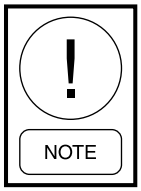
Johnson Controls	STEAM TURBINE CENTRIFUGAL LIQUID CHILLERS	
START-UP CHECKLIST	Supersedes 160.67-CL1 (1108)	Form 160.67-CL1 (114)

YST PRE START-UP CHECKLIST

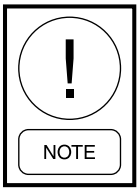
OFFICE LOCATION _____	TECHNICIAN'S NAME_____
UNIT MODEL NUMBER _____	YORK CONTRACT NO._____
JOB NAME _____	UNIT SERIAL NUMBER_____
START DATE_____	SOFTWARE VERSION _____
COMPRESSOR SERIAL NO. _____	BIOS NUMBER / CSUM _____
TURBINE SERIAL NO. _____	SURFACE COND. SERIAL NO._____

Equipment damage can occur if the unit is not properly installed and commissioned. The following checks must be performed prior to the startup of the chiller, AFTER the installation is complete as detailed in the Installation Instructions (Form 160.67-N2). The following checklist must be used to ensure that all steps have been completed prior to starting/running equipment.



Prior to and during the following checks, all pressure and temperature displays on the OptiView™ screens should be observed to verify that the displayed values are as expected for the present ambient temperatures and condition of the chiller components (pressures, oil heater on, oil pump running, etc). If displays are not correct, perform diagnostic checks per the Service Instructions manual (Form 160.67-M3), and correct the problem prior to operation of the chiller.

Do not apply power to the chiller before ensuring that the compressor oil heater overload (OL1) and all motor protector overloads (OL2 - OL6) in the Power Panel are in the "OFF/Tripped" position. Remove fuses FU10, FU11, and FU12 to prevent premature operation of the compressor oil pump. Do not switch motor protectors ON or replace fuses until instructed to do so per Operation and Maintenance Manual 160.67-O2.



Reference all applicable drawings supplied with the job manual, and FIG's 8 and 9 in form 160.67-N2 for piping connections. Reference all applicable drawings supplied with the job manual, and forms 160.67-PW2, 160.67-PW4, 160.67-PW5, and 160.67-PW6 for applicable wiring diagrams.

UNIT
PRE START-UP CHECKLIST

	PROCEDURE	MANUAL	SECTION / HEADING
☐	Chiller installed level and Vibration Isolators/Pads installed.	160.67-N2	Section 2 - Locating & Installing Isolator Pads, leveling the Unit
☐	Verify customer supplied Components/Piping correctly installed.	160.67-N2	Section 3, Section 4
☐	Governor Valve and Spool Piece adequately supported.	160.67-N2	Section 4 - Governor Valve and Spool Piece
☐	Steam Exhaust Expansion Joint properly installed.	Job Manual	Field Notes - Steam Condenser Field Kit Drawing
☐	Verify pipe strain testing procedure has been completed.	160.67-N2	Section 4 - Pipe Strain Testing
☐	Verify incoming steam supply design temperature/pressure.	160.67-01	Sales Order Screen
☐	Verify status of all utilities including power and instrument air.	160.67-O2	Section 2 - Check The Status Of All Utilities
☐	Verify Field Wiring.	160.67-N2	Section 6 - Field Installed Wiring
☐	Verify Oil level in Compressor Oil Reservoir.	160.67-O2	Section 2 - Check The Oil Level in The Compressor
☐	Verify Compressor Oil Pump operation.	160.67-O2	Section 2 - Verify Compressor Oil Pump Operation
☐	Verify Governor Valve calibration and operation.	160.67-O2	Section 2 - Verify Turbine Governor Valve Operation
		160.67-M3	Section 24 - Diagnostics and Troubleshooting - Analog I/O Expansion Tests - Analog Outputs
☐	Verify Compressor Pre-Rotation Vane operation.	160.67-02	Section 2 - Verify Compressor Pre-rotation Vane Operation
		160.67-M3	Section 24 - Digital Input/Output Tests - Digital Outputs
☐	Verify Subcooler level control operation.	160.67-O2	Section 2 - Pre-Startup and System Operating Procedure
		160.67-M3	Section 24 - Diagnostics and Troubleshooting - Analog I/O Expansion Tests - Analog Outputs
☐	Verify Hot-gas Bypass operation.	160.67-02	Section 2 - Verify Hot-Gas Bypass Operation
		160.67-M3	Section 24 - Diagnostics and Troubleshooting - Analog I/O Expansion Tests - Analog Outputs
☐	Prepare the chilled and condenser water Piping and Pumps.	160.67-N2	Section 4 - Checking Piping Circuits and Venting Air
☐	Verify Microboard Switches and Program Jumpers	160.67-M3	TABLE 1 & TABLE 2
☐	Verify/adjust system setpoints, Micro configuration, Anti-Surge tuning.		See pages 4-11

