

# MULTISTACK

MS80T



## *Turbostack* Modules OPERATION & MAINTENANCE

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## 1.0 Chiller Identification

The module data plate which contain the model and serial number for all *Turbostack* modules is located on the electrical box door of each module

### 1.1 Model Number

#### MS80T1H2W-V

MS   80   T   1   H   2   W   -V

MS = Multistack

80 = tons

T = Turbocor Centrifugal

1 = single cond & evap std. efficiency

H = 460V

2 = wired as multiple module

W = water cooled

V = variation (\* if noted)

### 1.2 Serial Number Identification

JD-06-25

J = --0- (decade built)

I = 1990's

J = 2000's

D = ---4 (year built)

A = '01

B = '02

.....

06 = June (month built)

01 = Jan.

02 = Feb.

.....

25 = 25<sup>th</sup> module built

01 = 1<sup>st</sup>

02 = 2<sup>nd</sup>

.....

## 2.0 Theory of Operation

The Multistack *Turbostack* chiller provides chilled water to an external load based off of the leaving chilled water temperature sensed in the Multistack master control. When the Leaving Chilled Water sensor sends the signal to the master control that cooling is needed, compressors will begin to start and produce chilled water. The point at which the LCHW temperature calls for compressors to start is determined by the Loset-point setting in the system variables menu of the master control.

When the LCHW sensor senses that the chilled water temperature has dropped below the set-point, compressors will begin to cycle off.

## 3.0 Daily Log Sheet

On the back page of this manual is a chiller information log sheet. The log sheet can be used daily, weekly or as desired to record operation characteristics of the chiller. The information recorded on the log sheet can also be very helpful for diagnosing potential problems in the system.

## 4.0 Pressure Readings / Cut- Outs

The operating suction and discharge pressures in the system are directly related to water flow, condenser temperatures, chilled water set-point, and the cleanliness of the system.

The *Turbostack* modules use R-134a refrigerant. With standard conditions of 55° ECHW, 45° LCHW, 85° ECW, 95° LCW, the suction pressure should be approximately 32 psig with a 135 psig discharge pressure.

All *Turbostack* modules have multiple high pressure cut out safety devices. The HP cut out is 200 psig through the PCO2 master control internal controls. The compressor itself has a cut out set at 232 psig. A 2<sup>nd</sup> back up switch set at 240 psig is also on each module. This switch has a manual reset button on it.

Each *Turbostack* module also has multiple low pressure safety devices. The LP cut out is 20 psig through the compressors internal controls. A back up switch set at 15 psig is also on each module. This switch has a manual reset button on it.

If circuits are faulting on HP the first action to be taken should be checking the condenser water inlet filter cartridge for debris. *See filter strainer cleaning procedure in section 5.0.*

A LP fault is an indication of low refrigerant charge in the system. If a circuit is going out on a LP fault check the static pressure of the system while the circuit is in the off mode. If pressures are low check the circuit for possible leaks. The circuit can be pressurized to 15 psig with refrigerant and topped to 160 psig with dry Nitrogen.

## 5.0 Strainer Cleaning

All *Turbostack* modules have a 30 mesh filter cartridge in the condenser and evaporator inlet header. The purpose for the filter cartridge is to keep debris from entering the heat exchanger. An external “Y” or basket type system strainer should also be installed as a pre-filter to the *Turbostack* strainers.

There is no set time for cleaning the filter cartridges. The frequency of this process is dependant on the water quality in the condenser and / or evaporator loop.

Normally, debris in a water loop is going to take the path of least resistance and build up on the last modules to receive water. Multistack modules come with an auto blow down (the DDRS-210A) installed on the condenser side of the last module to receive water flow. The DDRS-210A is controlled by a timer in the master control, it opens once a day to remove debris from the loop. The DDRS-210A does not eliminate the need to pull the filters for cleaning. It is however meant to decrease the frequency.

The effect of debris being built up in the condenser water inlet filter cartridge will be nuisance HP (high pressure) faults. By checking the pressure differential between the inlet and outlet of the condensers, an indication can be determined if the filters are contaminated. *Refer to the Product Data Catalog for correct pressure drop of your model.* To keep HP faults from repeating, the filters will need to be pulled. If HP faults still occur after cleaning the filter cartridges the condenser pump should be checked for proper flow. If flow is not a problem the heat exchangers may need to be cleaned. *Refer to section 11.0 on Heat Exchanger Cleaning.*

Following is the procedure for removing and cleaning the filter cartridges on the condenser side.

1. Turn off the chiller, shut down the condenser pump, and close the butterfly / gate valves to the condenser.
2. Drain the water remaining in the condensers and header pipes. You can do this by opening the drain valve in the supplied pipe stubs or removing the end Victaulic cap on the DDRS-210A.

