed. Stop is always active. Other messages are displayed on the second line of the display for special cases as noted below in association with the affected setpoint display.

When the Front Panel Chilled Water Setpoint is within 1.7 F of the Leaving Water Temperature Cutout Setpoint or within 6 F of the Low Refrigerant Temperature Cutout Setpoint, the second line of this display will read:

"Limited by Cutout Setpt, <+> to Change"

Front Panel Current Limit Setpoint

```
Front Panel Current Limit Stpt:     XXX %
     Press <+> <-> to Change Setting
```

Range of Values is 40 to 100% in increments of 1% Factory Default is 100%

Front Panel Hot Water Setpoint

The Front Panel Hot Water Setpoint is only displayed when the Hot water option is enabled.

```
Front Panel Hot Wtr Setpt:      XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 80 to 125 F (26.7 to 51.7C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory Default is 90 F (32.2C).

Free Cooling Enable

The free cooling enable screen is displayed only if the free cooling option is installed.

```
Free Cooling                          [status]
     Press <+> <-> to Change Setting
```

Possible values of [status] are: On, Factory Default is Off.

Chilled Water Reset Type

```
Chilled Water Reset Type              [type]
     Press <+> <-> to Change Setting
```

Possible values for [type] are: Return, Constant Return, Outdoor Air, Factory Default is Disable

If either Disable or Constant Return are selected, the remaining chilled water reset displays are skipped by the human interface. If either Return or Outdoor Air are selected, the first word of the remaining chilled water reset displays will be the type of reset.

Reset Ratio

```
[type] Reset Ratio:                    XXX %
     Press <+> <-> to Change Setting
```

The values for "RESET RATIO" for each of the reset types are:

Reset Type	Reset Ratio Range	Increment English Units	Increment SI Units	Factory Default Value
Return:	10 to 120 %	1 %	1 %	50 %
Outdoor:	80 to -80 %	1 %	1 %	10 %

Start Reset Setpoint

```
[type] Start Reset Setpoint:          XXX %
     Press <+> <-> to Change Setting
```

The values for "START RESET" for each of the reset types are:

Reset Type	Start Reset Range	Increment English Units	Increment SI Status	Factory Default Value
Return	4 to 30 F (2.2 to 16.7 C)	1 F	0.1 C	10 F (5.6 C)
Outdoor	50 to 130 F (10 to 54.4 C)	1 F	0.1 C	90 F (32.2 C)

Max Reset Setpoint

```
[type] Max Reset Setpoint:          XXX.X F
     Press <+> <-> to Change Setting
```

The values for MAXIMUM RESET for each of the reset types are:

Reset Type	Maximum Reset Range	Increment English Units	Increment SI Units	Factory Default Value
Return	0 to 20 F (0.0 to 11.1 C)	1 F	0.1 C	5 F (2.8 C)
Outdoor	0 to 20 F (0.0 to 11.1 C)	1 F	0.1 C	5 F(2.8C)

Ice Building Enable

The following will be displayed only if ice building option is installed.

```
Ice Building                                [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Disable; Factory Default, Enable.

Front Panel Ice Termination Setpoint

The following will be displayed only if ice building option is installed.

```
Panel Ice Termination Setpoint: XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 20 to 32.0 F (-6.7 to 0.0 C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory Default is 27.0 F (-2.8 C).

Ice Making to Normal Cooling Transition Timer

This screen was added for CTV UCP2 Phase B Release.

The following will be displayed only if ice building option is installed.

```
Ice To Normal Transition:          XX MIN
     Press <+> <-> to Change Setting
```

Range of values is o to 10 minutes. Default is 5 minutes.

Chilled Water Setpoint Source

If the Tracer option is installed the word "Default" will appear in front of the setpoint source.

```
[Default] Chilled Water Setpoint Source:
                  [source]
```

Possible values of [source] are:
- Front Panel is Factory Default.
- Future 1
- Future 2
- External Source
- Future 3

Current Limit Setpoint Source

If the Tracer option is installed the word "Default" will appear in front of the setpoint source.

```
[Default] Current Limit Setpoint Source
                  [source]
```

Possible values of [source] are:
- Front Panel; Factory Default.
- Future1
- Future 2
- External Source

Hot Water Setpoint Source

If the Tracer option is installed the word "Default" will appear in front of the setpoint source. The following will be displayed only if Heat Pump Controls enabled.

```
        Hot Water Setpoint Source
                  [source]
```

Possible values of [source] are:
- Front Panel; Factory Default
- Future 1
- Future 2
- External Source
- Future 3

Ice Termination Setpoint Source

If the Tracer option is installed the word "Default" will appear in front of the setpoint source. The following will be displayed only if the Ice Building Option is installed.

```
[Default] Ice Termination Setpoint Source
                  [source]
```

Possible values of [source] are:
- Front Panel; Factory Default
- Future 1
- Future 2

Setpoint Source Override

This screen was added for CTV UCP2 Phase B Release.

```
        Setpoint Source Override:
                  [source]
```

Possible values of [source] are:
- None - ROM Default
- Use Front Panel Setpoints
- Override Tracer. Use Default Setpoints. (Available only if Tracer Option is installed).

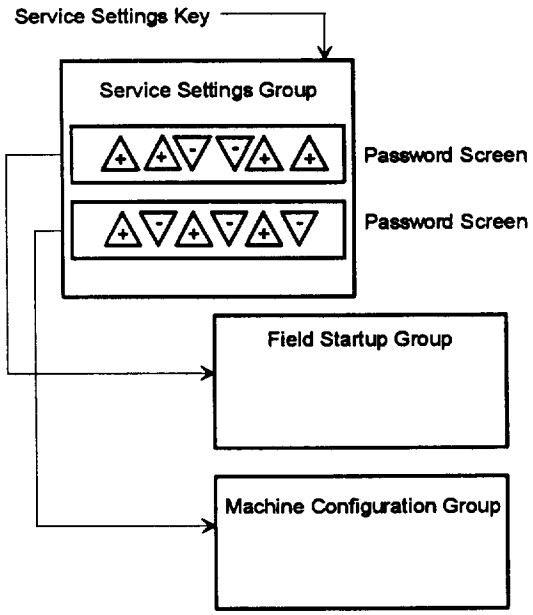
Service Settings Group

The Service settings menu has three distinct grouping of items within it. The first group is the basic setups, non-password protected group that consists of all of the settings, feature enables, setpoints etc, that are benign; while they are unlikely to be changed often by a user or operator. Changes in them do not seriously effect the standard protection or reliability of the chiller.

The other two groupings are protected, each with a separate password. These two groups are for changing parameters and settings regarding field commissioning and fundamental protection and control of the chiller subsystems (Field Startup) or for programming of the UCM as to how the specific chiller was built in the factory (Machine Configuration). Once properly set, the items in these protected menus should never be changed again without specific knowledge of the effects of the changes.

CAUTION: Settings in the Service Settings Group are only be set or changed by qualified Trane service technicians. Improper settings in this group may adversely affect the operation of the unit.

Menu Structure Under The Service Settings Key



Service Settings - Basic Setups

```
Service Settings: Basic Setups
Press <Next> <Previous> to Continue
```

Menu Settings Password

If the Menu Settings Password is Enabled in the Service Setup Group, following each setting group heading the following will be displayed:

```
Settings In This Menu Are [status]
        [password message]
```

If the Menu Settings Password is disabled in the Service Setup Group, the above screen will be suppressed.

The possible values for [status] are "Locked" or "Unlocked". If the password status is locked, the password message will be "Enter Password to Unlock". The user will then depress  followed by the <Enter> key. The password keystrokes will be echoed to the screen as a visual aide. The last six keystrokes represent the current password and up to twenty keystrokes can be entered. An incorrect password or the twenty-first keystroke will result in the password message "Invalid Password".

If the password status is unlocked, the password message will be "Press Enter to Lock". Pressing <Enter> will lock all of the setpoint menus. Likewise, if the password status is locked and the correct password is entered, all of the setpoint menus will be unlocked.

Whenever a password is in use the "Press <+> <-> to change setting" message will be suppressed on all setpoint screens. Any attempt to change a setpoint will result in the message "Setting is Locked" being displayed for 1 second. The password once entered will remain valid until canceled.

Keypad/Display Lockout

This display only appears if the keypad lockout feature is enabled.

```
Press <Enter> to Lock Display & Keypad
 Password Will be Required to Unlock
```

If the <Enter> key is pressed to lock the keypad, the following message is displayed, and all further input from the keypad is ignored, including the <Stop> key, until the password is enter. The password consists of pressing the <Previous> and <Enter> keys at the same time

```
******DISPLAY AND KEYPAD ARE LOCKED******
********ENTER PASSWORD TO UNLOCK********
```

If the keypad is locked and the password is entered, the display will go to the Chiller Operating Report.

Language Setting

This screen will not be installed until the languages are installed 2/28/94.

```
Language:                          XXXXXXXX
     Press <+> <-> to Change Setting
```

Possible language selections are: English; Factory Default, Francais, Deutch, Espanol, Nippon (also known as Katakan, Use Japanese characters), Italiano and Nederlands.

Display Units

```
Display Units:                          [type]
    "Press <+> <-> to Change Setting"
```

Possible values of [type] are: SI, Factory Default is English.

Decimal Places Displayed Setpoint:

```
Decimal Places Displayed:          [status]
    "Press <+> <-> to Change Setting"
```

Possible choices for [status] are: XXX, Factory Default is XXX.X.

Display Menu Headings Enable

```
Display Menu Headings:                  [d/e]
     Press <+> <-> to Change Setting
```

The factory default value is Enabled. If the setting is changed to disabled the Menu Headings in each Menu or Group will be suppressed.

Differential to Start Setpoint

```
Differential to Start Setpoint: XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 1 to 10 F (0.5 to 5.5 C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory default is 5 F (2.8 C).

Differential to Stop Setpoint

```
Differential to Stop Setpoint:  XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 1 to 10 F (0.5 to 5.5 C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X Factory default is 5 F (2.8 C).

Evap Pump Off Delay Time

```
Evap Pump Off Delay:                   XXX Min
     Press <+> <-> to Change Setting
```

Range of values is 1 to 30 minutes in increments of 1 minute. Factory default is 1 minute.

Clear Restart Inhibit Timer

```
              Press <Enter> to
     Clear the Restart Inhibit Timer
```

When <Enter> is pushed a 2 second message appears as shown below and then returns to above screen.

```
  Restart Inhibit Timer Has Been Cleared
```

Field Startup Group Password Request

```
Pswd Reqd to Access Field Startup Group
          Please Enter Password
```

The Field Start-up Group Password is △△▽▽△△ <Enter>. Successfully entering the password sends you to the Field Start-up Group Heading Screen as defined below.

Machine Configurating Group Password Request

```
Pswd Reqd to Access Machine Config Group
          Please Enter Password
```

The Machine Configuration Group Password is △▽△▽△▽ <Enter>. Successfully entering the password sends you to the Machine Configuration Group Heading Screen.

Service Settings - Field Startup

The Field Startup Group password is ▲▲▽▽▲▲ <Enter>. The Field Startup Group contains items which are primarily associated with Field Commissioning of the chiller as well as the fundamental control and protection of the chiller subsystems. If the Field Start-up Group password is entered, the display goes to the menu defined below. If a key is not pressed for 10 minutes or more in this password protected menu, the display returns to the Chiller Operating Mode display of the Chiller Report, and the password must be entered again to return to this menu.

Field Startup Group Heading

```
      Field Startup Group Settings
  Press <Next> <Previous to Continue
```

This header is not suppressed when the headers are suppressed in the Service Settings menu.

Keypad/Display Lock Feature Enable

This feature permits the entire Keypad and Display to be locked out. A message appears on the screen to describe this condition. No access is permitted to either the Report screens or the Setting Screens when this feature is both Enabled here and Locked at the Service Settings Menu. It is important to note that in this condition both the <Stop> and <Auto> keys do not function.

```
Keypad/Display Lock Feature:          [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Enable, Factory default is Disable.

When the keypad lock feature is disabled, the keypad lock display does not appear in the non-password protected area of the Service Settings menu and the Keypad/Display cannot be locked. When the keypad/display lock feature is Enabled, the keypad lock display does appear in the Service Settings menu so the keypad can be locked.

Menu Settings Password Enable

The Menu Settings Password permits the Settings in each of the menus to be password protected. All Report Menus and Setting Menus can still be viewed at any time if this feature is either Enabled or Disabled; the <Stop> and <Auto> keys also remain active. If this feature is Enabled, then all Menu Settings are password protected.

```
Menu Settings Password Feature:       [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [c/d/e] are: Enable, Factory default is Disable.

When the feature is Disabled, the Menu Setting Password display does not appear at the top of each of the Settings Menus and the Menu Settings cannot be password protected. When the Menu Setting Password feature is Enabled, the Menu Settings Password display appears just below each of the Settings Menus Header so the settings can be changed if the proper password is entered.

ICS Address

```
ICS Address:                              XX
     Press <+> <-> to Change Setting
```

Range of values is 0 to 255 in increments of 1 . Factory default is 65

Power Up Start Delay Time

```
Power Up Start Delay Time:    XXX Seconds
     Press <+> <-> to Change Setting
```

Range of values is 0 to 600 seconds. Factory Default is 0 seconds.

Design Delta Temperature Setpoint

```
Design Delta Temp Setpoint:     XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 4 to 30 F (2.2 to 16.7 C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory default is 10 F (5.5 C).

Leaving Water Temperature Cutout Setpoint

```
Lvg Wtr Temp Cutout Setpoint:   XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is -10 to 36 F (-23.3 to 2.2 C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory default is 36.0 F (0.0 C).

When this setpoint is within 1.7 F of the Front Panel Chilled Water Setpoint, the Front Panel Chilled Water Setpoint is increased along with this setpoint to maintain the differential. A message will be displayed for 2 seconds to indicate that the FPCW setpoint has been increased.

Low Refrigerant Temperature Cutout Setpoint

```
Low Rfgt Temp Cutout Setpt:     XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is -35 to 36 F (-37.2 to 2.2 C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory default is 32.0 F (0.0 C).

When this setpoint is within 6 F of the Front Panel Chilled Water Setpoint, the Front Panel Chilled Water Setpoint is increased along with this setpoint to maintain the differential. A message will be displayed for 2 seconds to indicate that the FPCW setpoint has been increased.

Low Evaporator Water Flow Warning Setpoint

The following will be displayed only if the Differential Water Sensing Option is installed.

```
Low Evap Flow Warning:        XX.X gpm/ton
     Press <+> <-> to Change Setting
```

Range of values is 0.0 to 4.0 gpm/ton (lpm/ton) in increments of 0.1. ROM default is ?? gpm/ton (?? lpm/ton). This feature will be available on Phase C CTV UCP2 chillers.

Condenser Limit Setpoint

```
Condenser Limit Setpoint:          XX % HPC
     Press <+> <-> to Change Setting
```

Range of values is 80 to 120 % in increments of 1%. Factory default is 93 %.

Maximum RI Timer Setting

```
Maximum RI Timer:                XXX Minutes
     Press <+> <-> to Change Setting
```

The range of values is 30 to 60 minutes in increments of 1 minute. Factory default is 60 minutes.

Purge Service Log Reset

```
Service Log: "Press <Enter> to Reset"
Purge Pumpout Time: X,XXX Pumpout Min
```

The maximum value for X,XXX is 9,999 minutes

```
Service Log: "Press <Enter> to Reset"
Time Since Last Rst: X,XXX Cal Days
```

The maximum value for X,XXX is 9,999 days.

Note: Resetting in either screen above will reset both pieces of data to Zero.

Purge Maximum Pumpout Rate

```
Purge Max Pumpout Rate:      XX Min/24 Hrs
     Press <+> <-> to Change Setting
```

Range of values is 1 to 100 minutes/24 hours in increments of 1 minute/24 hours. Factory default is 20 minutes/24 hours.

Purge Disable Pumpout Alarm

```
Prg Disable Pumpout Alarm for:      XX Hrs
     Press <+> <-> to Change Setting
```

Range of values is 1 to 72 hours in increments of 1 hour. Factory default is 0 hours.

Purge Low Chiller Sat. Cond. Liquid Temp Protection Enable

```
Prg Low Liquid Temp Inhibit Enable: [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Disable; Factory Default is Enable

Purge Low Chiller Sat. Cond. Temp Setpoint

```
Prg Low Liq Temp Inhibit Setpt   XX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 32 to 50 F (0.0 to 10.0 C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory default is 40 F (4.4 C). Does not display this menu item unless this feature is enabled in the menu above.

Surge Protection Enable

```
Surge Protection:                    [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Disable, Factory default is Enable.

Under/Over Voltage Protection Enable

This screen is displayed only when line voltage sensing is installed.

```
Under/Over Voltage Protection:       [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Disable, Factory Default is Enable

Phase Reversal Protection Enable

```
Phase Reversal Protection:          [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are Disable; Factory Default is Enable

Phase Unbalance Protection Enable

```
Phase Unbalance Limit:              [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Disable, Factory Default is Enable.

Momentary Power Loss Protection Enable

```
Momentary Power Loss Protection:    [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are Disable, Factory Default is Enable

Oil Temp Setpoint

```
Oil Temp Setpoint:                  XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 100 F to 160 F (37.8 to 71.1 C) in increments of 1 to 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory default is 143.5 F (61.9 C).

Low Oil Temp Cutout

```
Low Oil Temp Cutout:                XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 80 to 140 F (26.7 to 60.0 C) in increments of 1 or 0.1 F or C depending on the Service Setup Group Screen XXX or XXX,X. Factory Default is 95 F (35.0 C).

High Discharge Temp Cutout

```
High Discharge Temp Cutout:         XXX.X F/C
     Press <+> <-> to Change Setting
```

Range of values is 170 to 220 F (76.6 to 104.4 C) in increments of 1 or 0.1 F or C depending on the Service Setup Screen XXX or XXX.X. Factory default is 200 F (93.3 C).

Control Type

```
Control Type:                       [control]
     Press <+> <-> to Change Setting
```

Possible values of [control] are: Hot Water, Factory default is Chilled Water.

Heat Pump Control Enable

```
Heat Pump Control:                  [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Enable, Factory Default is Disable

Control Sensitivity

```
Control Sensitivity:                    [type]
     Press <+> <-> to Change Setting
```

Possible values of [type] are: Process, Factory Default is Comfort

External Vane Control Enable

```
External Vane Control Enable:           [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Enable, Factory Default is Disable

Soft Load Control Enable

```
Soft Load Control:                      [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Enable, Factory Default is Disable.

Soft Load Starting Current Limit

```
Soft Load Starting Current Limit:     XX %
     Press <+> <-> to Change Setting
```

Range of values is 40 to 100 % in increments of 1 %. Factory Default is 100%.

Soft Load Current Limit Rate of Change

```
Soft Load Current Limit Rate:     XX %/min
     Press <+> <-> to Change Setting
```

Range of values is 0.5 to 5 %/min in increment s of 1 or 0.1 %/min depending on the Service Setup Screen XXX or XXX.,X. Factory default is 5 %/min.

Soft Load Lvng Wtr Temp Rate of Change

```
Soft Load Lvg Water Rate:       XX F/C/min
     Press <+> <-> to Change Setting
```

Range of values is 0.5 to 5 F/min (0.3 to 2.8 C/min) in increments of 1 or 0.1 F/min depending on the Service Setup Screen XXX or XXX.X. Factory default is 5 F/min (2.8 C/min).

Hot Gas Bypass Enable

This screen will be suppressed when the hot gas bypass option is not installed.

```
Hot Gas Bypass Control:                 [d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Enable, Factory Default is Disable

Hot Gas Bypass Cut in Vane Position

This screen will be suppressed when the hot gas bypass option is not installed

```
Hot Gas Bypass Cut in IGV Position:  XX %
     Press <+> <-> to Change Setting
```

Range of values is 0 to 30 % in increments of 1%. Factory default is 10 %.

HGBP Proportional Gain (Kp) Setpt

This screen will be suppressed when the hot gas bypass option is not installed.

```
HGBP Proportional Gain Setpt:    XXX.X %/F
  Factory Default is 10.0%/F & 18.0 %/C
```

The range of values is 0 to 100 %/F (0 to 180 %/C) in increments of 0.1. The factory default is 10.0 %/F (18.0 %/C).

HGBP Integral Gain (Ki) Setpt

This screen will be suppressed when the hot gas bypass option is not installed.

```
HGBP Integral Gain Setpt:        X.XXX %/F
 Factory Default is 0.110 %/F & 0.198 %/C
```

The range of values is 0 to 1 %/F (0 to 1.8 %/C in increments of 0.001. The factory default is 0.110 %/F (0.198 %/C).

HGBP Derivative Gain (Kd) Setpt

This screen will be suppressed when the hot gas bypass option is not installed.

```
HGBP Derivative Gain Setpt:       XX.X %/F
  Factory Default is 00.0 %/F & 00.0 %/C
```

The range of values is 0 to 10.0 %/F (0 to 18.0 %/C) in increments of 0.1. The factory default is 00.0 %/F (00.0 %/C).

LWT Control Proportional Gain (Kp) Setpt

```
LWT Proportional Gain Setpt:     XXX.X %/F
  Factory Default is 10.0 %/F & 18.0 %/C
```

The range of values is 0 100 %/F (0 to 180 %/C) in increments of 0.1. The factory default is 10.0 %/F (18 %/C).

LWT Control Integral Gain (Ki) Setpt

```
LWT Integral Gain Setpt:         X.XXX %/F
 Factory default is 0.110 %/F & 0.198 %/C
```

The range of values is 0 to 1 %/F (0 to 1.8 %/C) in increments of 0.001. The factory default is 0.110 %/F (0.198 %/C).

LWT Control Derivative Gain (Kd) Setpt

```
LWT Derivative Gain Setpt:        XX.X %/F
  Factory Default is 00.0 %/F & 00.0 %/C
```

The range of values is 0 to 10.0 %/F (0 to 18.0 %/C) in increments of 0.1. The factory default is 00.0 %/F (00.0 %/C).

IGV MAXIMUM Travel Setpt

```
IGV MAXIMUM Travel Setpt:     XX,XXX Steps
     Press <+> <-> to Change Setting
```

Range of values is 0 to 60,000 Steps in increments of 100 Steps. Factory default is 50,000 Steps.
Note: This is also known as the 90 degree vane setting.

Guide Vane Open Travel Stop

```
Guide Vane Open Travel Stop:          XX %
     Press <+> <-> to Change Setting
```

Range of values is 50 to 100 % in increments of 1 %. Factory default is 100%.

Guide Vanes Closed Travel Stop

```
Guide Vane Closed Travel Stop:        XX %
     Press <+> <-> to Change Setting
```

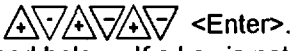
Range of values is 0 to 30 % in increments of 1 %. Factory default is 0 %.

Local Atmospheric Pressure

```
Local Atmospheric Pressure:       XX.X F/C
     Press <+> <-> to Change Setting
```

The range of settings shall be 10 to 16 PSIG in increments of 1 or 0.1 PSIG or kPa depending on the Service Setup Screen XXX or XXX.X. The factory default is 14.7 PSIG.

Service Settings - Machine Configuration

The Machine Configuration password is  <Enter>. If the machine configuration password is entered, the display goes to the menu defined below. If a key is not pressed for 10 minutes or more in this password protected menu, the display returns to the Chiller Operating Mode display of the Chiller Report, and the password must be entered again to return to this menu.

Machine Configuration Group Heading

```
Machine Configuration Group Settings
Press <Next> <Previous> to Continue
```

This header is not suppressed when the headers are suppressed in the Service Settings menu.

Unit Frequency

```
Unit Frequency:                    [freq]
     Press <+> <-> to Change Setting
```

Possible values of freq are: 50 Hz, Factory Default is 60 Hz.

Unit Type

```
Unit Type:                         [type]
     Press <+> <-> to Change Setting
```

ROM Default is CVHE. Factory set for CVHE or CVHF as appropriate.

Unit Tons

```
Nominal Unit Tons:                 [tons]
     Press <+> <-> to Change Setting
```

Possible values of [tons] are "100" through "1600" in 10 ton increments. Factory Default is 500 tons.

Refrigerant Type

```
Refrigerant Type:                  [type]
     Press <+> <-> to Change Setting
```

Possible values type are: R11, R12, R134a, Water, R22, Factory Default is R123

Refrigerant Monitor Type

```
Refrigerant Monitor Type:          [type]
     Press <+> <-> to Change Setting
```

Possible values for type are:
- 01 - Analog interface
- 02 - IPC Interface
- Factory default is None

Starter Type

```
Starter Type:                      [type]
     Press <+> <-> to Change Setting
```

Possible values for type are:
- Undefined
- Variable Speed
- Y-Delta: Factory Default.
- X-Line
- Solid State
- Auto Xformer
- Primary Reactor

Startup Contactor Test - Y-D Starters Only

This screen will be displayed only when the starter type is Y-Delta.

