YORK BY JOHNSON CONTROLS	YCIV 0590-1500 50HZ & 0157-0397 60HZ START-UP CHECKLIST	
SERVICE POLICY & PROCEDURES	Supersedes: Nothing	Form 201.23-CL1 (309)

COMMISSIONING

PREPARATION

Commissioning of this unit should only be carried out by Johnson Controls Authorized personnel.

Commissioning personnel should be thoroughly familiar with the information contained in this literature.

Perform the commissioning using the detailed checks outlined in the EQUIPMENT START-UP CHECK as the commissioning procedure is carried out.

PREPARATION – GENERAL

The following basic checks should be made with the customer power to the unit switched OFF.

Proper electrical lock out and tag procedures must be followed.

Inspection

Inspect unit for installation damage. If found, take action and/or repair as appropriate.

Refrigerant Charge

Packaged units are normally shipped as standard with a full refrigerant operating charge. Check that refrigerant pressure is present in both systems and that no leaks are apparent. If no pressure is present, a leak test must be undertaken, the leak(s) located and repaired. Remote systems and units are supplied with a nitrogen holding charge. These systems must be evacuated with a suitable vacuum pump/recovery unit as appropriate to below 500 microns.

Do not liquid charge with static water in the cooler. Care must also be taken to liquid charge slowly to avoid excessive thermal stress at the charging point. Once the vacuum is broken, charge into the condenser coils with the full operating charge as given in the Technical Data Section.

Service and Oil Line Valves

Open each compressor suction, economizer, and discharge service valve. If valves are of the back-seat type, open them fully (counterclockwise) then close one turn of the stem to ensure operating pressure is fed to pressure transducers. Open the liquid line service valve and oil return line ball valve fully in each system.

Compressor Oil

To add oil to a circuit - connect a YORK hand oil pump (Part No. 470-10654-000) to the 1/4” oil charging valve on the oil separator piping with a length of clean hose or copper line, but do not tighten the flare nut. Using clean oil of the correct type (“L” oil), pump oil until all air has been purged from the hose then tighten the nut. Stroke the oil pump to add oil to the oil system. The oil level should be between the middle of the lower and middle of the upper sight glasses of the oil separator. Approximately 4-5 gallons is present in the each refrigerant system, with typically 1-2 gallons in each oil separator. Oil levels in the oil separators above the top sight glass in either oil separator should be avoided and may cause excessive oil carryover in the system. High oil concentration in the system may cause nuisance trips resulting from incorrect readings on the level sensor and temperature sensors. Temperature sensor errors may result in poor liquid control and resultant liquid overfeed and subsequent damage to the compressor.

Fans

Check that all fans are free to rotate and are not damaged. Ensure blades are at the same height when rotated. Ensure fan guards are securely fixed.

Isolation / Protection

Verify all sources of electrical supply to the unit are taken from a single point of isolation. Check that the maximum recommended fuse sizes given in the Technical Data Section of IOM has not been exceeded.

Control Panel

Check the panel to see that it is free of foreign materials (wire, metal chips, etc.) and clean out if required.

Power Connections

Check that the customer power cables are connected correctly to the terminal blocks or optional circuit breaker. Ensure that connections of power cables within the panels to the circuit breaker or terminal blocks are tight.

Grounding

Verify that the unit's protective ground terminal(s) are properly connected to a suitable grounding point. Ensure that all unit internal ground connections are tight.

Water System

Verify the chilled liquid system has been installed correctly, and has been commissioned with the correct direction of water flow through the cooler. The inlet should be at the refrigerant piping connection end of the cooler. Purge air from the top of the cooler using the plugged air vent mounted on the top of the cooler body.

Flow rates and pressure drops must be within the limits provided in the IOM. Operation outside of these limits is undesirable and could cause damage.

If mains power must be switched OFF for extended maintenance or an extended shutdown period, the compressor suction, discharge and economizer service stop valves should be closed (clockwise). If there is a possibility of liquid freezing due to low ambient temperatures, the coolers should be drained or power should be applied to the chiller. This will allow the cooler heater to protect the cooler from freezing down to –20°F. Before placing the unit back in service, valves should be opened and power must be switched on (if power is removed for more than 8 hours) for at least 8 hours (24 hours if ambient temperature is below 86°F [30°C]) before the unit is restarted.