3. Remove the first filter in the DDRS and remove all remaining filters in the bottom condenser header pipes. You may need to fabricate a tool to hook onto and pull the strainers out through the DDRS end.
4. Slowly open the top butterfly / gate valve and allow water to flow through the condensers and onto the floor for approximately 30 seconds. This will push out any debris that was trapped in the bottom of the heat exchanger as the filters were removed
5. Clean the filters with hose, power washer, or wire brush as needed and re-install. Slide filters in until you hit the filter stop ring on the first module. Some people like to keep an extra set of strainers for quick re-installation. These filters are available for purchase through your local Multistack Representative.
6. Close the system by installing any Victaulic clamps previously removed.
7. Open the 1/4" petcock bleed valves on the pipe stubs.
8. Re-fill the system by opening the bottom butterfly / gate valve and filling from the bottom up. Close the 1/4" petcock valves and open the top butterfly / gate valve after the air has been bled from the system.
9. Restart the condenser pump. Bleed any remaining air in the system once the pump has started and re-start the chiller

If circuits are faulting on Low Suction Temperature, or Low Chilled Water Temperature the chilled water inlet filter cartridge should be checked. The strainers are located in the top header on the CHW side so the previous instructions on condenser strainer removal do not have to be exactly followed. If the strainers are clean the fault is most likely being caused by a low flow condition or to low of set-points in the master control. If these possibilities are eliminated the evaporator heat exchangers may need cleaning.

## **6.0 Compressor Oil Level**

The *Turbostack* Chiller uses an oil-less centrifugal compressor. There is no oil in the system.

## **7.0 Refrigerant Charge / Evacuation**

All *Turbostack* modules come factory charged with the recommended refrigerant volume. Prior to charging, each circuit is evacuated to a maximum of 150 microns and held 15 minutes. The proper refrigerant charge for each module can be found on the module data plate. The *Turbostack* is charged to 45 lbs. of R-134a.

For proper charge on water-cooled machines the circuit should be charged until the sight glass just clears.

## **8.0 Filter Driers**

*Turbostack* modules contain very short piping runs to the major components. Only a micro refrigerant charge (.6 of a lb. per ton) is used, and all circuits are evacuated to 150 microns. For this reason a liquid line filter drier is not factory installed in the unit.

When changing a major component in the system, a replaceable core liquid line filter kit can be added to reduce contamination. The filter kit can be purchased from Multistack through your local Multistack Representative. Installation instructions and drawings are also available from Multistack.

## **9.0 Superheat / Subcooling**

*Turbostack* modules use either a mechanical type expansion valve or an electronic type valve controlled through the compressor.

By turning the mechanical valve adjustment clockwise superheat is increased.

To access control of the electronic expansion valve you will need the Turbocor Monitor software program and a PC.

On MS modules, superheat is set at the factory during the run test. Superheat is set for 10 – 12 degrees during the test run.

Subcooling is necessary in the system to prevent flash gas as the refrigerant enters the expansion valve. Multistack condensers are sized so that subcooling of the liquid refrigerant will take place with no separate subcooler being needed. The general range of subcooling seen is 10- 20 degrees.

## **10.0 Pressure Relief Valve**

MS modules do not have pressure relief valves as a standard component. If desired or required by local code, pressure relief can be added as an option.

## 11.0 Maintenance

Most of the annual maintenance requirements for *Turbostack* Chillers involve proper shut-down of the machine, and cleaning of the heat exchangers. *Preventative Maintenance bulletin #021594PM* and *Heat Exchanger Cleaning Procedures bulletin #091594CP* describe the recommended procedures for both processes. Multistack has available the 151A Cleaning Kit to assist with this process. Please see the *151A Cleaning Kit bulletin # 090195CK* for more details. All of these bulletins are part of the standard O&M manual package.

### 11.1 Annual Maintenance Checks

1. Electrical Components
  - a. check all external interlocks
  - b. inspect compressor terminals
  - c. tighten all contactor, relay and circuit breaker terminals.
  - d. check all safety controls.
  - e. check and record voltages and amperages for compressors.
  - f. inspect relay contacts for damage or pitting
  
2. Refrigeration Circuits
  - a. analyze refrigerant with tube type moisture/acid analyzer.
  - b. check and record refrigerant subcooling and superheat.
  - c. check liquid solenoid valves (if applicable)
  - d. check expansion valve and sensing bulb connections.
  
3. Condenser and Chilled Water System
  - a. clean pump strainers and system strainers.
  - b. remove header caps and clean the CW and CHW strainers in accordance with the Multistack™ Annual Cleaning Procedure detailed in this manual
  
4. Cabinet and Related Hardware
  - a. dry clean electrical panels, remove debris.
  - d. apply protective coatings or wax if required.
  
6. Update Your Maintenance Log Book!
  
7. The Capacitors on the compressor's have a lifetime of 5-10 years. Turbocor recommends replacing these in that time frame.

## 12.0 Compressors

With any chiller system there is always the chance of a compressor failure. In the event of a failure, proper steps should be taken to determine the cause of the failure.

A motor burn due to a fault in the motor insulation is quite rare. Most burnouts are actually caused by a mechanical condition or lubrication problems. In the event of a burnout, proper clean up procedures should be followed.