```
2nd Level Contactor Integrity Test:[d/e]
     Press <+> <-> to Change Setting
```

Possible values of [d/e] are: Enable, Factory Default is Disable

Rated Load Amps

```
Rated Load Amps:                    XXXX Amps
     Press <+> <-> to Change Setting
```

The range of values is 0 - 2500 in 1 amp increments. ROM default is 500 Amps. Factory set per nameplate.

Motor Heating Constant

```
Motor Heating Constant Setpt:     XXX Min
     Press <+> <-> to Change Setting
```

The range of values for XXX is 0 to 100 minutes in 1 minute increments. Factory default is 25 minutes.
Set the Motor Heating Constant per the follwoing table.

NTON		Motor Heating
60 Hz	50 Hz	Constant
230-320	190-270	30 Min.
360-500	300-420	35 Min.
560-800	470-660	40 Min.
890-1280	740-1040	45 Min.

Current Overload Setting #1

```
Current Overload Setting #1:     XXXXXXXX
     Press <+> <-> to Change Setting
```

The range of values is decimal 00 through 31. ROM Dfault is 00. Factory set per nameplate.

Current Overload Setting #2

```
Current Overload Setting #2:     XXXXXXXX
     Press <+> <-> to Change Setting
```

The range of values is decimal 224 through 255. For security purposes the second setting is the 8-bit one's complement of the first setting above.

Verify Current Overload Settings #1 and #2 per the following procedure.

Procedure for Selecting Current Overload Settings for UCP2

1. Determine the Rated Load Amps (RLA) from the Unit Nameplate

2. Refer to **Table 1** or **Table 2** below as follows:

Select **Table 1** if either of the following conditions are met:
a. The unit has a unit mounted starter with an RLA less than 936 Amps.
b. The unit has a 24" wide control panel, no unit mounted starter and RLA less the 936 Amps.

Select **Table 2** if either of the following conditions are met:
a. The unit has an RLA over 935 Amps.
b. The unit has a 38" wide "Starter By Others" control panel.

3. Using **Table 1** or **Table 2** (determined from Step 2), determine the CT Meter Scale Rating based on the RLA from Step 1.

4. Calculate the CT factor using one of the following two equations:
If **Table 1** was used: CT Factor = (Motor RLA/CT Meter Scale Rating) x 100
If **Table 2** was used: CT Factor = (Motor RLA/CT Meter Scale Rating) x 139

5. Refer to **Table 3.** Determine Current Overload Settings #1 and #2 based on the CT Factor calculated in Step 5.

Verify Current Overload Setting #1.
Verify Current Overload Setting #2.

6. If the unit has a Trane supplied starter, verify that the CT Part Number listed in Table 1 or Table 2 matches the number of the CT used in the starter panel.

7. If the unit has a 38" wide "Starter By Others" control panel, verify that the CT Part Number listed in Table 2 matches the number of the CT used in the motor junction box.

Table 1
CT Factor = (Motor RLA/CT Meter Scale Rating) x 100

Motor RLA	CT Part Number	Extension Number	CT Meter Scale Rating
34-50 A	X13580253	-09	50 A
51-67 A	X13580253	-10	75 A
68-100 A	X13580253	-01	100 A
101-134 A	X13580253	-02	150 A
135-184 A	X13580253	-03	200 A
185-267 A	X13580253	-04	275 A
268-334 A	X13580253	-05	400 A
335-467 A	X13580253	-06	500 A
468-667 A	X13580253	-07	700 A
668-935 A	X13580253	-08	1000 A

Table 2
CT Factor = (Motor RLA/CT Meter Scale Rating) x 139

Motor RLA	CT Part Number	Extension Number	CT Meter Scale Rating
24-29 A	X13580048	-01	50 A
30-36 A	X13580048	-01	60 A
37-43 A	X13580048	-01	75 A
44-48 A	X13580048	-01	90 A
49-60 A	X13580048	-01	100 A
67-72 A	X13580048	-01	125 A
73-86 A	X13580048	-01	150 A
87-96 A	X13580048	-01	180 A
97-120 A	X13580048	-01	200 A
121-144 A	X13580048	-02	250 A
145-168 A	X13580048	-02	300 A
169-192 A	X13580048	-02	350 A
193-240 A	X13580048	-03	400 A
241-288 A	X13580048	-03	500 A
289-336 A	X13580048	-03	600 A
337-384 A	X13580048	-04	700 A
385-480 A	X13580048	-04	800 A
481-576 A	X13580048	-04	1000 A
577-720 A	X13580048	-05	1200 A
721-864 A	X13580048	-05	1500 A
865-1008 A	X13580047	-01	1800 A
1009-1200 A	X13580047	-01	2100 A
1201-1800 A	X13580047	-01	2500 A

Table 3

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

Maximum Acceleration Timer #1

```
Maximum Accel Timer Setpt #1:      XX Sec
     Press <+> <-> to Change Setting
```

The range of values is 2 to 64 seconds.

Starter Type	Recommended Maximum Acceleration Timer #1 Setting
Undefined	Contact Factory
Variable Speed	20
Y-Delta	27 (Factory Default)
X-Line	6
Solid State	20
Auto-Transformer	16
Primary Reactor	11

Maximum Acceleration Timer #2

```
Maximum Accel Timer Setpt #2:      XX Sec
     Press <+> <-> to Change Setting
```

The range of values is 191 to 249 seconds. Factory default is 228 seconds. For security purposes the second setting is the 8-bit one's complement of the first setting above, or equals 255 minus Timer #1 Setting.
Example: Setting #2 is 255 - 27 = 228

External Chilled Water Setpoint Option

```
External Chilled Wtr Setpoint:   [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed.

External Current Limit Setpoint Option

```
External Current Limit Setpt:    [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed.

External Hot Water Setpoint Option

This display will only be used when hot water control is enabled.

```
External Hot Wtr Setpoint:       [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed

Exceeded Max Accel time Action

```
Acceleration Time Out Action:    [action]
     Press <+> <-> to Change Setting
```

Possible values for action include: Transition, Factory default is Shutdown.
Shutdown will result in an MMR Diagnostic. Transition will result in an IFW diagnostic.

Starter Type	Recommended "Action" Value
Undefined	Contact Factory
Variable Speed	Shutdown
Y-Delta	Transition
X-Line	Shutdown
Solid State	Shutdown
Auto-Transformer	Transition
Primary Reactor	Transition

Motor Winding RTD Type

```
Motor Winding RTD Type:              [type]
     Press <+> <-> to Change Setting
```

Possible values for type are: 100 Ohm at 0 C, Factory default is 70 Ohm at 25 C

High Pressure Cutout Setting

```
High Pressure cutout setting: XXXX Psig
     Press <+> <-> to Change Setting
```

The range of values will be 0 - 500 PSIG in increments of 5 PSIG. Factory default is 15 PSIG for a standard unit and 25 PSIG for an ASME unit.

Line Voltage Sensing Option

```
Line Voltage Sensing Option:     [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed

Unit Line Voltage

Suppress this screen if the Line Voltage Sensing Option is not installed.

```
Unit Line Voltage:                [volt] V
     Press <+> <-> to Change Setting
```

Possible values of [volt] are "180" through "6600" in 5 volt increments. ROM default is 460 volts. Factory set per nameplate.

Auxiliary Condenser Option

```
Auxiliary Condenser Option:      [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory Default is Not Installed

Heat Recovery Option

```
Heat Recovery Option:                [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed.

Hot Gas Bypass Option

```
Hot Gas Bypass Option:               [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed.

Free Cooling Option

```
Free Cooling Option:                 [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed.

Condenser Pressure Sensor Option

```
Condenser Press. Sensor Option:      [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed.

Bearing Temperature Sensors Option

```
Bearing Temp Sensors Option:         [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed.

Discharge Temperature Sensor Option

```
Discharge Temp Sensor Option:        [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Factory default is Not Installed.

Ice Building Option

```
Ice Building Option:                 [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: Installed, Not Installed; Factory default

Differential Water Press Sensing Option

```
Diff Wtr Press Sensor Opt:           [status]
     Press <+> <-> to change Setting
```

Possible values for status are: Installed, </= 150 PSIG
Installed, > 150 PSIG
Not Installed; Factory default

This option screen applies to both the Evap and Cond differential water pressure sensors for both systems less than or equal to 150 PSIG (Sensors at the Chiller Module) and systems greater than 150 PSIG (Sensors at the Options Module).

External Analog Input Type Selection. 4-20 ma/2-10vdc

```
External Analog Inputs:                    [type]
     Press <+> <-> to Change Setting
```

Possible values for status are: 2-10 vdc, Factory Default is 4-20 ma

Tracer Option

```
Tracer Option:                             [status]
     Press <+> <-> to Change Setting
```

Possible values of status are: Enable, Factory Default is Disable

TCI Option

```
TCI Option:                                [status]
     Press <+> <-> to Change Setting
```

Possible values of status are: Enable, Factory Default is Disable

Service Test Group

The Service Tests Group sequence is as follows:

Service Tools Group Password Request

```
Pswd Reqd to Access Service Tools Group
          Please Enter Password
```

The Service Tools Password is ⚠⚠▽▽⚠⚠ <Enter>. Successfully entering the password sends you to the Service Tools Group Heading Screen.

The Service Tools Group contains items which are primarily associated with either test or manual override of the chiller or chiller subsystems. If the service tools password is entered the display goes to the menu defined below. If a key is not pressed for 10 minutes or more in this password protected menu the display returns to the Chiller Operating Mode display of the Chiller Report and the password must be entered again to return to this menu.

Service Tools Group Heading

```
          Service Tests & Overrides
   Press <Next> <Previous> to Continue"
```

This header is not suppressed when the headers are suppressed in the Service Settings menu.

Chilled Water Pump

```
Chilled Water Pump:                    [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: On, Factory default is Auto.

Chilled Water Flow Switch Status

This screen was added for CTV UCP2 Phase B Release. The following screen is not a setpoint. This screen displays the status of the chilled water flow switch status at the input to the UCM.

```
     Chilled Water Flow Switch Status
                        [y]
```

Possible values for [y] are: Flow Switch is Open/No flow.
Flow Switch is Closed/Flow

Condenser Water Pump

```
Condenser Water Pump:                  [status]
     Press <+> <-> to Change Setting
```

Possible values for status are: On, Factory Default is Auto.

Condenser Water Flow Switch Status

This screen was added for CTV UCP2 Phase B Release. The following screen is not a setpoint. This screen displays the status of the condenser water flow switch status at the input to the UCM.

```
    Condenser Water Flow Switch Status:
                        [y]
```

Possible values for [y] are: Flow Switch is Open/No Flow.
Flow Switch is Closed/Flow.

Starter Dry Run

Use the following screen when [XX] = "Disabled".

```
Starter Dry Run:                                [XX]
     Press <+> <-> to Change Setting
```

Use the following screen when [XX] Not equal to "Disabled"

```
Starter Dry Run:                                [XX]
  <+> <-> <Enter>: Trans Compl Inp: [Y]
```

Possible values for [XX] are:
- Disabled; Factory Default
- Shorting Relay On
- Run Relay On
- Start Relay On
- Transition Relay On
- Start and Transition Relays On.

Possible values for [Y] are:
- Closed — This denotes that the Transition Complete input is seeing a contact closure.
- Open — This denotes that the Transition Complete input is seeing a contact open.

If the unit is not in the local stop mode the following is displayed.

```
        Starter Dry Run, Disabled
  Unit Must Be In Stop To Activate Test
```

Oil Pump

```
Oil Pump:                                       [status]
   Differential Oil Pressure XX.X PSID
```

Possible values for status are: On, Factory Default is Auto.

Vane Control Status/Vane Position Commands

The status of the Vane Control is as follows:

```
Vane Control Is:                                [status]
     Press <+> < > to Change Setting
```

The possible values of [status] are: Manual, Factory default is Auto.
If the vane control status is "Auto" the following is displayed:

```
Inlet Guide Vane Position: XXX.X % Open
                [limit mode]
```

If the vane control status is "Manual" the following is displayed. When the Vane Control Status is transitioned from "Auto" to "Manual", the manual target is initialized to the current vane position.

```
Vane Pos XXX.X %       Target XXX.X % Open
  [limit mode] <+> <-> to Change Target
```

The possible values of [limit mode] are:
- Current Limit
- Condenser Limit
- Evap Limit
- Blank

Vane Position

This screen was added for CTV UCP2 Phase B Release.

Inlet Guide Vane Position:	XXXXX steps
Inlet Guide Vane Position:	XX.X degrees

Electrical Sequence Of Operation

Overview

This section will acquaint the operator with the control logic governing CVHE/CVHF chillers equipped with UCP2 based control systems. Be sure to refer to the typical wiring schematic shown in Figure 22 when reviewing these step-by-step electrical sequences of operation. Typical starter electrical configurations are illustrated by Figure 22 and 23.

Note: The typical wiring diagrams in Figures 22 and 23 are representative of standard CVHE/CVHF units and are provided only for general reference. They may not reflect the actual wiring of your unit. For specific electrical schematic and connection information, always refer to the wiring diagrams that shipped with the chiller.

With the supply power disconnect switch or circuit breaker (2CB1) closed, 120-volt control power is provided through control power transformer 2T5 and a 30-amp starter panel fuse (2F4) to terminal 1TB1-1 in the UCP2 control panel. From this point, control voltage flows to:

Circuit Breaker 1CB1, supplying power to starter module (2U1) via terminal 2TB1-6 for starter contactors operation and the high condenser pressure switch 3S1.

Circuit Breaker 1CB2, supplying power to the purge module (3U1) and the 24 volt supply transformer 3T1 for the purge module (3U1).

Circuit Breaker 1CB3, Supplying power to:

(a) The I/O module (1U10) will operate the Hot Gas Bypass valve, the Vent Line Solenoid valve (4L1), the Oil Heater (4R1), and the oil pump motor through Fuse 1F2.
(b) The chiller module (1U1) to operate the evaporator (4L2) and condenser (4L3) water pressure transducer solenoids and to the chilled water (5S1) and condenser water (5S2) flow switch circuits.

The starter module (2U1) receives 24 volt power from control power transformer 2T4 in the starter panel.

The Clear Language Display (1U4) Stepper (1U3), Circuit (1U2), Options (1U5), Chiller (1U1), and COMM (1U6), (1U7), (1U8) & (U10) modules obtain 24 volt power from control power transformer 1T1 in the control panel.

Chilled and Condenser Water Flow Interlock Circuits

Proof of chilled water flow for the evaporator is made by the closure of flow switch 5S1 and the closure of auxiliary contacts 5K1 on terminals 1TB1-11 and 1TB1-12.

Proof of condenser water flow for the condenser is made by the closure of flow switch 5S2 and the closure of auxiliary contacts 5k2 on terminals 1TB1-11 and 1TB1-13.

UCP2 and "Wye-Delta" Starter Control Circuits

Logic Circuits within the various modules will determine the starting, running, and stopping operation of the chiller. If operation of the chiller is required and the chiller mode is set at "Auto," then the Chiller Module's logic decides to start the chiller based on the differential to start setpoint.

The chilled water pump relay (5K1) is energized by the Chiller Module (1U1-J12) and chilled water flow must be verified within 3 minutes by the Chiller Module (1U1-J26).

Based on the restart inhibit timer and the differential to start setpoint, oil pump (4B3) will be energized by the Circuit Module (1U2-J22) and the condenser water pump relay (5K2) will be energized by the Chiller Module (1U2-J14) when the restart inhibit timer is at 30 seconds or less. The oil pressure must be at least 9 PSID for 30 continuous seconds and condenser water flow verified within 3 minutes by the Chiller Module (1U1-J28) for the compressor start sequence to be initiated.

When less than 5 seconds remains before compressor start, a starter test is conducted to verify contactor states prior to starting the compressor. The following test/start sequence is conducted for "Wye-Delta" starters: See Figure 24.

(a). Test for transition complete - contact open (2K2 AUX at 2U1-J4) - 120 to 180 msec. An MMR diagnostic will be generated if the contact is closed.

(b). Delay time - 20 msec.

(c). Close start contactor (2K1) and check for no current - 500 msec. If currents are detected, the MMR diagnostic "Starter Fault Type I" is generated.

(d). Stop relay (2U1-J6) closes for 1 second for test C above.

(e). Delay time - 200 msec.

(f). Close shorting contactor, (2K3) and check for no current - 1 sec. If currents are detected the MMR diagnostic "Starter Fault Type II" is generated.

(g.) If no diagnostics are generated in the above tests, the Start Relay (2U1-J6) is closed for 2 seconds and the Stop relay (2U1-J8) is closed to energize the start contactor (2K1). The shorting contactor (2K3) has already been energized from (f) above. The compressor motor (4B1) starts in the "Wye" configuration, an auxiliary contact (2K1-AUX) locks in the start contactor (2K1) coil, the vent line solenoid valve (4L1) is closed by relay 1U2-J16 for 100 seconds, and the acceleration timer begins to time out.

(h). After the compressor motor has accelerated and the maximum phase current has dropped below 85% of the chiller nameplate RLA for 1.5 seconds, the starter transition to the "Delta" configuration is

initiated.

(j). The transition contactor (2K4) is closed through relay 2U1-J14, placing the transition resistors (2R1, 2R2 and 2R3) in parallel with the compressor motor windings.

(k). The shorting contactor (2K3) is opened through the opening of relay 2U1-J12 100 msec after the closure of the transition relay 2U1-J14.

(l.) The run contactor (2K2) is closed through relay 2U1-J10 shorting out the transition resistors 260 msec after the opening of the shorting relay 2U1-J12. This places the compressor motor in the "Delta" configuration and the micro waits to look for this transition for 2.35 seconds through the closure of the transition complete contacts (2K2-AUX) at 2U1-J4.

(m). The micro must now confirm closure of the transition complete contact (2K2-AUX) within 2.5 seconds after the run relay (2U1-J10) is closed. Finally, the transition relay (2U1-J14) is opened de-energizing the transition contactor (2K4) and the compressor motor starting sequence is complete. An MMR diagnostic will be generated if the transition complete contacts (2K2-AUX) do not close. A diagram of this test/start sequence is shown in Figure 24.

Now that the compressor motor (4B1) is running in the "Delta" configuration, the inlet guide vanes will modulate, opening and closing to the chiller load variation by operation of the stepper vane motor acuator (4B2) to satisfy chilled water setpoint. The chiller continues to run in its appropriate mode of operation: Normal, Soft-load, Limit Mode, etc.

If the chilled water temperature drops below the chilled water setpoint by an amount set as the "differential to stop" setpoint, a normal chiller stop sequence is initiated as follows:

(a). The inlet guide vanes are driven closed for 50 seconds.

(b). After the 50 seconds has elapsed, the stop relay (2U1-J6) and the condenser water pump relays (1U1-J14) open to turn off the compressor motor (4B1) and the condenser water pump. The oil pump motor (4B3) will continue to run for 2 minutes post lube while the compressor coasts to a stop. The chilled water pump will continue to run while the chiller module (1U1) monitors leaving chilled water temperature preparing for the next compressor motor start based on the "differential to start" setpoint. If the STOP key is pressed on the human interface, the chiller will follow the same stop sequence as above except the chilled water pump relay (1U1-J12) will also open and stop the chilled water pump after the chilled water pump delay timer has timed out after compressor shut down.

If the STOP key is pressed twice in rapid succession, twice within 5 seconds, a "panic stop" is initiated which follows the same stop sequence as pressing the STOP key once except the inlet guide vanes are not sequenced closed and the compressor motor is immediately turned off.

Vane Actuator Control

The 1U3 Stepper Module pulses a DC voltage to the windings of the 4B2 Stepper Module Vane Actuator to control inlet guide vane position.

While operation of this stepper motor is automatic, manual control is possible by going to the Vane Control Status/Vane Position Commands screen in the Service Tests Menu and changing the "Target" value.

Note: If the chiller is operating in a limit mode (i.e. current limit, condenser limit, evaporator limit, etc.) The limit operation has priority over all manual modes of operation.

On each UCP power-up, the inlet guide vanes are driven full closed to recalibrate the zero position (Steps) of the Stepper motor vane acuator. An inlet guide vane stroke test is conducted for BPI (Binary Position Indicator) Position on all resets (hardware and software) if there has not been a Momentary Power Loss. This is also done if there is a call for cooling or heating condi- tion and it has been 24 hours or more since the last BPI test and there has not been a Momentary Power Loss for 5 minutes. See Figure 25 for BPI operation.

Note: The closed range of the BPI must straddle the factory programmed 90 degree Vane Position.

Circuit Breaker 1CB3 Oil Pump

Circuit Breaker 1CB3 115-Volt control power from control power transformer 2T5 flows through branch circuit breaker 1CB3 and Terminal 1TB1-6 to a 6.2 amp fuse (1F2). Fuse 1F2 protects the oil pump motor (4B3) from over amperage conditions.

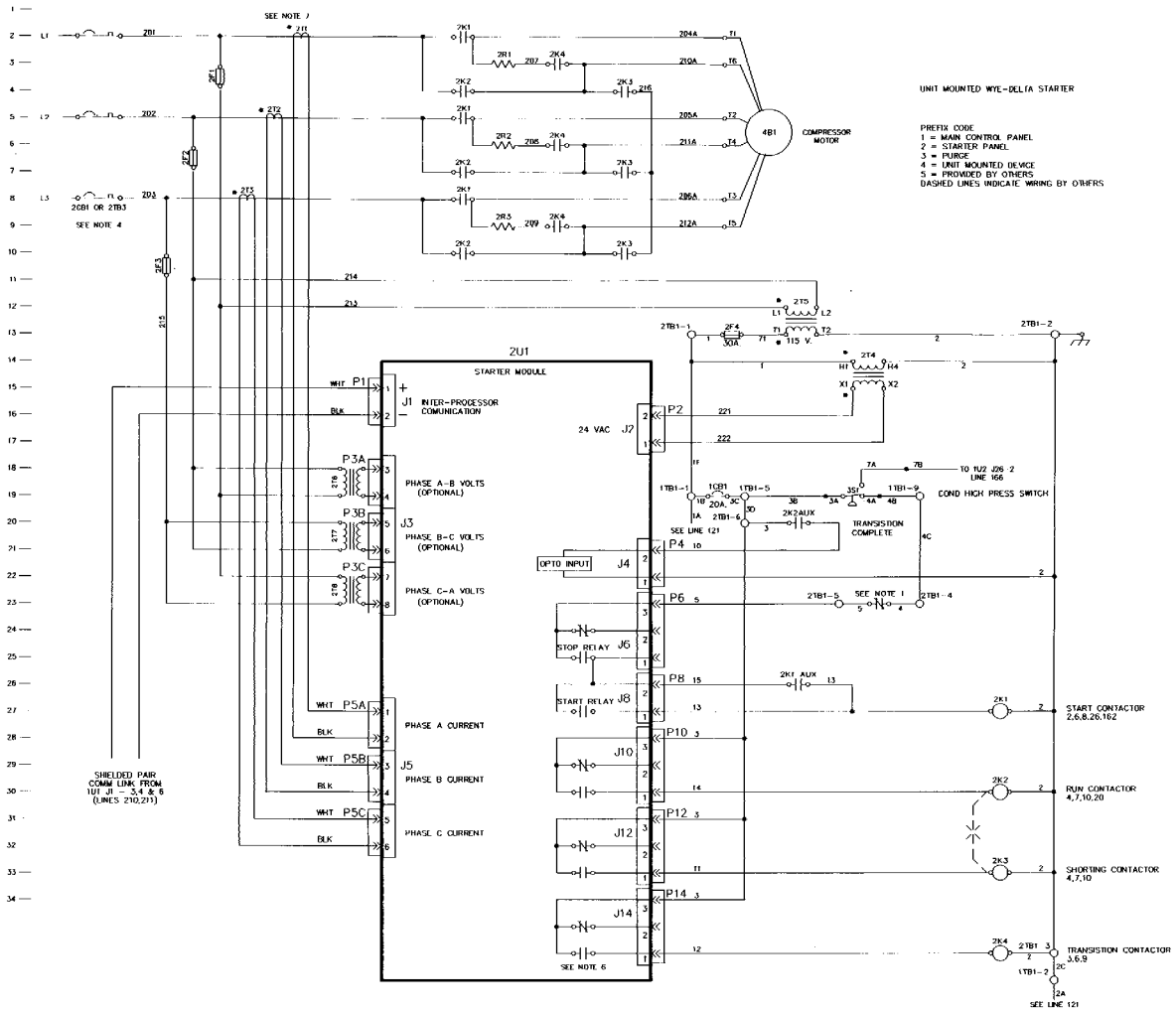
Current passing through Fuse 1F2 reaches 2 normally-open, parallel sets of contacts, those of oil pump relay 1U2-J22 and start contactor 2K1-AUX

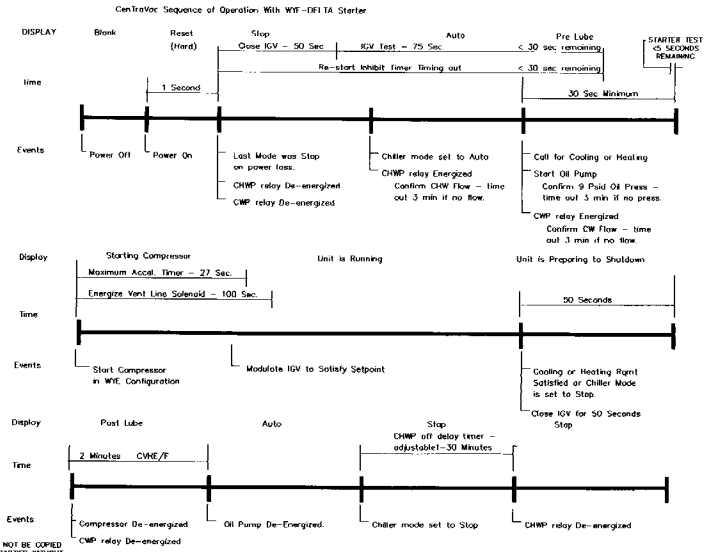
Note: While the 1U2-J22 Relay 13 automatically closed by 1U2 as a part of the start sequence, it can also be closed manually by changing the Oil Pump status to "ON" in the Service Tests menu.

