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User Manual for HMI Version 4

ArcticCool Chillers

ArcticCool Chillers Limited
Authored by: Casey Smith

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User Manual for HMI Version 4

An Operating Guide

Casey Smith

Table of Contents

List of Figures

List of Tables

Introduction

This document provides user details for the Interface version 4 of the ArcticCool Chiller. The following is a typical **About** screen that provides your exact version.

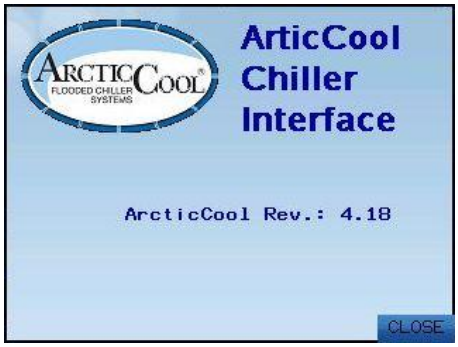


Figure 1: Revision Screen

This HMI software is designed to meet the need of all ArcticCool Chillers with 1-4 compressors and in either Air-Cooled or Water Cooled configurations. In additional, this software provides visibility into external controls that are optional functionalities of all ArcticCool Chillers:

- Condenser Valve control
- Cooling Tower Fan Enable/Control
- BMS integration

Who Should Read this Manual

This document is produced for the use of the end user and representatives therein, especially those who are involved in the day-to-day maintenance and upkeep of this ArcticCool Chiller. Also, this document is for ArcticCool Personnel and their Representatives.

Terms and Definitions

References

The following table lists the reference material to be used in conjunction with this document.

Table 1: Document References

Name	Synopsis	Supplier	Document Reference Number
Chiller Control Manual	Complete control manual including options and special functionalities.	Danfoss	AC_T3C_DKRCC.PS.RI0.B5.02_520H7630
Master/Slave Manual	Provides a description of the functionality of the communication and control strategy when 2 or more similar chillers are linked together.	Danfoss	T3C_MasterSlave_v2

Control Architecture

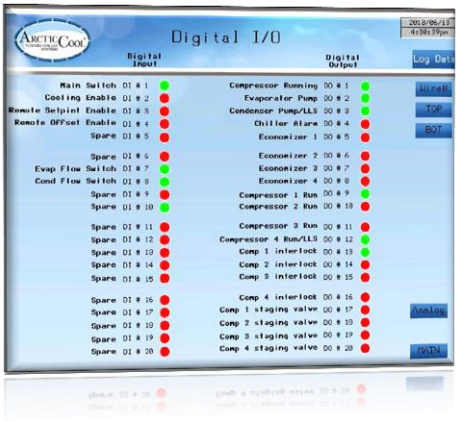
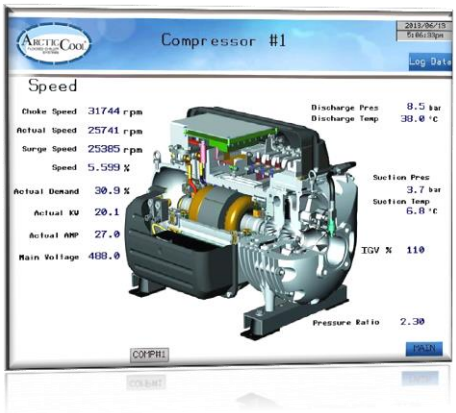
The control architecture is broken down in the following categories:

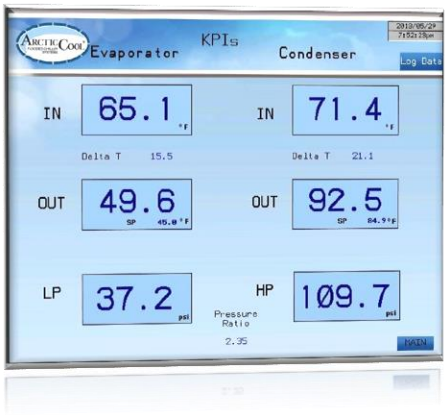
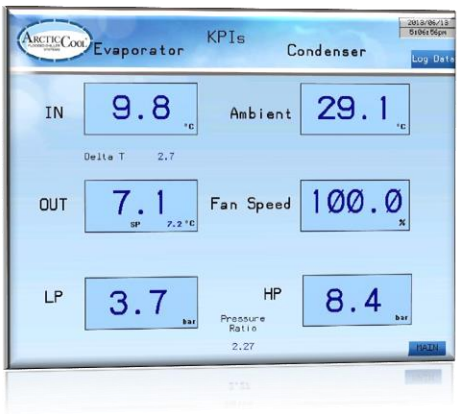
- Basic Controls – considers both standard Water-Cooled and Air-Cooled Chillers.
- Special Controls:
  - Hand/Off/Auto
  - Chiller Setpoint Control
  - EXV Control
  - Condenser/Fan/Cooling Tower Control
- Optional Functionalities
  - Data Logging
  - Controller options
  - Interfacing to External controllers
  - Master/Slave
  - Tonnage and Power calculations
  - Metric/Imperial Display
  - BMS interconnectivity
  - Mechanical Enable.
- Security Configuration
- Alarming

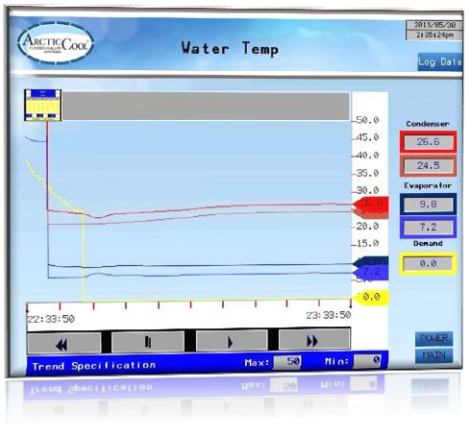
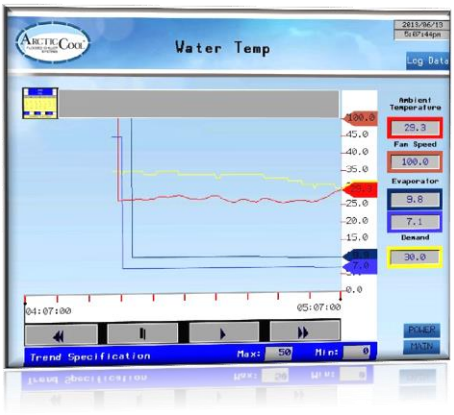
Basic Controls

Table 2: Basic HMI User Controls

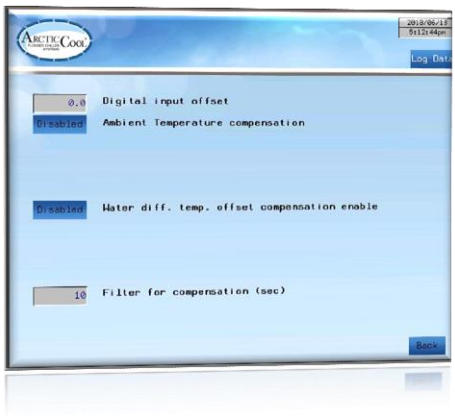
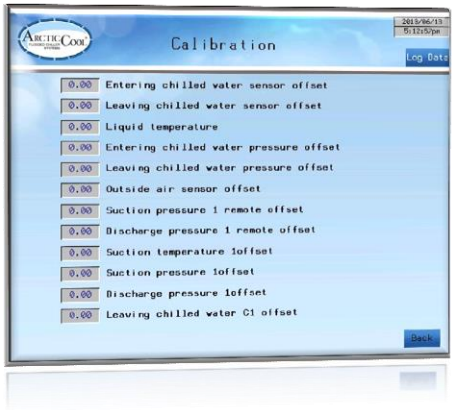
Screen	Controls
 	1. Screen: Main (Air-Cooled and Water-Cooled options displayed). 2. Function: Primary Display: a. Displays All KPIs for the chiller: i. Compressor and Chiller State ii. Evaporator and Condenser Specifics. iii. Hand/Off/Auto (**HOA**) Control (see Special Functions). iv. Power, Capacity and Tonnage calculations (see Special Functions). b. Provides access to primary setpoint c. Has main menu and access to all other screens. d. Has New Alarm indication. 3. Screen is first displayed on power-up and from the **Main** button on any other screen. 4. Has Security Access: **Logon**/**Logout**.

