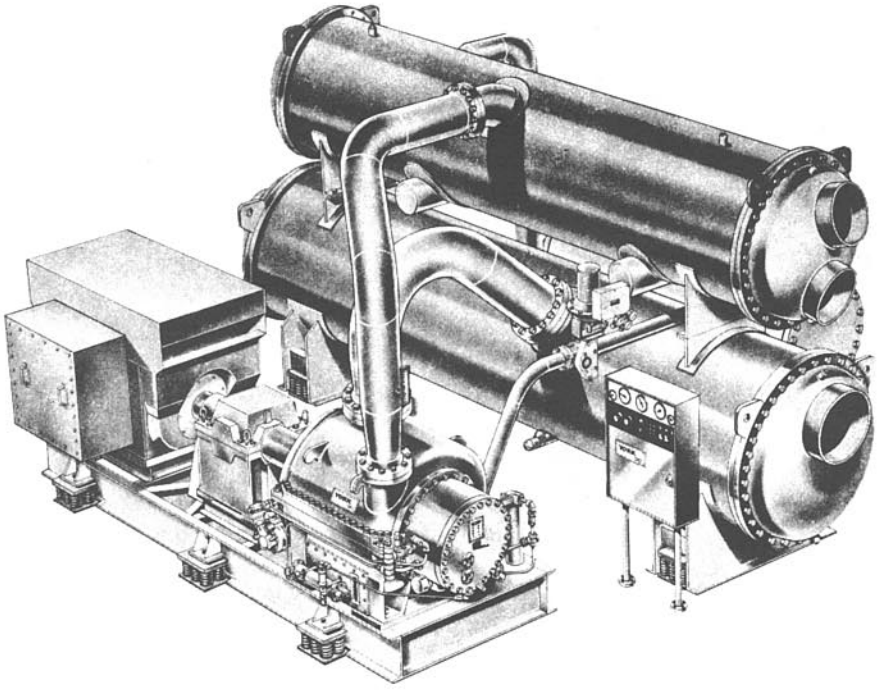
YORK®

OM TURBOMASTER

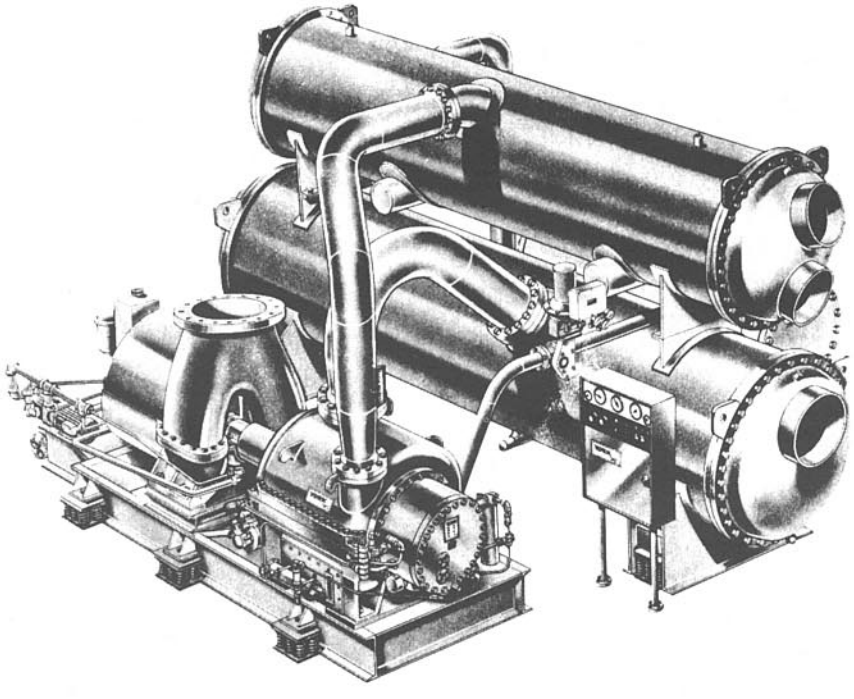
CENTRIFUGAL LIQUID CHILLING UNITS
1000 THRU 8500 TONS

INITIAL START-UP	Supersedes: Nothing	479	Form 160.71-SU1

"FOR YORK PERSONNEL ONLY"



TURBOMASTER
MOTOR DRIVE



TURBOMASTER
TURBINE DRIVE

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INITIAL START-UP

IMPORTANT – THIS INITIAL START-UP INSTRUCTION IS TO BE USED BY THE YORK START-UP ENGINEER TO INITIALLY START UNIT IN ACCORDANCE WITH THE YORK CONTRACT. ANY ATTEMPT TO INITIALLY START UNIT, WITHOUT THE ASSISTANCE OF THE YORK START-UP ENGINEER WILL VOID YORK'S RESPONSIBILITY IF DAMAGE OCCURS, UNLESS OTHERWISE AGREED UPON.

THE INITIAL START-UP INSTRUCTION IS TO BE USED IN CONJUNCTION WITH THE INSTALLATION INSTRUCTION 160.71-N1 AND OPERATING AND MAINTENANCE INSTRUCTION FORM 160.71-01.

THE YORK START-UP ENGINEER SHALL INSTRUCT OPERATING PERSONNEL IN THE OPERATION OF THE UNIT AND THE USAGE OF THE OPERATING AND MAINTENANCE INSTRUCTION FORM 160.71-01 BEFORE LEAVING THE JOB SITE.

PURPOSE

The purpose of this instruction is to supplement the installation instructions by advising YORK Personnel of the factory recommended procedures for properly installing and aligning couplings, doweling of compressor, speed increasers and drivers, handling, checking, testing, prestart-up operation and initially starting a YORK OM TURBOMASTER Unit. Each OM TURBOMASTER contract for installation within the Continental United States includes services by an Authorized YORK Representative to check each installation, make the initial start-up and instruct operating personnel.

