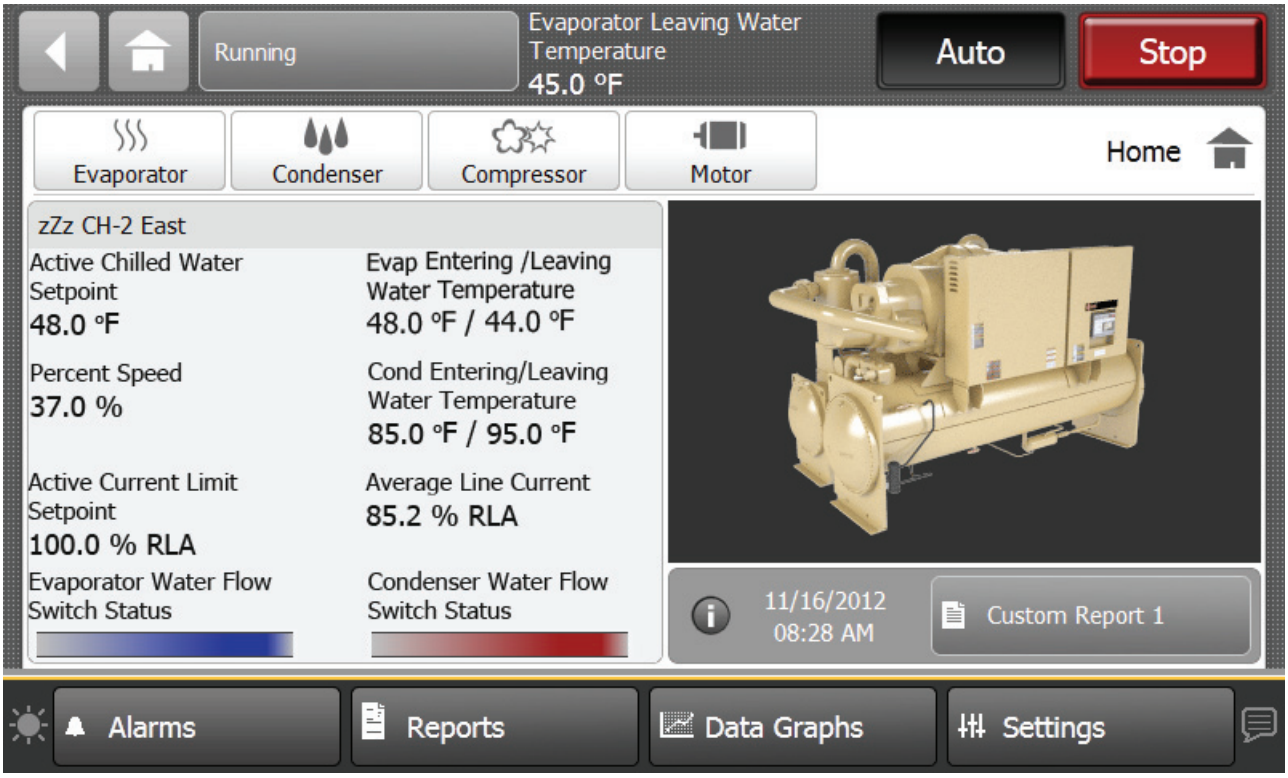
Tracer™ TD7 with UC 800

for RTHD chillers



RTHD evo

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RLC-SVU006B-GB

TRANE TECHNOLOGIES

Confidential and proprietary Trane information
Original instructions

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Installation Electrical

General Recommendations

As you review this manual, keep in mind that:

- All field-installed wiring must conform to European guidelines and any applicable local codes. Be sure to satisfy proper equipment grounding requirements per European guidelines.
- Compressor motor and unit electrical data (including motor kW, voltage utilization range, rated load amps) is listed on the chiller nameplate.
- All field-installed wiring must be checked for proper terminations, and for possible shorts or grounds.

Note: *Always refer to wiring diagrams shipped with chiller or unit submittal for specific electrical schematic and connection information.*

WARNING

Proper Field Wiring and Grounding Required!

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in local electrical codes. Failure to follow code could result in death or serious injury.

WARNING

Hazardous Voltage w/Capacitors!

Disconnect all electric power, including remote disconnects and discharge all motor start/run and AFD (Adaptive Frequency™ Drive) capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized.

- **For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.**
- **DC bus capacitors retain hazardous voltages after input power has been disconnected. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. After disconnecting input power, wait five (5) minutes for the DC capacitors to discharge, then check the voltage with a voltmeter. Make sure DC bus capacitors are discharged (0 VDC) before touching any internal components.**

Failure to follow these instructions could result in death or serious injury.

For additional information regarding the safe discharge of capacitors, see "Adaptive Frequency™ Drive (AFD_3) Capacitor Discharge," p. 28 and PROD-SVB06A-EN.

WARNING

Hazardous Voltage - Pressurized Burning Fluid!

Before removing compressor terminal box cover for servicing, or servicing power side of control panel, CLOSE COMPRESSOR DISCHARGE SERVICE VALVE and disconnect all electric power including remote disconnects. Discharge all motor start/run capacitors. Follow lockout/tagout procedures to ensure the power cannot be inadvertently energized. Verify with an appropriate voltmeter that all capacitors have discharged.

The compressor contains hot, pressurized refrigerant. Motor terminals act as a seal against this refrigerant. Care should be taken when servicing NOT to damage or loosen motor terminals.

Do not operate compressor without terminal box cover in place.

Failure to follow all electrical safety precautions could result in death or serious injury.

For additional information regarding the safe discharge of capacitors, see "Adaptive Frequency™ Drive (AFD_3) Capacitor Discharge," p. 28 and PROD-SVB06A-EN.

NOTICE:

Use Copper Conductors Only!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors could result in equipment damage.

Important: *To prevent control malfunctions, do not run low voltage wiring (<30 V) in conduit with conductors carrying more than 30 volts.*

In case of drive servicing only

WARNING

DISCHARGE TIME!

Frequency converters contain DC-link capacitors that can remain charged even when the frequency converter is not powered. To avoid electrical hazards, disconnect AC mains, any permanent magnet type motors, and any remote DClink power supplies, including battery backups, UPS and DC-link connections to other frequency converters. Wait for the capacitors to fully discharge before performing any service or repair work. The amount of wait time is listed in the Discharge Time table. Failure to wait the specified time after power has been removed before doing service or repair could result in death or serious injury.

Table 1 – Capacitor Discharge Times

Voltage	Power	Minimum waiting time [min]
380-500 V	90-250 kW	20
	315-800 kW	40

Units with Nitrogen Charge Option

For units with nitrogen charge option (model number digit 15 = 2), the unit must NOT have shore power, or unit power applied until the unit has been charged. Applying power will drive EXV valves closed, and will inhibit sufficient vac for unit charging.

Installer-Supplied Components

Customer wiring interface connections are shown in the electrical schematics and connection diagrams that are shipped with the unit. The installer must provide the following components if not ordered with the unit:

- Power supply wiring (in conduit) for all field-wired connections.
- All control (interconnecting) wiring (in conduit) for field supplied devices.
- Fused-disconnect switches or circuit breakers.

Power Supply Wiring

WARNING

Proper Field Wiring and Grounding Required!

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in your local electrical codes. Failure to follow code could result in death or serious injury.

All power supply wiring must be sized and selected accordingly by the project engineer in accordance with EN 60204.

All wiring must comply with local codes. The installing (or electrical) contractor must provide and install the system interconnecting wiring, as well as the power supply wiring. It must be properly sized and equipped with the appropriate fused disconnect switches.

The type and installation location(s) of the fused disconnects must comply with all applicable codes.

NOTICE:

Use Copper Conductors Only!

Unit terminals are not designed to accept other types of conductors. Failure to use copper conductors could result in equipment damage.

Cut holes into the sides of the control panel for the appropriately-sized power wiring conduits. The wiring is passed through these conduits and connected to the terminal blocks, optional unit-mounted disconnects, or HACR type breakers.

The high voltage field-provided connections are made through patch plate on the right side of the panel. The low voltage connections are made through knockouts provided on the left side of the panel. Additional grounds may be required for each 115 volt power supply to the unit. Green lugs are provided for 115V customer wiring.

Installation Electrical

Control Power Supply

The unit is equipped with a control power transformer. It is not necessary to provide additional control power voltage to the unit. No other loads should be connected to the control power transformer.

All units are factory-connected for appropriate labeled voltages.

Motor Cable

The motor must be connected to terminals U/T1/96, V/T2/97, W/T3/98. Earth (ground) to terminal 99. All types of three-phase asynchronous standard motors can be used with a frequency converter unit. The factory setting is for clockwise rotation with the frequency converter output connected as follows:

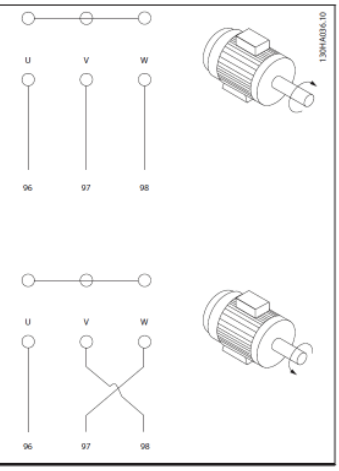
Table 2

Terminal no.	Function
96, 97, 98, 99	Mains U/T1, V/T2, W/T3 Earth (ground)

Motor Rotation Check

The direction of rotation can be changed by switching two phases in the motor cable or by changing the setting of 4-10 Motor Speed Direction.