Flow Switch

Verify a chilled water flow switch is correctly fitted in the customer's piping on the cooler outlet, and wired into the control panel correctly using shielded cable.

There should be a straight run of at least 5 pipe diameters on either side of the flow switch. The flow switch should be connected to terminals 2 and 13 in the panel.

Temperature Sensor(s)

Ensure the leaving liquid temperature sensor is coated with heat conductive compound (Part No. 013-00890-000) and is inserted to the bottom of the water outlet sensor well in the cooler. This sensor also provides some freeze protection and must always be fully inserted in the water outlet sensor well.

Programmed Options

Verify that the options factory-programmed into the Micro Panel are in accordance with the customer's order requirements by pressing the OPTIONS Key on the keypad and reading the settings from the display.

Programmed Settings

Ensure the system cutout and operational settings are in accordance with the operating requirements by pressing the PROGRAM key.

Date and Time

Program the date and time by first ensuring that the CLK jumper JP2 on the chiller control board is in the ON position. Then press the DATE/TIME key and set the date and time.

Start/Stop Schedule

Program the daily and holiday start/stop by pressing the SCHEDULE key.

Setpoint and Remote Offset

Set the required leaving chilled liquid temperature setpoint and control range under the SETPOINTS Key. The chilled liquid temperature control settings need to be set according to the required operating conditions.

If remote temperature reset (offset) is to be used, the maximum reset required must be programmed by pressing the SETPOINTS Key.

FIRST TIME START-UP

During the commissioning period there should be sufficient heat load to run the unit under stable full load operation to enable the unit controls, and system operation to be set up correctly, and a commissioning log taken. Be sure that the chiller is properly programmed and the Equipment Start-up Checklist is completed.

Interlocks

Verify that liquid is flowing through the cooler and that heat load is present. Ensure that any remote run interlocks are in the run position and that the daily schedule requires the unit to run or is overridden.

Unit Switch

Place the "Unit Switch" on the keypad to the ON position.

Start-up

Press the SYSTEM SWITCHES Key and place the system switch for System 1 to the ON position. There may be a few seconds delay before the first compressor starts because of the anti-recycle timer). Be ready when each compressor starts, to switch the Unit Switch OFF immediately, if any unusual noises or other adverse conditions develop.

When a compressor is running, the controller monitors oil pressure, motor current, and various other system parameters such as discharge pressure, chilled liquid temperature, etc. Should any problems occur; the control system will immediately take appropriate action and display the nature of the fault.

Oil Pressure

When a compressor starts, press the relevant SYSTEM PRESSURES key and verify that oil differential pressure (oil pressure-suction pressure) develops immediately. If oil pressure does not develop, the automatic controls will shut down the compressor. Under no circumstances should a restart attempt be made on a compressor, which does not develop oil pressure immediately. Switch the Unit Switch to the OFF position.

Refrigerant Flow

When a compressor starts, a flow of liquid refrigerant will be seen in the liquid line sight glass. After several minutes of operation, and provided a full charge of refrigerant is in the system, the bubbles will disappear and be replaced by a solid column of liquid.

Loading

Once the unit has been started, all operations are fully automatic. After an initial period at minimum capacity, the control system will adjust the unit load depending on the chilled liquid temperature and rate of temperature change. If a high heat load is present, the controller will increase the speed of the compressor(s).

Condenser and Fan Rotation

Once a compressor is running, discharge pressure rises as refrigerant is pumped into the air-cooled condenser coils. This pressure is controlled by stages of fans to ensure maximum unit efficiency while maintaining sufficient pressure for correct operation of the condensers and the lubrication system.

As discharge pressure rises, the condenser fans operate in stages to control the pressure. Verify that the fans operate in the correct direction of rotation and operation is correct for the type of unit.