Screen	Controls
	1. Screen: Digital I/O 2. Function: Displays current status of all hardwired digital Inputs and outputs. a. Provides access to Analog I/O b. Displays wire numbers for maintenance and Troubleshooting purposes. c. Provides access to wiring diagrams 3. Access: **Main** screen → **I/O** button.
	1. Screen: Analog I/O 2. Function: Displays current value of all hardwired analog Inputs and outputs. a. Provides access to Digital I/O b. Displays wire numbers for maintenance and Troubleshooting purposes. 3. Access: **Main** screen → **I/O** button. → **Analog** Button
	1. Screen: Compressor (1 for each compressor) 2. Function: provide detailed snap-shot information regarding the each compressor. 3. Access: a. **Main** → **Comp** button. b. **Main** → COMP#***x*** screen link.

Screen	Controls
	1. Screen: Alarms 2. Function: Display, acknowledge and reset system alarms. **NOTE:** All alarms must be acknowledged and reset (green) before deletion. 3. Access: **Main → Alarms** Button.
 	1. Screen: Water Display: display is different based on air or water cooled. Both versions displayed here. 2. Function: Displays water temperatures and system pressures in large font for easy long distance reading. a. Air-Cooled configuration replaces Condenser water temperatures with Ambient Temperature and Fan speed. 3. Access: **Main → W/Temp** Button.

Screen	Controls
 	1. Screen: Water Temp (trend): Context-Sensitive to Air or Water cooled configuration. 2. Function: Displays trend of the last hour's data: a. Evaporator water temperatures in and out. b. Water-Cooled: Condenser Water in and Out Temperatures. c. Air-Cooled: Ambient Temperature and Fan Speed(%). d. Demand(%). 3. Has Y-axis runtime zoom. 4. Provides access to Power Trend. 5. Access: **Main → Trend** Button.
	1. Screen: Setup 2. Function: Setup Menu: a. System control parameters. b. Configuration Parameters. c. Safety and Calibration parameters. d. Diagnostics. e. Access to HMI BIOS f. Security Manager 3. Access: **Main → Setup** button. 4. Has Security Access: Logon/Logout

Screen	Controls
	1. Screen: Chilled Water Control 2. Function: a. Tech Level Chiller SP Control (see Special Functions b. Display and adjust chiller PID settings (see section 3.8 Compressor Control of the Chiller Control manual). c. Compressor staging control (see section 3.8 Compressor Control of the Chiller Control manual). d. e. Tonnage Calculation Configuration (see Special Functions). 3. Access: **Main → Setup** button → **Chiller Control** button
	1. Screen: Compressor Setup 2. Function: Display and adjust compressor specific parameters (see section 3.8 Compressor Control of the Chiller Control manual). 3. Access: **Main → Setup** button → **Compressor** button
	1. Screen: Safety 2. Function: Display and adjust safety parameters 3. Access: **Main → Setup** button → **Safety** button

Screen	Controls
	1. Screen: CWH Reset. 2. Function: Display and configure setpoint compensation (see Special Functions). 3. Access: **Main → Setup → CWH Reset** button.
	1. Screen: Calibration 2. Function: Display and adjust calibration settings. 3. Access: **Main → Setup** button → **Calibration** button.
	1. Screen: HMI Configuration. 2. Function: Enable/Select or Select special and Optional functionalities. Details for each function are described in the sections **Special Functions** and **Optional Functionalities.** 3. Access: **Main → Setup** button → **HMI Configuration** Button.

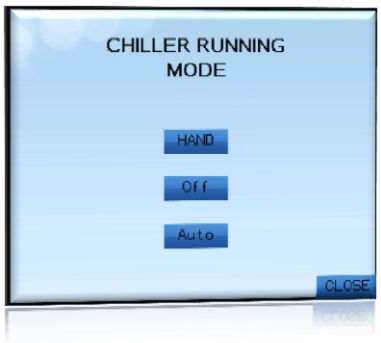
Special Functions

Hand/Off/Auto

The Hand/Off/Auto control consists of 2 components:

1. Display and Access button (invokes control screen).

2. Control Screen.



The Hand/Off/Auto function, as the name implies, has 3 modes:

1. Off – No function. Compressors are off and remain so regardless to loop temperatures. All display functions work as normal. Chiller Enable is Red and OFF
2. Hand – the chiller controls the compressors based on (by default) achieving setpoint on leaving chilled water temperature. Chiller Enable displays White and ON.
3. Auto – This mode requires an external (hardwired) signal providing Chiller Enable; otherwise, Chiller is Off. Once Chiller Enable signal is provided, chiller controls compressors according to setpoint.

Chiller Setpoint Control

Version 4 provides multiple chiller setpoint control modes. These are:

1. User Setpoint
2. Digital Offset
3. Remote Setpoint
4. Remote Offset

The chiller ultimately works with one value for setpoint, this value is always displayed on the main screen in the Evaporator Section, labeled **Set Point**:

Figure 2: Main Screen

User Setpoint

To Access the Chiller Setpoint control screen, select the setpoint indicator from the main screen or the Chiller Control screen. See the following figure:

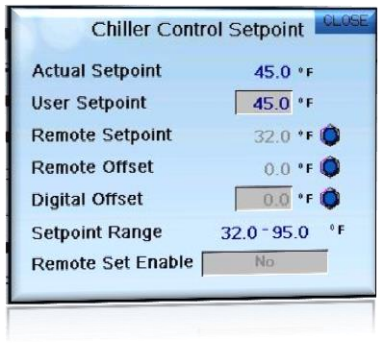


Figure 3: Chiller Setpoint Control

To change the setpoint:

1. Touch **User Setpoint**.
2. A keyboard appears and allows you to enter a new value.
3. In user setpoint mode Actual Setpoint equals User Setpoint.

Digital Offset

The Digital Offset Feature is new to Version 4. It requires a parameter and a digital input. The parameter, **Digital Offset** is exposed to the HMI on the Chiller Control Setpoint screen:

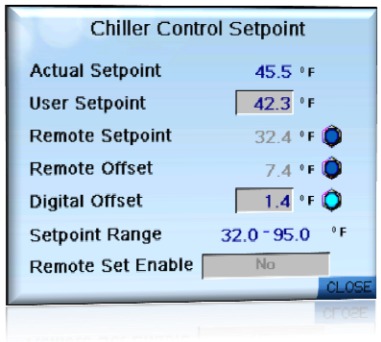


Figure 4: Chiller Setpoint Control - Digital Offset

The screen above allows you to enter a value (0-10) in °C or °F depending on the HMI configuration.

Version 4 currently has the digital input that enables the digital offset as Digital Input #4. When this input is on then the digital offset display turns blue and the accompanying pilot lights up.

Remote Setpoint

The remote setpoint is a new feature of version 4.04. When enabled it ignores the user setpoint and reads analog input #1. This function requires:

1. Inputs:
    a. Remote Setpoint – Analog Input #1 – range: 0-35 °C or 32-95 °F.
    b. Remote Setpoint Enable – Digital Input #3.
2. Parameter:
    a. Remote Set Enable – set to **Absolute**.

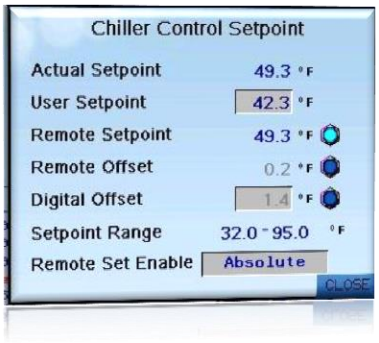


Figure 5: Chiller Setpoint Control - Remote Setpoint

NOTE: Actual Setpoint equals Remote Setpoint.