Table 3

•Terminal U/T1/96 connected to U-phase •Terminal V/T2/97 connected to V-phase •Terminal W/T3/98 connected to W-phase	

A motor rotation check can be performed using1-28 Motor Rotation Check and following the steps shown in the display.

AC Mains Connection

- Size wiring is based upon the input current of the frequency converter
- Comply with local and national electrical codes for cable sizes
- Connect 3-phase AC input power wiring to terminals L1, L2, and L3 (see Figure 1)

Figure 1 – Connecting to AC Mains

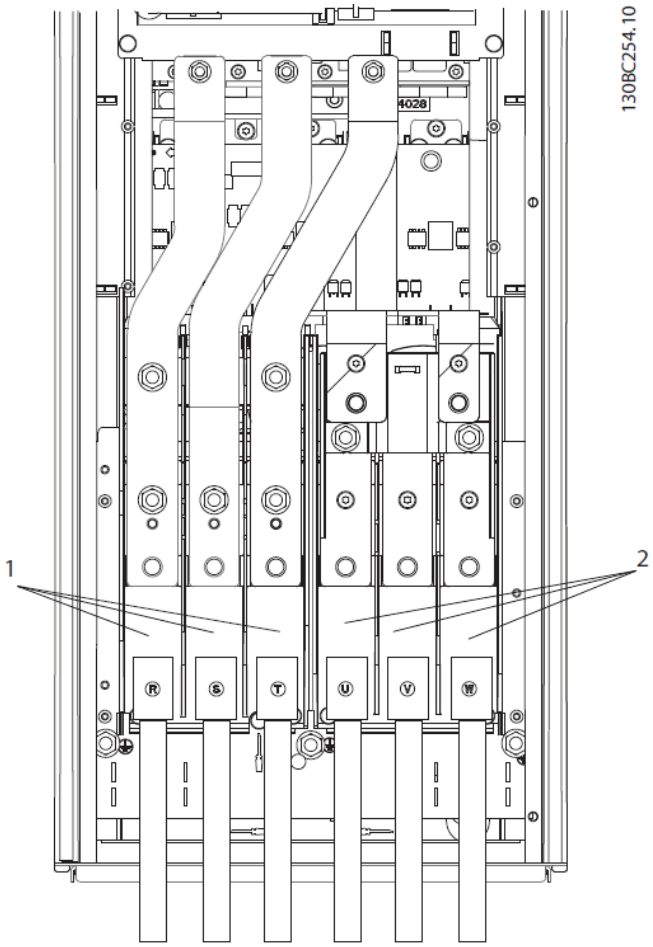


Table 4

1	Mains connection
2	Motor connection

- Earth (ground) the cable in accordance with the instructions provided
- All frequency converters may be used with an isolated input source as well as with earth (ground) reference power lines. When supplied from an isolated mains source (IT mains or floating delta) or TT/TN-S mains with a grounded leg (grounded delta), set 14-50 RFI Filter to OFF.
  When off, the internal RFI filter capacitors between the chassis and the intermediate circuit are isolated to avoid damage to the intermediate circuit and to reduce earth (ground) capacity currents in accordance with IEC 61800-3.

Installation Electrical

Interconnecting Wiring

Chilled Water Pump Control

NOTICE:

Equipment Damage!

If the microprocessor calls for a pump to start and water does not flow, the evaporator may be damaged catastrophically. It is the responsibility of the installing contractor and/or the customer to ensure that a pump will always be running when called upon by the chiller controls.

An evaporator water pump output relay closes when the chiller is given a signal to go into the Auto mode of operation from any source. The contact is opened to turn off the pump in the event of most machine level diagnostics to prevent the build up of pump heat.

The relay output is required to operate the Evaporator Water Pump (EWP) contactor. Contacts should be compatible with 115/240 VAC control circuit. Normally, the EWP relay follows the AUTO mode of the chiller. Whenever the chiller has no diagnostics and is in the AUTO mode, regardless of where the auto command is coming from, the normally open relay is energized. When the chiller exits the AUTO mode, the relay is timed to open in an adjustable (using TU) 0 to 30 minutes. The non-AUTO modes in which the pump is stopped, include Reset, Stop, External Stop, Remote Display Stop, Stopped by Tracer, Start Inhibited by Low Ambient Temp, and Ice Building complete.

Table 5 – Pump Relay Operation

Chiller Mode	Relay Operation
Auto	Instant close
Ice Building	Instant close
Tracer Override	Close
Stop	Timed Open
Ice Complete	Instant Open
Diagnostics	Instant Open

When going from Stop to Auto, the EWP relay is energized immediately. If evaporator water flow is not established in 20 minutes (for normal transition) or 4 minutes, 15 seconds (for pump commanded ON due to an override safety), the UC800 de-energizes the EWP relay and generates a non-latching diagnostic. If flow returns (e.g. someone else is controlling the pump), the diagnostic is cleared, the EWP is re-energized, and normal control resumed.

If evaporator water flow is lost once it had been established, the EWP relay remains energized and a non-latching diagnostic is generated. If flow returns, the diagnostic is cleared and the chiller returns to normal operation.

In general, when there is either a non-latching or latching diagnostic, the EWP relay is turned off as though there was a zero time delay. Exceptions whereby the relay continues to be energized occur with:

- **Low Chilled Water Temp. diagnostic** (non-latching) (unless also accompanied by an Evap Leaving Water Temperature Sensor Diagnostic)

or

- **Loss of Evaporator Water Flow diagnostic** (non-latching) and the unit is in the AUTO mode, after initially having proven evaporator water flow.

Programmable Relays

A programmable relay concept provides for enunciation of certain events or states of the chiller, selected from a list of likely needs, while only using four physical output relays, as shown in the field wiring diagram. The four relays are provided (generally with a Quad Relay Output LLID) as part of the Programmable Relay Option. The relay's contacts are isolated Form C (SPDT), suitable for use with 120 VAC circuits drawing up to 2.8 amps inductive, 7.2 amps resistive, or 1/3 HP and for 240 VAC circuits drawing up to 0.5 amp resistive.

The list of events/states that can be assigned to the programmable relays can be found in Table 6. The relay will be energized when the event/state occurs.

Table 6 – Chiller events/status descriptions

Event/State	Description
Alarm - Latching	This output is true whenever there is any active diagnostic that requires a manual reset to clear, that effects the Chiller, the Circuit, or any of the Compressors on a circuit. This classification does not include informational diagnostics.
Alarm - Auto Reset	This output is true whenever there is any active diagnostic that could automatically clear, that effects the Chiller, the Circuit, or any of the Compressors on a circuit. This classification does not include informational diagnostics. If all of the auto resetting diagnostics were to clear, this output would return to a false condition.
Alarm	This output is true whenever there is any diagnostic effecting any component, whether latching or automatically clearing. This classification does not include informational diagnostics.
Warning	This output is true whenever there is any informational diagnostic effecting any component, whether latching or automatically clearing.
Chiller Limit Mode	This output is true whenever the chiller has been running in one of the Unloading types of limit modes (Condenser, Evaporator, Current Limit or Phase Imbalance Limit) continuously for the last 20 minutes. A given limit or overlapping of different limits must be in effect continuously for 20 minutes prior to the output becoming true. It will become false, if no Unload limits are present for 1 minute. The filter prevents short duration or transient repetitive limits from indicating. The chiller is considered to be in a limit mode for the purposes of front panel display and annunciation, only if it is fully inhibiting loading by virtue of being in either the "hold" or "forced unload" regions of the limit control, excluding the "limited loading region". (In previous designs, the "limit load" region of the limit control was included in the criteria for the limit mode call out on the front panel and annunciation outputs)
Compressor Running	The output is true whenever any compressors are started or running on the chiller and false when no compressors are either starting or running on the chiller. This status may or may not reflect the true status of the compressor in Service Pumpdown if such a mode exists for a particular chiller.
Chiller Head Pressure Relief Request Relay	This relay output is energized anytime the chiller is running in one of the following modes; Ice Making Mode or Condenser Pressure Limit Control Mode continuously for the duration specified by the Chiller Head Relief Relay Filter Time. The Chiller Head Relief Relay Filter Time is a service setpoint. The relay output is de-energized anytime the chiller exits all above modes continuously for the duration specified by the same Chiller Head Relief Relay Filter Time.

Installation Electrical

Relay Assignments Using Tracer™ TU

Tracer™ TU Service Tool is used to install the Programmable Relay Option package and assign any of the above list of events or status to each of the four relays provided with the option. (See "Tracer™ TU," for more information on the Tracer TU service tool.) The relays to be programmed are referred to by the relay's terminal numbers on the LLID board 1A10.

The default assignments for the four available relays of the Programmable Relay option are:

Table 7 – Default assignments

Relay	
Relay 0Terminals J2-1,2,3:	Head press.
Relay 1Terminals J2-4,5,6:	Limit mode
Relay 2Terminals J2 - 7,8,9:	Alarm
Relay 3Terminals J2 -10,11,12:	CMP Running Relay

If any of the Alarm/Status relays are used, provide electrical power, 115 VAC with fused-disconnect to the panel and wire through the appropriate relays (terminals on 1A10). Provide wiring (switched hot, neutral, and ground connections) to the remote annunciation devices. Do not use power from the chiller's control panel transformer to power these remote devices. Refer to the field diagrams which are shipped with the unit.

Low Voltage Wiring

The remote devices described below require low voltage wiring. All wiring to and from these remote input devices to the Control Panel must be made with shielded, twisted pair conductors. Be sure to ground the shielding only at the panel.