Suction Superheat

Check suction superheat at steady full compressor load only. Measure suction temperature with a thermocouple on the copper line about 6" (150 mm) before the compressor suction service valve. Measure suction pressure at the suction transducer access valve or the compressor suction service valve. Superheat should be 10°F to 12°F (5.55 to 6.67°C) and should be reasonably close to the panel display. Superheat setting is programmable on the control panel, but is not mechanically adjustable. The Flash Tank Drain Valve controller modulates the 2-phase drain valve stepper motor to control system superheat. Superheat control is a function of suction pressure and suction temperature measurements from the sensors that are routed to the Chiller Control Board which in turn sends control signals to the Flash Tank Drain and Fill Valve Controller located in the left, back wall of the Chiller Controls Cabinet.

Subcooling

Check liquid subcooling at steady full compressor load only. It is important that all fans are running for the system. Measure liquid line temperature on the copper line at the main liquid line service valve. Measure liquid pressure at the liquid line service valve. Subcooling should be 5 - 7°F (2.77 - 3.88°C). YCIV 0157 & 0590 subcooling should be 10°F (5.55°C). No bubbles should show in the sight glass. If subcooling is out of range, add or remove refrigerant as required to clear the sight glass. Do not overcharge the unit. Subcooling should be checked with a flash tank level of approximately 35% with a clear sight glass.

General Operation

After completion of the above checks for System 1, switch OFF the 'SYS 1' switch on the keypad and repeat the process for each subsequent system. When all run correctly, stop the unit, switch all applicable switches to the 'ON' position and restart the unit.

Assure all checks are completed in the EQUIPMENT START-UP CHECK SHEET. The chiller is then ready to be placed into operation.

EQUIPMENT START-UP CHECK SHEET

JOB NAME: _____

SALES ORDER #: _____

LOCATION: _____

SOLD BY: _____

INSTALLING CONTRACTOR: _____

START-UP TECHNICIAN/ COMPANY: _____

START-UP DATE: _____

CHILLER MODEL #: _____

SERIAL #: _____

COMPRESSOR #1 MODEL#: _____

SERIAL #: _____

COMPRESSOR #2 MODEL#: _____

SERIAL #: _____

COMPRESSOR #3 MODEL#: _____

SERIAL #: _____

COMPRESSOR #4 MODEL#: _____

SERIAL #: _____

UNIT CHECKS (NO POWER)

The following basic checks should be made with the customer power to the unit switched off.

Proper electrical lock out and tag procedures must be followed.

Check the system 24 hours prior to initial start:

1. Inspect the unit for shipping or installation damage.
2. Ensure that all piping has been completed.
3. Assure the unit is properly charged and there are no piping leaks.
4. Open each system suction service valve, discharge service valve, economizer service valve, liquid line stop valve, and oil line ball valve.
5. The oil separator oil level(s) should be maintained so that an oil level is visible in either of the oil separator sight glasses when a compressor is running at high speeds for 10 to 15 minutes. An oil level may not be visible in the sight glasses when the compressor is off and it may be necessary to run the compressor to obtain a level. In shutdown situations and at some load points, much of the oil may be in the condenser and the level in the separators may fall below the bottom sight glass.

   On systems with dual oil separators per compressor, one separator may show a lower level or no level, while the other separator shows a level between the 2 sight glasses. This is normal and a level is only required in one separator. Do NOT add oil to raise the level in the other oil separator.

   Oil levels in single separator systems should not go above the top of the upper sight glass. Dual separator systems should also not show oil levels above the top of one of the sight glasses. In the rare situation where oil levels are high, drain enough oil to lower the level to the bottom of the top sight glass.

Sight glasses will vary in type depending upon the manufacturer of the separator. One type will have balls that float in the sight glasses to indicate level. Another type will have a bulls' eye glass. The bulls' eye glass will tend to appear to lose the lines in the bulls' eye when the level is above the glass. Oil level should not be above the top sight glass. In the rare situation where oil levels are high, drain oil to lower the level to the bottom of the top sight glass.

Oil levels in the oil separators above the top sight glass in either oil separator should be avoided and may cause excessive oil carryover in the system. High oil concentration in the system may cause nuisance trips resulting from incorrect readings on the level sensor and temperature sensors. Temperature sensor errors may result in poor refrigerant control and liquid overfeed to the compressor.

In the unlikely event it is necessary to add oil, connect a YORK oil pump to the charging valve on the oil separator, but do not tighten the flare nut on the delivery tubing. With the bottom (suction end) of the pump submerged in oil to avoid entrance of air, operate the pump until oil drips from the flare nut joint, allowing the air to be expelled, and tighten the flare nut. Open the Compressor oil charging valve and pump in oil until it reaches the proper level as described above.