Closure of the 1U2-J22 contacts also allows current to pass through the coil of oil pump starter relay 4K8 to the "run" windings of oil pump motor 4B3.

When motor 4B3 first starts, current draw is high; this causes current-sensing relay 4K8 to close its normally-open contacts and "pull in" of pump capacitor 4C1. With this circuit complete, current now flows to the "start" windings of the oil pump motor.

As the pump motor accelerates, its amps draw eventually falls





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.

IMPORTANT
USE COPPER CONDUCTORS ONLY TO PREVENT EQUIPMENT DAMAGE. UNIT TERMINALS ARE NOT DESIGNED TO ACCEPT ANY OTHER WIRING.

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 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
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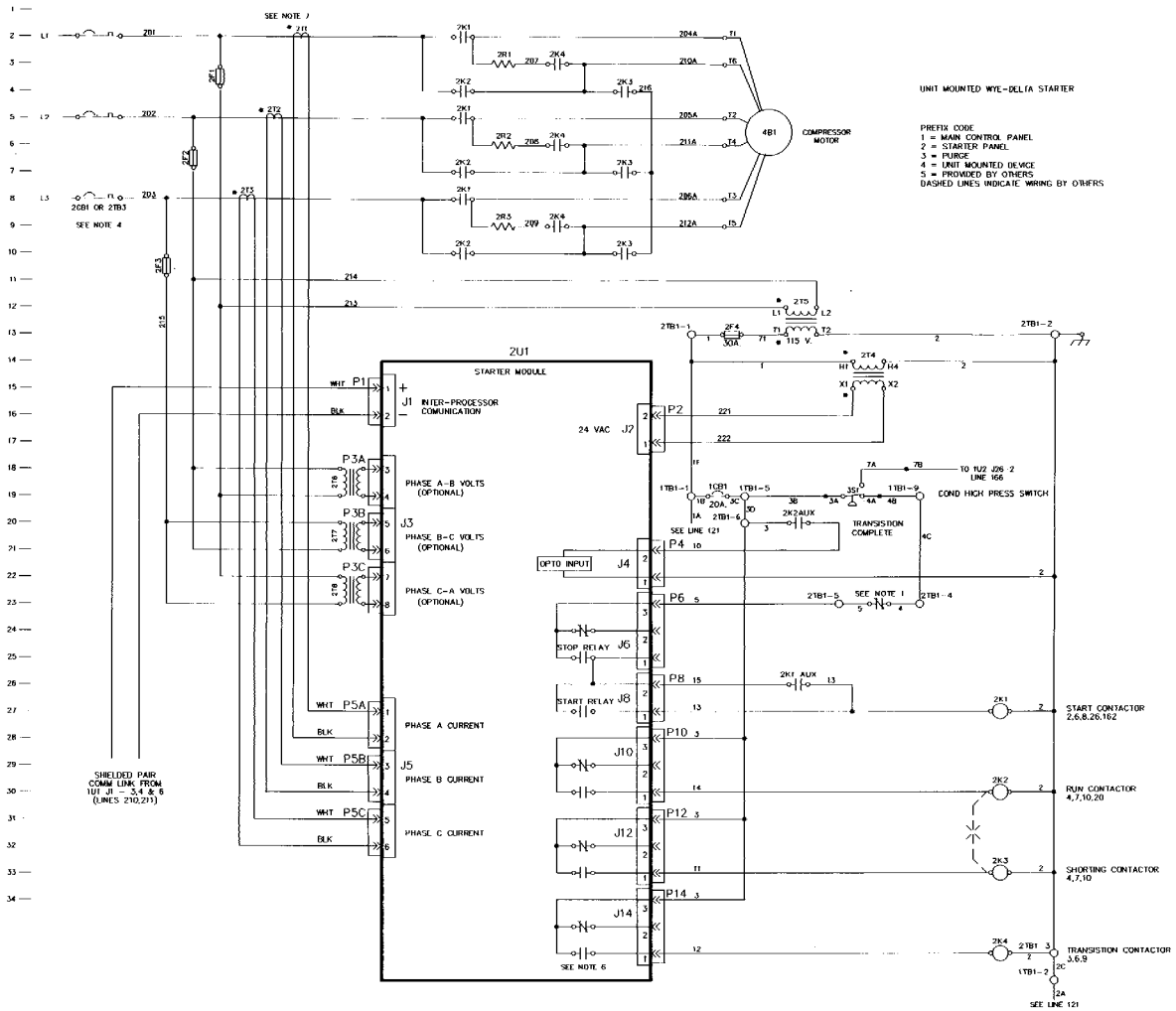
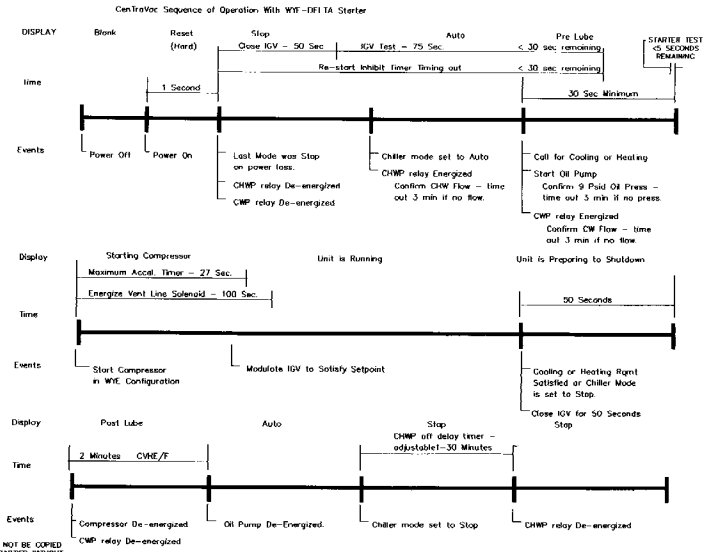
7. POLARITY MARKING ON THE CURRENT TRANSFORMER MUST BE FACING TOWARDS THE INCOMING CURRENT.

Figure 22
Unit Mounted Wye-Delta Starter CVHE, CVHF





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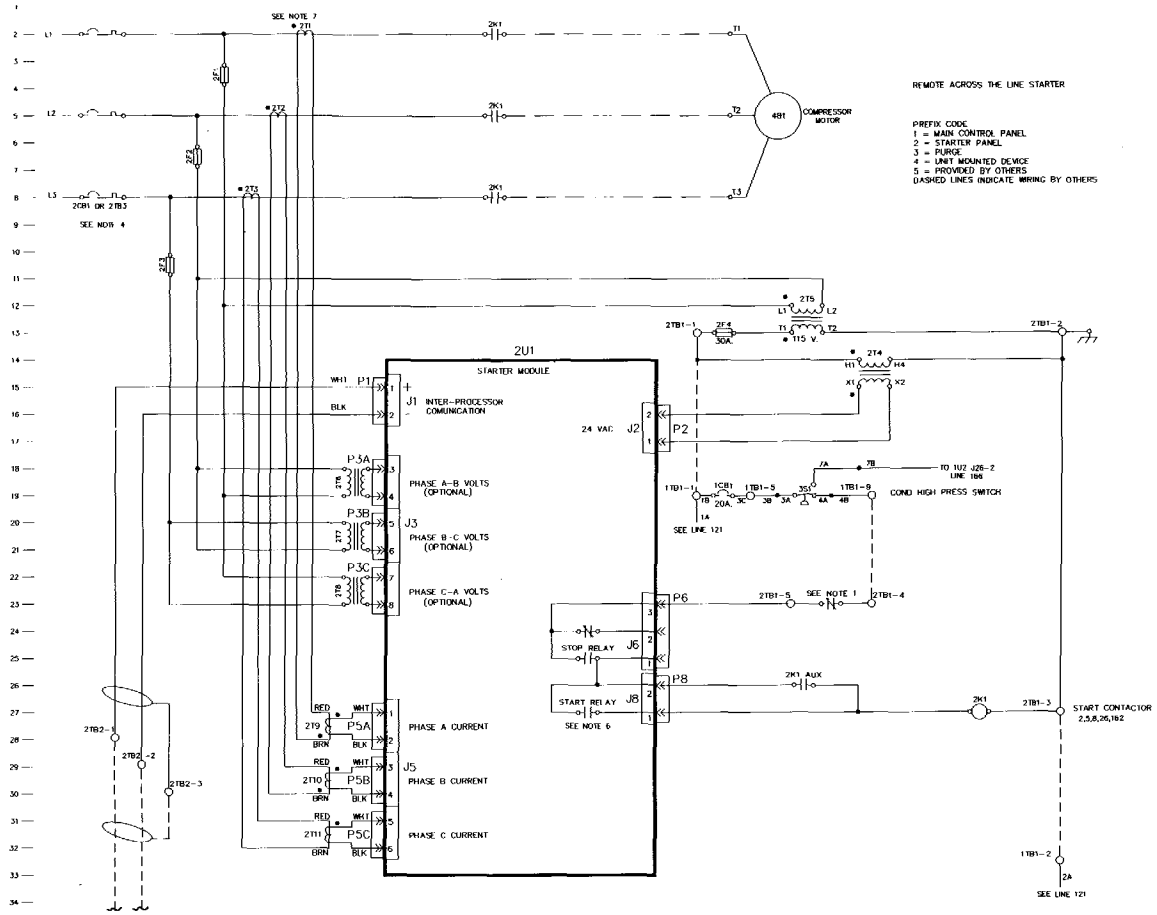

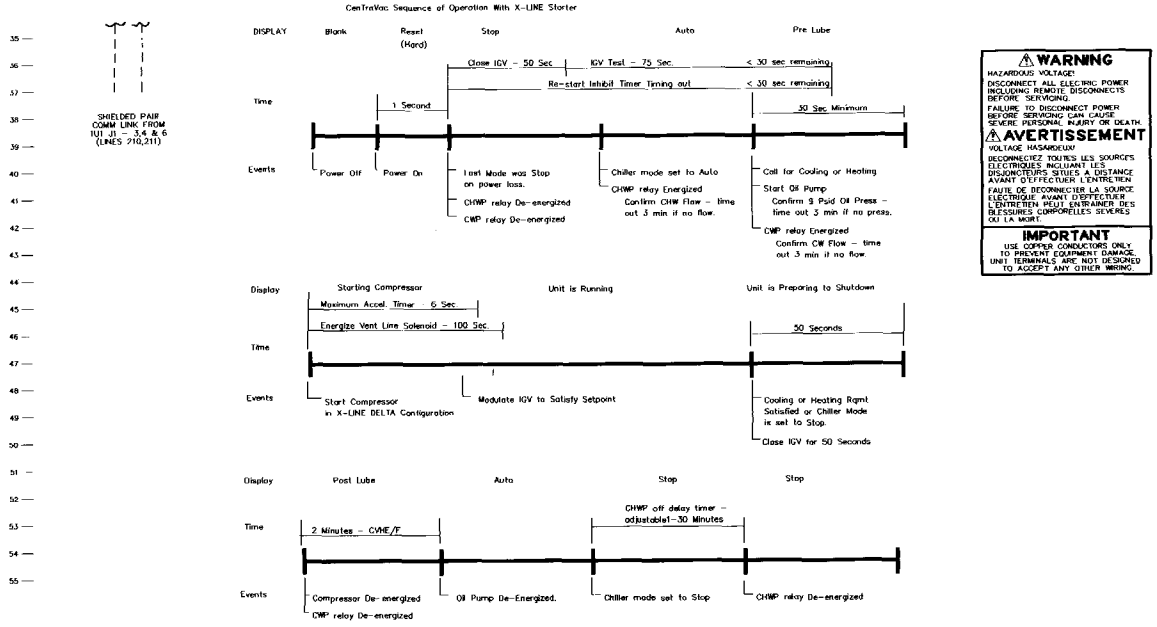

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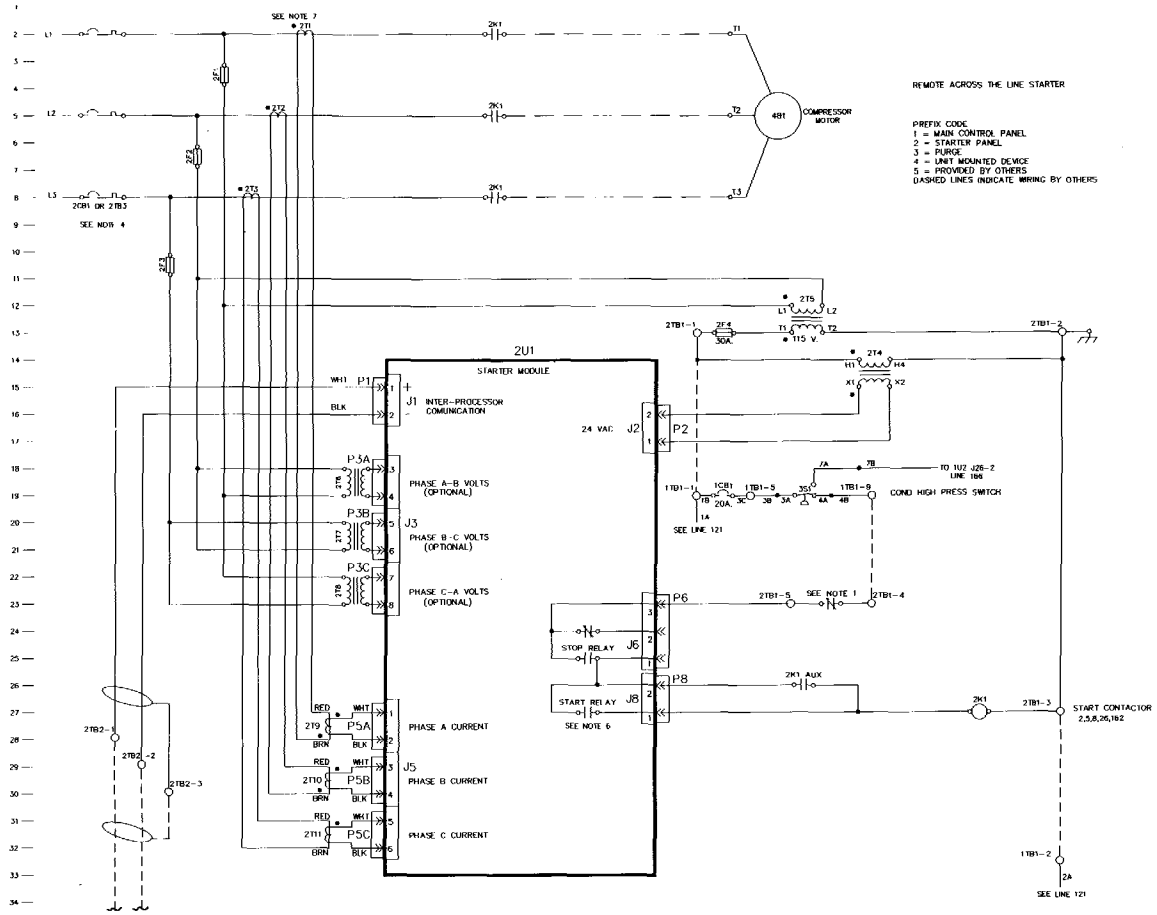
Figure 23
Remote Across the Line Starter



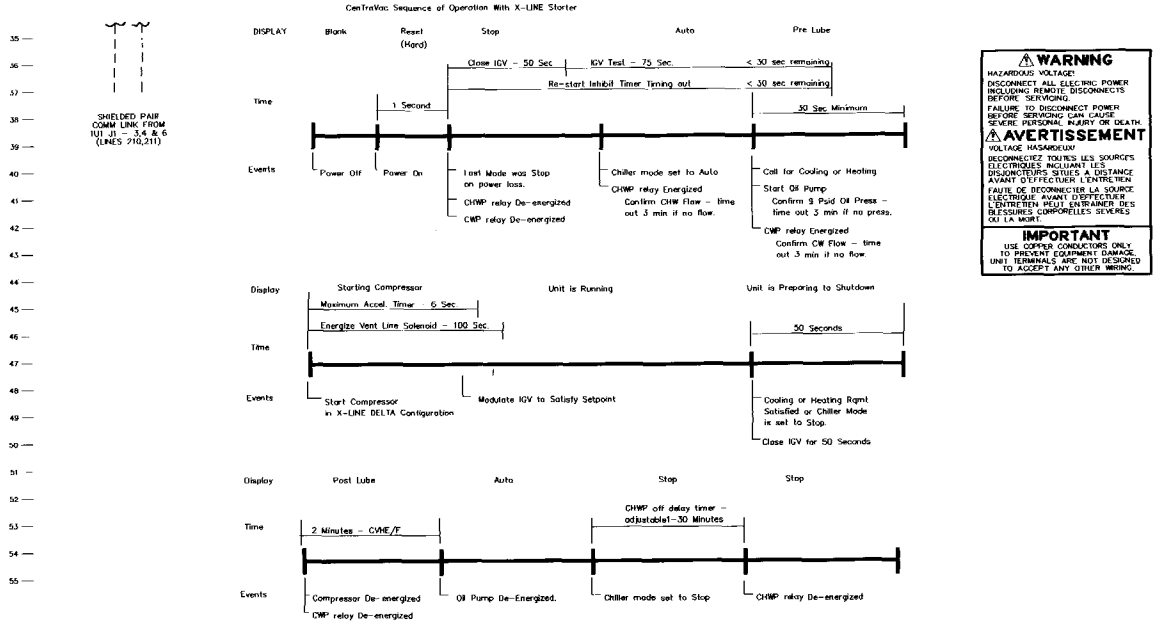


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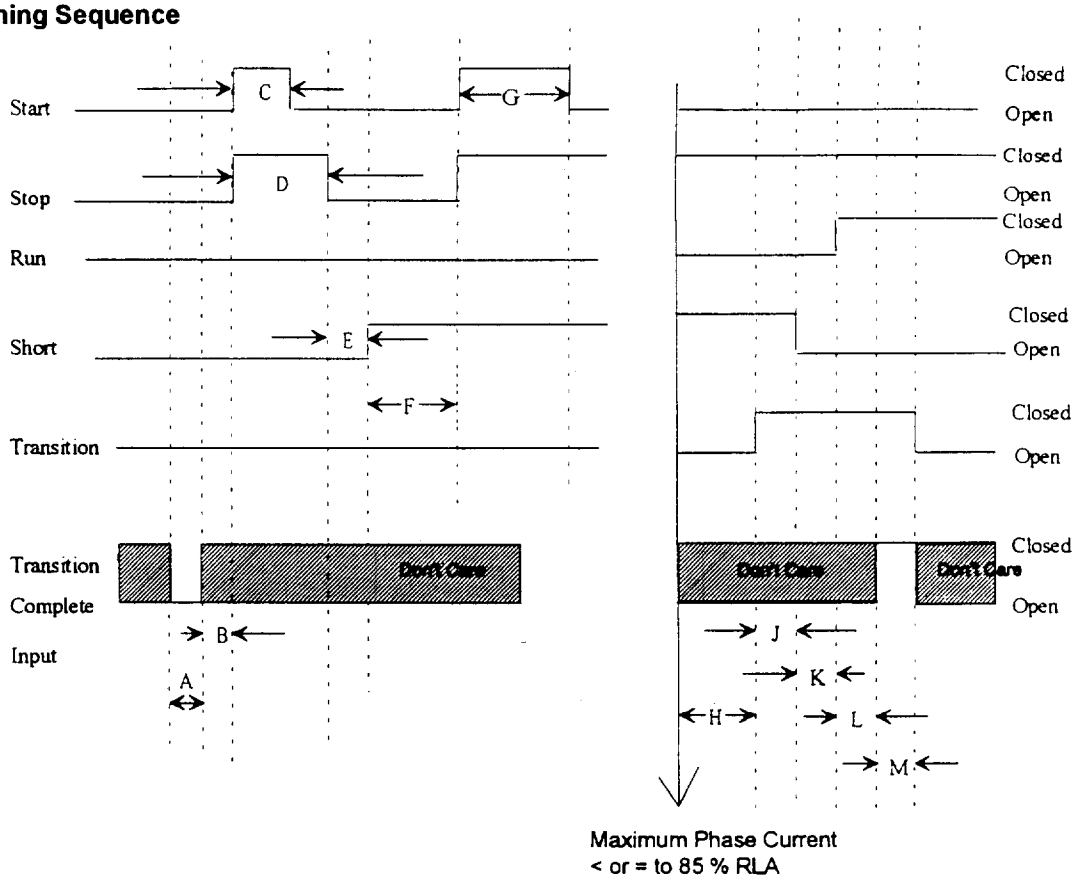
Figure 23
Remote Across the Line Starter

Figure 24
UCP2 Test/Start Timing Sequence



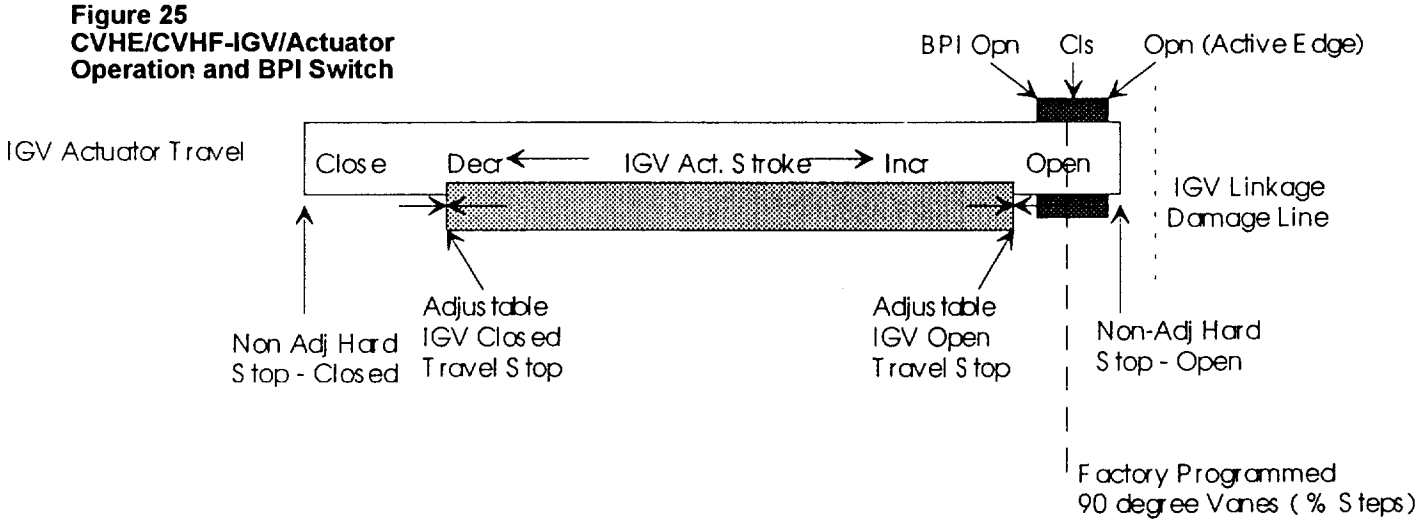
Interval	Minimum	Maximum	Units	Actual Design
A (Test for transition complete input open)				120 to 180 msec
B (Just delay time)				20 msec
C (Close 2K1 Contactor and test for no current.)				500 msec
D (Close Stop Relay and test for no current.)				1 sec
				200 msec
E (Just delay time)				1.0 sec (Min.)
F (Close shorting contactor and test for no current, then wait for Start command.	100 (1)		msec	
G	2.0		sec	2 sec
H (Wait 1.5 sec after drop to 85% to transition)	1	2	sec	1.5 sec
J	85	100	msec	100 msec
K	250	300	msec	260 msec
L (Wait to look for transition complete)	(2)		msec	2.32 to 2.38
M (Filtering time on transition complete input.)	(2)		msec	120 to 180 msec

Notes:

(1) This time period must be long enough to verify the absence of phase currents caused by the closing of the "Short" contacts.