Important: *To prevent control malfunctions, do not run low voltage wiring (<30 V) in conduit with conductors carrying more than 30 volts.*

Emergency Stop

UC800 provides auxiliary control for a customer specified/installed latching trip out. When this customer-furnished remote contact 5K22 is provided, the chiller will run normally when the contact is closed. When the contact opens, the unit will trip on a manually resettable diagnostic. This condition requires manual reset at the chiller switch on the front of the control panel.

Connect low voltage leads to terminal strip locations 1A12. Refer to the field diagrams that are shipped with the unit.

Silver or gold-plated contacts are recommended. These customer-furnished contacts must be compatible with 24 VDC, 12 mA resistive load.

External Auto/Stop

If the unit requires the external Auto/Stop function, the installer must provide leads from the remote contacts 5K21 to the proper terminals of the LLID 1A12 on the control panel.

The chiller will run normally when the contacts are closed. When either contact opens, the compressor(s), if operating, will go to the RUN:UNLOAD operating mode and cycle off. Unit operation will be inhibited. Closure of the contacts will permit the unit to return to normal operation.

Field-supplied contacts for all low voltage connections must be compatible with dry circuit 24 VDC for a 12 mA resistive load. Refer to the field diagrams that are shipped with the unit.

These customer-supplied contact closures must be compatible with 24 VDC, 12 mA resistive load. Silver or gold plated contacts are recommended.

Ice Building Option

UC800 provides auxiliary control for a customer specified/installed correct with contact closure 5K20 for ice building if so configured and enabled. This output is known as the Ice Building Status Relay. The normally open contact will be closed when ice building is in progress and open when ice building has been normally terminated either through Ice Termination setpoint being reached or removal of the Ice Building command. This output is for use with the ice storage system equipment or controls (provided by others) to signal the system changes required as the chiller mode changes from "ice building" to "ice complete". When contact 5K12 is provided, the chiller will run normally when the contact is open.

UC800 will accept either an isolated contact closure (External Ice Building command) or a Remote Communicated input (Tracer) to initiate and command the Ice Building mode.

UC800 also provides a "Front Panel Ice Termination Setpoint", settable through Tracer™ TU, and adjustable from 20 to 31°F (-6.7 to -0.5°C) in at least 1°F (1°C) increments.

Note: *When in the Ice Building mode, and the evaporator entering water temperature drops below the ice termination setpoint, the chiller terminates the Ice Building mode and changes to the Ice Building Complete Mode.*

NOTICE:

Equipment Damage!

Freeze inhibitor must be adequate for the leaving water temperature. Failure to do so will result in damage to system components.

Tracer™ TU must also be used to enable or disable Ice Machine Control. This setting does not prevent the Tracer from commanding Ice Building mode.

Upon contact closure, the UC800 will initiate an ice building mode, in which the unit runs fully loaded at all times. Ice building shall be terminated either by opening the contact or based on the entering evaporator water temperature. UC800 will not permit the ice building mode to be reentered until the unit has been switched out of ice building mode (open 5K12 contacts) and then switched back into ice building mode (close 5K12 contacts.)

In ice building, all limits (freeze avoidance, evaporator, condenser, current) will be ignored. All safeties will be enforced.

If, while in ice building mode, the unit gets down to the freeze stat setting (water or refrigerant), the unit will shut down on a manually resettable diagnostic, just as in normal operation.

Connect leads from 5K12 to the proper terminals of 1A15. Refer to the field diagrams which are shipped with the unit.

Silver or gold-plated contacts are recommended. These customer furnished contacts must be compatible with 24 VDC, 12 mA resistive load.

External Chilled Water Setpoint (ECWS) Option

The UC800 provides inputs that accept either 4-20 mA or 2-10 VDC signals to set the external chilled water setpoint (ECWS). This is not a reset function. The input defines the setpoint. This input is primarily used with generic BAS (building automation systems). The chilled water setpoint set via the Tracer TD7 or through digital communication with Tracer (Comm4). The arbitration of the various chilled water setpoint sources is described in the flow charts at the end of the section.

The chilled water setpoint may be changed from a remote location by sending either a 2-10 VDC or 4-20 mA signal to the 1A14, terminals 5 and 6 LLID. 2-10 VDC and 4-20 mA each correspond to a 10 to 65°F (-12 to 18°C) external chilled water setpoint.

The following equations apply:

Voltage Signal	
As generated from external source	VDC=0.1455*(ECWS) + 0.5454
As processed by UC800	ECWS=6.875*(VDC) - 3.75
Current Signal	
As generated from external source	mA=0.2909(ECWS) + 1.0909
As processed by UC800	ECWS=3.4375(mA) - 3.75

Installation Electrical

If the ECWS input develops an open or short, the LLID will report either a very high or very low value back to the main processor. This will generate an informational diagnostic and the unit will default to using the Front Panel (TD7) Chilled Water Setpoint.

Tracer TU Service Tool is used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA. Tracer TU is also used to install or remove the External Chilled Water Setpoint option as well as a means to enable and disable ECWS.

External Demand Limit Setpoint (EDLS) Option

Similar to the above, the UC800 also provides for an optional External Demand Limit Setpoint that will accept either a 2-10 VDC (default) or a 4-20 mA signal. The Demand Limit Setting can also be set via the Tracer TD7 or through digital communication with Tracer (Comm4). The arbitration of the various sources of demand limit is described in the flow charts at the end of this section. The External Demand Limit Setpoint may be changed from a remote location by hooking up the analog input signal to the 1A14 LLID terminals 2 and 3. Refer to the following paragraph on Analog Input Signal Wiring Details.

The following equations apply for EDLS:

	Voltage Signal	**Current Signal**
As generated from external source	VDC+0.133*(%)-6.0	mA=0.266*(%)-12.0
As processed by UCM	%=7.5*(VDC)+45.0	%=3.75*(mA)+45.0

If the EDLS input develops an open or short, the LLID will report either a very high or very low value back to the man processor. This will generate an informational diagnostic and the unit will default to using the Front Panel (Tracer TD7) Current Limit Setpoint.

The Tracer™ TU Service Tool must be used to set the input signal type from the factory default of 2-10 VDC to that of 4-20 mA current. Tracer TU must be also be used to install or remove the External Demand Limit Setpoint Option for field installation, or can be used to enable or disable the feature (if installed).

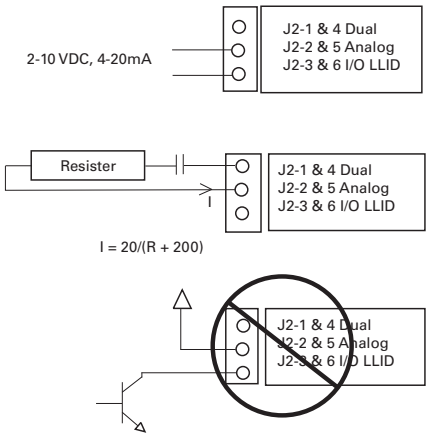
EDLS and ECWS Analog Input Signal Wiring Details:

Both the ECWS and EDLS can be connected and setup as either a 2-10 VDC (factory default), 4-20 mA, or resistance input (also a form of 4-2OmA) as indicated below. Depending on the type to be used, the Tracer TU Service Tool must be used to configure the LLID and the MP for the proper input type that is being used. This is accomplished by a setting change on the Custom Tab of the Configuration View within Tracer TU.

Important: *For proper unit operation, BOTH the EDLS and ECWS settings MUST be the same (2-10 VDC or 4-20mA), even if only one input is to be used.*

The J2-3 and J2-6 terminal is chassis grounded and terminal J2- 1 and J2-4 can be used to source 12 VDC. The ECLS uses terminals J2-2 and J2-3. ECWS uses terminals J2-5 and J2-6. Both inputs are only compatible with high-side current sources.

Figure 2 – Wiring examples for EDLS and ECWS



Chilled Water Reset (CWR)

UC800 resets the chilled water temperature set point based on either return water temperature, or outdoor air temperature. Return Reset is standard, Outdoor Reset is optional.

The following shall be selectable:

- One of three Reset Types: None, Return Water Temperature Reset, Outdoor Air Temperature Reset, or Constant Return Water Temperature Reset.
- Reset Ratio Set Points.
  For outdoor air temperature reset there shall be both positive and negative reset ratio's.
- Start Reset Set Points.
- Maximum Reset Set Points.

The equations for each type of reset are as follows:

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 set point or the "reset CWS"

CWS is the active chilled water set point before any reset has occurred, e.g. normally Front Panel, Tracer, or ECWS

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.

	Range			Increment		
Reset Type	**Reset Ratio**	**Start Reset**	**Max Reset**	**IP Units**	**SI Units**	**Factory Default**
Return	10 to 120%	4 to 30 F (2.2 to 16.7 C)	0 to 20 F (0.0 to 11.1 C)	1%	1%	50%
Outdoor	80 to -80%	50 to 130 F (10 to 54.4 C)	0 to 20 F (0.0 to 11.1 C)	1%	1%	10%

Installation Electrical

In addition to Return and Outdoor Reset, the MP provides a menu item for the operator to select a Constant Return Reset. Constant Return Reset will reset the leaving water temperature set point 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 MP will automatically set Ratio, Start Reset, and Maximum Reset to the following.

RATIO = 100%

START RESET = Design Delta Temp.

MAXIMUM RESET = Design Delta Temp.

The equation for Constant Return is then as follows:

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

and CWS' - CWS < or = Maximum Reset

When any type of CWR is enabled, the MP will step the Active 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 running.

When the chiller is not running, CWS is reset immediately (within one minute) for Return Reset and at a rate of 1 degree F every 5 minutes for Outdoor Reset. The chiller will start at the Differential to Start value above a fully reset CWS or CWS' for both Return and Outdoor Reset.