When oil levels are high, adding oil may not visibly increase the level in the separators during operation. This may be an indication the level is already too high and the oil is being pumped out into the system where it will cause heat transfer and control problems.

6. Ensure water pumps are on. Check and adjust water pump flow rate and pressure drop across the cooler.

Excessive flow may cause catastrophic damage to the evaporator.

7. Check the control panel to ensure it is free of foreign material (wires, metal chips, tools, documents, etc.).
8. Visually inspect wiring (power and control). Wiring MUST meet N.E.C. and local codes.
9. Check tightness of the incoming power wiring inside the power panel and inside the motor terminal boxes.
10. Check for proper size fuses in control circuits.
11. Verify that field wiring matches the 3-phase power requirements of the chiller.
12. Be certain all water temperature sensors are inserted completely in their respective wells and are coated with heat conductive compound.
13. Ensure the suction line temperature sensors are strapped onto the suction lines at 4 or 8 O'clock positions.
14. Assure the glycol level in the VSD cooling system is 9-15 inches (23-28 cm) from the top of the fill tube. This check should be performed prior to running the pump.
15. Check to assure the remote start/stop for Sys #1 on Terminals 2 to 15 and Sys #2 on Terminals 2 to 16 are closed on the User Terminal Block 1TB to allow the systems to run. If remote cycling devices are not utilized, place a wire jumper between these terminals.

Never run the glycol pump without coolant! Running the glycol pump without coolant may damage the pump seals.

Always fill the system with approved YORK coolant to avoid damage to the pump seals and the chiller.

16. Ensure that the CLK jumper JP2 on the Chiller Control Board is in the ON position.
17. Assure a flow switch is connected between Terminals 2 and 13 on the User Terminal Block 1TB in the panel. Throttle back flow to assure the flow switch opens with a loss of flow. It is recommended that auxiliary pump contacts be placed in series with the flow switch for additional protection, if the pump is turned off during chiller operation. Whenever the pump contacts are used, the coil of the pump starter should be suppressed with an RC suppressor (031-00808-000).

PANEL CHECKS
(POWER ON – BOTH SYSTEM SWITCHES "OFF")

You are about to turn power on to this machine. Safety is Number One! Only qualified individuals are permitted to service this product. The qualified individual furthermore is to be knowledgeable of, and adhere to, all safe work practices as required by NEC, OSHA, and NFPA 70E. Proper personal protection is to be utilized where and when required.

1. Assure the chiller OFF/ON UNIT switch at the bottom of the keypad is OFF.
2. Apply 3-phase power to the chiller. Turn ON the optional panel circuit breaker if supplied. The customer's disconnection devices can now be set to ON.
3. Verify the control panel display is illuminated.
4. To prevent the compressors from starting, assure that the system switches under the SYSTEM SWITCHES key are in the OFF position.
5. Verify that the voltage supply corresponds to the unit requirement and is within the limits given in the Technical Data Section of IOM.
6. Ensure the heaters on each compressor are on using a clamp-on ammeter. Heater current draw is approx. 3A.
7. Verify the "Factory Set" Overload Potentiometers on the VSD Logic Board are set correctly. Press the VSD DATA key and using the arrow keys, scroll to the compressor overload settings. Verify the "Factory Set" overload potentiometer(s) on the VSD logic board are set correctly. In the unlikely event that they are not set correctly, adjust the potentiometers until the desired values are achieved.

The VSD is powered up and live. High voltage exists in the area of the circuit board on the bus bars, VSD Pole Assemblies, and wiring to the input inductor.

Adjust the potentiometers, if needed, using the table in IOM. The potentiometers are Sys 1=R19, Sys 2=R64, Sys 3=R42, and Sys 4=R86.

Incorrect settings of the potentiometers may cause damage to the equipment.

Record the Overload Potentiometer settings below:

Compressor Overload Setting:

System 1 = _____ Amps

System 2 = _____ Amps

System 3 = _____ Amps

System 4 = _____ Amps

8. Press the STATUS Key. If the following message appears, immediately contact YORK Product Technical Support. The appearance of this message may mean the chiller has lost important factory programmed information. The serial number and other important data may need to be reprogrammed.