OM TURBOMASTER Units are field erected and require very careful inspection of the installation by the YORK Start-Up Engineer.

PRE START-UP INSTALLATION PROCEDURES

INSTALLATION AND FINAL ALIGNMENT OF FLEXIBLE COUPLINGS.

After the drive line base has been located on its isolators, blocked per the installation instructions and all equipment field installed on the base, the flexible coupling or couplings should be accurately aligned (Refer to Form 160.71-N2). (If mounted on a concrete base the grout layer should have been poured before porceeding with coupling alignment.)

The low speed coupling may be any one of several different types.

The high speed coupling (between speed increaser, or turbine, and compressor) is supplied by YORK, since this coupling must be capable of withstanding the high speeds of rotation at which the compressor operates.

To prevent excessive wear, both couplings should be aligned with the same care and accuracy as a fixed coupling.

Remember that the speed increaser or turbine must be misaligned to allow for expansion as the turbine or speed increaser, warms up during operation.

To install and align the low speed coupling, carefully follow the manufacturer's instructions, for the particular coupling. (see 160.71-N2 for low speed coupling alignment)

To install and finally align the high speed coupling follow the steps outlined in Form 160.71–N2 which covers the details of the high speed flexible coupling.

DOWELING THE EQUIPMENT

After the equipment has been aligned, but before the unit is charged, the feet of the components must be doweled to maintain the alignment.

Two dowel pins with a No. 2 Morse taper are furnished for each piece of equipment to be doweled, except turbines where special dowel pins may be required.

To properly dowel the equipment proceed as follows:

1. Drill the two diagonally opposite mounting feet of the speed increaser and driver. Drill the compressor feet at the coupling end in accordance with the drawings.

   NOTE: Speed increasers are furnished with ½" lead holes drilled through the mounting feet.

2. Using a No. 2 Morse taper reamer (roughing and finishing), carefully ream the 9/16" holes until the dowel pins drive tight with approximately ¾" of the taper protruding.

   NOTE: Some catalogs may list "Morse Taper Reamers" to differentiate from other tapers.

3. Within two weeks of normal operation, make hot alignment check, final alignment, then the dowel pins should be removed and the holes finish reamed for full depth seating.

CHECKING FOR PIPING STRAIN

After making final alignment of the prime mover to the compressor and after the piping to and from the condenser and cooler is completed, the following check for piping strains should be made:

1. Loosen the flange bolts of the compressor suction and discharge connections. If the flange faces are parallel and the bolts are free in their holes, piping strain is not apparent, tighten the bolts. If faces are not parallel or bolts are bound in the hole, piping strain is apparent and

must be eliminated by correcting the suction and discharge connections.

2. It may be found that the condenser water piping or the cooler water piping is causing the strain by not being properly supported.

3. After eliminating piping strain, tighten the compressor suction and discharge connections.

PREPARATION FOR INITIAL STARTING

The following steps should be carefully checked before starting the unit for the first time:

1. Make sure all electric motors are wired per their respective Installation Instructions and the YORK Wiring Diagrams.

2. Make sure control center is wired and piped properly according to the unit wiring diagram and job specifications. Inspect and recalibrate control center referring to Form 160.71-NM1.1.

3. Check the lubrication instruction or all auxiliary equipment; pumps, motors, gear, turbine and lubricate them accordingly.

4. Add oil to the compressor as required below. (See OIL CHARGING PROCEDURE page 4.)

MODEL NO.	OIL GALS.
226	10
238	35
255	50

5. Disconnect the high speed coupling in order to check for proper rotation of driver.

6. Rotate the compressor shaft by hand to be sure it turns freely.

7. Start the driver to be sure it will drive the compressor in its correct rotation. When viewed from the drive end of the compressor, the compressor shaft should rotate counterclockwise.

   NOTE: THIS ROTATION MUST NOT BE REVERSED.

8. Assemble the high speed coupling according to Form 160.71-N2.

9. Open all water valves to and from condenser, cooler and oil coolers for compressor, speed increaser and turbine (if applicable).

10. Circulate water through unit components to establish design flows through condenser, cooler and oil coolers.

11. After water has circulated through unit close all valves. Drain where necessary and check and clean all water strainers of foreign material.

12. Open all water valves and again circulate water through all components. Establish proper design flows and vent air from top of both the condenser and cooler water boxes.

13. Start the Auxiliary Oil Pump by placing switch in the "MAN" position and operate this pump long enough to establish stable oil pressure.

14. Refer to Form 160.71-NM1.1 for operating sequence of control center during starting and running the unit.

OIL CHARGING PROCEDURE

The oil should be charged into the system using the York Oil Charging Pump – York Part No. 070-10654. This pump is supplied with the tool kit that is furnished with the unit. To charge oil into the system proceed as follows:

1. The unit should be shut down.
   NOTE: If charging oil to restore the correct level – the unit may be kept in operation.

2. Immerse the suction connection of the oil charging pump in a clean container of new oil and connect the pump discharge connection to the oil charging valve located at the end of the oil sump of the compressor. (See Figs. 4 & 7.) Do not tighten the connection at the charging valve until after the oil is forced out by pumping a few strokes of the oil pump. This fills the lines with oil and prevents air from being pumped into the system.

3. Open the oil charging valve and pump oil into the system until oil level in the compressor oil sump is about midway in the upper sight glass. Then close the charging valve and disconnect the hand oil pump.

4. As soon as oil charging is complete, close the power supply to the control center to energize the oil heater. This will keep the conentration of refrigerant in the oil to a minimum.