Communications Interface

LonTalk™ Interface (LCI-C)

UC800 provides an optional LonTalk™ Communication Interface (LCI-C) between the chiller and a Building Automation System (BAS). An LCI-C LLID shall be used to provide "gateway" functionality between a LonTalk compatible device and the Chiller. The inputs/outputs include both mandatory and optional network variables as established by the LonMark Functional Chiller Profile 8040.

Note: *For more information see ACC-SVN100*-EN.*

BACnet Protocol

The Building Automation and Control Network (BACnet and ANSI/ASHRAE Standard 135-2004) protocol is a standard that allows building automation systems or components from different manufacturers to share information and control functions. BACnet provides building owners the capability to connect various types of building control systems or subsystems together for a variety of reasons. In addition, multiple vendors can use this protocol to share information for monitoring and supervisory control between systems and devices in a multi-vendor interconnected system. The BACnet protocol identifies standard objects (data points) called BACnet objects. Each object has a defined list of properties that provide information about that object. BACnet also defines a number of standard application services that are used to access data and manipulate these objects and provides a client/server communication between devices.

BACnet Testing Laboratory (BTL) Certification

All Tracer™ UC800 controllers are designed to support BACnet communication protocol. In addition,someparticular revisions of the UC800 firmware have been tested and have achieved BTL certification by an official BACnet testing laboratory. For more details, refer to the BTL website at www.bacnetassociation.org.

Modbus RTU Protocol

Modicon Communication Bus (Modbus) is an application layer-messaging protocol that, like BACnet, provides client/server communication between devices over a variety of networks. During communications on a Modbus RTU network, the protocol determines how each controller will know its device address, recognize a message addressed to its device, determine what action to take, and extract any data or other information contained in the message. Controllers communicate using a master/slave technique, whereby, only one device (master) can initiate transactions (queries). Other devices (slaves) respond by supplying the requested data to the master or by taking the action requested in the query.

The master can address individual slaves or it can initiate a broadcast message to all slaves. In turn, the slaves respond to queries that are addressed to them individually or broadcasted. The Modbus RTU protocol establishes the format for the master's query by placing into it the device address, a function code defining the requested action, any data to be sent, and an error-checking field.

Overview

RTHD units utilize the following control/interface components:

- Tracer™ UC800 Controller
- Tracer TD7 Operator Interface

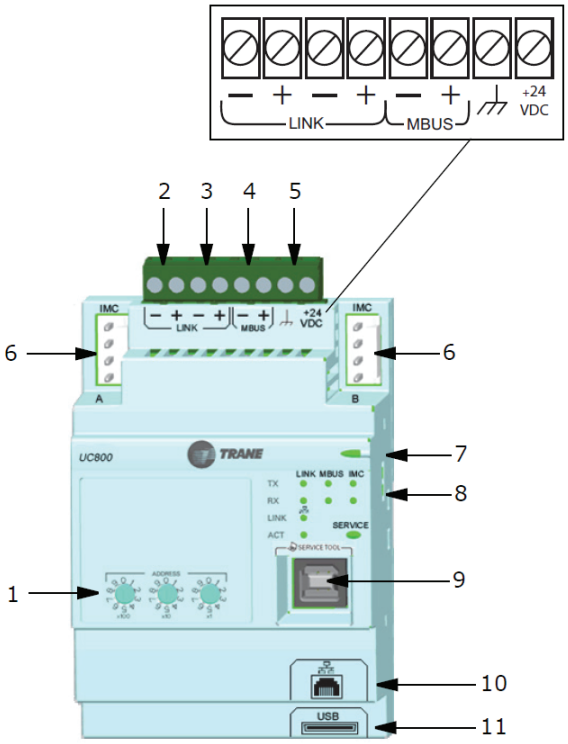
UC800 Specifications

This section covers information pertaining to the UC800 controller hardware.

Wiring and Port Descriptions

Figure 3 illustrates the UC800 controller ports, LEDs, rotary switches, and wiring terminals. The numbered list following Figure 3 corresponds to the numbered callouts in the illustration.

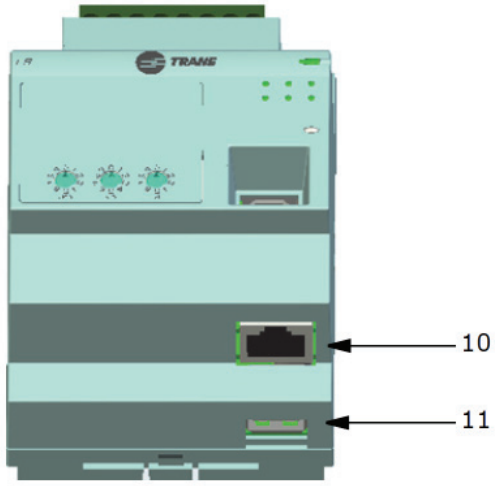
Figure 3 – Wiring locations and connection ports



Front View

Controls

Figure 3 – Wiring locations and connection ports



Bottom View

1. Rotary Switches for setting BACnet® MAC address or MODBUS ID.
2. LINK for BACnet MS/TP, or MODBUS Slave (two terminals, ±). Field wired if used.
3. LINK for BACnet MS/TP, or MODBUS Slave (two terminals, ±). Field wired if used.
4. Machine bus for existing machine LLIDs (IPC3 Tracer bus 19.200 baud). IPC3 Bus: used for Comm4 using TCI or LonTalk® using LCI-C.
5. Power (210 mA at 24 Vdc) and ground terminations (same bus as item 4). Factory wired.
6. Not used.
7. Marquee LED power and UC800 Status indicator.
8. Status LEDs for the BAS link, MBus link, and IMC link.
9. USB device type B connection for the service tool (Tracer TU).
10. The Ethernet connection can only be used with the Tracer AdaptiView display.
11. USB Host (not used).

Communication Interfaces

There are four connections on the UC800 that support the communication interfaces listed. Refer to Figure 3, p. 15 for the locations of each of these ports.

- BACnet MS/TP
- MODBUS Slave
- LonTalk using LCI-C (from the IPC3 bus)
- Comm 4 using TCI (from the IPC3 bus)

Rotary Switches

There are three rotary switches on the front of the UC800 controller. Use these switches to define a three-digit address when the UC800 is installed in a BACnet or MODBUS system (e.g., 107, 127, etc.).

Note: *Valid addresses are 001 to 127 for BACnet and 001 to 247 for MODBUS.*

LED Description and Operation

There are 10 LEDs on the front of the UC800. Figure 4 shows the locations of each LED and Table 8, p. 17 describes their behavior in specific instances.

Figure 4 – LED locations

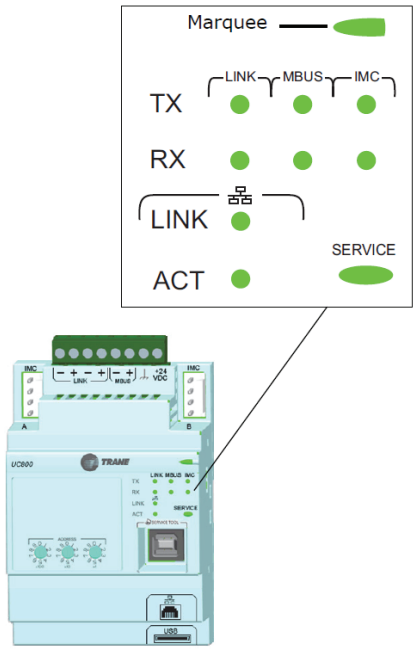


Table 8 – LED behavior

LED	UC800 Status
Marquee LED	**Powered.** If the Marquee LED is green solid, the UC800 is powered and no problems exist.
	Low power or malfunction. If the Marquee LED is red solid, the UC800 is powered, but there are problems present.
	Alarm. The Marquee LED blinks Red when an alarm exists.
LINK, MBUS, IMC	The **TX** LED blinks green at the data transfer rate when the UC800 transfers data to other devices on the link. The **Rx** LED blinks yellow at the data transfer rate when the UC800 receives data from other devices on the link.
Ethernet Link	The **LINK** LED is solid green if the Ethernet link is connected and communicating. The **ACT** LED blinks yellow at the data transfer rate when data flow is active on the link.
Service	The Service LED is solid green when pressed. For qualified service technicians only. Do not use.

NOTICE:

Electrical Noise!

Maintain at least 6 inches between low-voltage (<30V) and high voltage circuits. Failure to do so could result in electrical noise that could distort the signals carried by the low-voltage wiring, including IPC.

Controls

Tracer TD7 Operator Interface

Information is tailored to operators, service technicians, and owners.

When operating a chiller, there is specific information you need on a day-to-day basis—setpoints, limits, diagnostic information, and reports.

Day-to-day operational information is presented at the display. Logically organized groups of information—chiller modes of operation, active diagnostics, settings and reports put information conveniently at your fingertips.

Tracer™ TU

The RTHD operator interface allows for daily operational tasks and setpoint changes. However, to adequately service chillers Tracer™ TU service tool is required. (Non-Trane personnel, contact your local Trane office for software purchase information.) Tracer TU adds a level of sophistication that improves service technician effectiveness and minimizes chiller downtime. This portable PC-based service-tool software supports service and maintenance tasks, and is required for software upgrades, configuration changes and major service tasks.

Tracer TU serves as a common interface to all Trane® chillers, and will customize itself based on the properties of the chiller with which it is communicating. Thus, the service technician learns only one service interface.

The panel bus is easy to troubleshoot using LED sensor verification. Only the defective device is replaced. Tracer TU can communicate with individual devices or groups of devices.

All chiller status, machine configuration settings, customizable limits, and up to 100 active or historic diagnostics are displayed through the service-tool software interface.

