YORK
BY JOHNSON CONTROLS
Service Information

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SI0212
New 809

Equipment Affected: YK Chillers

YK Centrifugal Chillers Software Enhancements (V21)

General

Beginning August 2009, enhanced software will be supplied in new production YK chillers and replacement microboard kit 331-02430-601. This software is backward compatible to all previous chillers equipped with microboard 031-02430-000 or 031-02430-001. The enhancements are listed below.

The version and Program Card part number is: C.OPT.01.21-307 (031-02474-001)

Large Tonnage Chiller I/O Board

This software version supports the new LTC I/O Board (031-02895-000/001). This board communicates with the Microboard COM3 serial port (J12-2/3) using RS-485 Modbus protocol communications. This board is used for Hot Gas Bypass, Heat Recovery and Head Pressure Control options. It interfaces the Microboard to the components used for these options. A new Diagnostics Screen has been created from the Diagnostics Screen to support this board.

Optisave 2 KW Input

The Optisave 2 KW input (4-20mA) will now be wired to the LTC I/O Board (TB9-1/2) if present. Otherwise.

Pre-rotation Vanes Position Potentiometer

Previously, only those chillers equipped with Variable Speed Drive, Hot Gas Bypass or Variable Geometry Diffuser were equipped with a PRV position potentiometer. In the future, all new chillers will be equipped with a PRV Potentiometer, regardless of other options.

To allow this software to be backward compatible to all previous chillers not equipped with a PRV potentiometer or the options listed above, a new key labeled PRV POSITION has been added to the SETUP Screen. This allows the PRV Potentiometer input to be Enabled or Disabled.

If equipped with any of the above options, this setpoint is automatically set to ENABLED, and cannot be changed. If not equipped with any of the above options and not equipped with a PRV Potentiometer, this should be set DISABLED. If not equipped with any of the above options but factory equipped with a PRV Potentiometer, the software reads the Potentiometer input at microboard input J7-10

VSD Adaptive Capacity Control Enhancements

The following enhancements have been added:

ACC Details Screen - New Setpoints

- VSD Start Frequency – Allows the Service Technician to set the starting frequency from which the ramp-up will begin. Only shown Modbus Protocol configuration. GPIC object AV36. Programmable over the following range:
  a. 60Hz units – 30Hz to 60Hz (default 45Hz)
  b. 60Hz units with Quick Restart- 30Hz to 45Hz (default 45Hz)
  c. 50Hz units – 25Hz to 50Hz (default 37.5 Hz)
  d. 50Hz units with Quick Restart – 25Hz to 37.5Hz (default 37.5Hz)
- ACC Mapping Enable – Allows the Service Technician to set the Delta T (Leaving Chilled Liquid Temperature - Setpoint) needed to be met to enable surge mapping and speed reduction initially on startup. Only shown in Modbus Protocol configuration. Programmable over the range of 0.5ºF to 4.0ºF (default 1.0ºF). GPIC object AV37.
- Surge Sensitivity – This key is now only shown in Modbus Protocol configuration.

ACC Surge Mapping

In Modbus Protocol configuration, ACC surge mapping is now inhibited during soft shutdowns.

ACC Current Limiting

In this software version, when in Modbus Protocol Configuration, if motor current is >= 101 %FLA, the VSD speed command is decreased 0.1 Hz every 3.0 seconds until the motor current < 101 %FLA. The surge map takes priority over current limiting. Thus if there is a mapped surge point in the present sector, ACC current limiting shall not be allowed to decrease the frequency below the mapped point.
In previous software versions, the initial ramp is complete when either of the following conditions occur:

- Delta T < ACC Mapping Enable
- VSD Speed Command = Maximum

In this version, the initial ramp will be complete when any of the following occur:

- Delta T < ACC Mapping Enable
- VSD Speed Command = Maximum
- Motor Current >= 100 %FLA

Stability Limit

The Stability Limit programming button was removed from the ACC Details Screen in a previous software version. The Stability Limit default and maximum values are presently set to 7000. If a new version of software were installed in a chiller with Stability Limit set below 7000, the old value would be retained. The only way to clear it would be to clear the BRAM. To prevent this from happening, this value is no longer programmable. It is now always set to 7000.

Surge During Initial Ramp

In previous software versions, if 2 surges are detected during the initial ramp (ramp towards max frequency after reaching start frequency), the command frequency is set to the max frequency regardless of motor current. This can result in motor current rising sharply and forcing vanes to have to close hard and even possibly a trip on high current or overload.