1. Check all electrical components of the circuit (contactors, fuses, wires, etc.)
2. If necessary do a system clean up. Nu-Calgon RX-11 flush, or Sporlan System Cleaner work well.
3. Install a liquid line filter drier with burnout core. *See section 7 on filter driers.*
4. Evacuate the system to a minimum of 500 microns and hold for 20 minutes.
5. Charge the circuit with virgin refrigerant. Charge with liquid into the discharge side. *See refrigerant charge on nameplate data of unit.*
6. Run the system 2-3 weeks with burnout filter core. Replace with standard core drier.

## 13.0 Heat Exchangers

Multistack uses brazed plate stainless steel heat exchangers for all condensers and evaporators.

Without proper water treatment or due to abuse, heat exchangers, especially condensers can corrode over time and eventually develop an internal leak. In such an event it would become necessary to replace the heat exchanger.

Following are the step's for field replacement of a failed condenser or evaporator heat exchanger.

1. If the refrigerant has not been lost on the failed circuit, you should first do a standard refrigerant recovery.
2. Begin by isolating the chiller and draining water from the side to be worked on.
3. Remove the 8" water header pipes by unbolting the victaulic couplings

4. Using a saws all you can now cut the refrigerant piping to remove the heat exchanger. Cut on the bottom side of the elbow and sweat off remaining portion of old elbow.
5. Remove the red support brace that holds both heat exchangers in place. Once this is removed you can remove the defective exchanger.
6. Set the new heat exchanger in place and re-install the support brace.
7. Fit the couplings and refrigerant piping into the heat exchanger. You may need to loosen the bolts at the compressor at this time.
8. Braze in the new exchanger while purging with a low pressure of nitrogen.
9. After brazing leak check and evacuate to a maximum of 500 microns. Charge the circuit according to the name plate charge.

If the heat exchanger failure has caused water to enter into the refrigerant side, the compressor and opposite side heat exchanger should also be checked for possible contamination. If water has entered into the compressor it is recommended the compressor be replaced, as removing all the moisture from it is very difficult. Replacement of the other contaminated heat exchanger, the expansion valve, and installation of a liquid line drier with a water core cartridge is also recommended. Evacuate the circuit to a maximum of 500 microns and let stand for 20 minutes. Charge the circuit and run 2-3 weeks with the high water core cartridge and then replace with a standard core.

## 14.0 Troubleshooting *Turbostack* Module

*Turbostack* modules use the Carel PCO2 master control. The user manual for the *Turbostack* PCO2 controller is located in *section 6 of the O&M package*. The user manual details the different status screens and explanations of system or module faults.

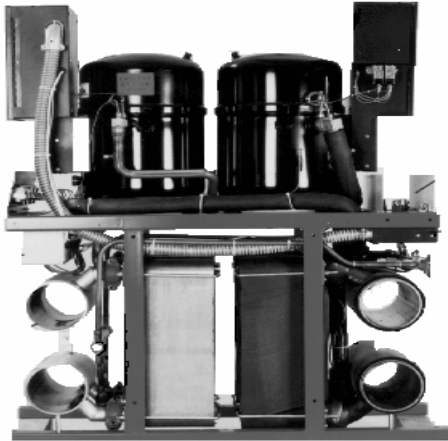
The following guide is for troubleshooting *Turbostack* modules and the PCO2.

<u>FAULT</u>	<u>SOLUTION</u>
No Display on Master Module	Check main disconnect for power Check circuit breakers in module Check transformer in modules Check for 24V at J1 on board
EX 1,2, Interlock	Check appropriate interlock component

	Check jumpers on TS2 in master module
EX 4 Interlock	Check for proper rotation, phasing Check PPM device
Waiting For Chilled Water Flow	Check CHW pump Check flow switch operation Check filter strainers Check TS2 inputs #3 - #7
Low Chilled Water Temp	Check LCHW sensor Check setpoints in system variables Check for flow restriction
No Demand	Check LCHW sensor Check setpoints in system variables Check sensor location
100% Demand all the time	Check LCHW sensor Check setpoints in system variables
100% Demand, chiller won't load	Turn chiller on Check sensors Check load limit setting in system variables
Excessive Cycling	Check LCHW sensor location
High Discharge Pressure (HP)	Check condenser water flow Check and clean system strainer Check and clean filter cartridges in modules Check pressure switch operation
Low Suction Pressure (LP)	Check refrigerant charge / leaks Check expansion valve
Low Suction Temperature	Check suction sensor Check setpoints in system variables Check for flow restriction
Communication Error	Check settings in system variables Check cables at J11 comm ports Check dip switch settings
Circuit Fault	Check components in control circuit Check wire crimps in control circuit

P Lan Error

Check P-Lan cabling and connections  
Check for possible airwave interference



# III MULTISTACK CHILLER DAILY LOG SHEET

	DATE					
	Status	Suct. Press	Head Press	Suct. Temp	LoChw Temp	Fault (if any)
Comp #1						
Comp #2						
Comp #3						
Comp #4						
Comp #5						
Comp #6						
Comp #7						
Comp #8						
Comp #9						
Comp #10						
Comp # 11						
Comp #12						
	Ent. Chw	Lvg. Chw	Ent CW	Lvg. CW	Demand	Capacity
System						
	Upset	Loset	VSP	Load Limit	Tdiff	Index
System						

COMMENTS:	CHW P Drop _____ .      CW P Drop _____ .