TURBINE
PRE START-UP CHECKLIST

	PROCEDURE	MANUAL	SECTION / HEADING
☐	*Verify protective Mylar Sheets removed from Turbine Journal Bearings before rotating Turbine. *Remove Probes/Sensors from Bearing Caps to Prevent Damage when removing Mylar.	160.67-N2	Section 1 - Introduction: Mylar Shipping Film
☐	Verify Turbine to Compressor alignment.	160.67-N2	Section 5 - Driveline Alignment
☐	Verify Inlet Stream Line Blow-down procedure completed per manual.	160.67-N2	Section 4 - Customer Piping:Steam Piping - Recommended Blow-Down Procedure
☐	Inspect and clean Steam Strainers.	160.67-O2	Section 2 - Inspect and clean Steam Strainer
☐	Inspect and clean Water Strainers.	160.67-O2	Section 2 - Inspect and clean System Strainers
☐	*Inspect and clean Turbine.	160.67-02	Section 2 - Inspect and Clean Turbine
☐	*Flush Turbine Lube System (KD Turbines).	160.67-O2	Section 2 - Flush Turbine Lube System
☐	Verify proper oil level in Turbine Bearing Reservoir (KG Turbines - ring oil lube).	160.67-O2	Section 2 - Check Oil in Turbine Oil Reservoir
☐	Steam Separator Drain Line drained immediately prior to system start.	System Piping Drawings	-

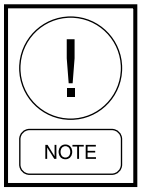
NOTE:
*May have been completed by Dresser Rand Start-up Technician prior to commissioning - verify with local YORK/Johnson Controls service office prior to starting the chiller.

SURFACE CONDENSER
PRE START-UP CHECKLIST

	PROCEDURE	MANUAL	SECTION / HEADING
☐	Verify Steam Condenser Vacuum Pump(s) Storage Solution drained and filled with water to proper level prior to starting pump(s).	160.67-O2	Section 2 - Prepare Steam Condenser Vacuum Pumps
☐	Verify proper rotation of Steam Condenser Vacuum Pump(s).	160.67-O2	Section 2 - Prepare Steam Condenser Vacuum Pumps
		160.67-M3	Section 24 - Diagnostics and Troubleshooting - Digital Outputs
☐	Verify Steam Condenser Atmospheric Manual Valve is disabled and the sealing water is adjusted to a trickle-flow to seal valve.	160.67-O2	Section 2 - Prepare the Steam Condenser Atmosphere Relief Valve
☐	Verify proper hotwell liquid level, liquid level control operation, and high & low level switches setup.	160.67-O1	Section 2 - Condensate Screen & FIG. 3A of 160.67-02
☐	Verify proper rotation of Hotwell Pump(s).	160.67-02	Section 2 - Steam Condenser and Hotwell Pumps
		160.67-N2	Section 24 - Diagnostics and Troubleshooting - Digital Outputs
☐	Verify proper mounting alignment of surface condenser. Ref. steam cond. mounting kit drawing in job manual.	Condenser Mounting Drawing	Section 4 - Installation Instructions 160.67-N2
☐	Verify expansion joint tolerances/installation	Expansion Joint Drawing	Section 4 - Installation instructions 160.67-N2

SYSTEM SETPOINTS

(Reference 160.67-O2, NAVIGATION Section and OPTIVIEW CONTROL CENTER screens)



IMPORTANT! The initial values shown on the screens are the setpoints loaded at the factory and may need to be changed to suit the operating conditions of the individual chiller. All final PID tuning values must be determined during initial operation at design conditions - Reference PID tuning in 160.67-M3, Section 23. For Retrofit applications, all setpoints must be confirmed to be correct at Field Commissioning.