With Digital Offset

With Version 4, you can combine remote setpoint and the digital offset:

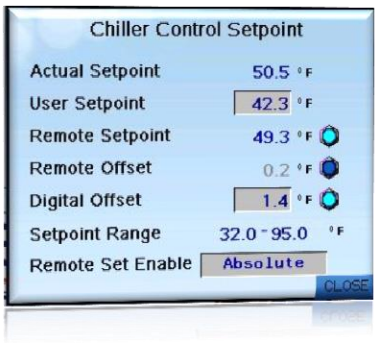


Figure 6: Chiller Setpoint Control - Remote Setpoint with Digital Offset

In this situation, the controller adds the offset value to the remote setpoint value.

Example: 49.3 + 1.4 = 50.7

This requires everything in the previous section plus the **Remote Offset Enable** input (#4).

Remote Offset

With Version 4, you can combine the sum of 2 offsets:

1. Remote Offset.
2. Digital Offset.

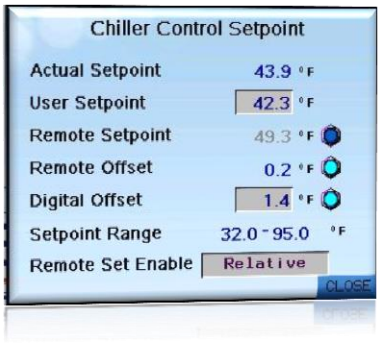


Figure 7: Chiller Setpoint Control - Remote Offset with Digital offset

To use this scenario the controller requires:

1. Inputs:
    a. Remote Offset Enable – input #4.
2. Parameters:
    a. Remote Set Enable – set to **Relative**.

The actual setpoint is calculated:

User Setpoint + Digital Offset+ Remote Offset

42.3 + 1.4 + 0.2 = 43.9

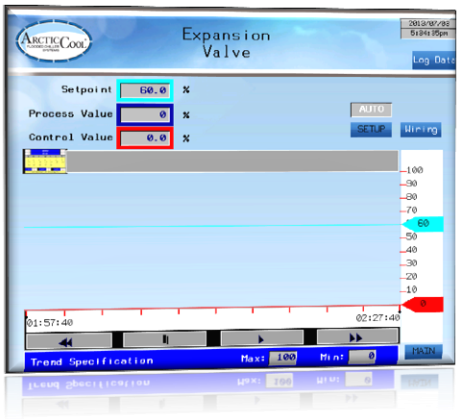
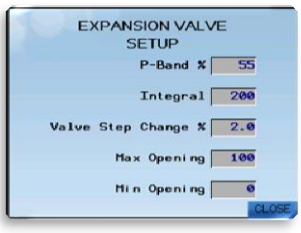
EXV Control

This chiller has 4 options for controlling the EXV(s):

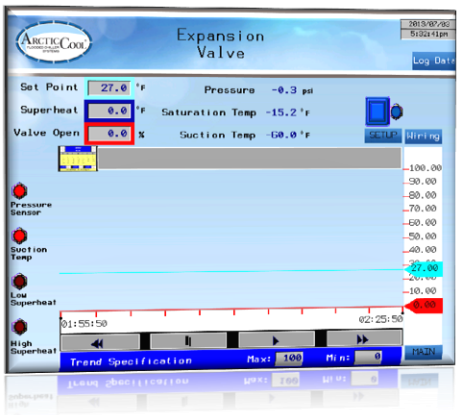
1. Disabled – Only indicates that the EXV is controlled externally without any visibility at the HMI.
2. Liquid Level – this is the standard EXV Control functionality used on all flooded chillers.
3. Superheat – Uses an external controller connected via Modbus to the HMI. Control functions vary by controller.
4. DTC EXV Control – Used on chillers with multiple refrigeration circuits (primarily Air-Cooled units). This utilizes the compressor's to control the EXV based on a liquid level sensor.

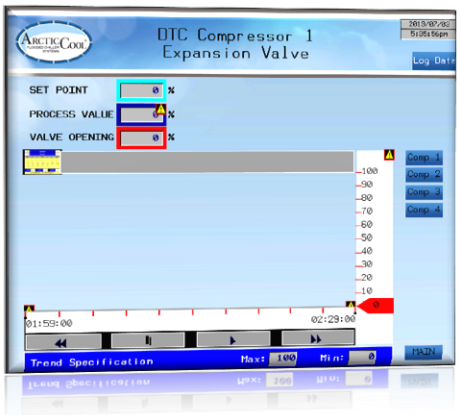
The following table displays the varied EXV control screens with their options and limitations.

Table 3: EXV Control Options

Screen	Controls
As demontrated below, the screens are almost identical.	Common Controls: • Setpoint. Process Value and Control value particular to the signal measured. • Auto/Manual control. • Trend with Y-axis zoom. • Access: **Main → EXV** button.
	Standard EXV Control: • Includes OFF state. • Can invoke wiring diagram for level sensor. • Has a PID setup control screen: 

Screen	Controls

	Superheat Control.
	• HMI Connects to an external controller (KelvinII displayed).
	• 4 additional Alarm indicators:
	  ○ Pressure Sensor
	  ○ Suction Temp
	  ○ Low Superheat
	  ○ High Superheat
	• Shows Parameters by which Superheat is calculated.

	DTC EXV Control • Setpoint is readonly – requires compressor monitoring tool to adjust. • Allows for multiple refrigeration circuits usually 1 per compressor.

Condenser/Fan/Cooling Tower Control

This software has the ability to control external devices as well as take care of any devices that are local to the chiller. Two of these features are:

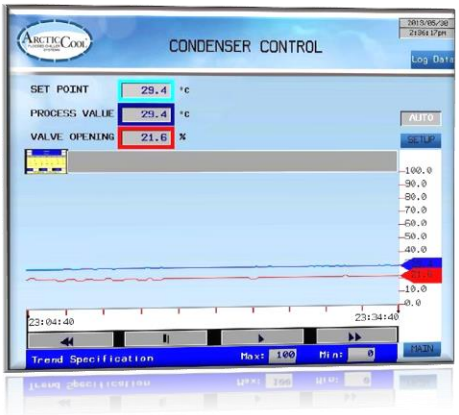
1. Condenser Valve control
2. Condenser Fan Control

Condenser Valve Control

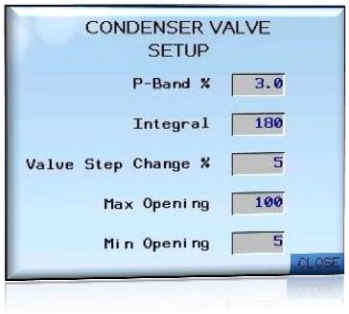
The condenser valve can be a device attached to the chiller or, just as easily, a device connected to the BMS. The controller provides a signal reference that is PID driven to control the condenser inlet temperature to a defined setpoint value.

The valve-control interface has 2 components:

1. Condenser Valve Control:
    a. Displays trend and current values for Setpoint, Process Value and Control value.
    b. Setpoint is Tech level adjustable.
    c. Display and Control Mode:
        i. Auto/Manual/Off
    d. Access to PID **Setup**.
    e. Trend has y-axis zoom capability.
    f. Access: **Main → COND** button.



2. Condenser Valve Setup
    a. P and I constants
    b. Step change of valve
    c. Maximum and Minimum valve opening settings
    d. All values settable at Tech level user logon.
    e. Access: **Main → COND** button → **SETUP** button.



Condenser Fan Control

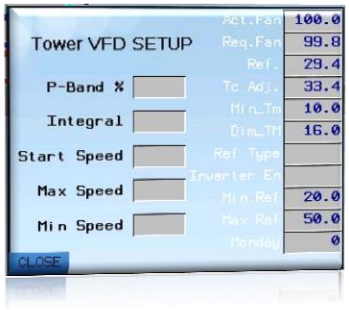
The condenser fans can be a devices attached to the chiller or, just as easily, a devices connected to the BMS. The fans can also in a cooling tower configuration on a water-cooled chiller or in a direct condenser cooling configuration as in an air-cooled chiller.

The controller provides a signal reference that is PID driven to control the condenser saturated discharge temperature to a defined setpoint value.