When the compressor is initially charged with oil, the oil pump should be started to fill the lines, passages, oil cooler and oil filter. This will lower the oil level in the sump. It will then be necessary to add oil to bring the level back to the center of the upper sight glass.

Checking The Operating Oil Level

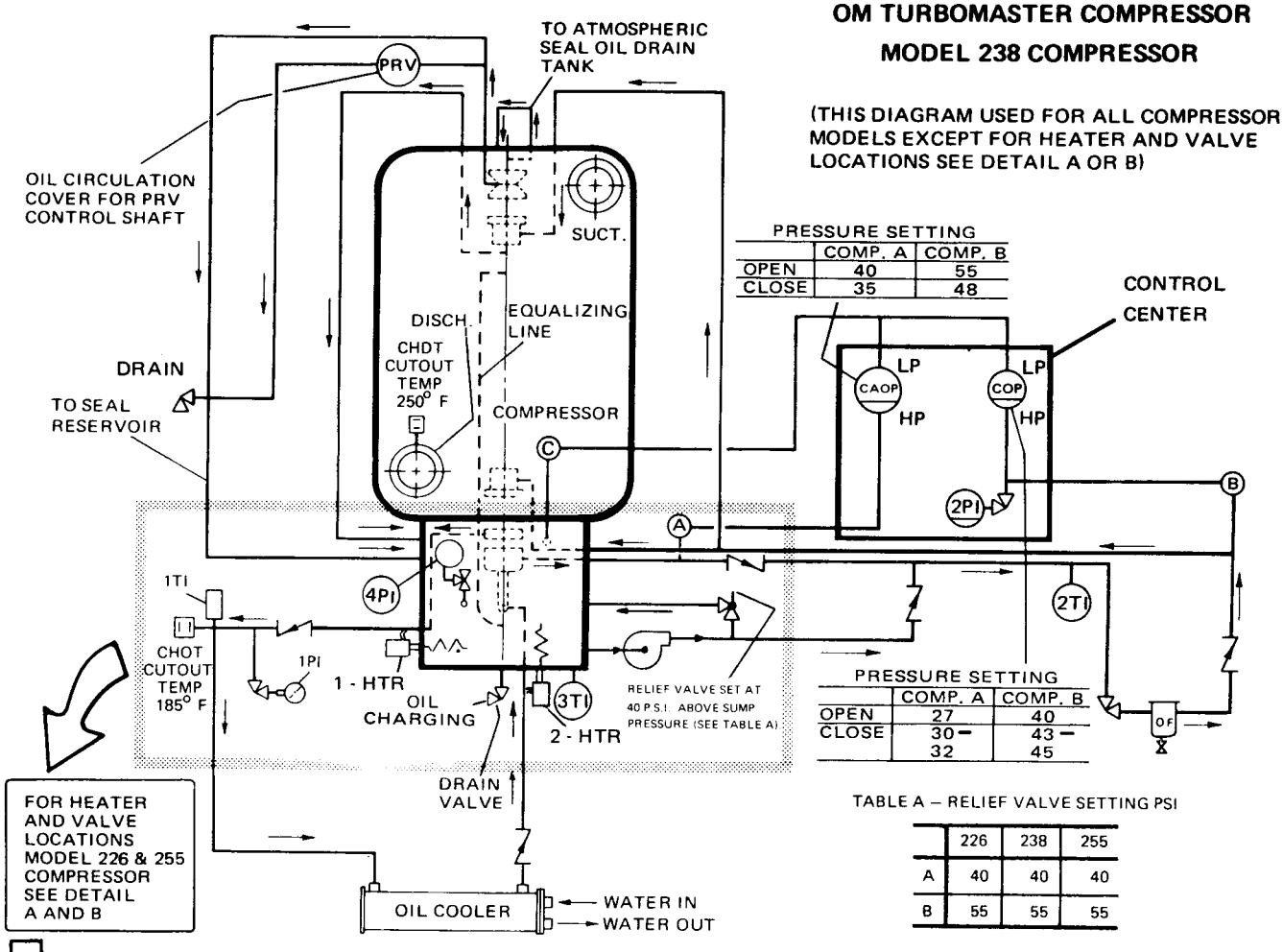
The correct operating oil level is with oil visible in middle of the lower sight glass or 1/4 of the upper sight glass, but should not fill the upper sight glass.

If the oil level is too high, the compressor may tend to lose some oil under starting conditions or conditions of rapidly changing load. This is likely to happen if the level is above the middle of the upper sight glass.

If the oil level is too low, pump cavitation and oil pressure

OIL FLOW DIAGRAM
OM TURBOMASTER COMPRESSOR
MODEL 238 COMPRESSOR

(THIS DIAGRAM USED FOR ALL COMPRESSOR MODELS EXCEPT FOR HEATER AND VALVE LOCATIONS SEE DETAIL A OR B)