(2) The sum of intervals L and M are designed to be 2.5 seconds.

Figure 25
CVHE/CVHF-IGV/Actuator Operation and BPI Switch



below the "capacitor-enable" threshold of relay 4K8. Once this occurs, 4K8 reopens its normally-open contacts, and power is supplied only to the "run" windings of motor 4B3.

The normally-open, 2K1-AUX contacts that parallel those of oil pump relay 1U2-J22 are located on start contactor 2K1. As soon as 2K1 energizes, these auxiliary contacts close. Notice that completion of this circuit assures that voltage is provided to the oil pump motor as long as the compressor motor is operating.

Oil pump operation ceases when both the 1U2-J22 and 2K1-AUX contacts open.

Also, during the start sequence the 1U2-J16 contacts close energizing the 4L1 Vent Line Solenoid for 100 seconds. During this period, closure of this valve isolates the oil sump from the compressor to prevent loss of oil pressure while starting the compressor. When the 100 second interval expires, the 1U2-J16 relay opens and the 4L1 valve reopens for normal compressor operation.

Restart Inhibit

A Restart Inhibit Timer is used to prevent high frequent chiller ON-OFF cycling and subsequent motor overheating.

The Restart Inhibit (RI) timer is set based on a Background Timer (BT) that is incremental by (XX) minutes at every start and is timed out from the new total only while the chiller is running and is based on the equation:

RI = BT-50

The value of XX is based on nominal compressor size to include the motor heating constant as listed in the table on page 60.

This value of the motor heating constant (XX) must be set in the Machine Configuration Group of the Service Settings Menu based on the unit NTON and motor frequency.

On any UCM Reset (either hardware (e.g. powerup or software), the RI Timer is reset to 30 seconds if the motor winding temperature is less than or equal to 165 °F or 15 minutes if the motor winding temperature is greater than 165 °F.

The maximum value of the RI Timer is 60 minutes, and is adjustable from 25 to 60 minutes in the Field Startup Group of the Service Settings menu.

See Figure 26 for an example of how the RI Timer functions.

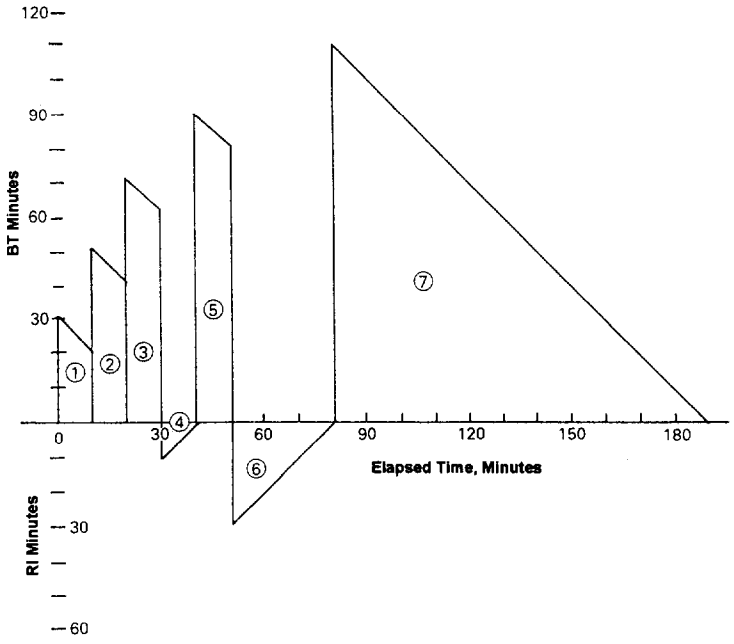
Any other pre-start system timers, e.g. prelube = 30 seconds, overlap the RI Timer to anticipate its time out and permit start of the compressor at or shortly after the RI. If the RI Timer value ever reaches 45 minutes an IFW diagnostic is generated.

The RI Timer can be cleared to 30 seconds in the Service Settings Menu.

If the RI Timer is the overriding criteria holding the chiller off, this mode will be displayed along with the remaining time, counting down, prior to the chiller starting.

Figure 26
CVHE/CVHF - UCP2 Restart Inhibit Timer

Parameter	CVHE/CVHF
Background Timer Increment on Start (Motor Heating Constant)	Adjustable, 25 Min. Fac. Dflt.
General RI Timer Setting	RI = BT -50 Minutes
Minimum RI Timer Setting	30 Seconds
Maximum RI Timer Setting	60 Minutes
Adjustment Range of Maximum RI Timer Setting	30 to 60 Minutes
Winding Temperature Decision Point/RI Timer Above this Temp. after Reset	165 F (73.8C)/15 Minutes
IFW Diagnostic Threshold	RI Timer = 45 Minutes



1. Unit started and ran 10 min., BT incremented 30 Min., and decreased by 10 min. RI = (30-10) - 50 = -30.

2. Unit restarted RI = -30, BT incremented another 30 min., unit ran 10 min. and BT decreased by 10 min. RI = (50-10) - 50 = -10

3. Unit restarted RI = -10, BT incremented another 30 min., unit ran 10 min. and BT decreased by 10 min., RI = (70-10) - 50 = 10.

4. Unit Restart Inhibit is 10 min. from **(3)**.

5. Unit restarted after 10 min. RI in **(4)** , BT incremented another 30 min., unit ran 10 min. and BT decreased by 10 min. RI = (90-10) -50 = 30.

6. Unit restart is 30 min. from **(5).**

7. Unit restarted after 30 minute RI min, **(6)**, BT incremented another 30 min., and unit ran for 110 min., and BT goes to zero.

Notes:

1. 30 second/15 minute restart inhibit due to motor winding temperature not included.
2. Example for Motor Heating Constant = 30
3. If calculated RI is negative then RI = 0.

Controls

Chilled Water Reset (CWR)

Chilled water reset is designed for those applications where the design chilled water temperature is not required at partload. In these cases, the leaving chilled water temperature setpoint can be reset upward using the CWR feature.

When the CWR function is based on return water temperature, the CWR feature is standard. When the CWR function is based on outdoor air temperature, the CWR feature is an option requiring an outdoor temperature sensor and the Options Module installed in the UCP2 panel.

The type of CWR is selectable in the Operator Settings Menu along with the Reset Ratio, Start Reset Setpoint, and the Max Reset Setpoint.

The following equations and parameters apply for CWR.

Return

CWS' = CWS + RATIO (START RESET - TWE - TWL)
and CWS' >or = CWS
and CWS' - CWS<or = Maximum Reset

Outdoor

CWS' = CWS + RATIO * (START RESET - TOD)
and CWS' >or = CWS
and CWS' - CWS<or = Maximum Reset

Where

CWS' is the new chilled water setpoint

CWS is the active chilled water setpoint before any reset has occurred

RESET RATIO is a user adjustable gain

START RESET is a user adjustable reference

TOD is the outdoor temperature

TWE is entering evap. water temperature

TWL is leaving evap. water temperature

MAXIMUM RESET is a user adjustable limit providing the maximum amount of reset. For all types of reset, CWS' - CWS < or = Maximum Reset.

The values for "Star Reset " for each of the reset types are shown in Table 4.

Table 4 - Values for Star Reset Types

The values for "RESET RATIO" for each of the reset types are:

Reset Type	Reset Ratio Range	Increment English Units	Increment SI Units	Factory Default Value
Return	10 to 120%	1%	1%	50%
Outdoor	80 to -80%	1%	1%	10%

Reset Type	Start Reset Range	Increment English Units	Increment SI Units	Factory Default Value
Return	4 to 30 F (2.2 to 16.7 C)	1F	0.1 C	10 F (5.6C)
	50 to 130 F (10 to 54.4 C)	1F	0.1 C	90 F (32.2C)

The values for MAXIMUM RESET for each of the reset types are:

Reset Type	Maximum Reset Range	Increment English Units	Increment SI Units	Factory Default Value
Return	0 to 20 F (0.0 to 11.1 C)	1 F	0.1 C	5 F (2.8 C)
Outdoor	0 to 20 F (0.0 to 11.1 C)	1 F	0.1 C	5 F (2.8 C)

Both Return and Outdoor Reset do not apply to heat Pump Mode where the UCP2 is controlling the Leaving Condenser Water Temperature.

Constant Return Reset will reset the leaving water temperature setpoint so as to provide a constant entering water temperature. The Constant Return Reset equation is the same as the Return Reset equation except on selection of Constant Return Reset, the UCP2 shall automatically set RATIO, START RESET, and MAXIMUM RESET to the following.

The RATIO = 100%
The START RESET = Design Delta Temp.
The MAXIMUM RESET = Design Delta Temp.

The equation for Constant Return is then as follows:

Constant Return

CWS' = CWS + 100% (Design Delta Temp. - (TWE - TWL))

and CWS' > or = CWS and CWS' - CWS<or = Maximum Reset

Notice that Constant Return is nothing more than a specific case of Return Reset offered for operator convenience.

When any type of CWR is enabled, the UCP2 will step the CWS toward the desired CWS' (based on the above equations and setup parameters) at a rate of 1 degree F every 5 minutes until the Active CWS equals the desired CWS'. This applies when the chiller is both running and not running. The chiller will start at the Differential to Start value above a fully reset CWS or CWS' for both Return and Outdoor Reset.

Differential To Start/Stop

The Differential to Start setpoint is adjustable from 1 to 10° F (0.5 to 5.55 C) and the Differential to Stop setpoint adjustable from 1 to 10° F (--0.5 to --5.55C). Both setpoints are with respect to the Active Chilled Water Setpoint and are set in the Service Settings menu.

When the chiller is running and the LWT reaches the Differential to Stop setpoint the chiller will go through its shutdown sequence to AUTO.

Leaving Water Temperature Cutout

Leaving water temperature cutout is a safety control that protects the chiller from damage caused by water freezing in the evaporator. The cutout setpoint is adjustable in the Service Settings Menu.

For freeze protection from low leaving water temperatures the UCP2 provides a low leaving water temperature cutout based on leaving water temperature. The "Leaving Water Temperature Cutout Setpoint" is independently adjustable from the chilled water setpoint and factory set. Shutdown of the compressor due to violation of the Leaving Water Temperature Cutout results in an automatically resettable diagnostic (MAR).

The UCP2 indicates when the "Leaving Water Temperature Cutout Setpoint" conflicts with the chilled water temperature setpoint by a message on the display. The "Leaving Water Temperature Cutout Setpoint" and chilled water setpoint, both active and front panel, are separated by a minimum of 1.7° F. (See Cutout Strategy Figure 27). When either difference is violated the UCP2 does not permit the above differences to be violated and the display displays a message to that effect and remains at the last valid setpoint.

When the chilled water setpoint, both active and front panel, is adjusted downward, it does not violate the above minimum differences and the "Leaving Water Temperature Cutout Setpoint" remains at its current setting. When the "Leaving Water Temperature Cutout Setpoint" is adjusted upward, the above minimum difference is not violated and as the "Leaving Water Temperature Cutout Setpoint" is adjusted upward the chilled water setpoint, both active and front panel, is raised to maintain the minimum difference.

After violation of the "Leaving Water Temp. Cutout Setpoint" for 30° F seconds the chiller will shutdown and indicate a diagnostic.

Low Refrigerant Temperature Cutout

This is a safety function that prevents water in the evaporator from freezing due to low evaporator refrigerant temperatures. When the trip point is violated, the chiller will shut down and display a latching diagnostic (MMR) indicating the violation. The cutout setpoint is adjustable in the Service Settings Menu.

The UCP2 indicates when the "Low Refrigerant Temp. Cutout Setpoint" conflicts with the chilled water temperature setpoint by a message on the display. The "Low Refrigerant Temp Cutout Setpoint" and chilled water setpoint, both active and front panel, are separated by a minimum of 6° F (See Figure 27). When either difference is violated, the UCP2 does not permit the above differences to be violated and the display displays a message to that effect and remains at the last valid setpoint.

Figure 27
Cutout Strategy

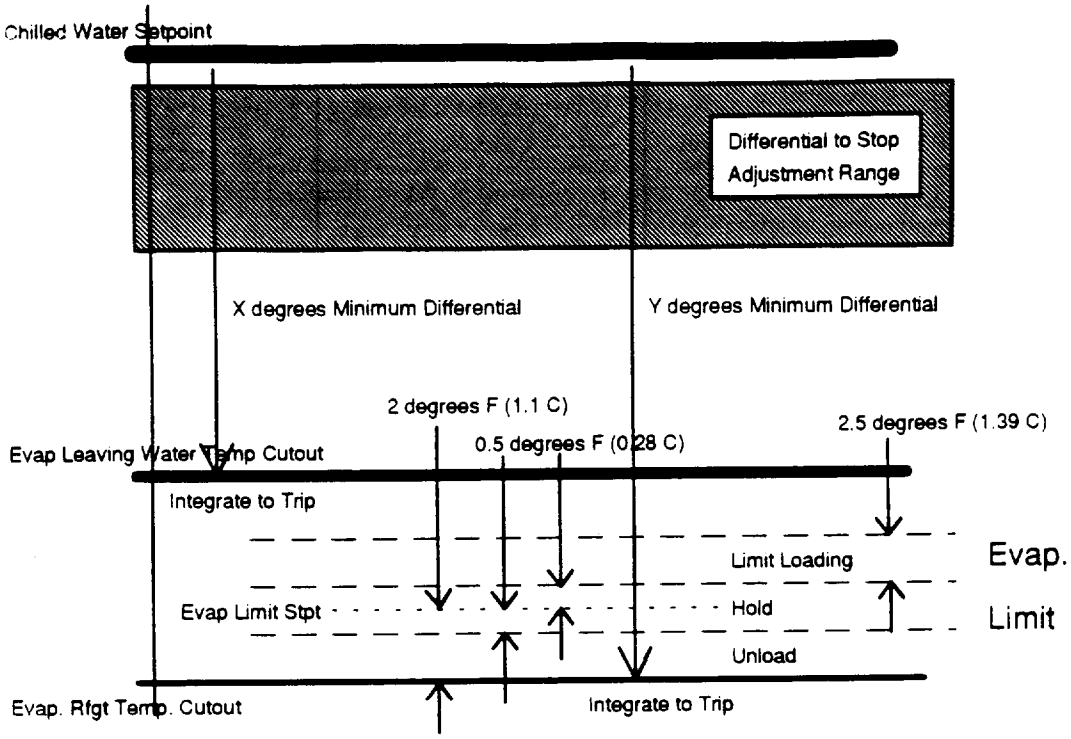


Figure "Cutout Strategy"

When the chilled water setpoint, both active and front panel, is adjusted downward, it does not violate the above minimum differences, and the "Low Refrigerant Temp. Cutout Setpoint" remains at it's current setting. When the "Low Refrigerant Temp. Cutout Setpoint" is adjusted upward, the above minimum difference is not violated, and as the "Low Refrigerant Temp Cutout Setpoint" is adjusted upward, the chilled water setpoint, both active and front panel, are raised to maintain the minimum difference.

After violation of the "Low Refrigerant Temp. Cutout Setpoint" for 30 ° F - seconds, the chiller will shutdown and indicate a diagnostic.

Enhanced Condenser Limit Control

When the chiller is running in Condenser Limit Mode or in Surge Mode, the head relief request relay on the Options Module (1U5-J12) will be energized and can be used to control or signal for a reduction in the entering condenser water temperature.

Designed to prevent high refrigerant pressure trip-outs during critical periods of chiller operation, this UCP2 option consists of:

1. Condenser Refrigerant Pressure Transducer (3R3).
2. The Options Module (1U5) with the head relief request relay (1U5 - J12).
3. Interconnecting Wiring

If the unit is not equipped with the Enhanced Condenser Limit Option (3R31U5) the unit will use the condenser refrigerant temperature sensor (input converted to saturated refrigerant pressure) to perform the Standard Condenser Limit function, without the head relief request relay, by limiting inlet guide vane stroke and chiller capacity.

Keep in mind that the UCP2 Condenser Limit Control supplements the protection provided by the condenser pressure high pressure cutout switch 3S1.

Free Cooling

As described in mechanical Operation, this control option adapts the basic chiller to function as a simple heat exchanger without controlling leaving water temperature.

To enable Free Cooling Mode:

1. "Install" Free Cooling in the Machine Configuration Menu.

2. Enable the Free Cooling mode in the Operator Settings Menu to "ON" while the chiller is in "AUTO", or

3. Close the external binary input switch to the Options Module 1U5-J3-5 and -6 if so equipped while the chiller is in "AUTO".

Free Cooling can not be entered if the chiller is in "STOP".

If the chiller is in "AUTO" and not running, the condenser water pump will start. After condenser water flow is proven, relays at 1U5-J16, 1U5-J20, and 1U5-J24 will energize operating the Free Cooling Valves 4B12 and 4B13. The Free Cooling Valves End Switches must open within 3 minutes, or an MMR diagnostic will be generated. Once the Free Cooling Valves End Switches open, the unit is in the Free Cooling Mode.

If the chiller is in AUTO and running powered cooling, the chiller will do a friendly shut down first, (RUN: Unload, POST LUBE, and drive vanes closed). After the vanes have been overdriven, closed and condenser water proven, the Free Cooling relays will be energized.

To disable Free Cooling and return to Powered Cooling, either disable the Free Cooling Mode in in the Operators Settings menu if used to enable Free Cooling or "OPEN" the external binary input switch to the Options Module if it was used to enable Free Cooling.

Once Free Cooling is disabled, the Free Cooling relays 1U5-J16, and 1U5-J20 and 1U5-J24 will de-energize allowing the Free Cooling valves to close. The Free Cooling valves end switches must close within 3 minutes or an MMR diagnostic is generated.

Once the end switches close the chiller will return to "AUTO" and powered cooling will resume if there is a call for cooling based on the differential to start.

Once powered cooling has resumed and the compressor has started, the inlet guide vanes will be held closed for 3 minutes to allow for temperature/pressure stabilization.

Note: The manual control of the inlet guide vanes is disabled while in the Free Cooling Mode and the compressor is prevented from starting by the control logic.

Note: The relay at 1U5-J20 is a FC auxiliary relay and can be used as required.

Hot Gas Bypass

The hot gas bypass (HGBP) control option is designed to minimize machine cycling by allowing the chiller to operate stably under minimum load conditions. In these situations, the inlet guide vanes are "locked" at a preset minimum position, and unit capacity is governed by the HGBP valve actuator.

Control circuitry is designed to allow both the inlet guide vanes and the HGBP valve to close for unit shutdown.

HGBP is enabled in the Field Startup Group of the Service Settings Menus by enabling the option and setting the HGBP Cut-in Vane Position in the same menu.

After a chiller starts and is running the inlet guide vanes will pass through the HGBP Cut-In Vane position as the chiller starts to load. As the chiller catches the load and starts to unload, the inlet guide vanes will close to the HGBP Cut-In Vane position. At this point the movement of the inlet guide vanes is frozen and further unloading of the chiller is controlled by the opening of the HGBP Valve 4B5 by the 1U10 module. The 1U10 module modulates the HGBP valve at low loads.

When the control algorithm determines the chiller to be shut down, the inlet guide vanes will be driven fully closed, and the HGBP valve will be driven closed. After the inlet guide vanes are fully closed the chiller will shut down in the Friendly mode.

Chillers with HGBP have a discharge temperature sensor (4RT6) monitoring the discharge gas temperature from the Compressor. If this temperature exceeds 200° F, the chiller will shut off on a MAR diagnostic. The chiller will reset automatically when this temperature drops 50° F below the trip-point.

Unit Start-Up Procedures

Daily Unit Start-Up

1. Verify the chilled water pump and condenser water pump starters are in "ON" or "AUTO".

2. Verify the cooling tower is in "ON" or "AUTO".

Note: Refer to Figure 28 for UCP Start-Run-Shutdown sequence and UCP timing functions.

3. Check the oil tank oil level; the level must be visible in or above the lower sight glass. Also, be sure to check the oil tank temperature; normal oil tank temperature before start-up is 140 ° F to 145 ° F (60 to 63 C).

Note: The oil heater is energized whenever power is supplied to the unit and the oil temperature is less than 140 ° F (60 C).

4. If the chiller is equipped with the free cooling option, ensure that the free cooling option is disabled in the Operator Settings menu.

5. Check the chilled water setpoint and readjust it, if necessary, in the Operator Settings menu.

6. If necessary, readjust the current limit setpoint in the Operators Setting menu.

7. Press "AUTO".

The UCP also checks compressor motor winding temperature, and a minimum 30 second delay is initiated if the winding temperature is less than 165 ° F. If it is greater than 165 ° F, however, a 15-minute delay period begins. The chilled water pump relay is energized and evaporator water flow is proven.

Next, the UCP checks the leaving evaporator water temperature and compares it to the chilled water setpoint. If the difference between these values is less than the start differential setpoint, cooling is not needed.

If the UCP determines that the difference between the evaporator leaving water temperature and chilled water setpoint exceeds the start differential setpoint, the unit enters the Initiate Start Mode and the oil pump and the condenser water pump are started.

If condenser water flow is not proven (i.e., flow switch 5S3 does not close) within 3 minutes, the unit is locked out on a MMR Diagnostic.

Oil pressure must be verified within 3 minutes or a MMR diagnostic is generated.

When less than 5 seconds remain on the restart inhibit, the pre-start starter test is conducted on Y-Delta starters. If faults are detected, the unit's compressor will not start, and a MMR Diagnostic will be generated.

After the pre-start Starter test, the UCP sends a start signal to the compressor motor. Within 2-seconds, 3 phases of current in the correct phase sequence must be detected. If there is no current, 1 or 2 phases missing, or reverse electrical sequence, diagnostics will occur. Acceleration and proof of transition must occur within 2.5-seconds of transition initiation, or unit start-up is aborted. (If this occurs, the unit goes into the post-lube mode, and a MMR diagnostic is generated.

If the compressor motor starts and accelerates successfully, "Unit is Running" appears on the display. At this time the purge unit will start operating on "Automatic" and will continue to operate as long as chiller compressor is running.

Note: Whenever the UCP detects a MMR diagnostic condition during start-up, unit operation is locked out, and manual reset is required before the start-up sequence can begin again. If the fault condition has not cleared, the UCP will not permit restart.

When the cooling requirement is satisfied, the UCP originates a "Shutdown" signal. The inlet guide vanes are driven closed for 50 seconds, and the unit enters a 2-minute post-lube period. The compressor motor and condenser water pump starter are de-energized immediately, but the oil pump continues to run during this 2-minute interval; the evaporator pump will continue to run.

Once the post-lube cycle is complete, the unit returns to the auto mode.

Seasonal Unit Start-Up

Note: Refer to Figure 28 for UCP Start-Run-Shutdown sequence and UCP timing functions.

1. Close all drain valves, and re-install the drain plugs in the evaporator and condenser headers.

2. Service the auxiliary equipment according to the start-up/maintenance instructions provided by the respective equipment manufacturers.

3. Vent and fill the cooling tower, if used, as well as the condenser and piping. At this point, all air must be removed from the system (including each pass). Then close the vent valves in the condenser water boxes.

4. Open all of the valves in the evaporator chilled water circuit.

5. If the evaporator was previously drained, vent and fill the evaporator and chilled water circuit. When all air is removed from the system (including each pass), close the vent valves in the evaporator water boxes.

6. Lubricate the external vane control linkage.

7. Check the adjustment and operation of each safety and operating control.

8. Close all disconnect switches.

WARNING: To prevent injury or death due to electrical shock or contact with moving parts, use care when measurements, adjustments, or other service-related operations are performed with power on.

9. Perform instructions listed in "Daily Unit Start-Up" section.

Unit Shutdown Procedures

Daily Unit Shutdown

Note: Refer to Figure 28 for UCP Start-Run-Shutdown sequence and UCP timing functions.

