YORK®	SERVICE BULLETIN	
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SUBJECT: MICROCOMPUTER CONTROL CENTER (YK CENTRIFUGAL CHILLER) - EPROM VERSION C.02F.16 & C.02T.16

On/about June 1997, the subject units will be equipped with eprom version C.02F.16 (P/N 031-01431-002). Version C.02T.16 (P/N 031-01431-003) will be available for Remote Chiller Communications applications. These eproms have the following operational enhancements that revise Operation Manual 160.49-02 as follows:

OIL PUMP VARIABLE SPEED DRIVE

On the new style "D" YK chillers, the oil pump is driven by a small Variable Speed Drive (VSD). This eprom supports both Variable Speed Oil Pump applications and fixed speed oil pump applications. It can be used in existing chillers that are not equipped with the oil pump Variable Speed Drive.

The Microcomputer Control Center maintains desired system oil pressure by controlling the speed of the oil pump. The speed at which the oil pump runs is determined by the VSD output frequency. The Micro Board applies a speed command to the oil pump VSD to control the output frequency. The speed command is in the form of a Pulse Width Modulation (PWM) signal. The technical details of this signal are provided in Service Manual 160.49-M2.

During the Pre-lube period and the first 15 seconds of compressor run, the program operates the oil pump VSD over a range of 25Hz to 60Hz to maintain the oil pressure to 45 PSID. Thereafter, it operates the VSD over this range to maintain the oil pressure to the programmed **OIL PRESSURE SETPOINT** (20 to 45 PSID) that has been programmed by a qualified Service Technician.

The oil pump is started and stopped at the same time as in the fixed speed oil pump application. The Micro Board applies a speed command to the VSD that ramps the VSD output frequency from 25Hz to whatever frequency is required (up to a maximum of 60Hz) to achieve the 45 PSID target oil pressure. The target oil pressure remains 45 PSID throughout the pre-lube period and during the first 15 seconds of compressor run. While this target is in effect, "**OIL PRESSURE=XX.XPSID;TARGET=XX.XPSID**" is displayed when the OIL PRESSURE display key is pressed. As with the previous fixed speed oil pump application, the compressor is started 50 seconds after the the chiller start was initiated.

If either of the following conditions occur, a safety shutdown is initiated and "**DAY-TIME-HIGH OIL FLOW**" is displayed:

a.) If the oil pressure is < 40.0 PSID for 5 continuous seconds during the last 10 seconds of the compressor pre-lube or during the first 15 seconds of SYSTEM RUN.

b.) If the oil pressure is < the programmed **OIL PRESSURE SETPOINT** and the speed command is at 60Hz for 5 continuous seconds, anytime after the first 30 seconds of SYSTEM RUN.

The "**DAY-TIME-HIGH OIL FLOW**" safety checks are not performed during MANUAL SPEED control.

All other oil pressure safety shutdown thresholds are the same as with the fixed speed oil pump applications. For both fixed speed and variable speed oil pump applications, the safety shutdown threshold for **"DAY-TIME-HIGH OIL PRESSURE**" is now 90 PSID. In previous eprom versions, this threshold was 125 PSID for the first 7 minutes of compressor operation and 60 PSID thereafter.

After the compressor has been running for 15 seconds, the target oil pressure becomes the **OIL PRESSURE SETPOINT** (20 to 45 PSID) that has been programmed by a qualified Service Technician using procedure in Service Manual 160.49-M2. The Micro Board then applies a speed command to the VSD that changes the VSD output frequency as required to achieve this oil pressure. This programmed **OIL PRESSURE SETPOINT** is the target oil pressure for the remainder of "SYSTEM RUN" and through "SYSTEM COASTDOWN", unless changed. While this target is in effect, "**OIL PRESSURE=XX.XPSID;SETP=XX.XPSID**" is displayed when the OIL PRESSURE key is pressed.

During oil pump operation, the actual oil pressure and the frequency the VSD is commanded to be running can be monitored with the DISPLAY DATA key. One of the scrolled messages is "**OIL PUMP VSD=XX.XHZ;PRS=XX.XPSID**".