The valve-control interface has 2 components:

1. Tower Fan Control:
    a. Displays trend and current values for Setpoint, Process Value and Control value.
    b. Setpoint is Tech level adjustable.
    c. Display and Control Mode:
        i. Auto/Manual/Off
    d. Access to PID **Setup**.
    e. Trend has y-axis zoom capability.
    f. Access: **Main → COND** button.

2. Tower VFD Setup
    a. P and I constants
    b. Step change of valve
    c. Maximum and Minimum valve opening settings
    d. These values settable at Tech level user logon.
    e. Includes diagnostic parameters that are adjustable at Factory Rep level logon.
    f. Access: **Main → COND** button → **SETUP** button.



Optional Functionalities

This section discusses the following options that are available to the chiller operation:

- Data Logging
- Controller options
- Interfacing to External controllers
- Master/Slave
- Tonnage and Power calculations
- Metric/Imperial Display
- BMS interconnectivity

Data Logging

New to Version 4 is data logging. The HMI captures chiller and Compressor specific data and records to a pair of CSV files. The system creates 2 files per day with data recorded in 3 ways:

1. Once per minute – factory settable
2. One-shot when an alarm occurs
3. On-Demand via Log Data button that appears on all screens: 

The following table shows the chiller specific data captured by this function.

Table 4: Common Chiller Data Captured for Logging

Pneumonic	Description
ChSP	Evaporator set point
LWT	Evaporator leaving water temp
EWT	Evaporator entering water temp
SST	Evaporator Saturated suction temp
LP	Suction pressure
CndSP	Condenser Setpoint
AT	Ambient temp
FS	Fan Speed
CndEWT	condenser entering water temp
CndLWT	condenser entering water temp
SDT	Saturated discharge temp
HP	Discharge pressure
KWT	Total power for all compressor calculated for BMS

Pneumonic	Description
AmpT	Total Amp for all compressor calculated for BMS
KWh	Hourly Power Consumption
KWhD	Daily Power Consumption
KWhM	Monthly Power Consumption

The following table describes the compressor specific data. **NOTE:** This will have data for 1-4 compressors depending on the chiller configuration.

Table 5: Compressor Specific Data Captured for Logging

Pneumonic	Description
KWCx	Compressor Power (Integer Value with x implied decimal) - Compressor #x
LPCx	Suction Pressure (Integer Value with x implied decimal) - Compressor #x
ALMCx	Alarm Register (see details page for bit layout) - Compressor #x
StCx	Compressor State (see Details Page for State Enumeration) - Compressor #x
HPCx	Discharge Pressure (Integer Value with x implied decimal) - Compressor #x
AmpCx	Compressor Current (Integer Value with x implied decimal) - Compressor #x
STCx	Suction Temperature (Integer Value with x implied decimal) - Compressor #x
FLTCx	Fault Register (see details page for bit layout) - Compressor #x
DTCx	Discharge Temperature (Integer Value with x implied decimal) - Compressor #x

The following tables display sample data from the 2 data logging files:

Table 6: Logging File 1 Sample Data

23:59:00	ChSP	LWT	EWT	SST	LP	CndSP	AT	FS	CndEWT	CndLWT	SDT	HP	KWT	AmpT	KWC1	LPC1	ALMC1	StC1	HPC1	AmpC1	STC1	FLTC1	DTC1
23:59:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:00:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:01:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:02:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:03:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:04:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:05:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:06:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:07:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:08:24	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:09:24	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:10:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:11:24	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:12:25	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:13:24	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:14:24	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:15:24	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8
0:16:24	44.6	392	392	154.4	288.6	104	0	0	0	0	-139.2	-1.5	0	0	0	-1.5	0	1	0	0	-459.8	0	-459.8

Table 7: Logging File 2 Sample Data

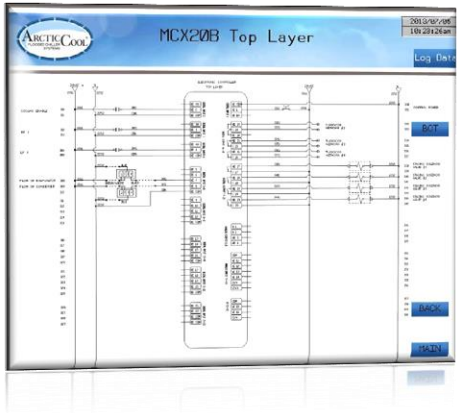
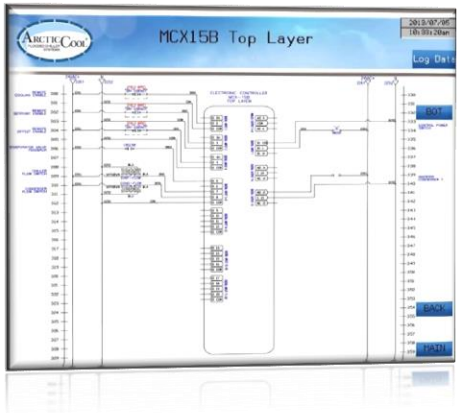
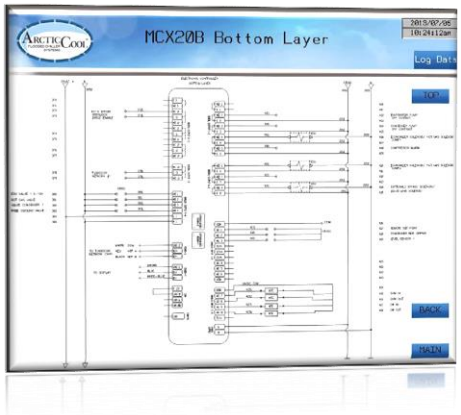
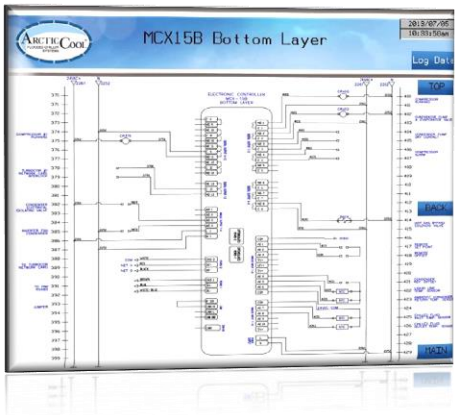
23:59:00	KWC3	LPC3	ALMC3	StC3	HPC3	AmpC3	STC3	FLTC3	DTC3	KWC4	LPC4	ALMC4	StC4	HPC4	AmpC4	STC4	FLTC4	DTC4	KWh	KWhD	KWhM
23:59:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:00:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:01:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:02:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:03:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:04:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:05:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:06:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:07:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:08:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:09:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:10:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:11:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:12:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:13:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:14:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:15:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:16:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:17:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:18:24	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0
0:19:25	0	-1.5	0	0	-1.5	0	32	0	32	0	-1.5	0	0	-1.5	0	32	0	32	0	0	0

Controller options

Version 4 works with 2 versions of the MCX Danfoss Controller:

The functionality of the 2 controllers is identical; the only difference is the Input/Output capabilities of the 2 units. At the HMI this difference is reflected in the following screens:

Functions	MCX20B	MCX15B
Digital Inputs and Outputs screen: • Shows all digital I/O – Spare indicates that it is not used. • **Green** indicates active signal – **Red** indicates inactive. • Shows wire numbers on-demand by toggling the **Wire#** button. • Provides access to Analog I/O via **Analog** button. • Provides access to on-line electrical drawings for the controller via **TOP** and **BOT**tom buttons. • Access: **MAIN→ I/O** button.		
Analog Inputs and Outputs: • Shows all analog I/O – Spare indicates that it is not used. • Shows wire numbers on-demand by toggling the **Wire#** button. • Provides access to digital I/O via **Digital** button. • Access: **MAIN→ I/O** button → **Analog** button.		

Functions	MCX20B	MCX15B
Controller Top Layer Electrical Drawing: • For Reference • Can toggle between **TOP** layer and **BOT**tom layer. • Access: **MAIN → I/O** button → **TOP** button.		
Controller Bottom Layer Electrical Drawing: • For Reference • Can toggle between **TOP** layer and **BOT**tom layer. • Access: **MAIN → I/O** button → **BOT** button.		