In this software version, for every 2 surges that are detected during the initial ramp, increase the command frequency (no higher than the maximum frequency) by the amount listed in the following table. After increasing the command frequency, the initial ramp surge count is reset so it can react to another 2 surges and the initial ramp shall be continued. This logic shall be in effect during the entire initial ramp and take action as many times as necessary.

Frequency Command Increase	Motor Current
1 Hz	> 90 %FLA
1.5 Hz	> 75 %FLA
2 Hz	> 60 %FLA
4 Hz	<= 60 %FLA

VSD High Instantaneous Current Fault

In previous software versions, the “VSD-High Phase X Instantaneous Current” fault (VSD) and “VSD-High Instaneous Current” fault (MVVSD) are a Cycling shutdown. In this version, they become a Safety shutdown if the same fault (on any phase) occurs 3 times in 90 minutes. The first 2 shutdowns with the 90 minute window will be Cycling shutdowns as it is presently. If a third occurs within 90 minutes of the first, the third will be a Safety shutdown that requires a manual restart.

The 90 minute window applies to a High Instantaneous Fault on any phase. Three faults on any phase in 90 minutes results in the 3rd fault becoming a Safety shutdown. Likewise, one fault on each of the three phases results in the 3rd fault becoming a Safety shutdown.

Refrigerant Level Control Enhancements

During the VALVE PRESET TIME and subsequent 3 minute hold period after entering System Run on startup, if the actual refrigerant level is greater than the programmed Level Setpoint for 2 seconds, the preset/hold timer is canceled and normal level control is started immediately. This only applies to the programmed Level Control Setpoint and not the ramped level setpoint and only occurs while the chiller is running.

Korean Language

Korean Language has been added to the available languages.

Oil Sump Enhancements

In previous software versions, the Oil Return Solenoid (1SOL) is opened 1 minute into System Run and remains open until System Coastdown.

In this version, to avoid an "Oil – Low Temperature Differential" condition from preventing a chiller start after running at low load conditions for extended periods, the Oil Return Solenoid (1SOL) is now cycled closed when the oil temperature gets too low on the P, Q and H9 compressor chillers, while the chiller is running.

An OIL RETURN MIN Setpoint key now appears on the Oil Sump Screen when the CHILLER STYLE/ COMPRESSOR TYPE Setpoint (on the Operations Screen) is set to P, Q or H9 compressor In Service access level. This setpoint is programmable over the range of 80.0ºF to 110.0ºF (default 95.0ºF) and controls the oil return Solenoid as follows:

- When the compressor is running and the Oil Sump Temperature < Oil Return Min Setpoint, close (de-energize) the Oil Return Solenoid by de-energizing K12 relay
- When the compressor is running and Oil Sump Temperature > Oil Return Min + 7°F, open (energize) the Oil Return Solenoid by energizing K12 relay.
- During coastdown, the solenoid operation is not changed from standard logic, it remains closed. During startup the operation is not changed from standard logic, it remains closed for 1 minute after System Run.

An OIL –SATURATED CONDENSER TEMPERATURE data box is added to the Oil Sump Screen. This displays the difference between the Oil Temperature and the Saturated Condenser temperature. This parameter is useful when analyzing oil heater operation since it is used in the control of the Oil Heater.

Variable Geometry Diffuser Operation with Hot Gas Bypass

If the VGD operation is in the HOT GAS OVERRIDE state and a Stall is detected, it will transition to the STALL REACTING State. In previous software versions, it would not react to stall in the Hot Gas Override State.

Trend Data Point Max (Y-Axis) Setup

This software version allows a greater range of the trend maximum display value for the Y-Axis.

Heat Recovery

This software supports the new Heat Recovery option. This option uses two tube bundles in the condenser. The lower bundle is the standard condenser bundle and is piped to the cooling tower water source. The upper tube bundle is used to recover heat waste heat rejection for use in a closed loop heating circuit.

On a heat recovery chiller, the chiller primary control remains the cooling load. So, the compressor capacity is still functioning according to the leaving chilled water temperature set point.

The desired hot water temperature leaving the heating bundles is obtained by regulating the heat rejection through the standard lower tube bundle (sourced by cooling tower or other water circuit). This is done by controlling the temperature of the Return Condenser Water Temperature (by tower bypass circuit to elevate the temperature of the return condenser water) or varying the condenser water flow. This control can be performed by the Optiview Control Center or an external controller. If the Optiview Control Center is used to perform this control, The Heat Recovery Control Valve is modulated to control the Leaving Heating Condenser Water Temperature to the Hot Water Setpoint. The control output to the valve is Direct Acting

(when the Leaving Heating Condenser Water Temperature rises above the Hot Water Setpoint, the valve is driven more open to provide greater cooling to the standard lower tube bundle).