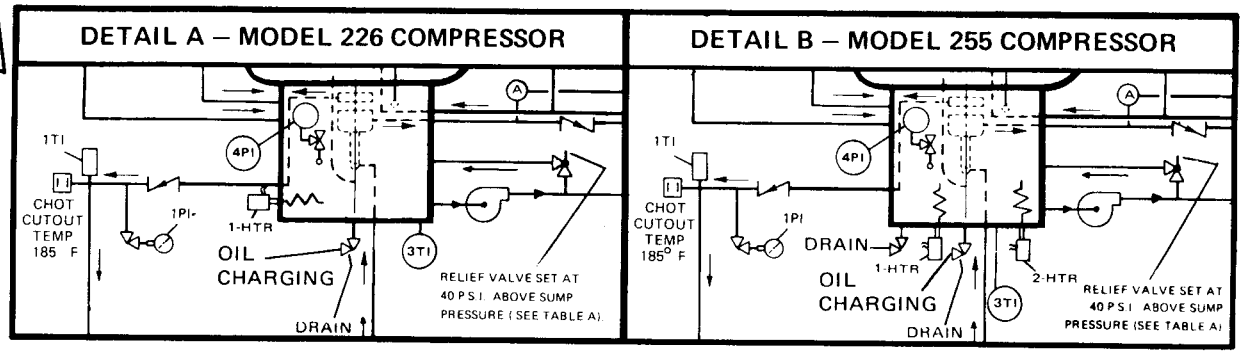


PRESSURE SETTING	COMP. A	COMP. B
OPEN	40	55
CLOSE	35	48

PRESSURE SETTING	COMP. A	COMP. B
OPEN	27	40
CLOSE	30 – 32	43 – 45

TABLE A – RELIEF VALVE SETTING PSI

	226	238	255
A	40	40	40
B	55	55	55



LEGEND

Auxiliary Oil Pump	Seal Cap Angle Stop Valve	A	To HP Side of CAOP
Seal	Screw Check Valve	B	To HP Side of COP
Shaft Bearing	Heater ol Lines	C	To LP Side of COP & CAOP
Thrust Bearing	Flow Lines	1HTR	Heater 1000W
Centrifugal Main Oil Pump	1TI Thrust Bearing Oil Temp. (Thermometer)	2HTR	Heater 1000W
Vertical Jet Oil Pump	2TI Bearing Supply Oil Temp. (Thermometer)		
OF Oil Filter	3TI Sump Oil Temp. (Thermometer)		
	M Balance Piston Press Gauge (B.P.P.)		
	CHOT Thrust BRG. Oil Thermoswitch		
	CHDT Discharge Temp. Thermoswitch		
	1PI Thrust Oil Press. Gauge		
	2PI Bearing Oil Press . Gauge		
	4PI Compressor Balance Piston Press.		

FIG. 1 – SCHEMATIC OIL FLOW DIAGRAM

failure may occur. This will shut down the machine automatically.

AIR RUN-IN OF COMPRESSOR

When starting any compressor for the first time or after replacing bearings and seals a "Wearing In" procedure should be followed. In general compressors designed for hydrocarbon refrigerants or air service can be run-in on air without exceeding the discharge temperature limit of 250°F.

STARTING UNIT

During the initial starting of the compressor make sure the Auxiliary Oil Pump switch is in the "MAN" position so that the auxiliary oil pump is supplying oil pressure to the bearings at all times during the "Running In" of the compressor.

Shut off the Auxiliary Oil Pump only after the compressor has stopped rotating for its cool down period.

1. FOR MOTOR DRIVEN UNITS, start and stop the compressor immediately. Allow the compressor to cool for at least 15 minutes. Repeat this procedure several times (try to obtain 1/4, 1/2, 3/4 and full speed) allowing compressor to cool each time then operate for one minute, shut down and allow to cool.

2. FOR TURBINE DRIVEN UNITS, bring the compressor up to 1/4 speed. Shut down and allow to cool. Repeat this procedure at 1/2, 3/4 and full speed, allowing the compressor to cool each time. Then operate for one minute. Shut down and allow to cool.

During the initial operating period (20 to 30 min.) checks should be made on all mechanical parts of the unit to be sure they are functioning properly. They must include the following:

1. Check carefully for evidence of misalignment, vibration or overheating.
2. Be sure all auxiliary motors and pumps are operating properly and according to their respective instructions.
3. Be sure the compressor oiling system is properly furnishing oil to the bearings and seals. (see Daily Operation, Form 160.71-01).
4. Check prime mover bearing temperatures carefully. Be sure the oil cooler(s) are functioning properly. DO NOT THROTTLE THE OIL COOLER(S).
5. Observe the oil pressure with the auxiliary oil pump running. It should be 60 psig above suction pressure. If it is not, adjust the relief valve on the auxiliary oil pump until the oil pressure is 60 psig above suction pressure.
6. Manually open the prerotation vanes slightly to allow for stable operating conditions of the compressor during the air run-in period.
7. Make sure the discharge temperature does not exceed its cut-out point.
8. Place the auxiliary oil pump switch in the "AUTO" position and observe its operation during shut down of compressor.

SHUTDOWN AFTER AIR RUN-IN

Press "STOP" button observe correct operation of auxiliary oil pump. (AOP) should start automatically when compressor is shut down as outlined in Control Center instructions, Form 160.71-NM1.1, page 13.

After compressor has come to a complete stop, shut off all auxiliary motors. The unit is now ready for pressure test, evacuation and charging refrigerant.

TESTING THE UNIT FOR LEAKS

After all refrigerant piping has been made up and installed in accordance with the drawings furnished for each installation, a thorough test of the refrigerant side of the unit must be made for leaks.

To insure that all leaks are discovered, before the unit is charged, the unit must be pressure tested and vacuum tested.

The following paragraphs outline a detailed procedure for both the pressure and vacuum tests.

Conducting the Nitrogen Pressure Test

1. Be sure that both floats in the liquid intercooler are jacked open by using the hand operating devices.
2. Through the charging valve, introduce nitrogen at 140 psig (no higher). Normally this is 95% of the lowest pressure setting of any atmospheric relief device in the unit.
3. Test all joints with soap and water mixed to the proper consistency, or use liquid soap. Be sure to include in the test all welded joints, threaded joints, joints on the compressor housing and the compressor oil piping. Include also a preliminary test of the condenser and cooler tube sheet joints.
4. Mark any leaks found so that they can be repaired when the pressure is released.
5. Release the pressure through the charging valve.

Conducting Refrigerant Pressure Test

With all known leaks repaired, the unit should be charged with a small quantity of refrigerant mixed with nitrogen under pressure, so that the Halide test torch or electronic Halide leak detector can be used to detect any leaks too small to be found by the soap test.