The oil pump VSD is equipped with a set of normally open relay contacts that are driven closed as long as all the VSD internal protection circuits are satisfied. They open anytime its internal protection has initiated a drive shutdown. The contacts remain open until the internal protection circuits permit the drive to run. They will automatically close on all drive initiated shutdowns except if the drive experiences a short circuit on the output; this requires the drive be manually reset by the removal and restoration of AC power (460,230,208vac, etc) to the drive. The opening of these contacts initiate a chiller CYCLING shutdown. While the contacts are open, "**DAY-TIME-OIL PUMP DRIVE-AUTOSTART**" is displayed on the Microcomputer Control Center display and the chiller is prevented from starting. The closed contacts apply 115vac to Digital Input Board input TB1-70.

Since this eprom version can be used on chillers that are equipped

with the oil pump VSD and those that are not, VSD oil pump control must be enabled or disabled, as appropriate, and the associated setpoints programmed by a qualified Service Technician using procedure in Service Manual 160.49-M2.

MANUAL SPEED CONTROL

The oil pump speed can be manually controlled by a qualified Service Technician using the Pre-Rotation Vanes OPEN, CLOSE, HOLD or AUTO keys in SERVICE mode. Instructions for manual speed control are in Service Manual 160.49-M2.

The DISPLAY DATA key can be used to monitor the oil pump VSD frequency and system oil pressure. One of the scrolled messages is "**OIL PUMP VSD FREQ=XX.XHZ;PRS=XX.XPSID**".

As on fixed speed oil pump applications, after the pump is manually turned on, it is automatically turned off after 10 minutes, if not manually terminated earlier.

It can be confirmed that manual oil pump speed control has been enabled by pressing the "DISPLAY DATA" key. The first scrolled message will be **"MANUAL OIL PUMP SPEED CONTROL ALLOWED"**.

OIL HEATER OPERATION

On chillers equipped with the oil pump Variable Speed Drive, the oil heater is controlled by the Microcomputer Control Center program; not by the heater thermostat. The heater is turned on and off to maintain the oil temperature to a value 50 degrees F above the condenser saturation temperature. This is the target value. When the temperature falls to 4 degrees F or greater below the target, the heater is turned on. It is turned off when it increases to 3 degrees F above the target value. The heater is not turned on when the compressor is operating.

If the calculated target value is greater than 160 degrees F, the target defaults to 160 degrees F. If the calculated target value is less than 110 degrees F, it defaults to 110 degrees F.

The heater is operated by Relay Output Board terminal TB3-34. On chillers not equipped with the oil pump VSD, this terminal operates the Vent Line Solenoid. If oil pump VSD operation is selected by a qualified Service Technician using instructions in Service Manual 160.49-M2, this output is enabled for heater operation; disabling oil pump VSD operation enables this output for Vent Line Solenoid operation.

To prevent overheating the oil in the event of a control center component failure, the oil heater thermostat 1HTR, set to open at 180 deg. F, is wired in series with the heater contactor 1M.

PROGRAMMING

This eprom version can be used in chillers that are equipped with the oil pump Variable Speed Drive and those that are equipped with the fixed speed oil pump. If the chiller is equipped with the oil pump VSD, VSD oil pump application must be selected by a Qualified Service Technician using a programming procedure in Service Manual 160.49-M2. If the chiller is not equipped with the oil pump VSD, fixed speed oil pump application must be selected. If VSD oil pump application is selected, additional VSD setpoints, as described above, must be entered. Also, the "STANDBY LUBRICATION" feature, as described below, can be enabled or disabled in this procedure.

If VSD oil pump application is selected, the oil heater will be controlled as described under **OIL HEATER OPERATION** below and the program is configured to operate the chiller without the Liquid Line (2SOL), Vent Line (3SOL), and High Speed Thrust (4SOL) solenoid valves as described below under **SOLENOID VALVES** (these devices have been removed on style "D" YK chillers). If Fixed Speed oil pump application is selected, the program operates these devices in the same way as previous eprom versions.