Master/Slave

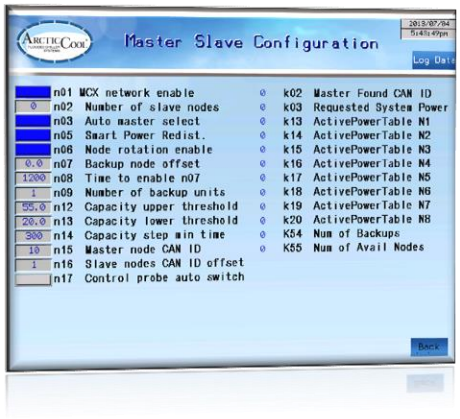
The master/slave functionality allows an array on n or n+m chillers to be controlled by one (Master) controller. Where n is the number of chillers in the array and m is the number of chillers in the array that are designated as "Backup" nodes. Please refer to reference document Master/Slave Manual for details.

To use Master/Slave functionality, you must do 2 operations:

1. Click **Master/Slave Enable** button on the HMI Configuration screen so that it displays Enabled.
    a. Enables the HMI to control Master/Slave but not master/Slave itself.
    b. Exposes the **Master/Slave CFG** button on Setup screen

2. To enable Master/Slave functionality click **n01 MCX network enable** button. Blue indicates active – grey indicates inactive.

- The left side of this screen provides the parameters for Master/Slave.
- The right side of this screen provides status information.
- Access: **MAIN** → **SETUP** button → **Master/Slave CFG** button.



Tonnage and Power Calculations

This information is displayed on the Main screen:

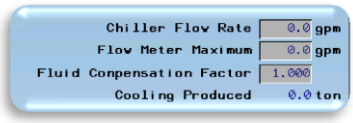
Power and Consumption

The power calculations start from the physical value, **Power**, from the compressors – a totalized instantaneous power from all compressors in the chiller. This value is integrated over a 1 hour period to provide **Hourly Usage**. The **Hourly Usage** value is totalized daily for the data logging report (reset at midnight) and monthly into the value **Monthly Usage** (reset on the 1st of the month at midnight).

Tonnage

To display tonnage:

1. Navigate to **HMI Configuration** screen.
2. Click **Current Load Display** button to display **Enabled**.
    a. Exposes control on **Chiller Control** Screen



3. Select Flow Metering Source:
    a. User Entered – Provides **Chiller Flow Rate** data entry on the **Chiller Control** screen enter a theoretical flow value for the chiller. NOTE: the tonnage display will also reflect this theoretical value.
    b. External – relies on Analog input 14 to have a calibrated flow rate for the chiller.
        i. Enter the **Flow Meter Maximum** value on the Chiller Control screen.
4. Enter **Fluid Compensation Factor** on the **Chiller Control** screen if the fluid used is not water.

Metric/Imperial Display

Version 4 allows you to customize your display to suit your environment. Whether you prefer to see data in imperial units of metric, it is a single click of a button:

1. Navigate to the HMI Configuration Screen – **MAIN → SETUP → HMI Configuration**.
2. Toggle the **Display Imperial** button (below).
    a. Button display current setting.

BMS interconnectivity

Version 4 allows BMS connectivity in the form of:

- Modbus (not recommended).
- Modbus TCP.
- BACNet MS/TP.
- BACNet IP.
- LONWorks

> ***NOTE**: Any BACNet or LONWorks configuration requires external hardware.*

Version 4 provides 3 levels of BMS interconnectivity:

1. No connectivity.
2. View Only.
3. View with control.

No Connectivity

This is slightly misleading, insofar as the data is always available from the chiller. No connectivity is a decision from your side of the system.

View Only

When a BMS is connected in the preferred flavour above, the entire data set is exposed. The listing is in the following table:

Table 8: BMS Data listing Version 1.3

Tag Name	Description	Array Offset	Object Instance
CHIL_EN_01	Chiller Enable	0	1
CHIL_SP_02	Chiller User Setpoint (Integer Value with 1 implied decimal)	1	2
CHIL_IN_03	Chiller Inlet Temperature (Integer Value with 2 implied decimals)	2	3
CHIL_OUT_04	Chiller Outlet Temperature (Integer Value with 2 implied decimals)	3	4
CND_IN_05	Condenser Inlet Temperature (Integer Value with 2 implied decimals)	4	5
CND_OUT_06	Condenser Outlet Temperature (Integer Value with 2 implied decimals)	5	6
CND_SP_07	Condenser Setpoint (Integer Value with 1 implied decimal)	6	7
CHIL_LIM_08	Chiller Limit Percent (Integer Value with 1 implied decimal)	7	8
CHIL_STA_09	Chiller State (see Details Page for State Enumeration)	8	9
CHIL_PW_10	Chiller Power (Integer Value with 1 implied decimal)	9	10
CHIL_AMP_11	Chiller Current (Integer Value with 1 implied decimal)	10	11
COM1_PW_12	Compressor Power (Integer Value with 1 implied decimal) - Compressor #1	11	12
COM2_PW_13	Compressor Power (Integer Value with 1 implied decimal) - Compressor #2	12	13
COM3_PW_14	Compressor Power (Integer Value with 1 implied decimal) - Compressor #3	13	14
COM4_PW_15	Compressor Power (Integer Value with 1 implied decimal) - Compressor #4	14	15
COM1_SP_20	Suction Pressure (Integer Value with 1 implied decimal) - Compressor #1	19	20
COM2_SP_21	Suction Pressure (Integer Value with 1 implied decimal) - Compressor #2	20	21
COM3_SP_22	Suction Pressure (Integer Value with 1 implied decimal) - Compressor #3	21	22
COM4_SP_23	Suction Pressure (Integer Value with 1 implied decimal) - Compressor #4	22	23
COM1_AL_28	Alarm Register (see details page for bit layout) - Compressor #1	27	28
COM2_AL_29	Alarm Register (see details page for bit layout) - Compressor #2	28	29
COM3_AL_30	Alarm Register (see details page for bit layout) - Compressor #3	29	30
COM4_AL_31	Alarm Register (see details page for bit layout) - Compressor #4	30	31
COM1_STA_36	Compressor State (see Details Page for State Enumeration) - Compressor #1	35	36
COM2_STA_37	Compressor State (see Details Page for State Enumeration) - Compressor #2	36	37

Tag Name	Description	Array Offset	Object Instance
COM3_STA_38	Compressor State (see Details Page for State Enumeration) - Compressor #3	37	38
COM4_STA_39	Compressor State (see Details Page for State Enumeration) - Compressor #4	38	39
COM1_DP_44	Discharge Pressure (Integer Value with 1 implied decimal) - Compressor #1	43	44
COM2_DP_45	Discharge Pressure (Integer Value with 1 implied decimal) - Compressor #2	44	45
COM3_DP_46	Discharge Pressure (Integer Value with 1 implied decimal) - Compressor #3	45	46
COM4_DP_47	Discharge Pressure (Integer Value with 1 implied decimal) - Compressor #4	46	47
CHIL_PWP_52	Chiller Percent Capacity (Integer Value with 1 implied decimal)	51	52
COM1_I_53	Compressor Current (Integer Value with 1 implied decimal) - Compressor #1	52	53
COM2_I_54	Compressor Current (Integer Value with 1 implied decimal) - Compressor #2	53	54
COM3_I_55	Compressor Current (Integer Value with 1 implied decimal) - Compressor #3	54	55
COM4_I_56	Compressor Current (Integer Value with 1 implied decimal) - Compressor #4	55	56
COM1_ST_61	Suction Temperature (Integer Value with 1 implied decimal) - Compressor #1	60	61
COM2_ST_62	Suction Temperature (Integer Value with 1 implied decimal) - Compressor #2	61	62
COM3_ST_63	Suction Temperature (Integer Value with 1 implied decimal) - Compressor #3	62	63
COM4_ST_64	Suction Temperature (Integer Value with 1 implied decimal) - Compressor #4	63	64
COM1_FL_69	Fault Register (see details page for bit layout) - Compressor #1	68	69
COM2_FL_70	Fault Register (see details page for bit layout) - Compressor #2	69	70
COM3_FL_71	Fault Register (see details page for bit layout) - Compressor #3	70	71
COM4_FL_72	Fault Register (see details page for bit layout) - Compressor #4	71	72
COM1_DT_77	Discharge Temperature (Integer Value with 1 implied decimal) - Compressor #1	76	77
COM2_DT_78	Discharge Temperature (Integer Value with 1 implied decimal) - Compressor #2	77	78
COM3_DT_79	Discharge Temperature (Integer Value with 1 implied decimal) - Compressor #3	78	79
COM4_DT_80	Discharge Temperature (Integer Value with 1 implied decimal) - Compressor #4	79	80
COM5_DT_81	Discharge Temperature (Integer Value with 1 implied decimal) - Compressor #5	80	81
COM6_DT_82	Discharge Temperature (Integer Value with 1 implied decimal) - Compressor #6	81	82
COM7_DT_83	Discharge Temperature (Integer Value with 1 implied decimal) - Compressor #7	82	83