1. Press STOP.

2. After compressor shutdown turn Pump Contactors to off or open pump disconnects.

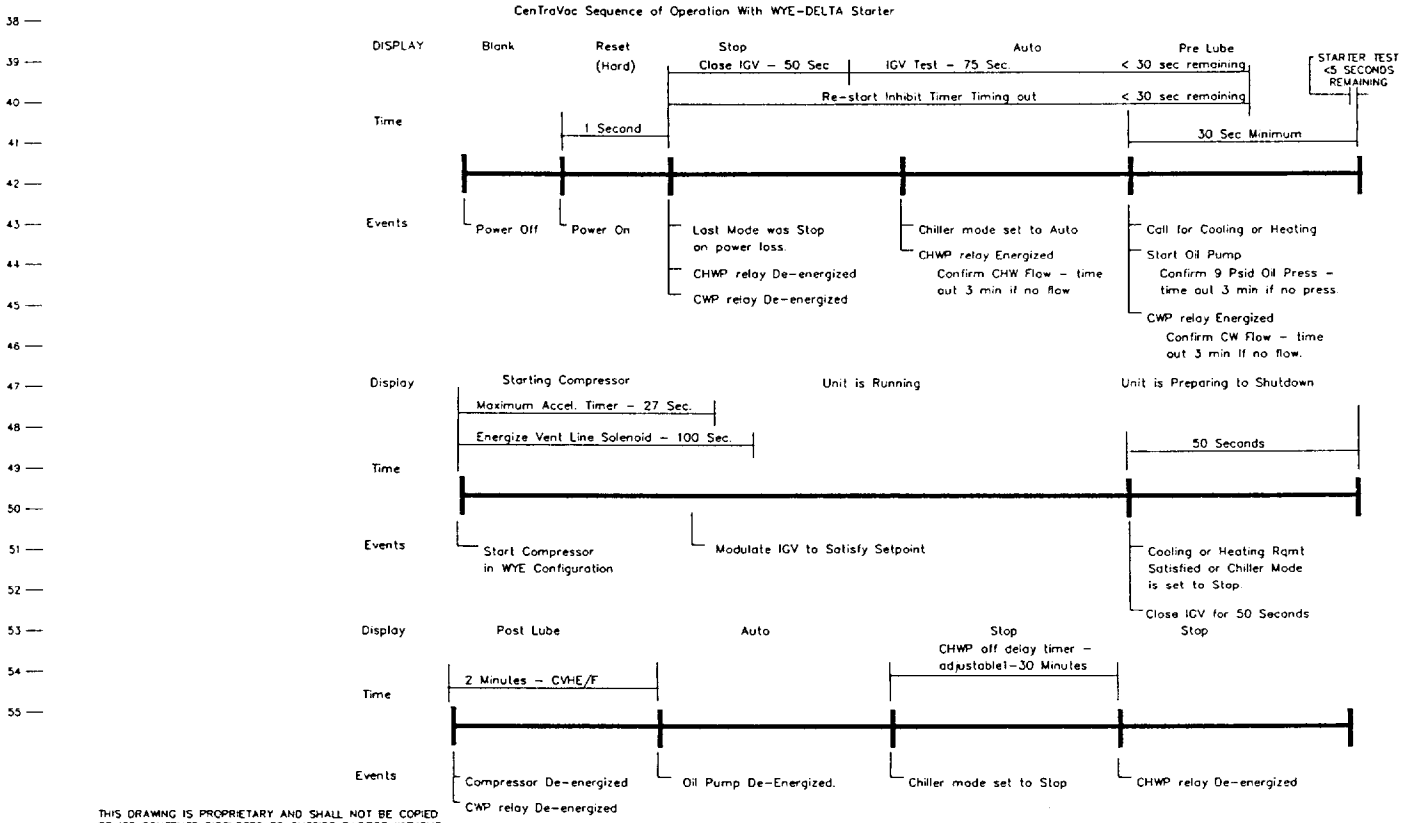
Seasonal Unit Shutdown

Note: Refer to Figure 28 for UCP Start-Run-Shutdown sequence and UCP timing functions.

1. Press STOP.

2. After compressor shutdown turn off the chilled water pump at the pump's push-button station. (Or, stop chilled water flow by the means devised for this particular application.)

Figure 28
CVHE/CVHF - UCP Sequence/Timing



3. Open all disconnect switches except the control power disconnect switch.

WARNING: To prevent injury or death due to electrical shock or contact with moving parts, use care when servicing system with power on.

CAUTION: Control Power disconnect must remain closed during entire shutdown period to allow oil sump heater operation. This prevents refrigerant from condensing in oil sump.

4. Drain the condenser piping and cooling tower, if used.

5. Remove the drain and vent plugs from the condenser headers to drain the condenser.

6. Once the unit is secured for winter, the maintenance procedures described under "Annual Maintenance" in the Periodic Maintenance section of this manual should be performed by qualified Trane service technicians.

Note: During extended shutdown, be sure to operate the purge unit for a 2-hour period every 2 weeks. this will prevent the accumulation of air and non-condensables in the machine. To start the purge change purge mode to "ON" in the Operator Settings Menu. Remember to turn the purge mode to AUTO after the 2-hour run time.

CAUTION: Do not allow the chiller to increase in temperature pressure while the unit is off, to a temperature above 110 ° F (43C) since this will cause the rupture disk to relieve and discharge the refrigerant from the machine. Continuous running of pumps while the machine is off may cause this condition to occur. The rupture disk is designed to relieve if the pressure in the evaporator exceeds 15 psig.

Trouble Analysis

If the red light on the control panel is flashing, an MMR diagnostic has occurred. See Diagnostic Section for trouble shooting information. The diagnostic must be analyzed, corrections made by qualified personnel and the MMR diagnostic reset before the chiller can be returned to operation.

Periodic Maintenance

Overview

This section describes the basic chiller preventive maintenance procedures, and recommends the intervals at which these procedures should be performed. Use of a periodic maintenance program is important to ensure the best possible performance and efficiency from a CenTraVac chiller.

Recommended purge maintenance procedures for the Purifier Purge unit are covered by PRG-OM-5

Periodic Maintenance

An important aspect of the chiller maintenance program is the regular completion of records. Provided at the end of this manual are copies of the "Annual Inspection Check List and Report", "CenTraVac with UCP2 Commissioning Checklist & Start-Up Test Log", a "Start-Up Test Log for Water Cooled CenTraVacs with UCP2 Control Panels" and "UCP2 "Settings Group" Menu Record". When filled out accurately by the machine operator, the completed logs can be reviewed to identify any developing trends in the chiller's operating conditions.

For example, if the machine operator notices a gradual increase in condensing pressure during a month's time, he can systematically check, then correct the possible cause(s) of this condition (e.g., fouled condenser tubes, non-condensibles in the system, etc.)

Daily Maintenance and Checks

[ ] Check the chiller's evaporator and condenser pressures, oil tank pressure, differential oil pressure and discharge oil pressure. Compare the readings with the values provided in Table 5 below.

CAUTION: If frequent purging is required (i.e., monitor purge pumpout rate) identify and correct source of air or water leak as soon as possible. Moisture contamina tion caused by leakage can shorten chiller life expectancy.

[ ] Check the oil level in the chiller oil sump using the 2 sight glasses provided in the oil sump head. When the unit is operating, the oil level should be visible in the lower sight glass.

Weekly Maintenance

[ ] Complete all daily maintenance procedures and checks.

Table 5
Normal Chiller Operating Characteristics

Operating Characteristic	Normal Reading
Evaporator Pressure	12" to 18" Hg (Vacuum)
Condenser Pressure **(See Notes 1 and 2)**	2 to 12 psig (standard condensers)
Oil Sump Temperature: Unit Not Running Unit Running	 140 to 145 F (60 to 63 C) 115 to 150 F (47 to 66 C)
Differential Oil Pressure	12 to 18 psid

Notes:

1. Condenser pressure is dependent on condenser water temperature, and should equal the saturation pressure of HCFC-123 at a temperature 5-10 F (-15 to -12 C) above that of leaving condenser water at full load.
2. Normal pressure readings for ASME condensers exceed 12 psig.
3. Oil Tank Pressure 12" to 18" Hg
   Discharge Oil Pressure 7 to 15 psig

Every 3 Months

WARNING: To prevent injury or death due to electrical shock or contact with moving parts, lock unit disconnect switch in open position.

[ ] Complete all recommended weekly maintenance procedures. (Refer to the previous sections for details.

[ ] Clean all water strainers in the CenTraVac water piping system.

Every 6 Months

WARNING: To prevent injury or death due to electrical shock or contact with moving parts, lock unit disconnect switch in open position.

[ ] Complete all recommended quarterly maintenance procedures.

[ ] Lubricate the vane control linkage bearings, ball joints, and pivot points; a few drops of light machine oil (e.g., SAE-20) is sufficient.

[ ] Drain the contents of the rupture disc/purge discharge vent-line drip-leg, into an evacuated waste container minimumly and more often if the purge is operated excessively.

Also, apply 1 or 2 drops of oil on the vane operator shaft and spread it into a very light film; this will protect the shaft from moisture and rust.

Off-Season Maintenance

During those periods of time when the chiller is not operated, be sure the control panel is energized.

Annual Maintenance

Shut down the chiller once each year to check the items listed below; a more detailed inspection checklist is provided on the "Model CVHE/ CVHF CenTraVac Annual Inspection Checklist and Report" illustrated in this manual.

[ ] Perform the annual maintenance referred to in the Maintenance Section of the purge manual.

[ ] Use an ice water bath to verify that the accuracy of the evaporator refrigerant temperature sensor (4RT5) is still within tolerance (i.e., + 2.0° F at 32° F).

If the evaporator refrigerant temperature displayed on the UCP's read-out is outside this 4-degree tolerance range, replace the sensor.

Note: If the sensor is exposed to temperature extremes outside its normal operating range (0° F to 90 °F) (-18° C to 32° C), check its accuracy at 6-month intervals.

Compressor Oil Change on CVHE/CVHF units.

[ ] Recommendations are to subscribe to an oil analysis program to determine the necessity to change oil, rather than change it automatically every year. This will reduce the chiller's overall lifetime oil consumption and minimize refrigerant emissions. A drain fitting is installed in the oil filter top, after the oil filter, for obtaining oil samples.

Oil Change Procedure

When oil analysis indicates the need to change compressor oil, use the following procedure for removing oil.

CAUTION: To prevent possible burnout of the oil sump heater, be sure to open control panel disconnect switch before draining the sump.

[ ] Draw the oil from the chiller through the oil charging valve on the chiller oil sump into an approved, evacuated tank; or,

[ ] Pump the oil from the chiller through the oil charging valve into an air-tight resealable container, using a magnetically-driven auxiliary pump.

Forcing the oil from the oil sump by pressurizing the chiller (i.e. by raising chiller temperature or adding nitrogen) is NOT recommended.

Refrigerant dissolved in the oil can be removed and returned to the chiller by using an appropriate deep-vacuum recovery unit and heating/agitating the oil container. Follow all Federal, state and local regulations with regard to disposal of waste oil.

Replacing Oil Filter

Replace oil filter: (1) annually, (2) at each oil change, (3) or if erratic oil pressure is experienced during chiller operation.

Replacement Procedure

[ ] Run oil pump for two to three minutes to insure that the oil filter is warmed up to oil sump temperature.

[ ] Close the shut-off valve after the oil filter. Turn the 3-way valve to a 45° angle from the normal operating position. This will allow the filter to drain into the sump. Allow to drain for 30 minutes. the drain time can be shortened by momentarily opening the oil sampling valve.

[ ] When filter is drained, close 3-way valve. Remove and replace filter. Place used oil filter in resealable container. Follow all state, federal and local regulations to disposal of filter.

Other Maintenance Requirements

[ ] Inspect the condenser tubes for fouling; clean if necessary.

[ ] Measure the compressor motor winding resistance to ground; a Qualified service technician should conduct this check to ensure that the findings are properly interpreted.

Contact a qualified service organization to leak-test the chiller; this procedure is especially important if the system requires frequent purging.

[ ] Use a nondestructive tube test to inspect the condenser and evaporator tubes at 3-year intervals.

Note: It may be desirable to perform tube tests on these components at more frequent intervals, depending upon chiller application. This is especially true of critical process equipment.

[ ] Depending on chiller duty, contact a qualified service organization to determine when to conduct a complete examination of the unit to discern the condition of the compressor and internal components.

Note: (a) Chronic air leaks, which can cause acidic conditions in the compressor oil and result in premature bearing wear; and, (b) Evaporator or condenser water tube leaks. Water mixed with the compressor oil can result in bearing pitting, corrosion, or excessive wear.

[ ] Submit a sample of the compressor oil to a Trane qualified laboratory for comprehensive analysis on an annual basis; this analysis determines system moisture content, acid level and wear metal content of the oil, and can be used as a diagnostic tool.

Lubrication

The only CVHE/CVHF chiller component that requires periodic lubrication is the external vane linkage assembly.

Lubricate the vane linkage shaft bearings and rod end bearings with a few drops of light-weight machine oil.

Refrigerant Charge

WARNING: To avoid injury or death due to inhalation of, or skin exposure to refrigerant, closely follow all safety procedures described in the Material Safety Data Sheet for the refrigerant containers. Certain procedures common to refrigeration system service may expose operating and/or servicing personnel to liquid and/or vaporous refrigerant.

The refrigerant charging procedure for Trane centrifugal chillers is:

1. If water is present in the tubes, break machine vacuum with refrigerant vapor, or circulate water, to avoid tube damage.

2. Always use refrigerant-compatible hoses or copper-tubing with self-sealing connections or shut-off valves.

3. Transfer the refrigerant using one of the following (listed in order of preference):

a. An approved Trane low-pressure refrigerant recovery/ recycle unit.

b. The available pressure differential.

c. Gravity. (Use a return vent line to refrigerant drums to equalize pressure.)

d. A mechanical gear pump with compatible seals, or a magnetically-driven pump.

4. When charging from new drums, use fitting designed for use with 3/4-inch center drum bung of 2-inch bung. Figure 29 shows Drum Bung Fitting with Quick Connect Coupling.

5. Do not use dry nitrogen to push refrigerant into the chiller as was common practice in the past. This will contaminate the charge and require excessive purging, which will result in unnecessary release of refrigerant.

6. Weigh in the proper charge.

7. Use recovery/recycle unit or vacuum pump to evacuate hoses; discharge outdoors.

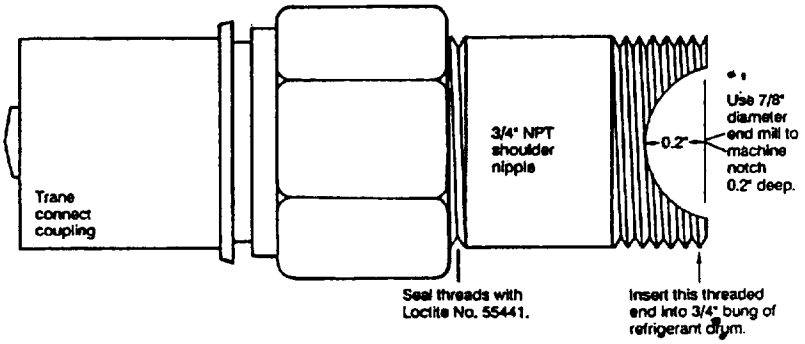
Recovery/Recycle Connections

To facilitate refrigerant removal and replacement, newer-design CVHE and CVHF units are provided with a 3/4-inch vapor fitting with shutoff valve on the chiller suction and with a 3/4-inch liquid connection with shutoff valve at the bottom of the evaporator shell.

Leak Testing

To leak-test a chiller containing full refrigerant charge, raise chiller pressure using a controlled hot water or electric-resistance system to a maximum of 8 psig. Do not use nitrogen, which will cause excessive refrigerant discharge by the purge system.

Figure 29
Trane-Designed Drum Bung Fitting w/Quick-Connect Coupling



Cleaning the Condenser

CAUTION: Do not use untreated or improperly treated water, or equipment damage may occur.

Condenser tube fouling is indicated when "the approach" temperature (i.e., the difference between the refrigerant condensing temperatures) is higher than predicted.

If the annual condenser tube inspection indicates that the tubes are fouled, 2 cleaning methods mechanical and chemical can be used to rid the tubes of contaminants.

Use the mechanical cleaning method to remove sludge and loose material from smooth-bore tubes.

(To clean other types of tubes including internally-enhanced types, consult a qualified service organization for recommendations).

1. Remove the retaining nuts and bolts from the water box covers at each end of the condenser. Use a hoist to lift the covers off the water box (A threaded connection is provided on each water box cover to allow insertion of an eyebolt).

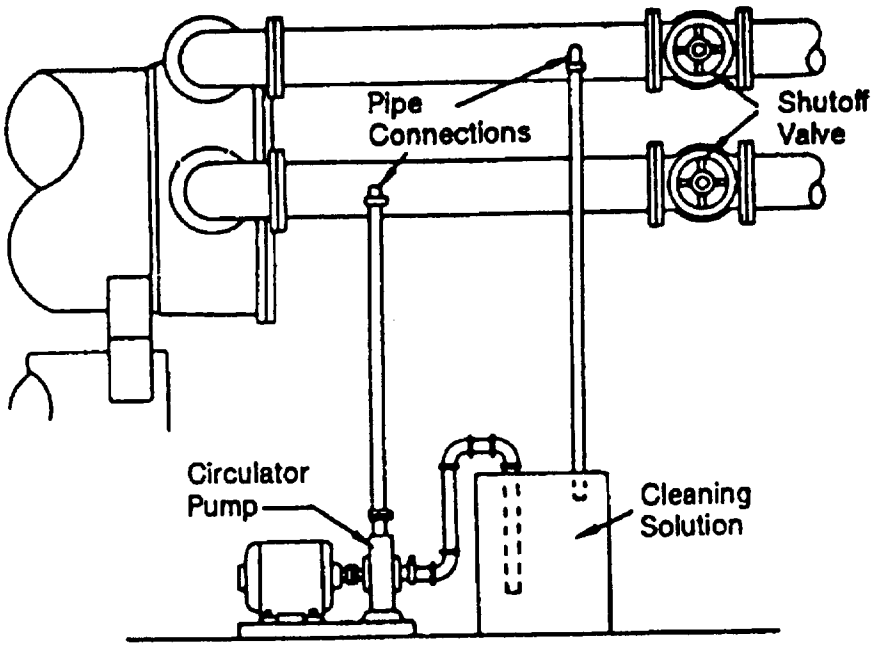
2. Work a round nylon or brass bristled brush (attached to a rod) in and out of each of the condenser water tubes to loosen the sludge.

3. Thoroughly flush the condenser water tubes with clean water.

Scale deposits are best removed by chemical means. Be sure to consult any qualified chemical house in the area (i.e., one familiar with the local water supply's chemical mineral content) for a recommended cleaning solution suitable for the job. (Remember a standard condenser water circuit is composed solely of copper, cast iron and steel).

A typical chemical cleaning setup is illustrated in Figure 30.

Figure 30
Typical Chemical Cleaning Setup



CAUTION: Improper chemical cleaning can damage tube walls.

CAUTION: All of the materials used in the external circulation system, the quantity of the solution, the duration of the cleaning period, and any required safety precautions should be approved by the company furnishing the materials or performing the cleaning.

Remember, however, that whenever the chemical tube cleaning method is used, it must be followed up with mechanical tube cleaning, flushing and inspection.

Cleaning the Evaporator

Since the evaporator is typically part of a closed circuit, it does not accumulate appreciable amounts of scale or sludge. Normally, cleaning every 3 years is sufficient. However on open CVHE/CVHF systems, such as air washers, periodic inspection and cleaning is recommended.

Control Settings And Adjustments

A list of CVHE/CVHF time delays and safety control cutout settings is provided in Table 1 in the Chiller Control System section of this manual. For control calibration and check-out, contact a Trane qualified service organization.

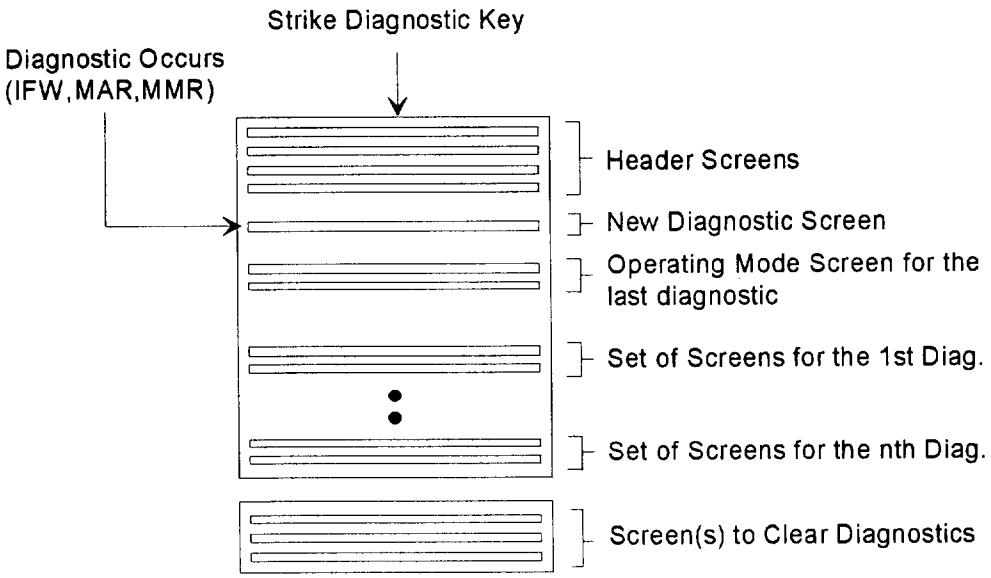
Purge System

Because some sections of the chiller's refrigeration system operate at less-than-atmospheric pressure, the possibility exists that air and moisture may leak into the system. If allowed to accumulate, these non-condensibles become trapped in the condenser; this increases condensing pressure and compressor power requirements, and reduces the chiller's efficiency and cooling capacity.

The Trane Purifier Purge is the only purge system available for the CVHE/CVHF chiller. The purge is designed to remove non-condensible gasses and water from the refrigeration system. Purifier Purge unit operation, maintenance and trouble shooting is covered by a separate operation and maintenance manual (PRG-OM-5).

Diagnostics

The Diagnostics Group is where all diagnostics, both historical and active are presented. The group also contains the facility to clear active diagnostics, historic diagnostics, and purge diagnostics individual groups. In order to clearly annunciate the occurrence of a diagnostic, the display will automatically go to this men and display certain messages as explained below. the following illustration gives an overview of how the diagnostic key and screens below it work.



Diagnostics Group Heading

Active & Historic Diagnostics
Press (Next) (Previous) to continue

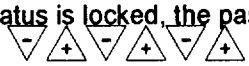
Menu Settings Password

If the Menu Settings Password is Enabled in the Service Setup Group, following each setting group heading the following will be displayed:

Settings In This Menu Are [status]

[password message]

Likewise, if the Menu Settings Password is Disabled in the Service Setup Group the above screen will be suppressed.

The possible values for status are "Locked" or "unlocked". If the password status is locked, the password message will be "Enter Password to Unlock". The user will then depress  followed by the Enter key. The password keystrokes will be echoed to the screen as a visual aide. The last six keystrokes represent the current password, and up to twenty keystrokes can be entered. An incorrect password, or the twenty-first keystroke will result in the password message "Invalid Password".

If the password status is unlocked, the password message will be "Press (Enter) to Lock". Whenever a password is in use the "Press  to change setting", message will be suppressed. Any attempt to change the setting will result in the message "Setting is Locked". The password once entered will remain valid until canceled.

Diagnostics and Annunciation

If there are no diagnostics present, only the following screen will be displayed under the Diagnostics Group heading screen.

No Diagnostics Present
Press (Next) (Previous) to continue

If there are any diagnostics present, the following 3 screens are displayed sequentially when the Next key is pressed. The first screen is:

Diagnostics Report Follows
Press (Next) for More

The second screen is:

Press (Next) to display operating mode
at time of last diagnostic

The third screen will be the chiller operating mode display that was present at the time that the most recent diagnostic occurred.

If there are one or more diagnostics present, the following displays will be inserted into the display sequence. Diagnostics will be listed in order of occurrence from newest to oldest. Diagnostics will be displayed on 2 screens. The two screens will vary slightly depending on whether the diagnostic is active or historic.

The first active diagnostic screen will be.

Press (Next) to display operating mode
at time of last diagnostic

The sequence number will run from 1 through n (n<=20) and number the diagnostics sequentially where the most recent diagnostic is sequence number [01].

The possible replacements for "diagnostic type" are:

Warning Only - Reset Not Reqd (Applies to all IFW diagnostics)
Unit Shutdown - Reset reqd (Applies to all MMR diagnostics)
Unit Shutdown - Automatic Reset (Applies to all MAR diagnostics)

The second active diagnostic display screen will contain the diagnostic sequence number, a time and date stamp, and a help message suggesting possible service procedures. The second active diagnostic display screen will be:

[sn] occurred at HH:MM xm Mon xx, 199X
[help message]

The time will be displayed as xx:xx am/pm.
The date will be displayed as month - date - year.
The month will use a standard 3-letter abbreviation. The year will not be abbreviated.

Depressing the next key will advance the display to the next diagnostic in the sequence.

The first historic diagnostic screen will be:

[sequence number] [Diagnostic]
Historic Only, Press (Next) for More

The definitions of diagnostic and sequence number are the same as for the active diagnostic messages. If Next is pressed the second historic diagnostic screen is displayed. The second historic diagnostic screen will be:

[sn] occurred at HH:MM xm Mon xx, 199x
Historic Only, Reset At End of Diag Menu

Up to 20 diagnostics will be displayed.