See OptiView™ Screen Navigation provided on back cover of this publication.

PRE START-UP DATA SHEET

SETPOINTS	DEFAULT VALUE	PROGRAMMED VALUE
OPTIVIEW™ PANEL		
EVAPORATOR SCREEN		
Leaving Chiller Liquid Temp.	42	
Remote Leaving Chilled Liquid Temp. Range	10	
Low Chilled Liquid Cycling SD Temp.	4	
Low Chilled Liquid Cycling SD/Restart Temp.	4	
Brine Low Evaporator Pressure Cutout	N/A	
Smart Freeze protection	Off	
Refrigerant Temp. Sensor	Enabled	
Condenser Screen		
High Pressure Warning Threshold	162.5	
Drop leg Refrig. Temp. Sensor	Enabled	
Compressor Screen		
Pre-Rotation Vanes Calibrate Screen		
PRV Calibration - Open/Closed Voltage	Factory Calibrated	Ref. 160.67-M3, Section 23
Proximity Screen Calibration		
Proximity Calibration - Reference Position	Factory Calibrated	Ref. 160.67-M3, Section 23
Oil Sump Screen		
Standby Lubrication	Enabled	
Oil Pressure Setpoint	35	
Control Period	0.9	
Manual or Automatic	Automatic	
Variable Geometry Diffuser (VGD) Setpoints Screen		
PRV Offset	5%	
Probe Wait	3 min.	
Open Pulse	2	
High Limit	1	
Low Limit	0.8	
PRV VGD Inhibit	95%	
Extreme Stall Duration	10 Min.	

PRE START-UP DATA SHEET (CONT'D)

SETPOINTS	DEFAULT VALUE	PROGRAMMED VALUE
CAPACITY CONTROL SCREEN		
PID SETUP SCREEN #1		
SELECT PID - TEMPERATURE CONTROL		
SELECT CONTROL - SPEED		
Proportional "P"	1	
Intergral "I"	2	
Derivitive "D"	0	
Select Control - PRV		
Proportional "P"	2	
Intergral "I"	4	
Derivitive "D"	0	
SELECT CONTROL - HGV		
Proportional "P"	2	
Intergral "I"	3	
Derivitive "D"	0	
Setpoint Ramp Rate "RR"	.1 °F /sec.	
Select PID - Evaporator Pressure		
Setpoint Psig	30 Psig	
SELECT CONTROL - SPEED		
Proportional "P"	2	
Intergral "I"	0.95	
Derivitive "D"	0	
SELECT CONTROL - PRV		
Proportional "P"	2	
Intergral "I"	2	
Derivitive "D"	0	
Select Control - HGV		
Proportional "P"	2	
Intergral "I"	2	
Derivitive "D"	0	
SELECT PID - CONDENSER PRESSURE		
Setpoint Psig	115 Psig	
Select Control - Speed		
Proportional "P"	1	
Intergral "I"	0.95	
Derivitive "D"	0	
Select Control - PRV		
Proportional "P"	2	
Intergral "I"	2	
Derivitive "D"	0	

PRE START-UP DATA SHEET (CONT'D)