UNIT WARNING: INVALID SERIAL NUMBER
ENTER UNIT SERIAL NUMBER

Changing the programming of this feature requires the date and time to be set on the chiller prior to programming. Additional information regarding this message and how to enter the serial number with the factory provided IOM.

If the following message appears when the STATUS key is pressed, immediately contact YORK Product Technical Support. The appearance of this message indicates the chiller is a HIGH IPLV chiller operating in STANDARD IPLV control.

UNIT WARNING: OPTIMIZED EFFICIENCY DISABLED – CONTACT YORK REPRESENTATIVE

Changing the programming of this feature requires the date and time to be set on the chiller prior to programming. Additional information regarding this message is provided in the ENABLING HIGH IPLV MODE.

9. Program the required options into the Panel for the desired operating requirements. Record the values below:

Display Language = _____

Chilled Liquid Mode = _____

Local/Remote Mode = _____

Display Units = _____

Lead/Lag Control = _____

Remote Temperature Reset = _____

Remote Current Reset = _____

Remote Sound Limit =_____

Low Ambient Cutout =_____

Damage to the chiller could result if the options are improperly programmed.

PROGRAMMED VALUES

10. Program the required operating values into the micro for cutouts, safeties, etc. and record them in the chart below.

Suction Press Cutout =
_____ PSIG (kPa)

Low Ambient Cutout =
_____ °F (°C)

Leaving Chilled Liquid Temp Cutout =
_____ °F (°C)

Motor Current Limit =
_____% FLA

Pulldown Current Limit Time =
_____MIN

Suction Superheat Setpoint =
_____°F (°C)

Remote Unit ID # =
_____

Sound Limit Setpoint =
_____%

CHILLED LIQUID SETPOINT

11 Program the Chilled Liquid Setpoint/Range and record:

Local Cooling Setpoint =
_____ °F (°C)

Local Cooling Range =
_____ to _____ °F (°C)

Maximum Remote Temp Reset =
_____ to _____ °F (°C)

DATE/TIME, DAILY SCHEDULE, AND CLOCK JUMPER

12. Set the Date and Time.
13. Program the Daily Schedule start and stop times.
14. Place the panel in Service mode and turn on each fan stage one by one. Assure the fans rotate in the correct direction, so air flow exits the top of the chiller.
15. Remove the cap on the fill tube and run the glycol pump to verify the level in the fill tube. Assure the glycol level in the VSD cooling system is 9-15 inches (23-28 cm) from the top of the fill tube while running. The pump can be run by placing the chiller in the SERVICE mode. Be sure to re-install the cap before stopping the glycol pump to avoid overflowing the fill tube when the glycol pump is turned off. The glycol system holds about 3.5 gallons of coolant on the largest chiller model.

INITIAL START-UP

After the control panel has been programmed and the compressor heaters have been energized for at least 8 hours (ambient temperature > 96ºF (36ºC)) or 24 hours (ambient temperature < 86ºF (30ºC)), the chiller may be placed in operation.

1. Turn on the UNIT SWITCH and program the System Switches on the Keypad to the "ON" position.
2. If cooling demand permits, the compressor(s) will start and a flow of refrigerant will be noted in the sight glass, after the anti recycle timer times out and the precharge of the DC Bus is completed. After several minutes of operation, the bubbles in the sight glass will disappear and there will be a solid column of liquid when the drain and feed valves stabilize the flash tank level.
3. Allow the compressor to run a short time, being ready to stop it immediately if any unusual noise or adverse conditions develop. Immediately at start-up, the compressor may make sounds different from its normal high-pitched sound. This is due to the compressor coming up to speed and the initial lack of an oil film sealing the clearances in the rotors. This should be of no concern and lasts for only a short time.
4. Check the system operating parameters. Do this by selecting various displays such as pressures and temperatures. Compare these to test gauge readings.

CHECKING SUBCOOLING AND SUPERHEAT

The subcooling should always be checked when charging the system with refrigerant and/or before checking the superheat. The subcooling measurement should always be taken with the system loaded, the economizer solenoid energized, and the level in the flash tank reasonably stable with a level of approximately 35%.

