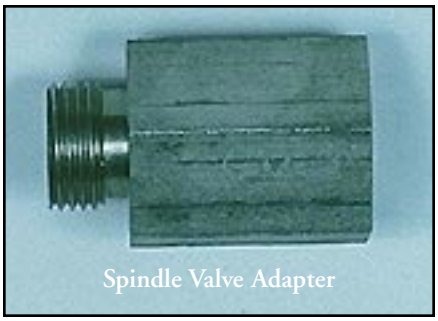
Service Tools and Equipment

The following is a list of miscellaneous items required to start-up and service the current *ParaFlow*™ Chiller/Heaters.

1. 50 ft section of clear plastic tubing - This tubing will be used as a water level for unit leveling. (Available at local supply houses).

2. Spindle Valve Adapters - The sample valves on *ParaFlow*™ units have spindle type valves for sampling purposes. The threads on the valves are straight threads and adapter fittings which convert to female pipe thread are required to be installed when taking samples or pump pressures. The adapters may be made locally or ordered from Houston Service. (713-782-5200 Attn. Bob Irvin).



Spindle Valve Adapter

Use above drawing for adapter design.

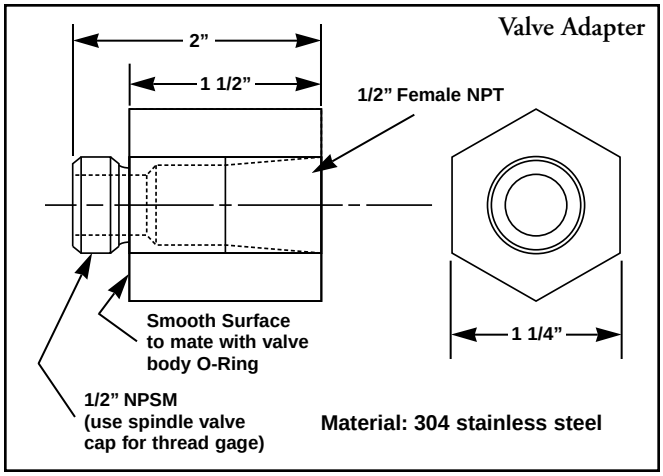
Note: If in a bind, the valve cap may be removed from the valve and brought to a machine shop. The shop can then make up a fitting with the correct threads.

3. Pressure Gauge - Compound with corrosion resistant internals. This gauge is to be used when measuring pump pressures to determine rotation.

4. Sample Flask - It is necessary to take solution samples from a unit. Most of the sample points are in a vacuum. Polypropylene or some other inert plastic container is recommended. One such flask can be purchased through **BEL ART Products - p/n F19953** - telephone (201) 694-0500.

Sample Flasks

5. Hydrometers - It is necessary to check concentrations of samples. A hydrometer in the correct range is needed for the various solution or refrigerant samples. The



hydrometer will measure the samples specific gravity and along with the samples temperature, the concentration may be determined from charts. A good hydrometer kit is available from the York Parts Center. It also includes a thermometer for measuring the sample temperature. **York P/N: 026-32366-000**. Individual hydrometers are also available through the parts center. Refer to Form 155.17- RP3.

6. Hydrometer Flask - A 100 or 150 ml plastic hydrometer flask is necessary to use when determining a samples specific gravity.

7. 1/2 inch MPT x 1/4 inch barbed fittings are used to connect sampling apparatus to the sample valves via the adapters. These fittings should be stainless or plastic.

8. Clear plastic vacuum hose for taking samples. Quantity will vary depending on the unit model. 50 feet will be sufficient under any circumstance and will allow for cutting small sections for other purposes. **York P/N - 028-12514-000**.

9. Dow Corning High Vacuum Grease - This grease is a silicone base and is inert. It is used to seal and lubricate sample valve oil rings, hose connections, etc. **DO NOT USE ANY OTHER GREASE EXCEPT SILICONE GREASE.**

10. Vacuum Sealant - Used on fittings to eliminate possible leaks under vacuum. **York P/N: 013-02882-003**.

11. A valve and fitting arrangement must be piped off of the existing purge system in order to use the unit purge pump to evacuate the sample flask or if desired an auxiliary vacuum

pump may be used for this purpose. Actual unit configuration should be considered, but normally a tee can be installed on the unit manometer connection and a valve installed on the branch of the tee. The valve should be kept capped when not in use. A diaphragm valve is preferable. **The p/n for a 1/2 inch diaphragm valve is 022-02046-000 (screw threads). Refer to procedure in this section for valve and tee location.**

12. Thread Sealing Procedures

Materials required:

1. Loctite Primer Type "N7649" in 6 oz. aerosol can. (**013-01753-000**)
2. Loctite 567 Thread Sealant in 250 ml tube. (**013-02280-000**)
3. Loctite Cleaner 7070 (**013-02899-000**)

This is the only York approved method of sealing pipe threads on *ParaFlow*™ units (refer to thread sealing procedure in this section.