Clearing Diagnostics

At the end of the diagnostic menu, there will be 3 screens which allow the user to Clear/Reset the different diagnostic groups.

If any active diagnostics are present, the following screen will be displayed:

Press (Enter) to Clr Active Diagnostics
and Shutdown/Reset System

If the enter key is depressed, the following message is displayed for 2 seconds:

Active Diagnostics Have Been Cleared
System is Resetting

The display will be reset to the operating mode screen of the chiller report after this message clears.

If any historic diagnostics are present, the following screen will be displayed:

Press (Enter) to
Clear Historic Diagnostics

If the enter key is depressed, the following message is displayed for 4 seconds:

Historic Diagnostics Have Been Cleared
Diagnostic Report is Being Reset

The display will be reset to the top of the Diagnostic Menu after this message clears.

If any purge diagnostics are present, the following screen will be displayed:

Press (Enter) To
Clear Purge Diagnostics

If the enter key is depressed, the following message is displayed for 4 seconds:

Purge Diagnostics Have Been Cleared
Diagnostic Report is Being Reset

The display will be reset to the top of the Diagnostic Menu after this message clears.

New Diagnostic Display

When a new diagnostic is sensed by the system, the display will reset to the diagnostic menu. A "one-time" screen will be displayed to inform the user that a new diagnostic has been detected. this screen will vary depending on the type of diagnostic detected. The two major categories of diagnostics are those which are informational only, and those which have resulted in machine shutdown.

If the diagnostic is an MMR/MAR, the screen will be:

A MACHINE SHUTDOWN HAS OCCURRED
Press (Next) for More

Otherwise, the screen will be:

A new warning has been detected
Press (Next) for More

This screen will be inserted into the diagnostic menu directly after the "Diagnostic Report Follows" screen. Pressing (Next) will therefore take the user to the "Press (Next) to display operating mode at time of last diagnostic" screen. If (Net) or (Prev) is pressed, this screen will no longer be in the display sequence.

Diagnostic Codes

As shown below, a "LATCHING" diagnostic is a condition which shall cause the machine or a portion of the machine as noted to shut down and shall require a manual reset to restore operation. A diagnostic that is non-latching shall reset automatically when the condition causing the diagnostic goes away. A non-latching diagnostic shall shut down the machine or a part of the machine if so indicated. If a diagnostic is informative only, no machine or circuit action is taken except to load a diagnostic code into the last diagnostic register.

Unless otherwise stated, all active diagnostics will be lost on loss of power.
DIAGNOSTIC TYPES AND ACTION:

MMR = MACHINE SHUTDOWN - MANUAL RESET
MAR = MACHINE SHUTDOWN - AUTO RESET
CMR = CIRCUIT SHUTDOWN - MANUAL RESET Applies to Multible Rfgt Circuit Units Only - Defaults to an MMR on single Circuit Units.
CAR = CIRCUIT SHUTDOWN - AUTO RESET Applies to Multible Rfgt Circuit Units Only - Defaults to an MAR on single Circuit Units.
IFW = INFORMATION - WARNING May or may not affect machine operation; lowest level of diagnostic.

REMOTELY RESETTABLE DIAGNOSTICS:

Except for the following, all diagnostics can be reset remotely from either the Remote Clear Language Display, the Tracer, or the External Diagnostic Reset input at the Options Module. The following diagnostics shall only be resettable ONLY at the Local Clear Language Display, e.g. with the operator standing at the unit.

DIAGNOSTIC DESCRIPTION	Appl Unit Type	Code	Diag Type	Can Be Remotely Reset
Starter Contactor Interrupt Failure	**All**	**CA**	**MMR**	**No**
Phase Loss	**All**	**E4**	**MMR**	**No**
Phase Reversal	**All**	**E5**	**MMR**	**No**
High Bearing #1 Temp	**CTV**	**EA**	**MMR**	**No**
High Bearing #2 Temp	**CTV**	**Eb**	**MMR**	**No**
Current Overload	**All**	**EC**	**MMR**	**No**
Starter did not Transition	**CTV**	**F0**	**MMR**	**No**
High Pressure Cutout Tripped	**All**	**F5**	**MMR**	**No**
Low Evap Rfgt Temp.	**All**	**Fb**	**MMR**	**No**
Emergency Stop Input	**All**	**Fd**	**MMR**	**No**
Starter Dry Run Test	**All**	**188**	**MMR**	**No**
Solid State Starter Fault Rly Clsd	**CTV**	**189**	**MMR**	**No**
High Motor Temp Position #1	**CTV**	**18b**	**MMR**	**No**
High Motor Temp Position #2	**CTV**	**18C**	**MMR**	**No**
High Motor Temp Position #3	**CTV**	**18d**	**MMR**	**No**
Severe Phase Unbalance	**All**	**1b2**	**MMR**	**No**
Starter Fault Type I	**CTV**	**1E9**	**MMR**	**No**
Starter Fault Type II	**CTV**	**1Ed**	**MMR**	**No**
Starter Fault Type III	**CTV**	**1F1**	**MMR**	**No**
Cprsr did not Accelerate Fully	**CTV**	**1F5**	**MMR**	**No**

The following are samples of applicable diagnostics.

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
Aux/Ht Rcvry Ent Water Temp Sensor	IFW	All	Open or shorted and Heat Recovery is installed (at the CLD).	Check Sensor, Wiring, and Connections
Aux/Ht Rcvry Lvg Water Temp Sensor	IFW	All	Open or shorted and Heat Recovery is installed (at the CLD).	Check Sensor, Wiring, and Connections
Bearing Temp Sensor #1	MMR	All	Open or Short, only if this option is enabled at the Human Interface.	Check Sensor, Wiring And Connections
Bearing Temp Sensor #2	MMR	All	Open or Short, only if this option is enabled at the Human Interface.	Check Sensor, Wiring And Connections
Check Clock	IFW	All	On loss of power the clock does not keep time, if there is an extended power loss (greater than 15 seconds) this diag. is also generated to alert the operator to check the clock.	Check Main Power Supply, Reset Clock
Chilled Water Flow Lost	MAR	All modes except STOP (00) and EXTERNAL STOP (100)	a. The chilled water flow switch input was open for more than 6-10 contiguous seconds. b. 6-10 seconds of contiguous flow shall clear this diagnostic.	Check Pump, Valves, Flow Switch
Chiller Mod Ref Voltage Calibration	IFW	All	An improper reference voltage was detected at the Chiller Module. A 2.5 vdc reference is used to calibrate the non-ratiometric analog I/O such as 2-10vdc and 4-20ma inputs as well as PWM Analog outputs. The micro checks to see that the A/D value falls within an acceptable range.	Check Chiller Module Voltages
Chiller: Loss of Comm with TCI	IFW	All	The Tracer was setup as "installed" at the CLD and the chiller module lost communicaitons with the TCI (comm 3 or comm 4) module for 15 contiguous seconds	Check IPC Wiring/Connections
Chiller:Loss of Comm with Circuit	MMR	All	The chiller module lost communications with the Circuit module for 15 contiguous seconds.	Check IPC Wiring/Connections
Chiller:Loss of Comm with Local CLD Note: As implemented this is a latching IFW diagnostic. That is, once generated it cannot be re-generated until a manual reset is done.	IFW-AR	All	The chiller module lost communications with the LCLD module for 15 contiguous seconds.	Check IPC Wiring/Connections
Chiller:Loss of Comm with Options	IFW	All	The chiller module lost communications with the Options module for 15 contiguous seconds. This IFW diagnostic is generated if Free Cooling is Not Installed, otherwise this is an MMR diag. under code 2F6	Check IPC Wiring/Connections
Chiller:Loss of Comm with Options	MMR	All	The chiller module lost communications with the Options module for 15 contiguous seconds. This MMR diagnostic is generated if Free Cooling is Installed, otherwise this is an IFW diag. under code 2AE	Check IPC Wiring/Connections
Chiller:Loss of Comm with Purge	IFW	All	The chiller module lost communications with the Purge module for 15 contiguous seconds.	Check IPC Wiring/Connections
Chiller:Loss of Comm with Starter	MMR	All	The chiller module lost communications with the Starter module for 15 contiguous seconds.	Check IPC Wiring/Connections
Chiller:Loss of Comm with Stepper #1	MMR	All	The chiller module lost communications with the Stepper #1 module for 15 contiguous seconds.	Check IPC Wiring/Connections
Chlr Sat Cond Temp Sensor (Purge) (As Sensed by the Purge module in Retrofit applicaitons)	IFW	All	Open or Shorted Sensor a. Applies to Retrofit applications of the Purge Only. Does not apply to UCP2 applications. b. IFW to the chiller, MMR to the Purge.	Purge Inop: See Purge O & M Manual
Circuit Mod Ref Voltage Calibration	IFW	All	An improper reference voltage was detected at the Circuit Module. A 2.5 vdc reference is used to calibrate the non-ratiometric analog I/O such as 2-10vdc and 4-20ma inputs as well as PWM Analog outputs. The micro checks to see that the A/D value falls within an acceptable range.	See Troubleshooting Service Bulletin
Circuit Module 24 Vdc Ref Missing	IFW	All	24vdc reference missing and the Rfgt monitor is installed.	Check Rfgt Monitor Wiring/24 Vdc Supply.

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
Circuit:Loss of Comm with Chiller	MMR	All	The circuit module lost communications with the Chiller module for 15 contiguous seconds. On loss of communications, the circuit module shall run the oil pump for the post lube time and then turn the oil pump off. On loss of communications, the circuit module shall continue to control the oil heater.	Check IPC Wiring/Connections
Circuit:Loss of Comm with Starter	MMR	All	The circuit module lost communications with the Starter module for 15 contiguous seconds.	Check IPC Wiring/Connections
Cond Diff Water Press Transducer	IFW	All	Input Shorted or Open and the Diff. water pressure sensing option, > 150 psig, is "installed" at the CLD.	Check Sensor, Wiring, and Connections
Cond Entering Wtr Temp Sensor	IFW	All	Open or Short	Check Sensor, Wiring And Connections
Cond Leaving Wtr Temp Sensor	IFW	All	Open or Short. a. IFW on Chilled Water Control b. MMR on Heat Pump (Hot Water) Control.	Check Sensor, Wiring And Connections
Condenser Rfgt Pressure Sensor	MMR	All	Open or Short. Must Hold on open AND short input is 2.0 Psia. Design: Both opens and shorts result in the pressure going to the low end of the scale. Therefore a Must Hold on the high pressure end is not required.	Check Sensor, Wiring And Connections
Condenser Rfgt Temp Sensor	MMR	All	Open or Short	Check Sensor, Wiring And Connections
Condenser Water Flow Lost	MAR	Start and All Run Modes.	The condenser water flow switch input was open for more than 6-10 contiguous seconds.	Check Pumps, Valves, Flow Switch
Condenser Water Flow Overdue	MMR	Estab. Cond Water Flow	Condenser water flow was not proven within 3 minutes of the condenser pump relay being energized.	Check Pump, Valves, Flow Switch
Condenser Water Pressure Sensor	MMR	All	Open or Short and the Cond Water Pressure Sensor is setup as installed at the Clear Language Display .	Check Sensor, Wiring, and Connections
Cprsr did not Accelerate Fully	MMR	Starting	a. Using either a Solid State Starter or a Variable Speed Drive the UCM did not receive an Up to Speed or At Speed Signal within the Maximum Acceleration Timer Setting. b. The Up to Speed/At Speed input was found to be shorted before the compressor was started. c. Applies only to Solid State Starters and Variable Speed Drives.	Check End of Limt/At Speed Input
Cprsr did not Accelerate: Shutdown	MMR	Start Mode	a. The compressor did not come up to speed in the allotted time defined by the Maximum Acceleration Timer. b. The Human Interface setups defined "Shutdown" as the action when the Maximum Acceleration Timer was exceeded.	Check Main Power Supply & Wiring
Cprsr Did Not Accelerate: Transition (The Motor is put across the line.)	IFW	Start Mode	a. The compressor did not come up to speed in the allotted time defined by the Maximum Acceleration Timer. b. The Human Interface setups defined "Transition" as the action when the Maximum Acceleration Timer was exceeded.	See Troubleshooting Service Bulletin
Current Overload	MMR	All Running Modes	Motor current exceeded overload time vs trip characteristic.	Check Main Power Supply & Wiring
Current Overload Setpts Error	IFW	All	a. The redundant overload settings did not agree for 30 contiguous seconds. (Continue to use the previous value for the 30 second timeout.) When this diagnostic occurs the affected Starter Module shall use the minimum (00000 binary, 00 decimal) overload setting as a default until either the UCM is reset or, if the redundant settings agree again , the starter module can go back to using the actual setting.	Review Overload Set Up

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
CWS/Leaving Wtr Temp. Cutout Setpt Overlap	None	All	No diagnostic, limit value to last legal value and tell the operator about it on the second line of the display. NOTE: The above is not a diagnostic because you don't want the display vectoring you to a different display state when you are trying to set either the chilled water setpoint or the leaving water temp. cutout setpoint as it will in the case of a diagnostic.	N/A
Differential Oil Pressure Overdue	MMR	Pre-Lube	A differential oil pressure 0f 9 psid was not established within 3 minutes of starting the Oil Pump in the Pre-Lube Mode. Design: Some hysteresis was introduced into this diagnostic. 9 psid is the criteria to establish pre-lube oil flow and 8 psid is used to define a loss of oil flow on pre-lube.	See Troubleshooting Service Bulletin
Discharge Temp Sensor	MMR	All	Open or Short, only if HGBP and the Discharge Temp. Sensor is called out as "Installed" at the Human Interface.	Check Sensor Wiring And Connections
Emergency Stop Input	MMR	All	a. EMERGENCY STOP input is open. An external interlock has tripped. Time to trip from input opening to unit stop shall be 0.1 to 1.0 seconds.	Check Emergency Stop Input Device
Evap Diff Water Press Transducer	IFW	All	Input Shorted or Open and the Diff. water pressure sensing option, > 150 psig, is "installed" at the CLD.	Check Sensor, Wiring, and Connections
Evap Entering Wtr Temp Sensor	IFW	All	Open or Short a. Normal operation, no effects on control. b. Chilled Water Reset, Will just run at either normal CWS or will run at maximum reset permitted.	Check Sensor, Wiring And Connections
Evap Leaving Water Temp Sensor	MMR	All	Open or Short	Check Sensor, Wiring And Connections
Evap Rfgt Temp Sensor	MMR	All	Open or Short	Check Sensor, Wiring And Connections
Evap Water Pressure Sensor	MMR	All	Open or Short and the Evap Water Pressure Sensor is setup as installed at the Clear Language Display .	Check Sensor, Wiring, and Connections
Evaporator Water Flow Overdue	MAR	Estab. Evap. Water Flow on going from STOP to AUTO.	Evaporator water flow was not proven within 3 minutes of the Evaporator pump relay being energized.	Check Pump, Valves, Flow Switch
Ext Energy Valve Position Setpt	MMR	All	a. Not "Enabled": no diagnostics. b. "Enabled ": Out-Of-Range Low or Hi, set diagnostic.	Check Signal at Input
Extended Compressor Surge	MMR	All Running Modes	An extended Surge condition was detected and the Surge protection feature was Enabled at the Clear Lang. Display.	Check Condenser Water Temp.
Extended Power Loss Note: This diagnostic and the functions tied to it are handled by the Check Clock diagnostic.	IFW	All	The unit lost power for an extended period of time. On CTV units if power is lost for an extended period of time the oil pump is not run on Power Up. If a power loss is determined to be a Momentary Power Loss the Oil Pump is run on the Power Up to Post Lube the bearings. The deciding factor determining if a power loss is Extended or Momentary is TBD.	Check Main Power Supply & Wiring
External Chilled Water Setpoint	IFW-AR	All	a. Not "Enabled": no diagnostics. b. "Enabled ": Out-Of-Range Low or Hi, set diagnostic, default CWS to next level of priority (e.g. Front Panel SetPoint). This IFW diagnostic will automatically reset if the input returns to the normal range.	Check Signal At Input

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
External Current Limit Setpoint	IFW-AR	All	a. Not "Enabled": no diagnostics. b. "Enabled ": Out-Of-Range Low or Hi, set diagnostic, default CLS to next level of priority (e.g. Front Panel SetPoint. This IFW diagnostic will automatically reset if the input returns to the normal range.	Check Signal At Input
External Hot Water Setpoint	IFW-AR	All	a. Not "Enabled": no diagnostics. b. "Enabled ": Out-Of-Range Low or Hi, set diagnostic, default HWS to next level of priority (e.g. Front Panel SetPoint). This IFW diagnostic will automatically reset if the input returns to the normal range.	Check Signal At Input
External Vane Position Setpoint	MMR	All	a. Not "Enabled": no diagnostics. b. "Enabled ": Out-Of-Range Low or Hi, set diagnostic.	Check Signal at Input
Free Cooling Valves	MMR	When exiting Free cooling	a. The Free Cooling Valves were commanded to close and did not close in the three minutes allowed for closure. And FC is installed (at the CLD) and commanded off. b. The Free Cooling Valves were commanded to open and did not open in the three minutes allowed for closure. And FC is installed (at the CLD) and commanded On.	Check Clsd End-Switches, Valves, Wiring
Heat Sink Temp Sensor	IFW	All	Open or Short and Solid State Starter installed.	Check Sensor Wiring And Connections
High Bearing #1 Temp	MMR	All starting and running modes	a. The bearing temperature at sensor #1 exceeded 180 + or - 5 F (82.2 C) for 0.5 - 2 seconds (Note: BT, WT, and DT may be "instantaneous trip" but consistent with the analog input filtering function.), and b. This function is enabled at the Human Interface.	Check Oil System
High Bearing #2 Temp	MMR	All starting and running modes	a. The bearing temperature at sensor #2 exceeded 180 + or - 5 F (82.2 C) for 0.5 - 2 seconds (Note: BT, WT, and DT may be "instantaneous trip" but consistent with the analog input filtering function.), and b. This function is enabled at the Human Interface.	Check Oil System
High Cprsr Discharge Temp.	MAR	All	a. The discharge temp. exceeded the trip value; 200 F + or - 5 F for CVHE/F, CVG and CVA. The Discharge Temp Cutout is adjustable at the Human Interface. b. Time to trip from trip value exceeded shall be 0.5 to 2.0 seconds. (Note: BT, WT, and DT may be "instantaneous trip" but consistent with the analog input filtering function.) d. The diag. shall reset automatically 50 F below the trippoint.	See Troubleshooting Service Bulletin
High Motor Temp Position #1	MMR	Any Start and Run Mode	The Motor winding temp. at sensor #1 exceeded 265 F + or - 15 F for 0.5 - 2 seconds. (Note: BT, WT, and DT may be "instantaneous trip" but consistent with the analog input filtering function.)	See Troubleshooting Service Bulletin
High Motor Temp Position #2	MMR	Any Start and Run Mode	The Motor Winding Temp. at sensor #2 exceeded 265 F + or - 15 F for 0.5 - 2 seconds. (Note: BT, WT, and DT may be "instantaneous trip" but consistant with the analog input filtering function.)	See Troubleshooting Service Bulletin
High Motor Temp Position #3	MMR	Any Start and Run Mode	The Motor Winding Temp. at sensor #3 exceeded 265 F + or - 15 F for 0.5 - 2 seconds. (Note: BT, WT, and DT may be "instantaneous trip" but consistent with the analog input filtering function.)	See Troubleshooting Service Bulletin

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
High Oil Temp	MMR	All starting and running Modes	UCP2 shall provide a fixed High Oil Temperature Cutout of 180 F (82.2 C). If the oil temperature violates the cutout by 120 degree F seconds (66.6 degree C seconds) an MMR diagnostic shall be generated.	Check Oil System
High Pressure Cutout Tripped	MMR	All	A high pressure cutout was detected. See the trip points for the various products under the HPC switch description of this specification.	Check Condenser Water Temp.
High Restart Inhibit Timer Warning	IFW	All	The Restart Inhibit timer has reached a maximum threshold for the host chiller. For CTV chillers this is 45 minutes. This indicates excessive chiller cycling, steps should be taken to correct this.	Check for Excessive Chiller Cycling
High Vacuum Lockout	MMR	Pre-Start	The Oil Tank Pressure transducer shall be used to sense for very low pressures in all Non-running cprsr modes.	See Troubleshooting Service Bulletin
IGV BPI Found Low During Search	IFW	All	The Inlet Guide Vane Actuator Binary Position Indicator was found too low in the stroke of the IGV during the BPI search.	Check Stepper Module, Wiring, & Motor
IGV BPI Not Found During Search	IFW	All	The Inlet Guide Vane Actuator Binary Position Indicator was not found over the entire stroke of the IGV during the BPI search.	See Troubleshooting Service Bulletin
IGV BPI Shorted	IFW	Pre-Start	At what is believed to be a closed position, the IGV BPI was found to be shorted.	Check Sensor, Wiring, and Connections
IGV Electrical Drive Circuit Open (Available CTV Phase ?? release)	MMR	On Demand and Pre-Start	Run the IGV Acturator electrical drive circuit test both on demand from the human interface and just before the chiller starts.	See Troubleshooting Service Bulletin
Incorrect Chiller Software Installed	MMR	All	The incorrect Eprom was loaded into this module. This diagnostic is detected when a factory test computer sets the unit type to something other than what the Eprom software was intended for.	(No message is required.)
Incorrect Stepper Software Installed	MMR	All	The incorrect Eprom was loaded into this module. This diagnostic is detected when a factory test computer sets the unit type to something other than what the Eprom software was intended for.	(No message is required.)
Low Chilled Water Temp: Unit Off (Unit in Auto but not Starting or Running)	IFW-AR	Unit in Auto and No Ckt's Energzd (Any Ckt(s)Energzd)	a. The chilled water temp. fell below the cutout setpoint while the compressor (or Solution Pump) was not running for 30 degree F Seconds. Automatic Reset of the IFW diag shall occur 2 degrees F (1.1 C) above the cutout setpoint.	Check Flow, Sensor, & Wiring
Low Chilled Water Temp: Unit On (Unit Starting or Running)	MAR	Any Ckt(s) Energzd (No Ckt's Energzd)	a. The chilled water temp. fell below the cutout setpoint while the compressor (or Solution Pump) was running for 30 degree F Seconds. Automatic Reset of the MAR diag shall occur 2 degrees F (1.1 C) above the cutout setpoint.	Check Flow, Sensor, & Wiring
Low Differential Oil Pressure	MMR	All starting and running Modes	Pre-Lube Mode on CVHE/F Chillers: a. See Diagnostic: Differential oil pressure overdue. Start & Run Mode on CVHE/F Chillers: a. If during these modes the Differential oil pressure drops below 9 PSID for more than 90 Psid Seconds, an MMR diagnostic shall be generated. The 90 Psid Seconds integral shall be reset to zero when the differential pressure rises above 9 psid.	Check Oil System
Low Evap Rfgt Temp.	MMR	Starter Contactor Energized	a. The Saturated Evap Rfgt Temp dropped below the Low Rfgt Temp. Cutout Setpoint when the circuit was running for 30 degree F seconds.	Check Operation, Call Service
Low Evap.Water Flow (To be implemented in CTV Phase C release and ABS Phase B release.)	IFW	All Running Modes	a. The evap. water flow measurement option was installed and the flow dropped to a setpoint set at the CLD.	See Troubleshooting Service Bulletin