Tag Name	Description	Array Offset	Object Instance
COM8_DT_84	Discharge Temperature (Integer Value with 1 implied decimal) - Compressor #8	83	84
GEN_ALM	Chiller General Alarm (1 - New Alarm Exists)	84	85
ActualSP	Chiller Actual Setpoint (Integer Value with 1 implied decimal)	85	86
Spare_87	Spare - Site/Project Specific	86	87
Spare_88	Spare - Site/Project Specific	87	88
Spare_89	Spare - Site/Project Specific	88	89
Spare_90	Spare - Site/Project Specific	89	90
Spare_91	Spare - Site/Project Specific	90	91
Spare_92	Spare - Site/Project Specific	91	92
Spare_93	Spare - Site/Project Specific	92	93
Spare_94	Spare - Site/Project Specific	93	94
Spare_95	Spare - Site/Project Specific	94	95
Spare_96	Spare - Site/Project Specific	95	96
Spare_97	Spare - Site/Project Specific	96	97
Spare_98	Spare - Site/Project Specific	97	98
Spare_99	Spare - Site/Project Specific	98	99
Spare_100	Spare - Site/Project Specific	99	100

NOTE: *AS with all of version 4, this system provides data for up to 4 compressors.*

The BMS Listing has the following characteristics:

- All values are integers.
- Some of the values like temperatures and pressures have an implied decimal place; this means that a value of 450 read from the chiller via BMS interface for Chiller Outlet Temperature, CHIL_OUT_04, means 45.0 °F (in an imperial configuration).
- Some values are enumerated integers:
    - Chiller State:

	Integer Value	Label	Font Name
Invalid			DefaultFont
0	0	IDLE	DefaultFont
1	1	START	DefaultFont
2	2	SHUTDOWN	DefaultFont
3	3	RESTART	DefaultFont
4	4	OPERATIONAL	DefaultFont
5	5	STAGE-IN	DefaultFont
6	6	STAGE-OUT	DefaultFont

Figure 8: Chiller State Map

    - Compressor State:

	Integer Value	Label	Font Name
Invalid			FontResource001
0	0	Absent	FontResource001
1	1	Offline	FontResource001
2	2	Idle	FontResource001
3	3	Operational	FontResource001
4	4	Hold	FontResource001
5	5	Starting	FontResource001
6	6	Stopping	FontResource001
7	7	Retreating	FontResource001
8	8	Fault	FontResource001
9	9	Timeout	FontResource001

Figure 9: Compressor State Map

- Some Values, specifically Compressor Alarms and Faults, are Bit Arrays:

Table 9: Compressor Alarm and Fault bit Configuration

	Compressor Fault List	Compressor Alarm list
Bit 0	0/1: Inverter Temperature	0/1: Inverter Temperature
Bit 1	0/1: Discharge Temperature	0/1: Discharge Temperature
Bit 2	0/1: Suction Pressure	0/1: Suction Pressure
Bit 3	0/1: Discharge Pressure	0/1: Discharge Pressure
Bit 4	0/1: 3 Phase Over Current	0/1: 3 Phase Current
Bit 5	0/1: Cavity Temperature	0/1: Shaft / Cavity Temperature
Bit 6	0/1: Leaving Air / Water	0/1: Leaving Water Temperature
Bit 7	0/1: Total Compression Ratio Fault	0/1: Total Compression Ratio
Bit 8	0/1: Generic Bearing Motor Compressor	0/1: SCR Temperature
Bit 9	0/1 Sensor Fault	Spare
Bit 10	0/1: SCR Temperature	Spare
Bit 11	0/1: Lockout Fault	Spare
Bit 12	0/1: Winding Temperature Fault	Spare
Bit 13	0/1: Super Heat Fault	0/1: Super Heat Alarm
Bit 14	Spare	Spare
Bit 15	Spare	Spare

Security Configuration

The Chiller control system has 3 levels of security:

1. USER:
    a. Automatic Logon
    b. View all main pages
    c. Can change user chilled water setpoint.
    d. No access to setup and control screens.
2. Tech User:
    a. User is responsible for day-to-day maintenance of the chiller.
    b. Must LOGON using the button on the MAIN or SETUP screens.
        i. Provide username and password.
    c. Has full access to screens and settings except factory settings (HMI Configuration).
3. Factory Representative:
    a. Full Access.

Alarms

The chiller control system has 4 alarm levels:

1. Warning – They appear in the Alarm list but do not adversely affect the chiller.
2. Alarm – an alarm will shut down a compressor or chiller depending on scope but an alarm is generally automatically reset and the compressor or chiller can restart without user intervention.
3. Fault – requires acknowledgement and the fault condition to clear before chiller or compressor can restart.
4. Critical Fault – applies to compressors. If a critical fault occurs, the compressor will requires a hard reset – power down and power up – before the chiller can restart the compressor. Generally, a compressor maintenance function is required.

Alarm Handling

The following is the procedure for alarm handling:

- When an alarm occurs a new message appears in **RED** in the alarm screen.
- All alarm entries must be acknowledged; this turns the alarm entry YELLOW.
- Then press and hold the reset button on the alarm screen for 10 seconds. Any alarm condition that is clear will turn GREEN. Any condition that is still yellow means the alarm condition still exists.
- When all alarm entries on the alarm screen are green, press the delete button.

> *NOTE: Do not delete the alarm list if any are Yellow or Red.*

The following table list the alarms that may appear in the Alarm Screen:

Table 10: Chiller Alarm Listing

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
A01	Main switch	1	-1	0	25	0	X		INTERLOCK
A02	Refrigerant NOT selected: Select, Restart	1	0	60	0	0	X	X	INTERLOCK
A03	Evaporator flow switch alarm	1	5	60	60	5		X	INTERLOCK
A04	Condenser flow switch alarm	1	-1	60	10	5		X	OFF
A05	Communication fault	1	-1	0	0	0		X	INTERLOCK
A06	Compressor in surge	0	-1	0	0	0			-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
A07	Entering chilled water sensor alarm	1	-1	0	0	0	X	X	-
A08	Leaving chilled water sensor alarm	1	-1	0	0	0	X	X	-
A09	Liquid temperature alarm	1	-1	0	0	0	X	X	-
A10	Entering water pressure alarm	1	-1	0	0	0	X	X	-
A11	Leaving water pressure alarm	1	-1	0	0	0	X	X	-
A12	Condenser pump overload alarm	1	-1	0	0	0	X	X	-
A13	Outside air sensor alarm	0	-1	0	0	0			-
A14	Suction pressure 1 transmitter alarm	1	-1	0	0	0	X	X	-
A15	Discharge pressure 1 transmitter alarm	1	-1	0	0	0	X	X	-
A18	LP 1 cutout alarm	1	-1	0	0	0	X	X	INTERLOCK
A20	HP 1 cutout alarm	1	-1	0	0	0	X	X	INTERLOCK
A22	Evaporator high flow rate alarm	0	5	60	5	5		X	INTERLOCK
A23	Evaporator pump overload	1	-1	0	0	0	X	X	-
A24	Evaporator pump 1 overload	1	-1	0	0	0	X	X	-
A25	Evaporator pump 2 overload	1	-1	0	0	0	X	X	-
A26	Evaporator pump 1 run hours exceeded	1	-1	0	10	0	X	X	-
A27	Evaporator pump 2 run hours exceeded	1	-1	0	10	0	X	X	-
A28	Evaporator pump switched due to fault	1	-1	0	10	0	X	X	-
A29	NOT USED - Manual control activated	0	0	0	0	0	X	X	-
A30	Low water temperature	1	-1	0	10	0	X	X	-
A31	Low To (saturated suction temperature)	0	-1	0	100	0			-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
A32	High discharge pressure	1	-1	0	100	0	X	X	-
A33	High pressure ratio	1	-1	0	100	0	X	X	-
A34	Warning: Low water temperature	1	-1	0	10	sa9	X		-
A35	Warning: Low To (saturated suction temp.)	0	-1	0	100	sa9			-
A36	Warning: High discharge pressure	1	-1	0	100	sa9	X		-
A37	Warning: High pressure ratio	1	-1	0	100	sa9	X		-
A38	Liquid level sensor alarm	0	-1	0	0	0		X	-
A39	High Liquid Level 1	1	-1	0	10	70	X		-
A40	Low Liquid Level 1	0	-1	0	10	30	X		-
A41	High Liquid Level 2	1	-1	0	10	70	X		-
A42	Low Liquid Level 2	0	-1	0	10	30	X		-
A43	Inverter fan 1 overload alarm	1	-1	0	0	0		X	-
A44	Condenser fan 1 overload alarm	1	-1	0	0	0		X	-
A45	Condenser fan 2 overload alarm	1	-1	0	0	0		X	-
A46	Condenser fan 3 overload alarm	1	-1	0	0	0		X	-
A47	Condenser fan 4 overload alarm	1	-1	0	0	0		X	-
A48	Condenser fan 5 overload alarm	1	-1	0	0	0		X	-
A49	Condenser fan 6 overload alarm	1	-1	0	0	0		X	-
A50	Condenser fan 7 overload alarm	1	-1	0	0	0		X	-
A51	Condenser fan 8 overload alarm	1	-1	0	0	0		X	-
A52	Free cooling freeze error	1	-1	0	0	0		X	-
A53	General DI alarm 1	1	-1	0	0	20			OFF
A54	Freeze_Stat Alarm	0	-1	60	5	5			-
A55	General DI alarm 3	1	-1	0	0	0			-
A56	General DI alarm 4	1	-1	0	0	0			-
A57	General DI	1	-1	0	0	0			-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
	alarm 5								
A58	General DI alarm 6	1	-1	0	0	0			-
A59	General DI alarm 7	1	-1	0	0	0			-
A60	General DI alarm 8	1	-1	0	0	0			-
A61	General DI alarm 9	1	-1	0	0	0			-
A62	General DI alarm 10	1	-1	0	0	0			-
A63	General AI alarm 1	1	-1	0	0	0			-
A64	General AI alarm 2	1	-1	0	0	0			-
A65	General AI alarm 3	1	-1	0	0	0			-
A66	General AI alarm 4	1	-1	0	0	0			-
A67	General AI alarm 5	1	-1	0	0	0			-
A68	General AI alarm 6	1	-1	0	0	0			-
A69	General AI alarm 7	1	-1	0	0	0			-
A70	General AI alarm 8	1	-1	0	0	0			-
A71	General AI alarm 9	1	-1	0	0	0			-
A72	General AI alarm 10	1	-1	0	0	0			-
A73	Common interlock activated	0	-1	0	0	0		X	-
A74	Compressor 1 interlock activated	1	-1	0	0	0			-
A75	Compressor 2 interlock activated	1	-1	0	0	0			-
A76	Compressor 3 interlock activated	1	-1	0	0	0			-
A77	Compressor 4 interlock activated	1	-1	0	0	0			-
A78	Evaporator heaters overload	1	-1	0	0	0		X	-
A79	Evaporator heater 1 overload	1	-1	0	0	0		X	-
A80	Evaporator heater 2 overload	1	-1	0	0	0		X	-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
A81	Evaporator heater 3 overload	1	-1	0	0	0		X	-
A82	Evaporator heater 4 overload	1	-1	0	0	0		X	-
A83	Evap. Condenser water level	1	-1	0	0	0		X	-
A84	Evap. Condenser heaters	1	-1	0	0	0		X	-
A85	Adiabatic Pump overload	1	-1	0	0	0		X	-
A86	Cooling enable off	0	-1	0	0	0			-
A87	Scheduled action	1	-1	0	0	0			-
A88	Scheduler list cleared	1	-1	0	0	0			-
A89	Parameters reset to default	1	-1	0	0	0			-
A90	Capacity limited	1	-1	0	0	0			-
A91	Phase/Sequence alarm	1	0	0	0	0		X	OFF
aux	Aux device communication error	1	-1	0	60	0		X	-
aC1	TC1 communication error	1	-1	0	60	0		X	-
a11	TC1 AC - Inverter Temperature	1	-1	0	0	0	X	X	-
a12	TC1 AC - Discharge Temp	1	-1	0	0	0	X	X	-
a13	TC1 AC - Suction Pressure	1	-1	0	0	0	X	X	-
a14	TC1 AC - Discharge Pressure	1	-1	0	0	0	X	X	-
a15	TC1 AC - 3 Phase Current Trip	1	-1	0	0	0	X	X	-
a16	TC1 AC - Shaft Cavity Temperature	1	-1	0	0	0	X	X	-
a17	TC1 AC - Leaving Air /Water	1	-1	0	0	0	X	X	-
a18	TC1 AC - Total Compression Ratio Fault	1	-1	0	0	0	X	X	-
a19	TC1 AC - Bearing Motor Fault	1	-1	0	0	0	X	X	-
a1A	TC1 AC - Sensor error	1	-1	0	0	0	X	X	-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
a1B	TC1 AC - SCR Fault	1	-1	0	0	0	X	X	-
a1C	TC1 AC - Lock out Fault	1	-1	0	0	0	X	X	-
a1D	TC1 AC - Motor Thermistor	1	-1	0	0	0	X	X	-
a1E	TC1 AC - Super Heat Fault	1	-1	0	0	0	X	X	-
a1F	TC1 ANC - Inverter Temperature	1	-1	0	0	0	X		-
a1G	TC1 ANC - Discharge Temp	1	-1	0	0	0	X		-
a1H	TC1 ANC - Suction Pressure	1	-1	0	0	0	X		-
a1I	TC1 ANC - Discharge Pressure	1	-1	0	0	0	X		-
a1J	TC1 ANC - 3 Phase Current Trip	1	-1	0	0	0	X		-
a1K	TC1 ANC - Shaft Cavity Temperature	1	-1	0	0	0	X		-
a1L	TC1 ANC - Leaving Water	1	-1	0	0	0	X		-
a1M	TC1 ANC - Total Compression Ratio Fault	1	-1	0	0	0	X		-
a1N	TC1 ANC - SCR Temperature	1	-1	0	0	0	X		-
a1O	TC1 ANC - Super Heat	1	-1	0	0	0	X		-
aC2	TC2 communication error	1	-1	0	60	0		X	-
a21	TC2 AC - Inverter Temperature	1	-1	0	0	0	X	X	-
a22	TC2 AC - Discharge Temp	1	-1	0	0	0	X	X	-
a23	TC2 AC - Suction Pressure	1	-1	0	0	0	X	X	-
a24	TC2 AC - Discharge Pressure	1	-1	0	0	0	X	X	-
a25	TC2 AC - 3 Phase Current Trip	1	-1	0	0	0	X	X	-
a26	TC2 AC - Shaft Cavity Temperature	1	-1	0	0	0	X	X	-
a27	TC2 AC - Leaving Air /Water	1	-1	0	0	0	X	X	-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
a28	TC2 AC - Total Compression Ratio Fault	1	-1	0	0	0	X	X	-
a29	TC2 AC - Bearing Motor Fault	1	-1	0	0	0	X	X	-
a2A	TC2 AC - Sensor error	1	-1	0	0	0	X	X	-
a2B	TC2 AC - SCR Fault	1	-1	0	0	0	X	X	-
a2C	TC2 AC - Lock out Fault	1	-1	0	0	0	X	X	-
a2D	TC2 AC - Motor Thermistor	1	-1	0	0	0	X	X	-
a2E	TC2 AC - Super Heat Fault	1	-1	0	0	0	X	X	-
a2F	TC2 ANC - Inverter Temperature	1	-1	0	0	0	X		-
a2G	TC2 ANC - Discharge Temp	1	-1	0	0	0	X		-
a2H	TC2 ANC - Suction Pressure	1	-1	0	0	0	X		-
a2I	TC2 ANC - Discharge Pressure	1	-1	0	0	0	X		-
a2J	TC2 ANC - 3 Phase Current Trip	1	-1	0	0	0	X		-
a2K	TC2 ANC - Shaft Cavity Temperature	1	-1	0	0	0	X		-
a2L	TC2 ANC - Leaving Water	1	-1	0	0	0	X		-
a2M	TC2 ANC - Total Compression Ratio Fault	1	-1	0	0	0	X		-
a2N	TC2 ANC - SCR Temperature	1	-1	0	0	0	X		-
a2O	TC2 ANC - Super Heat	1	-1	0	0	0	X		-
aC3	TC3 communication error	1	-1	0	0	0		X	-
a31	TC3 AC - Inverter Temperature	1	-1	0	0	0	X	X	-
a32	TC3 AC - Discharge Temp	1	-1	0	0	0	X	X	-
a33	TC3 AC - Suction Pressure	1	-1	0	0	0	X	X	-
a34	TC3 AC - Discharge Pressure	1	-1	0	0	0	X	X	-
a35	TC3 AC - 3 Phase Current	1	-1	0	0	0	X	X	-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
	Trip								
a36	TC3 AC - Shaft Cavity Temperature	1	-1	0	0	0	X	X	-
a37	TC3 AC - Leaving Air /Water	1	-1	0	0	0	X	X	-
a38	TC3 AC - Total Compression Ratio Fault	1	-1	0	0	0	X	X	-
a39	TC3 AC - Bearing Motor Fault	1	-1	0	0	0	X	X	-
a3A	TC3 AC - Sensor error	1	-1	0	0	0	X	X	-
a3B	TC3 AC - SCR Fault	1	-1	0	0	0	X	X	-
a3C	TC3 AC - Lock out Fault	1	-1	0	0	0	X	X	-
a3D	TC3 AC - Motor Thermistor	1	-1	0	0	0	X	X	-
a3E	TC3 ANC - Super Heat	1	-1	0	0	0	X	X	-
a3F	TC3 ANC - Inverter Temperature	1	-1	0	0	0	X		-
a3G	TC3 ANC - Discharge Temp	1	-1	0	0	0	X		-
a3H	TC3 ANC - Suction Pressure	1	-1	0	0	0	X		-
a3I	TC3 ANC - Discharge Pressure	1	-1	0	0	0	X		-
a3J	TC3 ANC - 3 Phase Current Trip	1	-1	0	0	0	X		-
a3K	TC3 ANC - Shaft Cavity Temperature	1	-1	0	0	0	X		-
a3L	TC3 ANC - Leaving Water	1	-1	0	0	0	X		-
a3M	TC3 ANC - Total Compression Ratio Fault	1	-1	0	0	0	X		-
a3N	TC3 ANC - SCR Temperature	1	-1	0	0	0	X		-
a3O	TC3 ANC - Super Heat	1	-1	0	0	0	X		-
aC4	TC4 communication error	1	-1	0	0	0		X	-
a41	TC4 AC - Inverter Temperature	1	-1	0	0	0	X	X	-
a42	TC4 AC -	1	-1	0	0	0	X	X	-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
	Discharge Temp								
a43	TC4 AC - Suction Pressure	1	-1	0	0	0	X	X	-
a44	TC4 AC - Discharge Pressure	1	-1	0	0	0	X	X	-
a45	TC4 AC - 3 Phase Current Trip	1	-1	0	0	0	X	X	-
a46	TC4 AC - Shaft Cavity Temperature	1	-1	0	0	0	X	X	-
a47	TC4 AC - Leaving Air /Water	1	-1	0	0	0	X	X	-
a48	TC4 AC - Total Compression Ratio Fault	1	-1	0	0	0	X	X	-
a49	TC4 AC - Bearing Motor Fault	1	-1	0	0	0	X	X	-
a4A	TC4 AC - Sensor error	1	-1	0	0	0	X	X	-
a4B	TC4 AC - SCR Fault	1	-1	0	0	0	X	X	-
a4C	TC4 AC - Lock out Fault	1	-1	0	0	0	X	X	-
a4D	TC4 AC - Motor Thermistor	1	-1	0	0	0	X	X	-
a4E	TC4 ANC - Super Heat	1	-1	0	0	0	X	X	-
a4F	TC4 ANC - Inverter Temperature	1	-1	0	0	0	X		-
a4G	TC4 ANC - Discharge Temp	1	-1	0	0	0	X		-
a4H	TC4 ANC - Suction Pressure	1	-1	0	0	0	X		-
a4I	TC4 ANC - Discharge Pressure	1	-1	0	0	0	X		-
a4J	TC4 ANC - 3 Phase Current Trip	1	-1	0	0	0	X		-
a4K	TC4 ANC - Shaft Cavity Temperature	1	-1	0	0	0	X		-
a4L	TC4 ANC - Leaving Water	1	-1	0	0	0	X		-
a4M	TC4 ANC - Total Compression Ratio Fault	1	-1	0	0	0	X		-
a4N	TC4 ANC - SCR Temperature	1	-1	0	0	0	X		-
a4O	TC4 ANC - Super	1	-1	0	0	0	X		-