LEDs and their respective Tracer TU indicators visually confirm the availability of each connected sensor, relay, and actuator.

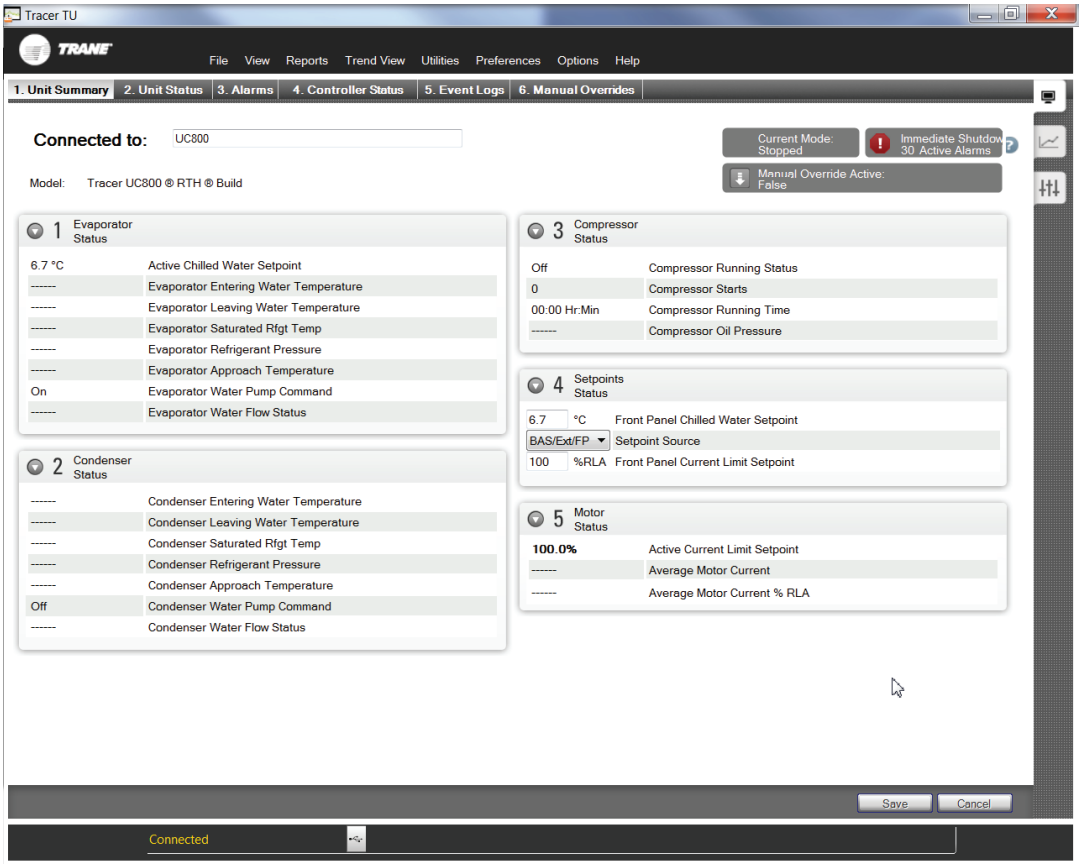
Tracer TU is designed to run on a customer's laptop, connected to the Tracer control panel with a USB cable. Your laptop must meet the following hardware and software requirements:

- 1 GB RAM (minimum)
- 1024 x 768 screen resolution
- CD-ROM drive
- Ethernet 10/100 LAN card
- An available USB 2.0 port
- Microsoft® Windows® XP Professional operation system with Service Pack 3 (SP3) or Windows 7 Enterprise or Professional operating system (32-bit or 64-bit)
- **Microsoft .NET Framework 4.0 or later**

Note: *Tracer TU is designed and validated for this minimum laptop configuration. Any variation from this configuration may have different results. Therefore, support for Tracer TU is limited to only those laptops with the configuration previously specified.*

Note: *For more information, see TTU-SVN01A-EN Tracer TU Getting Started Guide.*

Figure 5 – Tracer TU



Diagnostics

Diagnostic Name and Source: Name of Diagnostic and its source. Note that this is the exact text used in the User Interface and/or Service Tool displays.

Affects Target: Defines the "target" or what is affected by the diagnostic. Usually either the entire Chiller, or a particular Circuit or Compressor is affected by the diagnostic (the same one as the source), but in special cases functions are modified or disabled by the diagnostic. None implies that there is no direct affect to the chiller, sub components or functional operation.

Design Note: Tracer™ TU does not support the display of certain targets on its Diagnostics pages although the functionality implied by this table is supported. Targets such as Evap Pump, Ice Mode, Chilled Water Reset, External Setpoints etc. – are displayed as simply "Chiller" even though they do not imply a chiller shutdown – only a compromise of the specific feature.

Severity: Defines the severity of the above effect. Immediate means immediate shutdown of the affected portion, Normal means normal or friendly shutdown of the affected portion, Special Action means a special action or mode of operation (limp along) is invoked, but without shutdown, and Info means an Informational Note or Warning is generated. Design Note: Tracer TU does not support display of "Special Action", on its Diagnostics pages, so that if a diagnostic has a special action defined in the table below, it will be displayed only as "Informational Warning" as long as no circuit or chiller shutdown results. If there is a shutdown and special action defined in the table, then the Tracer TU Diagnostics Page display will indicate the shutdown type only.

Persistence: Defines whether or not the diagnostic and its effects are to be manually reset (Latched), or can be either manually or automatically reset when and if the condition returns to normal (Nonlatched).

Active Modes [Inactive Modes]: States the modes or periods of operation that the diagnostic is active in and, as necessary, those modes or periods that it is specifically "not active" in as an exception to the active modes. The inactive modes are enclosed in brackets, [ ]. Note that the modes used in this column are internal and not generally annunciated to any of the formal mode displays.

Criteria: Quantitatively defines the criteria used in generating the diagnostic and, if nonlatching, the criteria for auto reset. If more explanation is necessary a hot link to the Functional Specification is used.

Reset Level: Defines the lowest level of manual diagnostic reset command which can clear the diagnostic. The manual diagnostic reset levels in order of priority are: Local or Remote. For example, a diagnostic that has a reset level of Remote, can be reset by either a remote diagnostic reset command or by a local diagnostic reset command.

Help Text: Provides for a brief description of what kind of problems might cause this diagnostic to occur. Both control system component related problems as well as chiller application related problems are addressed (as can possibly be anticipated). These help messages will be updated with accumulated field experience with the chillers.

Starter Diagnostics

Hex Code	Diagnostic Name and Source	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
E5	Phase Reversal	Chiller	Immediate	Latch	Compressor energized to transition command [All Other Times]	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 0.3 second from compressor start.	Local
188	Starter Dry Run Test	Chiller	Immediate	Latch	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.	Local
E4	Phase Loss	Chiller	Immediate	Latch	Start Sequence and Run modes	a) No current was sensed on one or two of the current transformer inputs while running or starting (See Nonlatching Power Loss Diagnostic for all three phases lost while running). Must hold = 20% RLA. Must trip = 5% RLA. Time to trip shall be longer than guaranteed reset on Starter Module at a minimum, 3 seconds maximum. Actual design trippoint is 10%. The actual design trip time is 2.64 seconds. b) If Phase reversal protection is enabled and current is not sensed on one or more current xformer inputs. Logic will detect and trip in a maximum of 0.3 second from compressor start.	Local
E2	Momentary Power Loss	Chiller	Immediate	Nonlatch	All compressor running and stopping modes [all compressor starting and non-running modes]	Momentary Power Loss option disabled: No effect. Momentary Power Loss option enabled: A loss of power on three line cycles or more was detected. Diagnostic is reset in 30 seconds. See Momentary Power Loss Protection specification for additional information.	Remote
1A0	Power Loss	Chiller	Immediate	NonLatch	All compressor running modes [all compressor starting and non-running modes]	The compressor had previously established currents while running and then all three phases of current were lost. Design: Less than 10% RLA, trip in 2.64 seconds. This diagnostic will preclude the Phase Loss Diagnostic and the Transition Complete Input Opened Diagnostic from being called out. To prevent this diagnostic from occurring with the intended disconnect of main power, the minimum time to trip must be greater than the guaranteed reset time of the Starter module. Note: This diagnostic prevents nuisance latching diagnostics due to a momentary power loss – It does not protect motor/compressor from uncontrolled power reapplication. See Momentary Power Loss Diagnostic for this protection. This diagnostic will auto reset in 10 seconds from its occurrence, and is not active during the start mode before the transition complete input is proven. This prevents the chiller from cycling due to some internal starter problem, as the starter would latch out on either a "Starter Fault Type 3" or a "Starter Did Not Transition" latching diagnostic. However true power loss occurring during a start would result in a misdiagnosis and the chiller would not automatically recover.	Remote
E3	Severe Current Imbalance	Chiller	Normal	Latch	All Running Modes	A 30% current imbalance has been detected on one phase relative to the average of all 3 phases for 90 continuous seconds.	Local