SETPOINTS	DEFAULT VALUE		PROGRAMMED VALUE
SELECT CONTROL - HGV			
Proportional "P"	2		
Intergral "I"	2		
Derivitive "D"	0		
SELECT PID - HOTWELL LEVEL			
Setpoint %	50		
Proportional Gain "P"	2.79		
Integral "I"	1.25		
Derivative "D"	0		
O %	50%		
SELECT PID - SUBCOOLER LEVEL			
	Zone 1	Zone 2	
Setpoint %	50%	50%	
Proportional Gain "P"	0.1	0.1	
Integral "I"	2.5	2.5	
Derivative "D"	0	0	
Setpoint Ramp Rate "RR"	.1 % / sec.	.1% / sec.	
PID SETUP SCREEN #2 (PAGE DOWN)			
SELECT PID - GOVERNOR (SLOW ROLL)			
Proportional Gain "P"	1.68		
Integral "I"	1.46		
Derivative "D"	0		
Setpoint Ramp Rate "RR"	50		
Select PID - Governor (Min. Rated)			
Proportional Gain "P"	0.75		
Integral "I"	2		
Derivative "D"	0		
Setpoint Ramp Rate "RR"	200		
SELECT PID - GOVERNOR (RATED)			
Proportional Gain "P"	1.2		
Integral "I"	1.21		
Derivative "D"	0		
Setpoint Ramp Rate "RR"	10		
SELECT PID - *GOVERNOR VALVE POSITION LIMIT			
Setpoint %	100%		
Proportional Gain "P"	1		
Integral "I"	1.5		
Derivative "D"	0		

*Only active when MSSP8 - Power Limiting Mode = Position, as selected on Capacity Control Setpoints Screen 1.

PRE START-UP DATA SHEET (CONT'D)

SETPOINTS	DEFAULT VALUE	PROGRAMMED VALUE
SELECT PID - ** HORSEPOWER LIMIT		
" Setpoint HP (Initially determined by the Compressor Model entered on the Setup Screen.) "	840	
Proportional Gain "P"	1	
Integral "I"	1.5	
Derivative "D"	0	
SETPOINTS SCREEN #1		
Hot Gas Valve Ratio Bypass	5%	
Subcooler Level Valve Minimum Position	30%	
Capacity Ratchet Mode HGV Reselection	3%	
Capacity Ratchet Mode PRV Reselection	3%	
Capacity Ratchet Mode Speed Reselection	3%	
Speed Control Mode	Variable	
Power Limiting Mode	Horsepower	
Hot Gas Valve Ramp Rate	5%/sec.	
PRV Ramp Rate	5%/sec.	
Temperature Control Override Transfer Delay	5 sec.	
Anti-surge Update Delay Timer	30 sec.	
Hot Gas Valve Temperature Cont. Diff.	1.1 °F	
SETPOINTS SCREEN #2 (PAGE DOWN)		
PRV Minimum Open Position	10%	
Horsepower Calculation Slope	294.8	
Horsepower Calculation Intercept	301.5	
Horsepower Calculation Efficiency	0.67	
Design Steam Pressure	80	
Design Steam Temperature	325	
SETPOINTS SCREEN		
Remote Analog Input Range	0-10 volts	
SETUP SCREEN		
Enable Clock	Enable	
Enter CLOCK Time and Date		
Select 12 or 24 hour display	12	
Refrigerant Selection (State of switch SW1-1)	R134a	
Liquid Type	Water	
Chilled Liquid Pump Operation	Standard	
Power Failure Restart	Auto	
Pre-Lube	Standard	
Compressor Oil Pump Package	Variable Speed	
Compressor Model (Automatically sets the HP Limiter SP on PID Setup Screen #2)	H6	

**Only active when MSSP8 - Power Limiting Mode = Horsepower (Default) on Capacity Control Setpoints Screen 1.

PRE START-UP DATA SHEET (CONT'D)