To test with R-12 or R-500 or R-22 proceed as follows:

1. With an evacuated unit, discharge a 25 lb. drum of refrigerant into it through the unit charging valve.
2. Remove the drum, connect in its place the source of pressure (nitrogen) and raise the pressure within the unit to approximately 25 psig. To be sure that the concentration of refrigerant and nitrogen is thoroughly mixed throughout the unit, slightly open the flared joint at the suction and discharge pressure gauge connections to the cooler and condenser and test for presence of refrigerant with a leak detector.
3. Take a rapid, preliminary check at this pressure with the

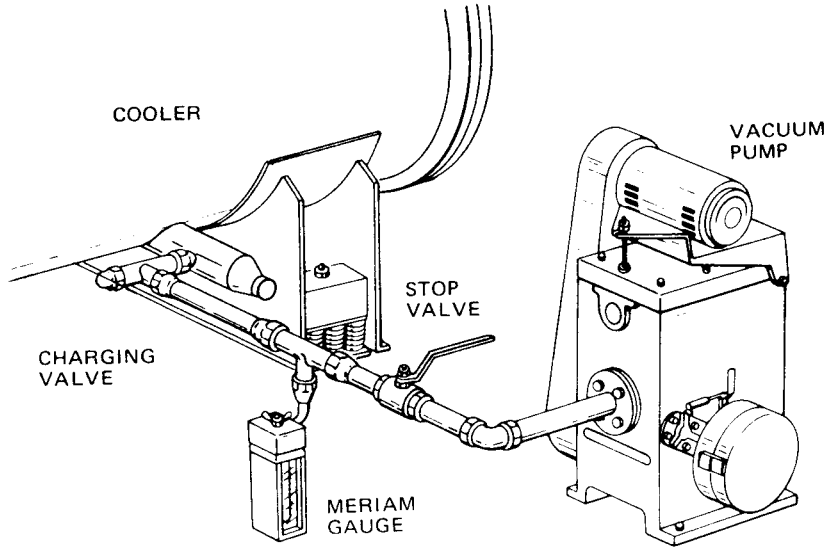


FIG. 2 – EVACUATING THE SYSTEM

TABLE 1 – SYSTEM PRESSURES

*Gauge	Absolute			
Inches of Mercury (HG) Below One Standard Atmosphere	PSIA	Millimeters Of Mercury (HG)	Microns	Boiling Temperatures of Water °F
0	14.696	760	760,000	212
10.14"	9.629	500	500,000	192
22.05"	3.865	200	200,000	151
25.98"	1.935	100	100,000	124
27.95"	.968	50	50,000	101
28.94"	.481	25	25,000	78
29.53"	.192	10	10,000	52
29.67"	.122	6.3	6,300	40
29.72"	.099	5	5,000	35 ← WATER
29.842"	.039	2	2,000	15 ← FREEZE
29.882"	.019	1.0	1,000	+1
29.901"	.020	.5	500	−11
29.917"	.002	.1	100	−38
29.919"	.001	.05	50	−50
29.9206"	.0002	.01	10	−70
29.921"	0	0	0	

* One standard atmospher = 14.696 Psia
= Atmospheric pressure at sea level
= 760 MM Hg. absolute pressure at 32°F
= 29.921 inches Hg.

NOTES:
Psig = Lbs. per sq. in. gauge pressure
= Pressure above atmospheric
Psia = Lbs. per sq. in. absolute pressure
= Sum of gauge plus atmospheric pressure
Hg = Mercury

Lbs. per sq. in. absolute pressure

Halide torch, spending only enough time to be assured that a torch burning a neutral flame can be brought close to the equipment to be tested without showing indications of refrigerant in the atmosphere surrounding that equipment.

4. Raise the pressure in the unit as before, observing the test pressure.
5. With the Halide test torch burning correctly (clear neutral flame), test all the way around each joint, including factory welds and condenser and evaporator tube sheet joints. It is important that this test be thoroughly and carefully made, spending as much time as necessary and using only a good Halide test torch which is kept burning properly.

   NOTE: Some Polyurethane Insulation reacts to Halide, so test prior to insulating unit.

6. When absolute tightness of the unit has been established, blow the mixture of nitrogen and refrigerant to the atmosphere.

EVACUATION OF UNIT

After the pressure test has been completed, proceed as follows to conduct the vacuum test:

1. Be sure that all normally open valves in the unit, including purge unit and gauge valves, are wide open. Close all valves to the atmosphere.
2. With a good vacuum pump, and Meriam gauge connected to the unit charging valve as shown by Fig. 3, evacuate the entire unit to at least 29.72" Hg. vacuum at sea level.
3. Operate the vacuum pump and circulate hot water through the condenser and cooler tubes for about 2 hours to thoroughly dehydrate the shells. A suggestion is to connect a hose to the source of hot water under pressure, into the water head drain valve on the cooler, out the cooler vent valve, into the condenser drain valve, then out the condenser vent valve to the sewer or drain pipe. This will help to speed evacuation.
4. Close the stop valve between the vacuum pump when 29.72" Hg. vacuum has been reached.
5. Hold this vacuum (29.72" Hg. vacuum) in the unit for at least 24 hours without change. The slightest rise in pressure indicates the presence of leaks or water.
6. If, after 24 hours the Meriam gauge has not risen above 8.3 millimeters (40°F with water) the unit may be considered tight. See Table 1.

CHARGING REFRIGERANT

The initial refrigerant charge for each individual installation is specified and furnished by YORK, in 2,000 and 145 lb. cylinders.

If possible, the unit should always be charged under normal full load design conditions with the specified gpm of water flow through the condenser and chilled water flow through the cooler at design temperatures.