Diagnostics

Hex Code	Diagnostic Name and Source	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
1E9	Starter Fault Type I	Chiller	Immediate	Latch	Starting - Y Delta Starters Only	This is a specific starter test where 1M(1K1) 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.	Local
1ED	Starter Fault Type II	Chiller	Immediate	Latch	Starting All types of starters	a. This is a specific starter test where the Shorting Contactor (1K3) 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.).	Local
1F1	Starter Fault Type III	Chiller	Immediate	Latch	Starting [Adaptive Frequency Starter Type]	As part of the normal start sequence to apply power to the compressor, the Shorting Contactor (1K3) and then the Main Contactor (1K1) 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. The test above applies to all forms of starters.	Local
189	Solid State Starter Fault	Chiller	Immediate	Latch	All	The Solid State Starter Fault Relay is open	Local
701	AFD Drive Fault	Chiller	Immediate	Latch	All	The AFD Drive Fault Relay is open	Local
F0	Starter Did Not Transition	Chiller	Immediate	Latch	On the first check after transition.	The Starter Module did not receive a transition complete signal in the designated time from its command to transition. The must hold time from the Starter Module transition command is 1 second. The Must trip time from the transition command is 6 seconds. Actual design is 2.5 seconds. This diagnostic is active only for Y-Delta, Auto-Transformer, Primary Reactor, and X-Line Starters.	Local
1F5	Compressor Did Not Accelerate Fully	Chiller	Immediate	Latch	Start Mode	The starter module did not receive an "Up to Speed" or "End of Ramp" signal from the SSS within 2.5 seconds after commanding a bypass, or after the maximum acceleration time had expired, whichever is longer. This diagnostic only applies to SSS/AFD.	Local
1FA	Compressor Did Not Accel: Transition	Chiller	Info	Latch	Start Mode	The compressor did not come up to speed (get to <85%RLA) in the allotted time defined by the Maximum Acceleration Timer and a transition was forced (motor put across the line) at that time. This applies to all starter types. Note: Since RTHD SSS has no forced transition capability, this info warning can be followed with a "Compressor did not accelerate fully" diagnostic above and an aborted start.	Remote
EE	Compressor Did Not Accelerate: Shutdown	Chiller	Immediate	Latch	Start Mode	The compressor did not come up to speed (get to <85%RLA) in the allotted time defined by the Maximum Acceleration Timer and and the start was aborted per the starter configuration selected.	Remote
3D5	Transition Complete Input Shorted	Chiller	Immediate	Latch	Pre-Start	The Transition Complete input is shorted before the compressor was started. This is active for all electromechanical starters.	Local
3D6	At Speed Input Shorted	Chiller	Immediate	Latch	Pre-Start	The "At Speed" input is shorted before the compressor was started. This is active for solid state starters and AFD.	Local

Hex Code	Diagnostic Name and Source	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
3D7	Transition Complete Input Opened	Chiller	Immediate	Latch	All Running Modes after transition completed	The Transition Complete input is open with the compressor motor running after a successful completion of transition. This is active only for all electromechanical starters	Local
3D8	At Speed Input Opened	Chiller	Immediate	Latch	All Running Modes after At Speed proven	The "At Speed" input was found to be opened with the compressor motor running after successfully obtaining an at speed and bypassed condition. This is active for solid state starters and AFD	Local
EC	Motor Current Overload	Chiller	Immediate	Latch	Chiller Energized	Compressor current exceeded overload time vs. trip characteristic. For A/C products Must trip = 140% RLA, Must hold=125%, nominal trip 132.5% in 30 seconds	Local
CA	Starter Contactor Interrupt Failure	Chiller	Immediate and Special Action	Latch	Starter Contactor not Energized [Starter Contactor Energized]	Detected compressor currents greater than 10% RLA on any or all phases when the compressor was commanded off. Detection time shall be 5 seconds minimum and 10 seconds maximum. On detection and until the controller is manually reset: generate diagnostic, energize the appropriate alarm relay, continue to energize the Evap and Cond Pump Outputs, continue to command the affected compressor off, fully unload the effected compressor. For as long as current continues, perform liquid level and oil return gas pump control	Local
D7	Over Voltage	Chiller	Normal	NonLatch	All	a. Average of all monitored Line voltages 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. and maximum of 5 min.) Design: Nom. trip: 60 seconds at greater than 112.5%, + or - 2.5%, Auto Reset at 109% or less.	Remote
D8	Under Voltage	Chiller	Normal	NonLatch	All	a. Average of all monitored Line voltages below - 10% of nominal or the Under/ Overvoltage transformer(s) are not connected. [Must hold = - 10% of nominal. Must trip = - 15% of nominal. Reset differential = 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% or greater.	Remote

Diagnostics

Main Processor Diagnostics

Hex Code	Diagnostic Name	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
D9	MP: Reset Has Occurred	Chiller	Info	NonLatch	All	The main processor has successfully come out of a reset and built its application. A reset may have been due to a power up, installing new software or configuration. This diagnostic is immediately and automatically cleared and thus can only be seen in the Historic Diagnostic List in TechView	Remote
6B5	Unexpected Starter Shutdown	Chiller	Normal	Nonlatch	All Cprsr Running modes, Starting, Running and Preparing to Shutdown	The Starter module status reported back that it is stopped when it should be running and no Starter diagnostic exists. This diagnostic will be logged in the active buffer and then cleared.	NA
FB	Low Evaporator Refrigerant Temperature	Chiller	Immediate	Latch	All Ckt Running Modes	a. The inferred Saturated Evap Refrigerant Temperature (calculated from suction pressure transducer(s)) dropped below the Low Refrigerant Temperature Cutout Setpoint for 450°F-sec (10°F-sec max rate) while the circuit was running after the ignore period had expired. The integral is held at zero for the 1 minute ignore time following the circuit startup and the integral will be limited to never trip in less than 45 seconds, i.e. the error term shall be clamped to 10°F. The minimum LRTC setpoint is -5°F (18.7 Psia) the point at which oil separates from the refrigerant. b. During the timeout of the trip integral, the unload solenoid(s) of the running compressors on the circuit, shall be energized continuously and the load solenoid shall be off. Normal load/unload operation will be resumed if the trip integral is reset by return to temps above the cutout setpoint.	Remote
198	Low Oil Flow	Chiller	Immediate	Latch	Chiller Energized and Delta P above 15 Psid	The oil pressure was out of the acceptable pressure range for 15 seconds, while the Delta Pressure was greater than 15 Psid.: Acceptable range is 0.50 or 0.60 > (PC-Po) / (PC-PE) for the first 2.5 minutes of operation, and 0.40 or 0.50 > (PC-Po) / (PC-PE) thereafter. The higher ratios used if the system DP is less than 23 psid	Local
59C	Loss of Oil at Compressor (Running)	Chiller	Immediate	Latch	Starter Contactor Energized	In running modes , Oil Loss Level Sensor detects lack of oil in the oil tank feeding the compressor (distinguishing a liquid flow from a vapor flow)	Local
59D	Loss of Oil at Compressor (Stopped)	Chiller	Immediate and Special Action	Latch	Compressor Pre-start [all other modes]	Oil Loss Level Sensor detects a lack of oil in the oil tank feeding the compressor for 90 seconds after EXV preposition is completed. Note: Compressor start is delayed while waiting for oil to be detected.	Local
1AE	Low Differential Refrigerant Pressure	Chiller	Immediate	Latch	Chiller Energized	The system differential pressure was either below 15 Psid for more than 164 Psid-sec, or below 23.0 Psid for 3000 Psid-sec. The latter integral's value is not cleared for any reason including diagnostic trip, manual reset, or power up reset (ie. Integral is saved nonvolatily on power down). The integral will decay while circuit is running at a max rate of –10 PSID, and while stopped at a rate of –0.4 PSID. This same integral is associated with the operating mode "Compressor Cool Down". Also see diagnostic below	Remote
297	No Differential Refrigerant Pressure	Chiller	Immediate	Latch	Chiller Energized	The system differential pressure was below 7.7 Psid. The occurrence of this diagnostic will saturate the above "Low Diff Rfgt Press" Integral and invoke the same "Compressor Cool Down" op mode.	Remote

Hex Code	Diagnostic Name	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
1C6	High Differential Refrigerant Pressure	Chiller	Normal	Latch	Chiller Energized	a. The system differential pressure was above 160 Psid- trip immediately (normal shutdown) B The diff pressure was above 152 Psid - trip in 1 hour	Remote
1C6	High Refrigerant Pressure Ratio	Chiller	Immediate	Latch	Service Pumpdown Only	The system pressure ratio exceeded 5.61 for 1 contiguous minute. This pressure ratio is a fundamental limitation of the compressor. The pressure ratio is defined as Pcond (abs)/ Pevap(abs).	Remote
1C2	High Cprsr Rfgt Discharge Temperature	Chiller	Immediate	Latch	All [compressor not running or during compressor run unload]	The compressor discharge temperature exceeded 190°F. This diagnostic will be suppressed if it occurs during the compressor run-unload period or after the compressor has stopped, but a run unload will be terminated early as a result. Note: As part of the Compressor High Temperature Limit Mode (aka Minimum Capacity Limit), the compressor shall be forced loaded as the filtered discharge temperature nears this trip-point.	Remote
18E	Low Discharge Superheat	Chiller	Normal	Latch	Any Running Mode	While Running Normally, the Discharge Superheat was less than 12 degrees F +- 1F for more than 6500 degree F seconds. At startup the UCM shall ignore the Discharge Superheat for 5 minutes.	Remote
284	Compressor Discharge Temperature Sensor	Chiller	Immediate	Latch	All	Bad Sensor or LLID	Remote
27D	Evaporator Liquid Level Sensor	Chiller	Normal	Latch	All	Bad Sensor or LLID	Remote
390	BAS Failed to Establish Communication	Chiller	Special		At power-up	The BAS was setup as "installed" and the BAS did not communicate with the MP within 15 minutes after power-up. Refer to Section on Setpoint Arbitration to determine how setpoints and operating modes may be effected. Note: The original requirement for this was 2 minutes, but was implemented at 15 minutes for RTAC.	Remote
398	BAS Communication Lost	Chiller	Special		All	The BAS was setup as "installed" at the MP and the Comm 3 llid lost communications with the BAS for 15 contiguous minutes after it had been established. Refer to Section on Setpoint Arbitration to determine how setpoints and operating modes may be effected by the comm loss. The chiller follows the value of the Tracer Default Run Command which can be previously written by Tracer and stored nonvolatilely by the MP (either use local or shutdown).	Remote
583	Low Evaporator Liquid Level	Chiller	Info	NonLatch	Starter Contactor Energized [all Stop modes]	The liquid level sensor is seen to be at or near its low end of range for 80 contiguous minutes while the compressor is running. Design: 20% or less of bit count corresponding to –21.2 mm or less liquid level for 80 minutes)	Remote
584	High Evaporator Liquid Level	Chiller	Normal	Latch	Starter Contactor Energized [all Stop modes]	The liquid level sensor is seen to be at or near its high end of range for 80 contiguous minutes while the compressor is running. (The diagnostic timer will hold, but not clear when the circuit is off). Design: 80% or more of bit count corresponding to +21.2 mm or more liquid level for 80 minutes)	Remote