The heat recovery bundle is provided with a Leaving Heating Condenser Water Thermistor, Return Heating Condenser Water Thermistor and a Heating Condenser Water Flow Switch. The heat recovery circuit control is only active when the flow sensor indicates flow.

If the chiller is equipped for Heat Recovery, the feature must be ENABLED on the SETUP Screen. Otherwise, it must be DISABLED. Once enabled, the HEAT RECOVERY Screen is available from the CONDENSER Screen. All of the Heat Recovery parameters are displayed on this screen. If Head Pressure Control is also enabled, the Head Pressure parameters appear on the Heat Recovery Screen (there is no separate Head Pressure Control Screen in this configuration).

A complete explanation of this feature is contained in Service Manual 160.54-M1 Section 24.

Head Pressure Control

YK Chillers are capable of operation within a wide range of condenser water temperatures. However, a minimum condenser water temperature, as specified in the Engineering Guide, is required to maintain sufficient pressure differential (head) between the condenser and evaporator for proper oil and refrigerant management in the chiller.

Should colder condenser water temperatures be anticipated at the cooling source, a field mounted facility control means may be provided to ensure adequate head pressure exists. The preferred means would be a cooling tower bypass circuit that maintains a constant flow rate through the condenser, since this would maintain adequate tube velocity in the condenser, while regulating the return cooling water to the condenser. However, a two-way condenser water throttling valve, a variable speed cooling tower pump, or tower fan control circuit might also be employed.

The head pressure control function provides an analog output control signal from the Optiview Control Center that responds to the programmed Head Pressure (condenser pressure minus evaporator pressure) Setpoint. The output is direct acting (as the Head Pressure increases above the setpoint, the valve is driven more open to provide less tower bypass or more flow through the condenser).

If the chiller is equipped for Head Pressure Control, the feature must be ENABLED on the SETUP Screen using the Head Pressure Control Setpoint. Otherwise it must be DISABLED. Once enabled, the Head Pressure Control Screen is available from the Condenser Screen. All of the Head Pressure Control parameters are displayed on this screen. If Heat Recovery is also Enabled, the Head Pressure parameters appear on the Heat Recovery Screen (there is no separate Head Pressure Control Screen in this configuration).

A complete explanation of this feature is contained in Service Manual 160.54-M1.

Quick Start Mode

The Quick Start feature is useful in data center and process control applications where it is desirable to re-establish cooling as fast as possible after a shutdown or power failure. This feature, when enabled, allows quicker starts and restarts than normal control. It does this by reducing the time cycle for chiller restart and once running, loading the chiller as fast as possible. After the chiller is running and has met a specified setpoint or a specified period of time has elapsed, control returns to normal.

In order to use this feature, the chiller must be equipped with a Variable Speed Drive (in Modbus Protocol Configuration) or a Medium Voltage Variable Speed Drive. The low inrush current of a VSD allows more starts per hour and allows the chiller to start with a more open vane position.

Although not required, the Hot Gas Bypass option is recommended, as it will allow the chiller to startup more smoothly with less chance of surging.

Quick Start feature has two different start modes:

- **Quick Restart** – When a chiller shutsdown, if certain conditions are met at the completion of Coastdown (and within 30 seconds thereafter), the VSD is started immediately with no Prelube. The vanes are given a constant open pulse and after the VSD achieves its start frequency, the speed ramp rate is faster than with normal control.
- **Quick Normal Start** – If the conditions for a Quick Restart are not met, the next time the chiller is started, it has a prelube period just like a normal start, however the vanes will begin to open at the beginning of Prelube, instead of waiting until System Run. At the completion of Prelube, the VSD is started and after the VSD achieves its Start Frequency, the speed ramp rate is faster than with normal control.

In order to take full advantage of the Quick Start feature after a power failure, the Optiview Control Center and VSD control power (except for the Trigger Board) must be on a UPS. This prevents a reboot of both on a power failure and keep communications between them active throughout the utility power failure. This provides the fastest possible ability to start or restart after generator or utility power is restored.

This feature can only be enabled if the Motor Drive Type setpoint is set to MV VSD or VSD (and the Motor Communications Protocol Setpoint is set to MODBUS). It requires an ADMIN password to change. When logged in at ADMIN access level, a QUICK START key will appear on the SETPOINTS Screen. Pressing this key will navigate to the QUICK START Screen where the QUICK START MODE Setpoint is used to enable/disable this feature as explained in the Setpoints section below.

Once enabled, all setpoints and parameters related to this feature are displayed on the QUICK START Screen, accessible from the SETPOINTS Screen when logged in at Service access level.

A complete explanation of this feature is contained in Service Manual 160.54-M1 Section 26.

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