However, if full load conditions can not be reached when the unit is initially charged, only about 80 or 85% of the normal charge should be admitted initially.

NOTE: The compressor discharge superheat should be carefully checked. If the discharge superheat is excessive after 85% of the charge has been admitted to the unit it will be necessary to charge more refrigerant. Compressor discharge superheat is determined by subtracting the saturation temperature corresponding to the discharge gauge pressure from the actual temperature indicated by the compressor discharge line thermometer. Excessive discharge gas superheat may cause the compressor to overheat with high bearing and oil temperature resulting.

The remaining 15 or 20% of the original charge should be retained in the shipping cylinders to be added when the unit is operating under full load conditions. By this method, the possibility of overcharging the unit is minimized.

While adding the final, full load charge, the following conditions should be carefully checked as an aid in determining the correct charge:

1. Motor limitations - The ammeter should be carefully checked as the full load charge is approached. Do not charge the unit so that motor overload limitations are exceeded or the amperage is suddenly increased.
2. Temperature difference between cooler and chilled water – if the motor is of sufficient size that its limitations will not be exceeded, charge refrigerant slowly until the temperature difference between the cooler and chilled water is at its minimum. While charging, the ammeter must be watched carefully since a point will be reached beyond which adding refrigerant will only increase the motor amps and will not decrease the temperature difference.

   Maximum efficiency is reached when brake horsepower is at a minimum per ton of refrigeration.

3. If the unit is overcharged so that liquid refrigerant is slopping back to the compressor in great enough quantity, the discharge temperature will tend to fall without increasing evaporator temperature.

Remember, when charging the unit –

a. Compressor discharge superheat should be as low as possible without slopping liquid refrigerant back to the compressor.

b. The temperature difference between the cooler and secondary refrigerant should be at a minimum without an excessive increase in motor amps.

c. Motor overload limitations must not be exceeded.

Because of the possibility of damaging evaporator tubes by freezing any water which may be in them, LIQUID REFRIGERANT MUST NOT BE CHARGED INTO ANY TURBOMASTER UNIT until the pressure within the unit has been raised higher than that corresponding to 32°F. (Refrigerant-12 pressure is 30.1 psig, Refrigerant-500 pressure is 37.9 psig and Refrigerant-22 pressure is 57.5 psig, all readings at sea level.) Only gas from the top of the cylinder (cylinders usually have one valve for refrigerant gas and one valve for refrigerant liquid) must be used to break the unit vacuum and raise the pressure above that corresponding to 32°F.

Since the entrance of the air must be kept to a minimum while charging, the following paragraphs outline the recommended charging procedure.

It is always necessary to charge refrigerant gas only directly from the top of the cylinder into the unit until the unit vacuum is broken and the pressure inside the unit is above that corresponding to 32°F. Then reconnect the charging line to the refrigerant liquid valve and charge liquid into the unit.

After a partial charge has been admitted to the unit, the compressor can be operated to facilitate charging since the cylinder pressure will always exceed the unit suction pressure.

Be sure the prerotation vanes are sufficiently throttled to prevent evaporator temperatures below 32°F.

When charging from cylinders be sure to purge the charging connection to prevent air from entering the unit.

TRIMMING THE REFRIGERANT CHARGE

The initial refrigerant charge is specified and furnished by YORK for each installation.

The refrigerant container should be placed on a scale and the weight carefully checked while charging as a guide in determining the quantity of refrigerant added and in determining when a container is empty.

Start the unit as outlined under PREPARATION FOR INITIAL STARTING. Open the charging valve and permit refrigerant to flow into the unit. Normally, with the unit in operation, refrigerant will easily flow into the cooler. However, if the ambient temperature is too cold, the use of heat lamps applied to the refrigerant container will speed up the flow of refrigerant into the unit.

While charging, check the cooler pressure carefully to be sure it does not pull down below the point corresponding to the freezing point of the water of brine. Be sure the low water temperature cutout is set to open before the water of brine reaches its freezing point. The prerotation vanes may be manually adjusted as necessary to help maintain the desired cooler pressure.

While operating the unit with partial charge, check the discharge temperature frequently to be sure it does not exceed 250°F. A thermometer location is provided in the compressor discharge line for this purpose.

A sight glass is provided in the cooler shell opposite the suction connection to observe the tube wetting action within the cooler. The compressor suction connection is equipped with a thermometer well for checking suction superheat.

If the unit is being charged under normal full load conditions, continue charging until the top row of cooler tubes is completely wetted as observed through the sight glass in the cooler.

If full load conditions are not available, do not exceed the calculated full load refrigerant charge until a thorough check, under full load conditions, can be made. The boiling action within the cooler is much slower at partial loads than at full load. Checking the refrigerant charge for coverage of the tubes during pull-down will be approximately the same as at full load conditions.

When adding the final full load charge, the following conditions should be carefully checked:

1. Motor Limitations - The motor amperes should be carefully checked as the full load charge is approached. Do not charge the unit so that motor overload limitations are exceeded or the amperage is suddenly increased with no increase in unit capacity.

2. Overcharging - If the unit is overcharged so that droplets of liquid refrigerant are being drawn into the compressor, the discharge temperature will rapidly fall and the motor amperage will increase with little or no apparent increase in unit capacity.

ADJUSTMENT OF SPRING ISOLATORS (Refer to Fig. 3)

Before making the following adjustments, the unit should be filled with water and charged with refrigerant so it is at operating weight. Care should be taken to keep the weight of the connected piping off the unit or the mountings will be overloaded. Piping weight can be kept off the unit by the proper application of spring hangers or flexible pipe connections.

Turn the adjustment bolts in the center of the mountings counterclockwise so the raised pin on top of the bolt enters the hole in the bracket and the top of the bolt contacts the surface of the bracket.