Diagnostics

Hex Code	Diagnostic Name	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
87	External Chilled/Hot Water Setpoint	Chiller	Info	NonLatch	All	a. Function Not "Enabled": no diagnostics. b. "Enabled": Out-Of-Range Low or Hi or bad LLID, set diagnostic, default CWS to next level of priority (e.g. Front Panel SetPoint). This Info diagnostic will automatically reset if the input returns to the normal range.	Remote
89	External Current Limit Setpoint	Chiller	Info	NonLatch	All	a. Not "Enabled": no diagnostics. b. "Enabled": Out-Of-Range Low or Hi or bad LLID, set diagnostic, default CLS to next level of priority (e.g. Front Panel SetPoint. This Info diagnostic will automatically reset if the input returns to the normal range.	Remote
702	AFD output power input	Chiller	Info	NonLatch	All	Out-Of-Range Low or Hi or bad LLID, set diagnostic, This Info diagnostic will automatically reset if the input returns to the normal range.	
4C4	External Base Loading Setpoint	Chiller	Info and Special Action	NonLatch	All	a. Not "Enabled": no diagnostics. b. "Enabled": Out-Of-Range Low or Hi or bad LLID, set diagnostic, default BLS to next level of priority (e.g. Front Panel SetPoint. This Info diagnostic will automatically reset if the input returns to the normal range.	Remote
8A	Evap Water Flow (Entering Water Temp)	Chiller	Info	NonLatch	Any Ckt(s) Energized [No Ckt(s) Energized]	The entering evaporator water temp fell below the leaving evaporator water temp. by more than 2°F for 100°F-sec. For falling film evaporators this diagnostic cannot reliably indicate loss of flow, but can warn of improper flow direction through the evaporator, misbound temperature sensors, or other system problems	Remote
8E	Evaporator Entering Water Temp Sensor	Chiller	Info and Special Action	Latch		Bad Sensor or LLID Normal operation unless CHW Reset is enabled. If CHW Reset is enabled and either Return or Constant Return Chilled Water Reset is selected, its effect will be removed but slew rates on the change will be limited per the Chilled Water Reset spec.	Remote
AB	Evaporator Leaving Water Temp Sensor	Chiller	Normal	Latch	All	Bad Sensor or LLID	Remote
9A	Condenser Entering Water Temp Sensor	Chiller	Info and Special Action	Latch	All	Bad Sensor or LLID. If chiller running, and condenser water regulating valve option installed, force valve to 100% flow.	Remote
9B	Condenser Leaving Water Temp Sensor	Chiller	Info	Latch	All	Bad Sensor or LLID	Remote
5B8	Condenser Rfgt Pressure Transducer	Chiller	Normal	Latch	All	Bad Sensor or LLID	Remote
5BA	Evaporator Rfgt Pressure Transducer	Chiller	Normal	Latch	All	Bad Sensor or LLID	Remote
5BE	Oil Pressure Transducer	Chiller	Normal	Latch	All	Bad Sensor or LLID	Remote
1E1	Oil Flow Protection Fault	Chiller	Immediate	Latch	Starter Contactor Energized [all Stop modes]	The Oil Pressure Transducer for this Chiller is reading a pressure either above its Condenser Pressure by 15 Psia or more, or below its Evaporator Pressure 10 Psia or more for 30 seconds continuously.	Local
B5	Low Evaporator Refrigerant Pressure	Chiller	Immediate	Latch	Chiller Prestart and Chiller Energized	The Evaporator Refrigerant Pressure dropped below 10 psia just prior to compressor start. The pressure fell below 10 psia while running but before the 3 minute ignore time had expired or fell below 16 Psia after the 3 minute ignore time had expired.	Local

Hex Code	Diagnostic Name	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
C5	Low Evaporator Water Temp (Unit Off)	Chiller	Info and Special Action	NonLatch	Unit in Stop Mode, or in Auto Mode and No Ckt(s) Energized [Any Ckt Energized]	The leaving Evaporator water temp. fell below the leaving water temp cutout setting for 30 degree F seconds while the Chiller is in the Stop mode, or in Auto mode with no compressors running. Energize Evap Water pump Relay until diagnostic auto resets, then return to normal evap pump control. Automatic reset occurs when the temp rises 2°F (1.1°C) above the cutout setting for 30 minutes.	Remote
6B3	Low Evaporator Temp: Unit Off	Chiller	Info and Special Action	NonLatch	Unit in Stop Mode, or in Auto Mode and No Ckt's Energizd [Any Ckt Energizd]	The evap sat temp fell below the water temp cutout setting while the respective evap liquid level was greater than –21.2 mm for 30 (or 150 begining with rev 08) degree F seconds while Chiller is in the Stop mode, or in Auto mode with no compressors running. Energize Evap Water pump Relay until diagnostic auto resets, then return to normal evap pump control. Automatic reset occurs when either the evap temp rises 2°F (1.1°C) above the cutout setting or the liquid level falls below –21.2mm for 30 minutes	Remote
C6	Low Evaporator Water Temp (Unit On)	Chiller	Immediate and Special Action	NonLatch	Any Ckt[s] Energized [No Ckt(s) Energizd]	The Evaporator water temp. fell below the cutout setpoint for 30 degree F Seconds while the compressor was running. Automatic reset occurs when the temperature rises 2°F (1.1°C) above the cutout setting for 2 minutes. This diagnostic shall not de-energize the Evaporator Water Pump Output.	Remote
384	Evaporator Water Flow Overdue	Chiller	Normal	NonLatch	Estab. Evap. Water Flow on going from STOP to AUTO.	Evaporator water flow was not proven within 20 minutes of the Evaporator water pump relay being energized. The Evap pump command status will not be effected. This diagnostic will auto-clear on proof of flow (6-10 seconds of continuous flow), or if chiller is returned to Stop mode.	Remote
ED	Evaporator Water Flow Lost	Chiller	Immediate	NonLatch	Evap pump commanded "on" except for [All Stop modes]	The Evaporator water flow proof input was open for more than 6-10 contiguous seconds after flow had been proven. The pump command status will not be effected. Even though the pump may be commanded to run in the STOP modes (pump off delay time), this diagnostic shall not be called out in the STOP modes. This diagnostic will auto-clear on proof of flow (6-10 seconds of continuous flow), or if chiller is returned to Stop mode.	Remote
DC	Condenser Water Flow Overdue	Chiller	Normal	NonLatch	Estab Cond Water Flow	Condenser water flow was not proven within 20 minutes of the condenser pump relay being energized. The Cond Pump shall be commanded off. Diagnostic is reset with return of flow (although only possible with external control of pump)	Remote
F7	Condenser Water Flow Lost	Chiller	Immediate	NonLatch	Start and All Run Modes	The condenser water flow proof input was open for more than 6 contiguous seconds after flow had been proven. This diagnostic is automatically cleared once the compressor is stopped by a fixed time out of 7 sec. The Cond Pump shall be commanded off but the Evap pump command will not be effected.	Remote
6B8	High Evaporator Refrigerant Pressure	Chiller	Immediate and Special Action	NonLatch	All	The evaporator refrigerant pressure has risen above 190 psig (future use – add "for continuous15 seconds"). The evaporator water pump relay will be de-energized to stop the pump regardless of why the pump is running. The diagnostic will auto reset and the pump will return to normal control when the evaporator pressures falls below 185 psig. This diagnostic must shutdown the chiller if it is running.	Local