Code	Description	Enable	Reset	Period	Start Up	Steady	Active in Off	Alarm Relay	Compressors
	Heat								
A92	Evaporator low flow rate alarm	0	5	60	5	5		X	INTERLOCK
A93	Condenser high flow rate alarm	0	5	60	5	5		X	-
A94	Condenser low flow rate alarm	0	5	60	5	5		X	-
A95	Master connection lost	1	-1	0	15	0		X	-
N01	Network Error	1	-1	90	60	60		X	-
N02	Master Error	1	-1	90	60	60			-
N03	Alarm Node 1	1	-1	90	60	0	X		-
N04	Alarm Node 2	1	-1	90	60	0	X		-
N05	Alarm Node 3	1	-1	90	60	0	X		-
N06	Alarm Node 4	1	-1	90	60	0	X		-

Table 11: Alarm Configuration Notes

Notes	
Enable:	only if 1 the alarm is active.
Reset:	is the type of reset. The possibilities are: • -1 Automatic: means that when the alarm occurs the reset is done automatically when the alarm conditions not longer persist. • 0 Manual: means that when the alarm occurs the reset have to be done compulsorily by the user (maintainer or service) by pressing a key-combination on the user interface. • >0 Semiautomatic: means that alarm is automatically reset for the "Reset" number of attempts in the specified "Period" of time, but if the alarms occurs one more time, it becomes Manual. This column can be set even with a parameters, so it can be changed on field by the user.
Period:	is the period of time where the alarm can occurs for "reset" number of times (minutes) with the automatic reset and without become manual.
Startup:	is the delay (second) in the alarm during the startup phase.
Steady:	is the delay (second) in the alarm during the steady phase. **sa9 – Safety steady delay - Default Setting: 5s (Safety Page)** Define steady delay before an alarm warning or alarm. Valid for alarms: • "A34" Warning: low water temperature; • "A35" Warning: low To saturated suction temperature; • "A36" Warning: high discharge pressure; • "A37" Warning: high pressure ratio
Active in OFF:	if this box is checked the alarm will be enabled even if the machine is in OFF condition.
Alarm relay:	if this box is checked, when the alarm occurs the corresponding digital output (configured in the "Digital Output" tab as "alarm") will be activated.
Compressors:	with this column there is the possibility to stop/run for security reasons the compressors when the alarm occurs. The compressors will be stopped/ran according with the column system/circuit.