Take two complete counterclockwise turns on each spring mounting in turn until all the mountings are adjusted. Continue this procedure until the blocks are free. Take additional turns on any mountings if there is need to level the machine.

Turn down the snubber nuts on the ends of the mountings until there is a clearance of 1/16" between the snubber nut and the steel washer.

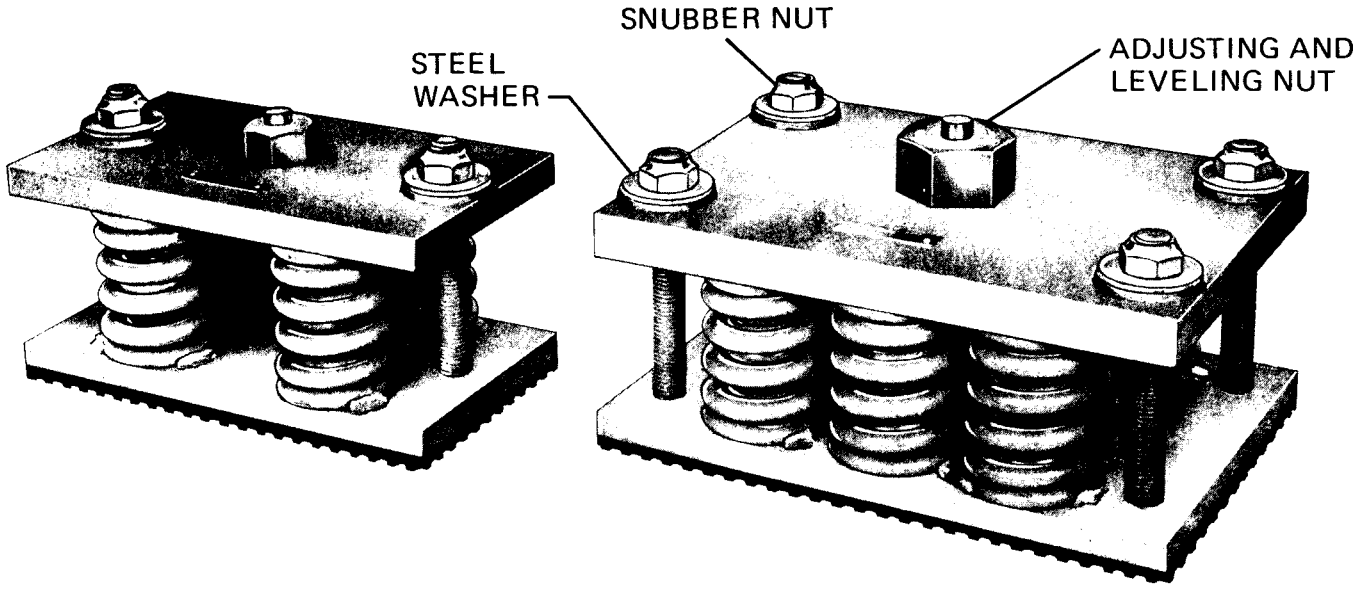


FIG. 3 – SPRING ISOLATORS

NOTE: IF IT BECOMES NECESSARY TO REMOVE WATER OR REFRIGERANT FROM THE COOLER OR CONDENSER, BE SURE THE SNUBBERS ARE TIGHTENED SUFFICIENTLY TO PREVENT THE SHELLS FROM RISING. BEFORE REMOVING A COMPRESSOR, SPEED INCREASER, MOTOR OR TURBINE FROM THE BASE, THE BASE MUST BE SUPPORTED AT ITS NORMAL OPERATING LEVEL ON BLOCKS AND THE TENSION REMOVED FROM THE ISOLATOR SPRINGS TO PREVENT THE BASE FROM RISING WHEN THE MACHINERY IS REMOVED.

INITIAL START-UP

The following steps should be carefully checked before starting the unit for the first time.

1. Be sure the control center is energized and that the compressor oil heater has been hot for at least twelve hours. If this twelve hour period is not practical, drain the oil and install a fresh charge.

2. Check the oil level of the compressor and the lubrication of all auxiliary pump motors.

   Check the setting of the evaporator pressure cutout, it should be set to open at 30 psig and close at approximately 36 psig (R-12) or 38 psig and close at approximately 32 psig (R-500) or 58 psig and close at 52 psig (R-22).

   This cutout is barometrically compensated and factory set to close tolerances. It should not be readjusted, but merely its operation verified.

   Check the setting of the condenser pressure cutout with air pressure; it should be set to open at 150 psig (R-12) or 190 psig (R-500) or 250 psig (R-22).

3. Be sure the prerotation vanes are closed. If they are not already closed, they should close immediately when the control center is energized. Move the (PREROTATION VANE SWITCH) on the control center to the HOLD position.

4. Move the (AUX. OIL PUMP) switch to the MANUAL position and run the auxiliary oil pump for a short time (not more than 30 seconds) to establish a stable oil pressure. The oil pressure gauge should register a pressure of approximately 30-32 psi (A compressor) and 43-45 psi (B compressor) above the unit standby pressure. Then return the (AUX. OIL PUMP) switch to the AUTO position, and it should remain in the AUTO position for normal automatic operation.

5. Open the chilled water valves to and from the cooler, start the chilled water pumps and vent the cooler.

6. Immediately after starting the condenser pump, start the compressor by depressing the COMPRESSOR "START" button. For normal automatic compressor operation, the condenser pump control is wired to the control panel to start automatically when the compressor starts.

7. Manually open the vanes (a small amount at a time) as necessary to pull the unit down to design temperatures. Observe motor amps during pull down to prevent exceeding the Full Load Amps until the load limiting control is calibrated.