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
Low Evap.Water Flow (To be implemented in CTV Phase C release and ABS Phase B release.)	IFW	All Running Modes	a. The evap. water flow measurement option was installed and the flow dropped to a setpoint set at the CLD.	See Troubleshooting Service Bulletin
Low Oil Temp	MAR	All Non-running Modes.	The oil temperature dropped below it's adjustable Low Oil Temp. Cutout. ("Instantaneous trip" but consistant with the analog input filtering function.) Automatic Reset of the MAR diag shall occur 5 degrees F (2.8 C) above the cutout setpoint.	See Troubleshooting Service Bulletin
Max Acceleration Setpts Error	IFW	All	a. The redundant Maximum Acceleration settings did not agree for 30 contiguous seconds. (Continue to use the previous value for the 30 second timeout.) When this diagnostic occurs the affected Starter Module shall use 6 seconds as a default until either the UCM is reset or, if the redundant settings agree again, the starter module can go back to using the actual setting.	Review Max Acceleration Set Up
Max Pumpout Rate Exceeded (Prg)	IFW	All	a. IFW to the chiller, MAR to the Purge.	Purge Inop: See Purge O & M Manual
Max Pumpout Rate Exceeded-Svc (Prg)	IFW	All	a. IFW to the chiller, MAR to the Purge.	Purge Inop: See Purge O & M Manual
Memory Error Type I: NOVRAM	MMR	On UCM Power Up or following a Type II Memory error diag.	a. On UCM either power up or following a Type II Memory Error a NOVRAM memory error was detected. The UCM is operating on all Engineering ROM defaults for all setup parameters. Check all setup parameters and continue to run chiller. Replace the Chiller Module as soon as a replacement is available. Note: It is expected that this diagnostic will be detected on the very first power up of the Chiller Module at the Manufacturer since the NOVRAM will not contain valid data on first power up.	Call Service to Check all Settings
Memory Error Type II: Shadow RAM	IFW	All	a. A Shadow RAM memory error was detected. The UCM is operating on all last valid values (pulled from NOVRAM) for all setup parameters. No setup parameter changes were pending to be loaded into NOVRAM, a complete recovery of all setup parameters was made and there is no need to check unit setup parameters. Compressor starts and hour were lost for not more than the last 24 hours. This is expected to be an isolated event and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Chiller module.	No Settings Were Lost
Memory Error Type III	IFW	All	a. A Shadow Ram memory error was detected. The UCM is operating on all last valid values (pulled from NOVRAM) for all setup parameters. Setup parameter changes less than 24 hours old pending to be loaded into NOVRAM were lost. Check all setup parameters made in the last 24 hours. Compressor starts and hours were lost for not more than the last 24 hours. This is expected to be an isolated event and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Chiller module.	Settings Changed in The Last 24 Hours Lost
Momentary Power Loss	MAR	All Running Modes (Start Mode, e.g. Before Transition)		Determine Cause Of Power Interruption
MOTOR TEMP SENSOR #1	MMR	All	Open or Short	Check Sensor, Wiring And Connections
MOTOR TEMP SENSOR #2	MMR	All	Open or Short	Check Sensor, Wiring And Connections
MOTOR TEMP SENSOR #3	MMR	All	Open or Short	Check Sensor, Wiring And Connections

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
MPL Detect Circuit Inoperative	MMR	All	A failure was detected in the Momentary Power Loss detect circuit. If there are no zero cross interrupts on Vab for approx. 3 half line cycles, the timer interrupt will trip and generate a diagnostic that indicates that our ability to detect MPL is gone. If Vab was truely gone the module would be powered down so if we can detect that Vab is gone then there must be a hardware failure on the board.	See Troubleshooting Service Bulletin
Oil Pressure Sensor Calibration	MMR	All Non-running Modes and not for 5 minutes after running.	The recalibration of the Differential Oil Pressure sensors resulted in an error correction of greater than 3 PSID.	See Troubleshooting Service Bulletin
Oil Pump Discharge Pressure Sensor	MMR	All	Open or shorted input. Must Hold on open AND short input is 2.0 Psia. Design: Both opens and shorts result in the pressure going to the low end of the scale. Therefore a Must Hold on the high pressure end is not required.	Check Sensor, Wiring, and Connections
Oil Sump Pressure Sensor	MMR	All	Open or shorted input. Must Hold on open AND short input is 2.0 Psia. Design: Both opens and shorts result in the pressure going to the low end of the scale. Therefore a Must Hold on the high pressure end is not required.	Check Sensor, Wiring, and Connections
OIL TEMP SENSOR	MMR	All	Open or Short	Check Sensor, Wiring And Connections
Options Mod Ref Voltage Calibration	IFW	All	An improper reference voltage was detected at the Options Module. A 2.5 vdc reference is used to calibrate the non-ratiometric analog I/O such as 2-10vdc and 4-20ma inputs as well as PWM Analog outputs. The micro checks to see that the A/D value falls within an acceptable range.	See Troubleshooting Service Bulletin
Options Module 24 Vdc Ref Missing	IFW	All	24Vdc reference missing and the differenctial water pressure transducers are installed.	Check Press Xducer Wiring/24 Vdc Supply.
Options Module 24 Vdc Ref Missing	MMR	All	24Vdc reference missing and the differential water pressure transducers are installed and VSD installed.	Check Press Xducer Wiring/24 Vdc Supply.
Options:Loss of Comm with Chiller	IFW	All	The options module lost communications with the Chiller module for 15 contiguous seconds.	Check IPC Wiring/Connections
Options:Loss of Comm with Starter	IFW	All	The options module lost communications with the Starter module for 15 contiguous seconds.	Check IPC Wiring/Connections
Outdoor Air Temp Sensor (Both Outdoor Air Rst and Low Ambient Lockout not selected.)	None	All	Open or Short a. Display end of range value.	N/A
Outdoor Air Temp Sensor (Either Outdoor Air Reset or Low Ambient Lockout Selected)	IFW	All	Open or Short a. Use end of range value (whatever value the open or short gives). b. Clear diag. when the resistance returns to normal range.	Check Sensor, Wiring And Connections
Over Voltage	MAR	Pre-Start and Any Ckt(s) Energzd	a. Line voltage above + 10% of nominal. (Must hold = + 10 % of nominal. Must trip = + 15 % of nominal. Reset differential = min. of 2% and max. of 4%. Time to trip = minimum of 1 min. 10 sec. and maximum of 5 min. 20 seconds) Design: Nom. trip: 60 seconds at greater than 112.5%, Auto Reset at 109.5% or less.	Check Main Power Supply & Wiring
Phase Loss	MMR	Contactor Energized (All Non-Rng Modes)	a. No current was sensed on one or more of the current xformer inputs. (Must hold = 20% RLA. Must trip = 5% RLA.) Time to trip shall be 1 second minimum, 3 seconds maximum. Actual design trippoint is 10%.	Check Main Power Supply & Wiring

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
Phase Reversal	MMR	Contactor energized to transition command (All Other Times)	a. A phase reversal was detected on the incoming current. On a compressor startup the phase reversal logic must detect and trip in a maximum of 0.7 second from compressor start for CTV.	Check Main Power Supply & Wiring
Phase Reversal Protection Lost	MMR	Starter Contactor energized to transition command	a. The phase reversal protection on the compressor has become inoperative. The phase rotation protection system failed to detect 2 in a row of one of the four phase circuit states; Phase reversal, Phase rotation OK, Phase A lost, Phase B lost.	Check Starter Module.
Purge Cprsr Suction Temp Sensor	IFW	All	Open or Shorted Sensor a. IFW to the chiller, MMR to the Purge.	Purge Inop: See Purge O & M Manual
Purge Liquid Level Too High	IFW	All	a. The Level Switch at the purge opened for 6 to 10 Seconds. b. IFW to the chiller, MMR to the Purge.	Purge Inop: See Purge O & M Manual
Purge Memory Error III This diag will be seen in UCP2 applications of the Purge Module. This diag will not be seen in retrofit applications of the Purge Module.	IFW	All	a. A Shadow Ram memory error was detected. Compressor starts and hours were lost for not more than the last 24 hours. This is expected to be an isolated event and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Purge module. This is an IFW diagnostic to both the Purge and Chiller.	No Settings Lost
Purge Memory Error Type I: NOVRAM This diag. should be seen in both UCP2 and retrofit applications only.	MMR	On Purge Power Up or following a Type II Memory error diag.	a. On either Purge Module power up or following a Type II Memory Error, a NOVRAM memory error was detected. The Purge Module is operating on all Engineering ROM defaults for all setup parameters. Check all setup parameters and continue to run purge. Replace the Purge Module as soon as a replacement is available. Note: It is expected that this diagnostic will be detected on the very first power up of the Purge Module at the Manufacturer since the NOVRAM will not contain valid data on first power up.	Purge Inop: See Purge O & M Manual
Purge Memory Error Type II: Shadow RAM This diag. should be seen in retrofit applications only.	IFW	All	a. A Shadow RAM memory error was detected. The Purge Module is operating on all last valid values (pulled from NOVRAM) for all setup parameters. No setup parameter changes were pending to be loaded into NOVRAM, a complete recovery of all setup parameters was made and there is no need to check unit setup parameters. Compressor starts and hour were lost for not more than the last 24 hours. This is expected to be an isolated event and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Purge module.	No Setting Were Lost
Purge Memory Error Type III This diag. should be seen in retrofit applications only.	IFW	All	a. A Shadow Ram memory error was detected. The Purge Module is operating on all last valid values (pulled from NOVRAM) for all setup parameters. Setup parameter changes less than 24 hours old pending to be loaded into NOVRAM were lost. Check all setup parameters made in the last 24 hours. Compressor starts and hours were lost for not more than the last 24 hours. This is expected to be an isolated event and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Purge module.	Settings Changed in The Last 24 Hours Lost
Purge: Loss of Comm w/ Retrofit CLD	IFW	All	The purge module lost communications with the retrofit Human Interface module for 15 contiguous seconds.	Check IPC Wiring/Connections
Purge:Loss of Comm with Chiller	IFW	All	The purge module lost communications with the chiller module for 15 contiguous seconds. a. IFW to the chiller, MAR to the Purge.	Check IPC Wiring/Connections

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
Purge Memory Error Type III This diag. should be seen in retrofit applications only.	IFW	All	a. A Shadow Ram memory error was detected. The Purge Module is operating on all last valid values (pulled from NOVRAM) for all setup parameters. Setup parameter changes less than 24 hours old pending to be loaded into NOVRAM were lost. Check all setup parameters made in the last 24 hours. Compressor starts and hours were lost for not more than the last 24 hours. This is expected to be an isolated event and repair or replacement is not required. If this diagnostic does occur repeatedly, then replace the Purge module.	Settings Changed in The Last 24 Hours Lost
Purge: Loss of Comm w/ Retrofit CLD	IFW	All	The purge module lost communications with the retrofit Human Interface module for 15 contiguous seconds.	Check IPC Wiring/Connections
Purge:Loss of Comm with Chiller	IFW	All	The purge module lost communications with the chiller module for 15 contiguous seconds. a. IFW to the chiller, MAR to the Purge.	Check IPC Wiring/Connections
Purge:Loss of Comm with Options	IFW	All	The purge module lost communications with the chiller module for 15 contiguous seconds. a. IFW to the chiller, IFW to the Purge.	Check IPC Wiring/Connections
Purge:Loss of Comm with Starter	IFW	All	The purge module lost communications with the starter module for 15 contiguous seconds. a. IFW to the chiller, MAR to the Purge.	Check IPC Wiring/Connections
Purge:Loss of Comm with Stepper	IFW	All	The purge module lost communications with the circuit module for 15 contiguous seconds. a. IFW to the chiller, MAR to the Purge.	Check IPC Wiring/Connections
Purge:Loss of Comm with Stepper #1	IFW	All	The purge module lost communications with the chiller module for 15 contiguous seconds. a. IFW to the chiller, MAR to the Purge.	Check IPC Wiring/Connections
Purge:Loss of Comm with Stepper #2	IFW	All	The purge module lost communications with the chiller module for 15 contiguous seconds. a. IFW to the chiller, MAR to the Purge.	Check IPC Wiring/Connections
Refrigerant Monitor Sensor	IFW	All	Open or Shorted input and the Rfgt Monitor is setup as installed at the Clear Language Display.	Check Sensor, Wiring, and Connections
Severe Phase Unbalance	MMR	All Running Modes	a. A 25% Phase Unbalance diagnostic has been detected. Items to check are the Current Transformer Part Numbers (they should all match), The Current Transformer resistances, line voltage phase balance, all power wiring connections, the contactor pole faces, and the motor. If all these are OK, replace the Starter module.	Check Main Power Supply & Wiring
Solid State Starter Fault Rly Clsd	MMR	Any Start and Run Mode	The SSS fault relay Closed.	See Solid State Starter Service Bulletin
Starter Contactor Interrupt Failure	MMR	Starter Contact not Energized (Starter Contact Energized)	a. Welded Starter contactor. b. Detected a welded compressor contactor when the compressor was commanded off but the current did not go to zero. Detection time shall be 5 second minimum and 10 seconds maximum for all Electromechanical and Solid State Starters. Detection time for Variable Speed Drives shall be 12 seconds minimum and 17 seconds maximum. On detection, generate the diagnostic, energize the appropriate alarm relay, continue to command the affected compressor off..	Complete Starter Checkout Required

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
Starter did not Transition	MMR	On the first check after transition.	a. The UCM did not receive a transition complete signal in the designated time from the UCM command to transition. The must hold time from the UCM transition command is 1 second. The Must trip time from the transition command is 6 seconds. Actual design is 2.5 seconds. b. The Transition Complete input was found to be shorted before the compressor was started. c. Item a. above is active only for Y-Delta, Auto-Transformer, and Primary Reactor Starters. d. Item b. above is active for all electromechanical starters.	Complete Starter Checkout Required
Starter Dry Run Test	MMR	Starter Dry Run Mode	While in the Starter Dry Run Mode either 50 % Line Voltage was sensed at the Potential Transformers or 10 % RLA Current was sensed at the Current Transformers.	Current or Voltage Detected
Starter Fault Type I	MMR	Starting	a. This is a specific starter test where 1M is closed first and a check is made to ensure that there are no currents detected by the CT's. If currents are detected when only 1M is closed first at start, then one of the other contactors is shorted. b. This test applies only to Y-Delta Closed Transition Starters.	See Troubleshooting Service Bulletin
Starter Fault Type II	MMR	Starting	a. This is a specific starter test where the Shorting Contactor (S) is individually energized and a check is made to ensure that there are no currents detected by the CT's. If current is detected when only S is energized at Start, then 1M is shorted. b. This test in a. above applies to all forms of starters (Note: It is understood that many starters do not connect to the Shorting Contactor.).	See Troubleshooting Service Bulletin
Starter Fault Type III	MMR	Starting	a. As part of the normal start sequence to apply power to the compressor the Shorting Contactor (S) and then the Main Contactor (1M) were energized. 1.6 seconds later there were no currents detected by the CT's for the last 1.2 Seconds on all three phases. b. This test in a. above applies to all forms of starters except Variable Speed Drives (Note: It is understood that many starters do not connect to the Shorting Contactor.). c. For VSD's, TBD	See Troubleshooting Service Bulletin
Starter Mod Ref Voltage Calibration	IFW	All	An improper reference voltage was detected at the Starter Module. A 2.5 vdc reference is used to calibrate the non-ratiometric analog I/O such as 2-10vdc and 4-20ma inputs as well as PWM Analog outputs. The micro checks to see that the A/D value falls within an acceptable range.	See Troubleshooting Service Bulletin
Starter:Loss of Comm with Chiller	MMR	All	The starter module lost communications with the Chiller module for 15 contiguous seconds.	Check IPC Wiring/Connections
Starter:Loss of Comm with Circuit	MMR	All	The starter module lost communications with the Circuit module for 15 contiguous seconds.	Check IPC Wiring/Connections
Stepper #1:Loss of Comm with Chiller	MMR	All	The Stepper #1 module lost communications with the Chiller module for 15 contiguous seconds.	Check IPC Wiring/Connections
Stepper #1:Loss of Comm with Starter	MMR	All	The Stepper #1 module lost communications with the Starter module for 15 contiguous seconds.	Check IPC Wiring/Connections
Surge Shutdown: Ice Building	MAR	All Ice Building Modes	An extended Surge condition was detected while in Ice Building Mode. This diagnostic shall clear when the Ice Building command is withdrawn.	See Troubleshooting Service Bulletin
TCI:Loss of Comm with Chiller	IFW	All	The TCI module lost communications with the Chiller module for 15 contiguous seconds.	Check IPC Wiring/Connections
TCI:Loss of Comm with Circuit	IFW	All	The TCI module lost communications with the Circuit module for 15 contiguous seconds.	Check IPC Wiring/Connections

DIAGNOSTIC DESCRIPTION	Diag Type	Diag. Active Modes (Non-Active Modes)	CAUSE	Help Message
TCI:Loss of Comm with Options	IFW	All	The TCI module lost communications with the Options module for 15 contiguous seconds.	Check IPC Wiring/Connections
TCI:Loss of Comm with Purge	IFW	All	The TCI module lost communications with the Purge module for 15 contiguous seconds.	Check IPC Wiring/Connections
TCI:Loss of Comm with Starter	IFW	All	The TCI module lost communications with the Starter module for 15 contiguous seconds.	Check IPC Wiring/Connections
TCI:Loss of Comm with Stepper #1	IFW	All	The TCI module lost communications with the Stepper #1 module for 15 contiguous seconds.	Check IPC Wiring/Connections
Tracer Communications Lost	IFW	All	The Tracer was setup as "installed" at the CLD and the TCI lost communications with the Tracer for 15 contiguous minutes after it had been established. Continue to run the chiller with the last valid Tracer Setpoints/Mode.	Check Tracer to UCP Wiring/Connections
Tracer failed to Establish Comm	IFW	At power-up	The Tracer was setup as "installed" at the CLD and the Tracer did not communicate with the TCI within 2 minutes after power-up.	Check Tracer Wiring/Connections/Power
Tracer Outdoor Air Temp Sensor Fail	IFW	All		Check Sensor, Wiring, and Connections
Tracer Temperature Sensor	IFW	All	Input Shorted.	Check Sensor, Wiring, and Connections
Under Voltage	MAR	Pre-Start and Any Ckt(s) Energzd	a. Line voltage below - 10% of nominal or the Under/Overvoltage transformer is not connected. (Must hold = - 10 % of nominal. Must trip = - 15 % of nominal. Reset differen tial = min. of 2% and max. of 4%. Time to trip = min. of 1 min. and max. of 5 min.) Design: Nom. trip: 60 seconds at less than 87.5%, + or - 2.8% at 200V or + or - 1.8% at 575V, Auto Reset at 90.5% or greater.	Check Main Power Supply & Wiring
Var Speed Drive Fault Relay Closed	MMR	Any Start and Run Mode	The VSD fault relay Closed.	See Var Speed Drive Service Bulletin

Remote Human InterFace

General Characteristics

Each unit control can support two human interfaces, one machine mounted ("local") and one remote. A remote human interface is not weatherproof, and is intended for indoor use. The remote human interface is mounted in a plastic enclosure. It uses a molded rubber keypad, not a membrane keypad. The keys will have the same labels on both the local and remote keypad.

IPC Buffer

The use of a remote human interface requires that an additional module be added to the unit control. The IPC Buffer Module is added, to buffer and protect the inter processor communication bus. This is required because the bus is brought outside the unit. The buffered IPC link will be electrically identical to the COM4 non-isolated protected digital communications link. With the correct twisted pair type, the remote display can be 5000 feet from the unit.

Multiple Unit Communication

The machine mounted human interface communicates only with its associated unit. The standard remote human interface communicates. A separate wire pair is nun from each unit control to the remote human interface.

OPERATION

The operation of the remote human interface will be identical to the operation of the machine mounted human interface, with the following exceptions:

Unit Identification

For remote human interfaces with the multiple unit option board installed, the following display will be inserted as the second display in each setting group, immediately following the report heading:

Modify Settings for Unit:
"Press (+) (-) to Change Setting"

where x is equal to 1, 2, 3 or 4.

When the unit number is changed, the human is changed the human interface will clear the buffers of any data from the previous unit, and update the buffers with new data before any of the new unit data is displayed. The display will say the following until the new unit data is received or for 5 seconds, whichever comes first:

Updating Unit Data, Please Wait

If the new unit data is not received after 5 seconds, the following display is used. For remote human interfaces with the multiple unit option board installed, this display will always be used in place of the "No Communica- tion to Unit, Data Not Valid" display.

There are diagnostics which cannot be cleared from a remote Human Interface. To distinguish between a local system reset and a remote system diagnostic clear. The reset screen in the diagnostic menu in the diagnostic menu is modified for a remote Human Interface as shown below.

Press (Enter) To Clear
Remote Reset Diagnostics

If the enter key is depressed, the following message is displayed for 4 seconds:

Remote Reset Diagnostics Have Been Cleared
Diagnostic Report Is Being Reset

The display will be reset to the top of the Diagnostic menu after this message clears.

TRANE™

Periodic Maintenance

Annual Inspection Check List and Report: CVHEs/CVHFs w/UCP2 Controls Panels

Review unit with operating personnel

Compressor Motor

[ ] Motor continuity check
Good [ ] Open [ ]

[ ] Check and tighten motor terminals

[ ] Meg motor
Phase 1 [ ] Phase 2 [ ] Phase 3[ ]

[ ] Check nameplate rating
Amps [ ]

Starter

[ ] Check condition of starter contacts
Good [ ] Fair [ ] Replace [ ]

Oil Sump

[ ] Change oil
If oil analysis, refer to program procedures
[ ] Gallons (7) required

[ ] Oil pump motor ground check
Good [ ] Open [ ]

[ ] Check motor terminals
[ ] Change oil filter

Condenser

[ ] Visually inspect for scaling in tubes: note findings and make recommendations.

Control Circuits

[ ] Low refrigerant temperature sensor checkout
__ F set point __ F trip point (ice water)

[ ] Leaving Evaporator water temperature sensor check out
__ F set point __ F trip point (ice water)

[ ] Condenser High Pressure Switch check out
__ psig setpoint
__ psig trip point

[ ] Check Net Oil Pressure

[ ] Check adjustment and operation of inlet guide vane actuator stepper motor. The stroke of the actuator motor is 10,000 steps/in and approximately 50,000 steps pull stroke.

Leak Test Chiller

Refrigerant and oil analysis for acid content.

[ ] Sample refrigerant and oil for laboratory analysis (attach copy of analysis to next monthly inspection report)

Purge Unit

[ ] Perform the purge system control check described in "Control Circuit Diagnostics" in the "Troubleshooting" section of PRG-OM-5 or most current edition of purge manual.

[ ] Perform Purge Tank check out and water removal as described in "Service Procedures" of PRG-OM-5 or latest edition of purge manual.

Comments:

Recommendations:

UCP2 "SETTINGS GROUP" MENU RECORD

OPERATOR SETTING GROUP:

	Menu Item	Choices	Default	Design/Actual
1	Purge Operating Mode:	Stop, On, Auto, Adaptive	Adaptive	
2	Front Panel Chilled Wtr Setpt:	0->65 Deg F, -17.8->18.3 Deg C	44.0 Deg F, 6.7 Deg C.	
3.	Front Panel Current Limit Setpt:	40->100%	100%	
4	Front Panel Hot Wtr 'Setpt: (IF Hot water option Enabled)	80->125 Deg F, 26.7->51.7 Deg C	90 Deg F, 32.2 Deg C	
5	Free Cooling: (If Free Cooling Option installed)	Off, On	Off	
6	Chilled Water Reset Type: (If set to "Return" or "Outdoor Air", please refer to manual for setting procedure)	Disable, Return, Constant Return, Outdoor Air	Disable	
7	Ice Building:	Disable, Enable	Disable	
8	Panel Ice Termination Setpoint: (Displayed if Ice Building Enabled)	20->32 Deg F, -6.7->0. Deg C	27 Deg F. -2.8 Deg C.	
9	Chilled Water Setpoint Source:	Front Panel, Tracer, Remote Computer, External Source, External Direct Capacity Cnt	Front Panel	
10	Current Limit Setpoint Source:	Front Panel, Tracer, Remote Computer, External Source	Front Panel	
11	Hot Water Setpoint Source: (Displayed only if "Heat Pump" Controls enabled)	Front Panel, Tracer, Remote Computer, External Source, External Direct Capacity Cnt	Front Panel	
12	Heat Recovery Setpoint Source: (Displayed only if "Heat Recovery Option is installed)	Front Panel, Tracer, Remote Computer	Front Panel	
13	Ice Termination Setpoint Source: (Displayed only if "Ice Building Option" is installed)	Front Panel, Tracer, Remote Computer	Front Panel	
14	Outdoor Air Temperature Source:	UCP, Tracer	UCP	

SERVICE SETTINGS GROUP::

	Menu Item	Choices	Default	Design/Actual
1	Language :	English, Francais, Deutch, Espanol, Nippon, Italiano, Nederlands	English	
2	Display Units:	English, SI	English	
3	Decimal Places Displayed:	XXX.X, XXX	XXX.X	
4	Display Menu Headings:	Enable, Disable	Enable	
5	Differential To Start Setpoint:	1->10 Deg F, .5->5.5 Deg C	5 Deg F	
6	Differential To Stop Setpoint:	1->10 Deg F, .5->5.5 Deg C	5 Deg F	
7	Evap Pump Off Delay:	1->30 Minutes	1 Minute	

UCP2 "SETTINGS GROUP" MENU RECORD

FIELD STARTUP GROUP:

	Menu Item	Choices	Default	Design/Actual
1	ICS Address:	0 -> 255	65	
2	Design Delta Temp Setpoint:	4 -> 30 Deg F, 2.2 -> 16.7 C	10 Deg F. 5.5 Deg C	
3	Lvg Wtr Temp Cutout Setpoint: (When this setpoint is within 1.7 Deg F of the Front Panel Chilled Water Setpoint, the Front Panel Chilled Water Setpoint is increased along with this setpoint to maintain the differential)	-10 -> 36 F, -23.2 -> 2.2 C	36 Deg F, 2.2 Deg C	
4	Low Rfgt Temp Cutout Setpt: (When this setpoint is within 6 Deg F of the Front Panel Chilled Water Setpoint, the Front Panel Chilled Water Setpoint is increased along with this setpoint ot maintain the differential.)	-35 -> 36 F, -37.2 -> 2.2 C	32 Deg F, 0.0 Deg C	
5	Condenser Limit Setpoint:	80 -> 120 %	90 %	
6	Maximum RI Timer Setiing:	30 -> 60 Minutes	60 Minutes	
7	Purge Control/Type:	01 - Micro Purge 02 - W/Supercharger	01 - Micro Purge	
8	Purge Max Pumpout Rate:	1 -> 100 Minutes / 24 Hours	12 Minutes / 24 Hours	
9	Prg Disable Pumpout Alarm for:	0 -> 72 Hours	0 Hours	
10	Prg Low Liq Temp Inhibit Enable:	Enable, Disable	Disable	
11	Prg Low Liq Temp Inhibit Setpt: (Does not display unless above feature = "Enable")	32 -> 50 F, 0.0 -> 10 C	40 Deg F, 4.4 Deg C	
12	Surge Protection:	Disable, Enable	Enable	
13	Under/Over Voltage Protection: (Permits "Enable" only if Option Installed)	Disable, Enable	Disable	
14	Phase Reversal Protection:	Disable, Enable	Enable	
15	Phase Unbalance Protection:	Disable, Enable	Enable	
16	Momentary Power Loss Protection:	Disable, Enable	Enable	
17	Oil Temp Setpoint:	100 -> 160 F, 37.8 -> 71.1 C	143.5 Deg F,61.9 Deg C	
18	Low Oil Temp Cutout:	80 -> 140 F, 26.7 -> 60 C	95 Deg F, 35 Deg C	
19	High Discharge Temp Cutout:	170 ->220 F, 76.6 -> 104.4 C	200 Deg F, 93.3 Deg C	
20	Control Type is:	Chilled Water, Hot Water	Chilled Water	
21	Heat Pump Control:	Disaable, Enable	Disable	
22	Control Sensitivity:	Comfort, Process	Comfort	
23	External Vane Control Enable:	Disable, Enable	Disable	
24	Soft Load Control:	Disable, Enable	Disable	
25	Soft Load Starting Current Limit:	40 -> 100 %	100 %	
26	Soft Load Current Limit Rate:	0.5 -> 5.0 % / Minute	5.0 % / Minute	
27	Soft Load Lvg Water Rate:	0.5 -> 5.0 Deg F/Minute 0.3 -> 2.8 Deg C/Minute	5.0 Deg F/Min 2.8 Deg C/Min	
	Hot Gas Bypass & Heat Recovery. See Manual if options are installed.			