STANDBY LUBRICATION

To maintain oil seal integrity while the chiller is shutdown, the oil pump is turned on for 2 minutes every 24 hours if the chiller has not run in the past 24 hours. While the pump is running, "STANDBY LUBE IN PROCESS - X.X MIN LEFT" is displayed. If a Variable Speed Drive oil pump is applied, the operating oil pressure will be the oil pressure setpoint programmed by the Service Technician.

To prevent oil pump damage due to low oil level, if at least 15 PSID of oil pressure is not achieved within 30 seconds of turning on the oil pump, the cycle is terminated and "STANDBY LUBE LOCKOUT - CHECK OIL LEVEL" is displayed when the STATUS key is pressed. No more standby lubrications will be performed until the WARNING RESET key is pressed in SERVICE mode, at which point another cycle will be attempted. Starting the chiller also resets this lockout.

These standby lubrication cycles are enabled or disabled by the Service Technician using the programming procedure in Service Manual 160.49-M2. It is recommended that the standby lubrication be enabled on chillers that remain shutdown for periods of 24 hours or greater.

Standby lubrication cycles will not be performed if either oil pressure transducer is out of range (HOP $\leq$ 6.8 PSIG; LOP $\leq$ 0 PSIG). This assures that standby lubrication cycles will not be performed until the chiller has been charged with refrigerant and chiller commissioning has been completed.

COMPRESSOR BACKSPIN ELIMINATION

To eliminate compressor backspin at chiller shutdown, the pre-rotation vanes are driven fully closed prior to shutting down the chiller on certain CYCLING shutdowns. This is not performed on safety shutdowns because the time required for the vanes to close could cause chiller damage. Also, this is not performed on operator initiated shutdowns at the front panel Start/Run/Stop-Reset switch because these could be emergency shutdowns.

When one of the below listed shutdown commands are received, the vanes are driven fully closed. During the vanes closure, "SYSTEM SHUTTING DOWN - VANES CLOSING" is displayed. When the vane motor switch closes (indicating the vanes have fully closed) or 210 seconds from start of vane closure have elapsed, the start signal is removed from the starter and "SYSTEM COASTDOWN" begins. This operation is performed on the following shutdowns:

1.) Low Water Temp
2.) Multi-Unit Sequence (TB2-9)
3.) Internal Time Clock
4.) Remote/Local Cycling (TB2-13)
5.) Remote Stop (TB2-8)
6.) Remote Stop from ISN 4500 BAS (RS-485 serial port)

OIL PUMP OPERATION AFTER POWER FAILURES

If a power failure occurs while the chiller is running, the duration of the power failure determines whether a "SYSTEM COASTDOWN" (post-lube) is performed when power is restored.

If the power failure is less than 2 minutes in duration, a standard 2.5 minute "SYSTEM COASTDOWN" operation is performed when power is restored. During the "SYSTEM COASTDOWN", the oil pump runs. If configured for AUTO-RESTART AFTER POWER FAILURE, a SYSTEM COASTDOWN is performed prior to the chiller automatically restarting.

If the power failure is greater than 2 minutes in duration, there is no 2.5 minute "SYSTEM COASTDOWN" with oil pump operation performed when power is restored.

SOLENOID VALVES

Style "D" YK chillers are not equipped with the following solenoid valves:

1.) Liquid line solenoid valve (2SOL)
2.) Vent line solenoid valve (3SOL)
3.) High speed thrust solenoid valve (4SOL)

When Variable Speed Oil Pump application is selected by a qualified Service Technician using programming procedure in Service Manual 160.49-M2, the program is configured to operate the chiller without these solenoid valves. When Fixed Speed Oil pump application is selected, the program operates these solenoid valves in the same way as previous eprom versions.

HIGH OIL PRESSURE SAFETY SHUTDOWN THRESHOLD

In previous eprom versions, the safety shutdown threshold for "**DAY-TIME-HIGH OIL PRESSURE**" was 125 PSID for the first 7 minutes of compressor operation and 60 PSID thereafter. The threshold is now 90 PSID, regardless of how long the compressor has been running. This new operation applies to both fixed speed and variable speed oil pump applications.

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