NOTE: A slight rapid oil pressure fluctuation may be noticed, (5 to 10 psig) with the unit and the (AUX. OIL PUMP) operating. This takes place only when the prerotation vanes are closed and is a normal occurrence caused by refrigerant separating from the oil in the (AUX. OIL PUMP) suction. This action will cease when the vanes are opened.

8. Open the static purge valve as necessary to clear the unit of non-condensable gas.
9. Check to operation of the capacity control system. (See CONTROL CENTER INSTRUCTION Form 160. 71.NM1.1 for setting controls and OPERATING INSTRUCTION Form 160.71-O1. Sequence of operation of capacity control system. (See CAPACITY CONTROL ADJUSTMENTS and CALIBRATION OF PT (PRESSURE TRANSMITTER) below.
10. If the unit is operating properly, calibrate the Load Limiting Control. (See CHECK OUT PROCEDURE FOR PNEUMATIC CONTROLS, Form 160.71-NM1.)

CAPACITY CONTROL ADJUSTMENT

1. Before making any adjustments to the capacity control settings, manually operate the PRV to reconfirm settings, (especially if multiple units are involved).

2. Determine the minimum and maximum condenser pressure and the corresponding minimum PRV position air signals. As a starting point the following pressures may be considered.

   a. Minimum Condenser Pressure:

   R-12 = 85 psig
   R-500 = 120 psig
   R-22 = 180 psig

   b. Maximum Condenser Pressure:

   Test run unit to determine what is the normal high head at high load conditions.

   To find the minimum vane position air signal, hold the condenser pressure (maximum or minimum) and close valves (keep the hot gas valve closed) until the compressor begins to surge. Open the PRV until the compressor operates normally and note the minimum PRV position air signal. (Refer to FIELD CALIBRATION OF PRESSURE TRANSMITTER (PT) page

3. Adjust the hot gas valve to become fully closed at an air signal equal to the minimum PRV position air signal.

CALIBRATION OF PT (PRESSURE TRANSMITTER)

1. Determine the minimum and maximum condensing pressure and the minimum PRV position air signals at both conditions as described under capacity control adjustments.

2. Calculate the PT span set point using the following formula:

$$\text{Span} = \triangle \text{Pc} \times \frac{12}{\triangle \text{Pvs}}$$

Where $\triangle$ Pc = Difference between maximum and minimum condenser pressure.

$\triangle$ Pvs = Difference between high head minimun vane position air signal and low head minimum PRV position air signal.

3. Set span at calculated set point as follows: (Refer to Fig. 4)

   A. Adjust zero adjustment screw (with 0 psig pressure to PT) until output is 3 psig

   B. Apply calculated span pressure to PT and adjust range wheel until output is 15 psig.

4. Apply minimum condenser pressure to PT and adjust zero adjustment screw until output is equal to low head minimum vane position air signal.

5. Apply maximum condenser pressure to PT output should be equal to high head minimum vane position air signal.

STEAM TURBINE (OTHER DRIVERS)

To check operation and installation of these drivers refer to the suppliers instructions.

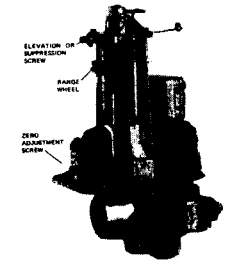


FIG. 4 – PRESSURE TRANSMITTER COVER REMOVED

OPERATIONAL CHECKS

With the OM TURBOMASTER operating check the following:

1. Oil level in compressor
2. Oil pressure
3. Water Temperatures
   a. Cooler – entering and leaving
   b. Condenser – entering and leaving
4. Water Flow to oil cooler (adjust water flow)
5. Water Flow through cooler and condenser
6. Refrigerant Temperatures:
   a. Thermometer entering cooler
   b. Intercooler
      (1) High pressure chamber
      (2) Intermediate pressure chamber
   c. Intercooler Connection to flash gas to compressor intermediate stage
   d. Compressor discharge
   e. Compressor suction
7. Make sure float valves in the intercooler are free and adjusted to allow refrigerant to flow.
8. Observe the Control Center during operation to make sure the proper lights are on during operation.

   If the above data checks with the operating data indicated on the drawings, the unit is properly adjusted.

INSTRUCT THE OPERATOR

The following is to be used as a guide to instruct the operator in the operation of the OM TURBOMASTER Unit.

1. Give the operator a copy of the Operating Maintenance Instruction Form 160.71-01. Be sure he reads it before you leave the job site.
2. Explain the component parts and the function of each.
   a. Control Center (Refer to Form 160.71-NM1.1.)
   b. Compressor
      (1) Pre-rotation Vanes
   c. Driver and Speed Increaser
   d. Cooler
   e. Condenser
   f. Intercooler Adjustment and keeping Float Valves free.
   g. Automatic hot gas by-pass.
   h. Pumpout Unit
   i. Gauges and Thermometers
3. Refrigerant Cycle
   a. Explain the unit
   b. Show him how to fill out a log sheet and point out the importance of keeping the log sheet.
4. Compressor Lubricating System
   a. Oil heaters
   b. Oil pressures
   c. Changing Oil Filter
5. Point out the safety and operating controls and explain each function.
   a. Red, Amber and white lights on control center
   b. Standard Controls
   c. Special Controls
6. Explain the operation of the capacity control system.
7. Explain the optional purge unit (if used).
8. Explain the Preventive Maintenance items.
9. Explain automatic, manual and extended shut-downs.
   a. Daily, weekly, monthly and annually.
10. Importance of water treatment
11. Check the operators knowledge of the unit.
    a. Stop and Start
    b. Safety and operating controls
    c. Red, amber and white lights on control center
12. Review the Operating and Maintenance Instruction.
    a. Questions and Answers
13. Give the operator the address and phone number of the nearest YORK Service Department.

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FORM 160.71-SU1(479)

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