SETPOINTS	DEFAULT VALUE	PROGRAMMED VALUE
USER SCREEN		
Select Desired Display English or Metric	English	
User I.D. Passwords		
COMMS. SCREEN		
Baud rate	19200	
Number of Data Bits	8	
Number of Stop Bits	1	
Parity	odd	
Chiller I.D.	0	
PRINTER SCREEN		
Automatic Print Logging Enable/Disable	Disabled	
Automatic Printer Logging Start Time	12:00 AM	
Automatic Logging Interval	60	
Printer Type	Weightronix	
Report Type (Status/Setpoints/Sales Order)		
SALES ORDER SCREEN		
Enter System Commissioning Date		
OPERATIONS SCREEN		
Control Source(LOCAL/ISN/Digital/Analog)	Local	
Edit Regional telephone if necessary		
Enter Local Phone Number		
Hot Gas Enabled/Disabled	Enabled	
Level Control Enabled/Disabled	Enabled	
Flow Switch Analog/Digital	Analog	
VGD Control Enabled/Disabled	Enabled	
Prox Probe Analog/Digital	Analog	
ALARM/SHUTDOWN SETPOINTS SCREEN		
Hotwell High Level Shutdown	90%	
Turbine Exhaust Steam High Press Shutdown	3.5	
Turbine Supply Low Oil Press. Shutdown	6	
Turbine Inlet Steam H.P. Alarm	500	
Turbine Shaft End BRG. H.T. Alarm	210	
Turbine Shaft End BRG. H.T. Shutdown	220	
Turbine Governor End BRG. H.T. Alarm	210	
Turbine Governor End BRG. H.T. Shutdown	220	
Turbine Supply Oil H.T. Alarm	130	
Turbine Supply Oil H.T. Shutdown	135	
Turbine Vibration Alarm	1.8 Mils	

PRE START-UP DATA SHEET (CONT'D)

SETPOINTS	DEFAULT VALUE	PROGRAMMED VALUE
ALARM/SHUTDOWN SETPOINTS SCREEN (CONT'D)		
Turbine Vibration Shutdown	3.0 Mils	
Compressor Vibration Alarm	0.3 In/Sec.	
Compressor Vibration S.D.	0.5 In/Sec.	
Overspeed Shutdown	4900	
TIME DELAY ALARM/SHUTDOWN SETPOINTS SCREEN		
Excessive Slow Roll Timeout	1200	
Turbine Exhaust High Pressure Timeout	600	
Excessive Start Delay Timeout	1200	
Hotwell High Level Timeout	10	
Turbine Mechanical Trip Timeout	10	
Slow Roll Underspeed Timeout	100	
Compressor Vibration Trip Timeout	5	
CONFIGURATION SCREEN #1		
Turbine Start Mode	Manual	
Turbine Lubrication Type	Pump	
Hotwell Pump Mode	Dual	
Vacuum Pump Mode	Dual	
Turbine Shaft Vibration Sensors	Disabled	
Turbine Bearing Temp Sensors	Enabled	
Turbine 1st Stage Press. Sensor	Enabled	
Turbine Nozzle Solenoids	Disabled	
Turbine Stage Count	7	
Compressor Vibration Sensors	Disabled	
CONFIGURATION SCREEN #2 (PAGE DOWN)		
Steam Flow Sensor Enable	Disabled	
Evaporator Flow Sensor Enable	Disabled	
Condenser Flow Sensor Enable	Disabled	
Steam Flow Sensor Range	24000 lbs/min.	
Evaporator Flow Sensor Range	6000 gal/min.	
Condenser Flow Sensor Range	8000 gal/min.	
Steam Flow Trans Signal Type	Linear	
Evap. Flow Trans Signal Type	Linear	
Cond. Flow Trans Signal Type	Linear	
CONFIGURATION SCREEN # 3 (PAGE DOWN)		
Configurable Analog Output	Gov. Position	
Configurable Digital Output	Comp. Oil Pump	
Configurable Digital Output	Comp. Oil Pump	
Configurable Digital Output	Comp. Oil Pump	

PRE START-UP DATA SHEET (CONT'D)