UCP2 "SETTINGS GROUP" MENU RECORD

FIELD STARTUP GROUP: (Continued)

	Menu Item	Choices	Default	Design/Actual
28	IGV MAXIMUM Travel Setpt:	0 -> 60,000 (100 Steps/Incr)	50,000 (90 Deg Vanes)	
29	Guide Vane Open Travel Stop:	50 -> 100%	100 %	
30	Guide Vane Closed Travel Stop:	0 -> 30 %	0 %	
31	Local Atmospheric Pressure:	10 -> 15 psia	14.7 psia	
32	Unspecified Flag # 1:	Disable, Enable	Disable	
33	Unspecified Type # 1	0 ->255	0.0	

MACHINE CONFIGURATION GROUP:

	Menu Item	Choices	Default	Design/Actual
1	Unit Line Voltage:	180 -> 6600 (5 Volt incr)	460	
2	Unit Frequency:	60 HZ, 50 HZ	60 HZ	
3	Unit Type:	CVH only(CVHE/CVHF)	CVH	
4	Unit Tons:	100 ->1600 (10 Ton incr)	500	
5	Refrigerant Type:	R11, R123, R12, R134a, Water. R22	R123	
6	Refrigerant Monitor Type:	None, 01-Analog, 02-IPC	None	
7	Starter Type:	Undefined, Variable Speed, Y-Delta, X-Line, Solid State, Auto Xformer, Primary Reactor	Y-Delta	
8	2nd Level Contactor Integrity Test: (Startup Contactor Test–Y-D Only)	Disable, Enable	Disable	
9	Rated Load Amps:	0 -> 2,500	500	
10	Motor Heating Constant:	0 - 100 Minutes	25 Minutes	
11	Current Overload Setting # 1: (See Manual for Setup Procedure)	00 -> 31	00	
12	Current Overload Setting # 2: (See Manual for Setup Procedure)	224 -> 255	255	
13	Maximum Accel Timer Setpt #1: (See Manual for Recommended Setpt)	6 -> 64 Seconds	27 Seconds	
14	Maximum Accel Timer Setpt #2: (255 Minus Timer Setpt #1 above)	191 -> 249 Seconds	228 Seconds	
15	External Chilled Wtr Setpoint:	Installed, Not Installed	Not Installed	
16	External Current Limit Setpt:	Installed, Not Installed	Not Installed	
17	External Hot Wtr Setpoint: (Use only when "Hot Wtr Cnt is "Enabled")	Installed, Not Installed	Not Installed	
18	Acceleration Time Out Action: **(Recommend "Shutdown" Only)**	Shutdown, Transition	Shutdown	
19	Motor Winding RTD Type:	70 Ohm/ 25 C, 100 Ohm/ 0 C	70 Ohm / 25 Deg C	
20	High Pressure cutout setting: (15 PSIG–Std, 25 PSIG–ASME)	0 ->500 PSIG (5 PSIG incr)	15 PSIG	
21	Line Voltage Sensing Option:	Installed, Not Installed	Not Installed	

UCP2 "SETTINGS GROUP" MENU RECORD

MACHINE CONFIGURATION GROUP: (Continued)

	Menu Item	Choices	Default	Design/Actual
22	Auxiliary Condenser Option:	Installed, Not Installed	Not Installed	
23	Heat Recovery Option:	Installed, Not Installed	Not Installed	
24	Hot Gas Bypass Option:	Installed, Not Installed	Not Installed	
25	Free Cooling Option:	Installed, Not Installed	Not Installed	
26	Condenser Press. Sensor Option:	Installed, Not Installed	Not Installed	
27	Bearing Temp Sensors Option:	Installed, Not Installed	Not Installed	
28	Discharge Temp Sensor Option:	Installed, Not Installed	Not Installed	
29	Ice Building Option:	Installed, Not Installed	Not Installed	
30	Diff Wtr Press Sensor Opt: (Both Evap and Cond Sensors)	Inst, </= 150 PSIG, Inst, >150 PSIG, Not Installed	Not Installed	
31	External Analog Inputs:	4-20 ma, 2-10 vdc	4-20 ma	
32	Tracer Option:	Installed, Not Installed	Not Installed	
33	Install TCI Option:	Installed, Not Installed	Not Installed	

SERVICE TESTS GROUP:

	Menu Item	Choices	Default	Design/Actual
1	Chilled Water Pump:	Auto, On	Auto	
2	Condenser Water Pump:	Auto, On	Auto	
3	Chilled Water Flow Switch:			
4	Condenser Water Flow Switch:			
5	Starter Dry Run: (See Manual for Procedures--Y-D only)			
6	Oil Pump:	Auto, On	Auto	
7	Vane Control is:	Auto, Manual	Auto	

CENTRAVAC WITH UCP2 COMMISSIONING CHECKLIST & START-UP TEST LOG

Job Name_____ **Location**_____

Model #_____ **Serial #**_____

Sales Order #_____ **Start-up Date**_____

NOTE: The Unit Installation, Operation and Maintenance Manuals, Submittals, and Design Specifications must be used in conjunction with this checklist.

I. PRECOMMISSIONING PROCEDURES

☐ **A. Obtain Installation Check Sheet**

This must be prepared by the installer for the particular unit, verifying the unit is ready for commissioning.

☐ **B. Obtain Design (order) Specification Data**

This indicates the design criteria of the particular unit. A unit cannot be properly commissioned unless this data is known. It is the responsibility of the selling office to furnish this data.

☐ **C. Obtain Wiring Diagrams**

The "as-wired" electrical diagram should be compatable with the recommended Trane submittals and diagrams. Are customer added external/remote control circuits compatable? ☐ Yes ☐ No

☐ **D. General Installation Observations**

☐ 1. Is there any apparent shipping or rigging damage? ☐ Yes ☐ No

☐ 2. Record the pressure on the shipping gauge_____PSIG. If there is no pressure on the gauge, a leak test will have to be done before the unit can be evacuated and charged.

☐ 3. Is the water piping correctly installed? ☐ Yes ☐ No

Flow Switches ☐ Yes ☐ No Pressure Gauges ☐ Yes ☐ No

Isolation Valves ☐ Yes ☐ No Flow Balancing Valves ☐ Yes ☐ No

Thermometer Wells ☐ Yes ☐ No Vent Cocks and Drains ☐ Yes ☐ No

☐ 4. Have proper clearances around the unit been maintained per submittal and/or Installation Manual guidelines? ☐ Yes ☐ No

☐ 5. Is power wiring of adequate ampacity and correct voltage? ☐ Yes ☐ No

Are fuses or circuit breakers of the correct value or type? ☐ Yes ☐ No

☐ 6. Is the unit base acceptable, level, and is the unit on isolators (rubber as supplied by Trane or spring type)? ☐ Yes ☐ No

☐ 7. Have the micro (less than 30 volts) circuits been properly isolated from the higher voltage control and power circuits? ☐ Yes ☐ No

☐ **E. Comments**_____

II. COMMISSIONING PROCEDURES

A. Pre-start operations

1. Holding Charge
   - ☐ _____PSIG. Must be positive pressure or leak test must be done.
   - ☐ Relieve the holding charge.

2. Calibration of High Pressure Cutout
   - ☐ Calibrate the HPC to cut out when 15 PSIG is exceeded. The cut in value is approximatly 10 PSIG. CUT OUT_____PSIG, CUT IN_____PSIG.

3. Meggar the Motor (500 volt Meggar)
   - ☐ Compressor motor Megohms- refer to temp/resistance chart for acceptable values. Remove surge suppressors before Megging. Never Meg test with the unit in a vacuum.

T1 to Earth____	T4 to Earth____	T1 to T2____	T1 to T4____
T2 to Earth____	T5 to Earth____	T1 to T3____	T2 to T5____
T3 to Earth____	T6 to Earth____	T2 to T3____	T3 to T6____

4. Evacuation
   - ☐ Connect the vacuum pump to start evacuation. Use a 2-stage pump with at least 5 CFM capacity. Connect to the evaporator charging valve with a hose no smaller than 3/4 inch ID.

5. Condenser
   - ☐ Isolation and flow balancing valves installed.
   - ☐ Calibrated thermometers and pressure gauges installed in/out of condenser on machine side of any valve or elbow.
   - ☐ If condenser pump controlled by UCP2, is field wiring correct and complete?
   - ☐ Condenser pump(s) run, system and strainers properly cleaned and/or flushed.
   - ☐ Condenser water strainer in close proximity to entering connection of condenser.
   - ☐ Provisions installed to properly maintain water treatment additives.
   - ☐ Initial water treatment added to system.
   - ☐ Flow or differential pressure switch installed and wired in series with auxiliary of pump motor starter. Operation of circuit verified.
   - ☐ Condenser water flow balanced. Ft H2O PD design_____, Ft H2O actual_____ GPM design_____ GPM actual_____

6. Evaporator

☐ _____PSIG. Must be positive pressure or leak test must be done.

☐ Calibrated thermometers and pressure gauges installed in/out of evaporator on machine side of any valve or elbow.

☐ If evaporator pump controlled by UCP2, is field wiring correct and complete?

☐ Evaporator pump(s) run 24 hrs. System and strainers properly cleaned and/or flushed.

☐ Evaporator water strainer in close proximity to entering connection of evaporator.

☐ Provisions installed to properly maintain water treatment additives.

☐ Initial water treatment added to system.

☐ Flow or differential pressure switch installed and wired in series with auxiliary of pump motor starter. Operation of circuit verified.

☐ Evaporator water flow balanced. Ft H2O PD design_____, Ft H2O PD actual_____
GPM design_____ GPM actual_____

7. Electrical and Controls

a. Motor starter panel

☐ All terminals tightened.

☐ Wiring free from abrasion, kinks, and sharp corners.

☐ Contactors and relays have freedom of movement.

☐ All contacts are free of corrosion or dirt. Panel is free of dust, debris etc.

☐ Check the ratio of the current transformers. Record the part #s on the start-up log.

☐ Use only twisted shielded pair for the IPC circuit between the starter and the UCP2 on remote starters. Recommended wire is Beldon 8760, 18 AWG. Polarity is critical.

☐ The low voltage IPC link (< 30 volts) must be in a separate conduit from the 115 volt wiring.

☐ IPC link routing within the starter panel must stay a minimum of 6 inches from higher voltages.

☐ Remote starter to UCP2 connections are complete and comply with Trane requirements.

☐ Check the correctness of the power connections from the starter to the motor.

☐ Check the wiring to the starter for size, voltage, and correct phase rotation (A-L1, B-L2, C-L3).

☐ Check for equal phase representation in each power wiring conduit.

b. Control panel

[ ] All terminals tightened.

[ ] Wires free from abrasion, kinks, sharp corners.

[ ] Low voltage wires are isolated from high voltage wires.

[ ] Panel is free of debris, dust, etc.

[ ] "Power up" the control panel.

1. Starter disconnect locked open.
2. Fuse 2F4 must be removed from the starter.
3. Connect auxiliary 115VAC power cord to Terminals 1TB1-1 and 1TB1-2 in the control panel. **MAKE SURE OF THE POLARITY. THE 'HOT' SIDE MUST BE CONNECTED TO TERMINAL 1TB1-1 AND THE 'NEUTRAL' SIDE TO 1TB1-2.**
4. Plug in cord to 115VAC power source. Control panel is now energized.

[ ] Record the settings found in the Operator Settings,Service Settings Field Start-up Group, and Machine Configuration Menus in the UCP2.

[ ] Using the CVHE Operation and Maintenance manual and the order specification, double check and reset, if required, the settings of Current Overload Setting #1 and Current Overload Setting #2 found in the Machine Configuration menu of the UCP2.
NOTE: DO NOT FORGET TO ADJUST THE RLA RATING TO MATCH THE ACTUAL JOBSITE VOLTAGE IF IT DIFFERS FROM THE DESIGN VOLTAGE.

[ ] If Evaporator and/or condenser water pumps are controlled by the UCP2, use the Service Test menu of the UCP2 to manually start and test the control of the pumps.

[ ] Check the setting of the oil pressure regulating valve.

1. Use the Service Tests menu of the UCP2 to manually start the oil pump.
2. Proceed to the Compressor Report menu of the UCP2 and observe the Differential Oil Pressure.
3. Adjust the oil pressure regulating valve to maintain 12 to 18 psid. The oil pressure regulating valve may require adjustment as the unit is started.
4. This procedure also checks to ensure correct sensing of oil pressure. The Oil Pressure Cutout setting is a non-adjustable 9 psid within the logic of the UCP2.
5. Return Oil Pump control to 'auto'.

[ ] Check vane operator and vanes.

1. Use the Service Tests menu of the UCP2 to manually overide the vane control.
2. Enter targets from 0% to 100% and observe vane operation. At minimum and maximum travel the operator should not exert any force on the vane assembly, adjust as required.
3. Vane movement is smooth to open/close.
4. Vane movement is reported back to the UCP2.
5. Return Vane control to 'auto'.

☐ Dry run the starter

1. Make sure the starter disconnect is safety locked open.
2. Use the Service Tests menu of the UCP2 to initiate the Starter Dry Run.
3. Observe correct operation of starter contactors.
4. Observe correct operation of transition complete signal (if required).
5. Disable Starter Dry Run when complete.

☐ Disconnect and remove the temporary power cord.

B. Preparation for Start-up.

1. Evacuation and charging

☐ Evacuation leak test. When vacuum has been drawn down to 1-2 MM Hg, secure the vacuum pump.Wait for 12 hours for a valid vacuum leak test. If the rise in vacuum is less than 2.5 per 12 hours, start-up may proceed.

☐ Charge refrigerant. **MAKE SURE THE CHILLED WATER IS FLOWING THROUGH THE EVAPORATOR.** Charge the prescribed amount of refrigerant through the liquid charging valve at the liquid inlet to the evaporator. Check that all drums contain a full amount of refrigerant. Amount charged _____lbs/kg.

2. Electrical

☐ Disconnect all temporary power cords, replace all fuses, connect motor leads, make final electrical inspection.

☐ Power up the motor starter. Check for control voltage at control panel terminals 1TB1-1 and 1TB1-2. _____volts

☐ Check current to the oil sump heater. ____amperes

☐ As the oil heats up, finish any operations not yet completed in preparation for starting the unit.

C. Chiller Start-up

1. Make all preliminary checks.

☐ Oil temp, oil level, chilled water flow, chilled water load available (cooling units on) etc.

2. Start the unit.

☐ If the phase rotation of the electrical power has not been positivly confirmed, the actual rotation of the motor must be checked. Observe the rotation of the motor shaft through the sight glass on the end of the motor at the moment of start-up. Rotation must be CLOCKWISE. If the phase sequence is incorrect, confirmed by observation of the Phase Reversal diagnostic on the UCP2, then L1 and L3 power leads to the starter must be reversed.

☐ As the unit starts and runs, observe closely all operating conditions.

☐ Adjust the oil pressure regulator if necessary to 12 to 18 psi net.

☐ In the Operator Settings menu of the UCP2, place the Purge Operating Mode to 'on' to allow the removal of non-condensables. It may also be necessary to increase the length of the Purge Service Override timer found in the Field Startup Group menu.

☐ After the unit has the system down to design leaving chilled water temp and is under control, and the purge is no longer relieving non-condensables, begin taking the startup test log. Log the unit a minimum of 3 times at 15 minute intervals.

☐ In the Operator Settings menu of the UCP2, return the purge operating mode to 'Adaptive'.

☐ When the logging is complete, shut the chiller down. Allow the unit to sit idle for 5-10 minutes. Attach a piece of clear plastic hose between the 1/2 inch valve at the bottom of the evaporator and the 1/4 inch valve near the top of the evaporator. Open the valves and record or mark permanently the refrigerant level in the hose.
RECORD THIS LEVEL - IT IS VERY IMPORTANT! At some later time, the refrigerant charge can be easily checked and verified.

☐ Restart the chiller and carefully observe the starting and loading sequence.

3. Instructions to the Chiller Operator.
   ☐ Instructions for starting, operating, and shutting down.

   ☐ Instructions for logging the unit.

   ☐ Instructions for periodic maintenance.

D. After 2 weeks of operation.

1. Remove the water box covers on both the evaporator and condenser. Mechanically brush clean all the tubes. This is to assure there is no debris blocking any of the tubes. A piece of debris partially blocking a tube may cause that tube to fail prematurely.

2. Replace the oil filter with the spare oil filter included in the control panel at time of shipment.

E. Comments and/or Recommendations:

_____
_____
_____
_____
_____
_____
_____
_____

_____

Service technician **Signature** **Date**

START-UP TEST LOG
WATER COOLED CENTRAVACS WITH UCP2 CONTROL PANELS

Job Name_____ **Job Location**_____

Model #_____ **Serial #**_____**Start Date**_____

Sales Order #_____ **Ship Date**_____ **Job Elevation (Ft above sea level)**_____

STARTER DATA:

Manufacturer_____

Type_____

(Star-Delta, X-Line, AutoTrans, Primary Reactor, Solid State ,Etc.)

Vendor ID#/Model #_____

Volts_____Amps_____Hz_____

MOTOR DATA:

Manufacturer_____

Type and Frame_____

Drawing #_____

Serial #_____

COMPRESSOR DATA: (RTHB units only)

Model #_____

Serial #_____

NAMEPLATE DATA:

RLA_____KW_____Volts_____Hz_____

DESIGN DATA: (From Design Specification)

RLA_____KW_____Volts_____Hz_____

HEAT RECOVERY PERFORMANCE:

RLA_____KW_____Volts_____Hz_____

CURRENT TRANSFORMER

PART NUMBERS: ("X" Code & 2 Digit Extension)

Primary CT's:

X_____-___

X_____-___

X_____-___

Secondary CTs:

X_____-___

X_____-___

X_____-___

(Note, secondary CTs are used only on remote starters "by others" & high voltage applications)

START-UP ONLY

CHILLER CONDITION:

On Arrival:

☐ Machine Vacuum=____mm (CVHE/F)

Or

☐ Machine Pressure=___psig (CVHE/F or RTHB)

At Start-Up:

☐ Machine Vacuum=____mm

Or

☐ Machine Pressure=___psig

Complete If Pressure Test Is Required:

☐ Vacuum after Leak Check=____mm

☐ Standing Vacuum Test=___mm Rise in ___hrs

UNIT REFRIGERANT CHARGE:

_____lbs of R-_____

HIGH PRESSURE CUTOUT (3S1):

☐ Cut-In =____psig ☐ Cutout =____psig

SUMMARY OF UNIT OPTIONS INSTALLED:

☐ Tracer Communications Interface

☐ Remote Clear Language Display Module

☐ Options Module

☐ Outdoor Air Sensor

☐ Enhanced Condenser Limit Control

☐ Heat Recovery / Aux Condenser

☐ Free Cooling Control

☐ Hot Gas Bypass Control

☐ Ice Making Control

☐ Monitoring Package

- ☐ Bearing Oil Temp Sensors
- ☐ Discharge Temp Sensor
- ☐ Compressor Phase Volt Sensors

☐ Other_____

Also complete the Commissioning Checklist, Record Sheet, and Start-up/Operation Log.

CENTRAVAC / UCP2 STARTUP AND OPERATING LOG

SALES ORDER # _____ **LOCATION** _____

MODEL # _____ **SERIAL #** _____

DESIGN CONDITIONS**

**From design specification

DEG F _____ →
DEG F _____ →
DEG F _____ →
DEG F _____ →
DEG F _____ →

GPM _____ →
GPM _____ →

(12 TO 18 PSID) →
(UNIT 'ON', 115 TO 150 DEG F)

DESIGN RLA _____ →
DESIGN KW _____

DESIGN VOLTS _____ →
DESIGN HZ _____

CHILLER REPORT:	1ST READING	2ND READING	3RD READING
CHILLER OPERATING MODE			
ACTIVE CHILLED WATER STPT			
EVAP LEAVING WATER TEMP			
EVAP ENTERING WATER TEMP			
CONDENSER ENTERING WATER			
CONDENSER LEAVING WATER			
ACTIVE CURRENT LIMIT STPT			
EVAPORATOR WATER FLOW			
CONDENSER WATER FLOW			
OUTDOOR AIR TEMP			
REFRIGERANT REPORT:			
EVAP RFGT PRESSURE			
COND RFGT PRESSURE			
SATURATED COND TEMP			
SATURATED EVAP RFGT TEMP			
COMPRESSOR REPORT:			
DIFFERENTIAL OIL PRESSURE			
OIL TANK TEMPERATURE			
DISCHARGE OIL PRESSURE			
OIL TANK PRESSURE			
COMPRESSOR PHASE AMPS A			
COMPRESSOR PHASE AMPS B			
COMPRESSOR PHASE AMPS C			
COMPRESSOR VOLTAGE AB			
COMPRESSOR VOLTAGE BC			
COMPRESSOR VOLTAGE CA			
COMPRESSOR WINDING TEMP W1			
COMPRESSOR WINDING TEMP W2			
COMPRESSOR WINDING TEMP W3			
COMPRESSOR STARTS			
COMPRESSOR RUNNING TIME			
BEARING TEMPERATURE 1			
BEARING TEMPERATURE 2			
OPERATING OIL LEVEL			

FRONT PANEL CHILLED WTR SETPT: _____ DESIGN DELTA TEMP SETPT: _____

LVG WTR TEMP CUTOUT SETPT: _____ LOW RFGT TEMP CUTOUT SETPT: _____

CURRENT OVERLOAD SETTING #1: _____ CURRENT OVERLOAD SETTING #2: _____

EVAPORATOR WATER PRESSURE DROP:

DESIGN PSIG: _____ GPM: _____

ACTUAL PSIG: _____ GPM: _____

CONDENSER WATER PRESSURE DROP:

DESIGN PSIG: _____ GPM: _____

ACTUAL PSIG: _____ GPM: _____

PURGE

RUN HRS _____

SUC TEMP ____ DEG F

MOTOR INSULATION MEG OHMS:

TER. 1 TO GND _____ TER. 1-2 _____

TER. 2 TO GND _____ TER. 1-3 _____

TER. 3 TO GND _____ TER. 2-3 _____

MEGGER VOLTAGE: _____

TER. 1-4 _____

TER. 2-5 _____

TER. 3-6 _____

TECHNICIAN _____

OWNER'S REP _____

DATE _____

ACTIVE AND HISTORIC DIAGNOSTICS:

COMMENTS:

Also complete CVHE/F UCP2 Commissioning Checklist and Record Sheet