Diagnostics

Hex Code	Diagnostic Name	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
6B6	High Evaporator Water Temperature	Chiller	Info and Special Action	NonLatch	Only effective if either 1)Evap Wtr Flow Overdue, 2)Evap Wtr Flow Loss, or 3)Low Evap Rfgt Temp,- Unit Off, diagnostic is active.	The leaving water temperature exceeded the high evap water temp limit (TV service menu settable –default 105F) for 15 continuous seconds. The evaporator water pump relay will be de-energized to stop the pump but only if it is running due one of the diagnostics listed on the right. The diagnostic will auto reset and the pump will return to normal control when the temperature falls 5°F below the trip setting. The primary purpose is to stop the evaporator water pump and its associated pump heat from causing excessive waterside temperatures and waterside pressures when the chiller is not running but the evap pump is on due to either Evap Water Flow Overdue, Evaporator Water Flow Loss , or Low Evap Temp – Unit Off Diagnostics. This diagnostic will not auto clear solely due to the clearing of the enabling diagnostic.	Local
F5	High Pressure Cutout	Chiller	Immediate	Latch	All	A high pressure cutout was detected; C.O. on rise @ 180 psig, reset @ 135 psig (+/-5 psi on switching tolerance) Note: Pressure relief valve is 200 Psig +- 2% trip at 315 ± 5 psi. Note: Other diagnostics that may occur as an expected consequence of the HPC trip will be suppressed from annunciation. These include Phase Loss, Power Loss, and Transition Complete Input Open.	Local
FD	Emergency Stop	Chiller	Immediate	Latch	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.	Local
A1	Outdoor Air Temperature Sensor	Chiller	Info and Special Action	Latch	All	Bad Sensor or LLID. This diagnostic will only occur if OA sensor is configured.OA Chilled water reset will be suspended if selected and Tracer OA unavailable.	Remote
2F2	Refrigerant Monitor Input	Chiller	Info	NonLatch	All –if installed	Open or Shorted input and the Rfgt Monitor is setup as installed	Remote
5C5	Starter Module Memory Error Type 1	Chiller	Info	Latch	All	Checksum on RAM copy of the Starter LLID configuration failed. Configuration recalled from EEPROM.	Local
5C9	Starter Module Memory Error Type 2 -	Chiller	Immediate	Latch	All	Checksum on EEPROM copy of the Starter LLID configuration failed. Factor default values used.	Local
5FF	MP: Invalid Configuration	None	Immediate	Latch	All	MP has an invalid configuration based on the current software installed	Remote
2E6	Check Clock	Chiller	Info	Latch	All	The real time clock had detected loss of its oscillator at some time in the past. Check / replace battery? This diagnostic can be effectively cleared only by writing a new value to the chiller's time clock using the TechView or DynaView's "set chiller time" functions.	Remote
6A3	Starter Failed to Arm/ Start	Chiller	Info	Latch	All	Starter failed to arm or start within the allotted time (2 minutes).	Remote
28C	Restart Inhibit	Chiller	Info	NonLatch	All	The Restart Inhibit was invoked on a compressor. This indicates excessive chiller cycling which should be corrected.	Remote
	LCI-C Software Mismatch: Use BAS Tool	Chiller	info	NonLatch	All	The neuron software in the LCI-C module does not match the chiller type. Download the proper software into the LCI-C neuron. To do this, use the Rover service tool, or a LonTalk® tool capable of downloading software to a Neuron 3150®.	Remote

Hex Code	Diagnostic Name	Effects Target	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
705	Software Error Number: 1001 Call Trane Service	All func-tions	Immediate	Latch – power down reset is reqd	all	A high level software watchdog has detected a condition in which there was a continuous 5 minute period of compressor operation, with neither chilled water flow nor a" contactor interrupt failure" diagnostic active. The occurrence of this software error message suggests an internal software state chart misalignment has occurred. The events that led up to this failure, if known, should be recorded and transmitted to Trane Controls Engineering – (SW rev 6 and higher)	local

Diagnostics

Communication Diagnostics

Hex Code	Diagnostic Name	Effects	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
5D1	Comm Loss: Slide Valve Unload	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5D2	Comm Loss: Slide Valve Load	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5DD	Comm Loss: External Auto/Stop	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5DE	Comm Loss: Emergency Stop	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5E1	Comm Loss: External Ice Building Command	Ice Build-ing	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Chiller shall revert to normal (non-ice building) mode regardless of last state.	Remote
5FA	Comm Loss: Ice Building Status Relay	Ice Build-ing	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Chiller shall revert to normal (non-ice building) mode regardless of last state.	Remote
5E2	Comm Loss: Outdoor Air Temperature	Chiller	Info and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Note that if this diagnostic occurs, Chiller shall remove any OA Chilled Water Reset, if it was in effect and if Tracer OA was unavailable. Apply slew rates per Chilled Water Reset spec	Remote
5E3	Comm Loss: Evap Leaving Water Temp	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5E4	Comm Loss: Evap Entering Water Temp	Chiller	Info and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Chiller shall remove any Return or Constant Return Chilled Water Reset, if it was in effect. Apply slew rates per Chilled Water Reset spec.	Remote
6B6	Comm Loss: Condenser Leaving Water Temp	Chiller	Info	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Condenser Entering Water Temp	Chiller	Info and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. If chiller running, and condenser water regulating valve option installed, force valve to 100% flow.	Remote
6B6	Comm Loss: Cprsr Discharge Rfgt Temp	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5E9	Comm Loss: Ext Chilled/Hot Water Setpoint	Chiller	Info and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Chiller shall discontinue use of the External Chilled Water Setpoint source and revert to the next higher priority for setpoint arbitration	Remote
5EA	Comm Loss: Ext Current Limit Setpoint	Chiller	Info and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Chiller shall discontinue use of the External Current limit setpoint and revert to the next higher priority for Current Limit setpoint arbitration	Remote

Hex Code	Diagnostic Name	Effects	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
5EB	Comm Loss: High Pressure Cutout Switch	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5EF	Comm Loss: Evaporator Water Flow Switch	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Condenser Water Flow Switch	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5F0	Comm Loss: Evaporator Rfgt Pressure	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5F2	Comm Loss: Condenser Rfgt Pressure	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5F4	Comm Loss: Oil Pressure	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Oil Return Gas Pump Fill	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Oil Return Gas Pump Drain	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Oil Loss Level sensor Input	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Master Oil Line SV	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5F8	Comm Loss: Evaporator Water Pump Relay	Chiller	Info	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Condenser Water Pump Relay	Chiller	Info	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: SSS/AFD Fault	Chiller	Info	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Refrigerant Monitor Input	Chiller	Info	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Ext Base Loading Setpoint	Chiller	Info and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. The external base load setpoint input is removed from the arbitration to establish the Base LoadingSetpoint.	Remote
6B6	Comm Loss: Ext Base Loading Command	Chiller	Info and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. The external base load input is removed from the arbitration to enable Base Loading.	Remote
688	Comm Loss: Evaporator Rfgt Liquid Level	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
690	Comm Loss: Starter	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Local

Diagnostics

Hex Code	Diagnostic Name	Effects	Severity	Persistence	Active Modes [Inactive Modes]	Criteria	Reset Level
694	Comm Loss: Electronic Expansion Valve 1	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
695	Comm Loss: Electronic Expansion Valve 2	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
5CD	Starter Comm Loss: Main Processor	Chiller	Immediate	Latch	All	Starter has had a loss of communication with the MP for a 15 second period.	Local
69D	Comm Loss: Local BAS Interface	Chiller	Info and Special Action	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period. Use the last values sent from BAS	Remote
6A0	Comm Loss: Op Status Programmable Relays	Chiller	Info	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Compressor % RLA Output	Chiller	Info	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Cond Rfgt Pressure Output	Chiller	Normal	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
6B6	Comm Loss: Cond Head Press Cntrl Output	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
703	Comm Loss: AFD speed signal output	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
704	Comm Loss: AFD output power input	Chiller	Immediate	Latch	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote
687	Comm Loss: External Hot Water Command	Chiller	Info	Warning Reset	All	Continual loss of communication between the MP and the Functional ID has occurred for a 30 second period.	Remote

Operator Display Diagnostics and Messages

Table 9 – Operator display diagnostics and messages

Operator Display Message	Description //Troubleshooting
A Valid Configuration is Present	• A valid configuration is present in the MP's nonvolatile memory. The configuration is a set of variables and settings that define the physical makeup of this particular chiller. These include: number/airflow,/and type of fans, number/and size of compressors, special features, characteristics, and control options. • //Temporary display of this screen is part of the normal power up sequence.
Communication Lost with UC800	• Ethernet cable not connected between display and UC800. • UC800 not powered. • UC800 has an invalid configuration – Download a valid configuration. • UC800 is in Binding View. When exit Binding View, select 'Restart' on this message.
Display Failed to Establish Communication	• Ethernet cable not connected between display and UC800. • UC800 not powered. • UC800 just has the backup application running as received from the vendor. Download CTV application software. • UC800 has an invalid configuration – Download a valid configuration.
Display is about to Restart	• The display is low on memory, and needs to re-start. Select Yes to restart. Selecting Yes will not affect the UC800 operation.. Only the Operator Display is reset.
Error Resulted From Invalid Configuration – Record Condition and Call Trane Service Assertion: 'File Name' 'Line Number'	• This error message is displayed when the MP code finds itself in an illegal location. These assertion points are placed in code locations to aid the software team in identifying why the MP locked up as a result of vectoring to an invalid location. • When this message occurs, copy down the file name and line number and have this ready to give Trane service. • This message remains on the screen for two minutes. After two minutes, the watchdog times out and a 'Watchdog Error' message is displayed The watchdog then resets the MP. The MP heads into a boot and configuration mode the same as it does on a power up. • These error messages are on the AdaptiView screen and do not appear in Tracer TU nor in the diagnostic logs.
File Not Found	• Update UC800 software with Tracer TU
Screen partially populated. Auto and Stop button graphics display, no text.	• Valid configuration is not present. Download a configuration.
Screen Unresponsive	• Tracer TU is downloading software. Wait till download is complete.
The Page Cannot be found	• Most likely this UC800 has only the backup application. Download the latest UC 800 software build. • This could also mean that the UC800 does not have a valid configuration. Download a configuration to it. • Cycle power to the OD and UC800. • UC could be in binding view. If so, get it out of binding view by navigating to another screen in Tracer TU.
UC800 Configuration is Invalid	• Update the UC800 configuration with Tracer TU.

Notes

Notes

Trane - by Trane Technologies (NYSE: TT), a global climate innovator - creates comfortable, energy efficient indoor environments for commercial and residential applications. For more information, please visit trane.com or tranetechnologies.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice. We are committed to using environmentally conscious print practices.

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