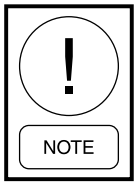
SETPOINTS	DEFAULT VALUE	PROGRAMMED VALUE
PRESSURE SETPOINTS SCREEN		
Vacuum Pump Shutdown	9 psia	
Ready To Run Turbine Exhaust Press	12 psia	
Turbine Aux. Oil Pump Off	16 psig	
Turbine Aux. Oil Pump On	8 psig	
Open Ejector Steam Inlet	5 psia	
Turbine Nozzle Sol. # 1	45 psig	
Turbine Nozzle Sol. # 2	50 psig	
Turbine Nozzle Sol. Deadband	5 psig	
TIME SETPOINTS SCREEN		
Turbine Nozzle Sol. #1 Delay	300 sec.	
Turbine Nozzle Sol. #2 Delay	100 sec.	
Chilled Water Pump Turn-On delay	5 sec.	
Chilled Water Flow Switch Ck Delay	10 sec.	
Subcooler Level Vlv. Pulldown Delay	5 min.	
Soft Shutdown Rampdown Timeout	5 min.	
Hotwell Pump Shutdown Delay	360 sec.	
Turbine Aux. Oil Pump Postlube	30 min.	
Turbine Stabilization Delay	5 sec.	
SPEED SETPOINTS SCREEN		
Slow Roll Speed	1000	
Fixed Speed	3600	
Overspeed Test Limit	5000	
Turbine Aux. Oil Pump Activate	3000	
Minimum Rated Speed	3200	
Chilled Water Pump Turn On Speed	1500	
Maximum Rated Speed	4500	
Maximum Speed Analog Input	5000	
Critical Band Base Speed	2000	
Critical Band Offset Speed	1000	
RAMP RATE SETPOINTS SCREEN		
Slow Roll Speed Setpoint	50	
Minimum Rated Speed Setpoint	200	
Rated Speed Setpoint	10	

POST START-UP UNIT CHECKLIST

PROCEDURE	MANUAL	SECTION / HEADING
☐ Complete Liquid Level Sensor Calibration	160.67-M3	Section 23 - Level Sensor Calibration
☐ Complete Anti-Surge Tuning (Record Setpoints below)	160.67-M3	Section 23 - Anti-Surge Tuning
☐ Complete Overspeed Test	160.67-01	Overspeed Test Key

CAPACITY CONTROL SCREEN

Auto/Manual Screen (Anti-Surge Tuning) Reference 160.67-M3, pg. 158



All Anti-surge setpoints must be determined during initial operation of the chiller at expected Min. and Max. "Head" conditions. If these operating conditions cannot be achieved at chiller commissioning, subsequent visits will be required to ensure that the controls are set up properly to prevent surging at all possible conditions.

SETPOINTS	DEFAULT VALUE	PROGRAMMED VALUE
High Head Pressure Delta (PD1)	75 Psid	
LowHead Pressure Delta (PD1)	40 Psid	
High Head Min PRV (MVP1)	20%	
Low Head Min PRV (MVP2)	15%	
High Head Min Speed (MSP1)	4500 RPM	
Low Head Min Speed (MSP2)	3600 RPM	

	TYPICAL VALUE	ACTUAL VALUE
☐ *Compressor Oil Pressure	35 Psid	
☐ **Turbine Oil Pressure	12-15 Psig	

NOTE:
*Verify Compressor Oil Pressure with Manifold Gauge.
**Verify Turbine Oil Pressure with Turbine Oil Pressure Gauge.

OPTIVIEW™ SCREEN NAVIGATION

- Home
  - Refrigeration System
  - Evaporator
  - Condenser
  - Compressor
    - Proximity Probe Calibration
    - Pre-Rotation Vanes Calibration
    - Oil Sump
    - Variable Geometry Diffuser (VGD)
      - VGD Setpoints
  - Steam System - Manual Start
  - Steam System - Auto Start
    - Turbine
    - Condensate
    - Vacuum
  - Capacity Controls - Fixed Speed Mode
  - Capacity Controls - Variable Speed Mode
    - PID Setup 1
    - PID Setup 2
    - Auto/Manual
    - Capacity Control Setpoints 1
      - Capacity Control Setpoints 2
  - Setpoints
    - Setup
      - User
      - Comms
      - Printer
      - Sales Order
      - Operations
    - Alarm/Shutdown Setpoints
      - Time Setpoints
    - Configuration 1
      - Configuration 2
        - Configuration 3
      - Pressure Setpoints
      - Time Setpoints
      - Speed Setpoints
      - Ramp Rate Setpoints
  - History

P.O. Box 1592, York, Pennsylvania USA 17405-1592
800-861-1001
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Form160.67-CL1 (114)
Issue Date: January 20, 2014
Supersedes: 160.67-CL1 (1108)