It may be desirable to check subcooling with one compressor running to allow the compressor to operate at full speed for a period of time to stabilize system temperatures and pressures.

When the refrigerant charge is correct, there will be no bubbles in the liquid sight glass with the system operating under full load conditions, and there will be 5 - 7°F (2.77 - 3.78°C) subcooled liquid leaving the condenser. Subcooling should be set at 10°F (5.56°C). An overcharged system should be guarded against. Evidence of overcharge is as follows:

a. If a system is overcharged, the discharge pressure will be higher than normal. (Normal discharge/ condensing pressure can be found in the refrigerant temperature/pressure chart in IOM; use entering air temperature +30°F (17°C) for normal condensing temperature.

b. The temperature of the liquid refrigerant out of the condenser should be about 5-7°F (2.77 - 3.78°C) less than the condensing temperature (The temperature corresponding to the condensing pressure from the refrigerant temperature/pressure chart).

The subcooling temperature of each system should be calculated by recording the temperature of the liquid line at the outlet of the condenser and subtracting it from the recorded liquid line pressure at the liquid stop valve, converted to temperature from the temperature/ pressure chart in IOM.

SUBCOOLING

Example:

Liquid line pressure =	
110 PSIG converted to	93°F (33.9°C)
Minus liquid line temp.	-87°F (30.6°C)
SUBCOOLING =	6°F (3.3°C)

The subcooling should be adjusted to 5 – 7 °F (2.77 – 3.78°C)

This may be difficult to measure, due to test instrument error and the difficulty generally encountered when measuring subcooling on systems operating with very low condenser subcooling.

1. Record the liquid line pressure and it's corresponding temperature, liquid line temperature, and subcooling below:

	SYS 1	SYS 2	
Liq Line Press =	_____	_____	PSIG (kPa)
Temp =	_____	_____	°F (°C)
Liq Line Temp =	_____	_____	°F (°C)
Subcooling =	_____	_____	°F (°C)

Add or remove charge as necessary to obtain a full sight glass fully loaded while keeping subcooling to about 5-7°F (2.77-3.78°C). After an adjustment is made to the charge, the flash tank level may rise or drop from the approx. 35% point. Before another measurement is made, allow the level to stabilize.

After the subcooling is set, the suction superheat should be checked. The superheat should be checked only after steady state operation of the chiller has been established, and the system is running in a fully loaded, stable condition. Correct superheat for a system is 8 - 12°F (4.45 - 6.67°C) and should be reasonably close to the system superheat on the chiller display.

The superheat is calculated as the difference between the actual temperature of the returned refrigerant gas in the suction line entering the compressor and the temperature corresponding to the suction pressure as shown in a standard pressure/temperature chart.

SUPERHEAT

Example:

Suction Temp =	46°F (8°C)
minus Suction Press	
30 PSIG converted to Temp	- 35°F (1°C)
	11°F (6°C)

The suction temperature should be taken 6" (13 mm) before the compressor suction service valve, and the suction pressure is taken at the compressor suction service valve.

No superheat adjustments are necessary and the electronically controlled drain valve need not be adjusted in the field. Ensure that superheat is controlling at 8 - 12°F (4.45 - 6.67°C). The purpose of this check is primarily to verify the transducer and suction temperature sensors in a system are providing reasonably accurate outputs to the chiller controls. It also checks the operation of the Feed and Drain Valves.

2. Record the suction temperature, suction pressure, suction pressure converted to temperature, and superheat of each system below:

	SYS 1	SYS 2	
Suction Press =	_____	_____	PSIG (kPa)
SP to Temp =	_____	_____	°F (°C)
Suction Temp =	_____	_____	°F (°C)
Superheat =	_____	_____	°F (°C)

3. Discharge superheat will typically run approx. 28-30°F. This can be checked on the micropanel display. If the suction superheat drops very low or the economizer feeds liquid into the compressor, the superheat will drop sharply to approx. 2-3°F.

LEAK CHECKING

1. Leak check compressors, fittings, and piping to ensure no leaks.

   If the chiller is functioning satisfactorily during the initial operating period, no safeties trip and the chiller controls chilled liquid temperature; it is now ready to be placed into service.

NOTES

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Supersedes: Nothing