13. Metric Allen Wrenches are used for the caps and the spindle on the spindle valves. There are three sizes of spindle valves (1/2", 1", 1-1/2"). Metric Allen wrenches will be needed in sizes 10, 17 and 22mm. The 10 and 17 mm wrenches are usually readily available at local tool stores. **The 22mm can be obtained from York with P/N 029-20981-000**.

14. Plastic Buckets - 2 or 3 plastic buckets are usually necessary during commissioning for washing hydrometers and taking samples. A plastic bucket is also necessary during the leak rate test. The 2 gallon Rubbermaid variety is sufficient.

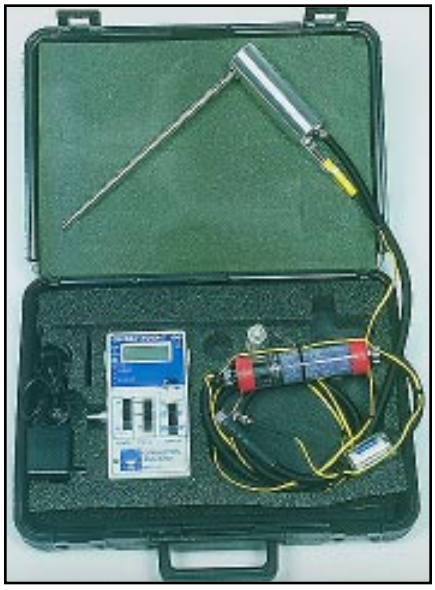
15. Plastic Garbage Cans - Balancing refrigerant or solution charges sometimes requires refrigerant to be taken out and put back in later depending on the situation. If the original drums are available, they may be used, but it is much more convenient to have 2 or 3 plastic garbage cans available for this purpose. The Rubbermaid 30 gallon model is preferred.

16. Infrared Thermometer - This device is a necessity when troubleshooting *ParaFlow*™ units. The York preferred model is the Exergen Microscanner D501. It is available direct from Exergen at 1- (800) 422-3006. There are other makes available, many cheaper than the Exergen, but generally speaking you get what you pay for.

17. Combustion Analysis Tools - In order to set up and troubleshoot the gas/oil burner the following tools are necessary.

1. Water Manometer to measure draft and manifold pressure.

2. Combustion Analyzer capable of measuring O_2, CO, CO_2 and NO_x if necessary. (A portable type that meets the minimum requirements is available from Enerac and is called the Pocket 100. A better analyzer, especially for districts with a lot of direct fired equipment, is the Enerac Model 2000. Enerac can be contacted at (800) 695-3637.



3. Smoke Pump and Indicator Paper (for oil fired units).

4. Stack Thermometer - (Stack Temperature Measurements).

Note: Most electronic combustion test equipment also determine stack temperature. A separate stack thermometer may not be needed.

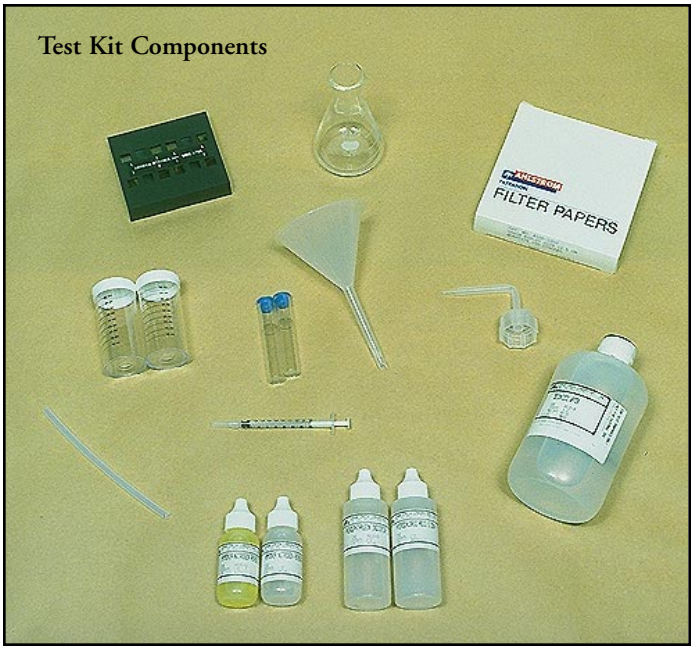
18. Accurate Digital Multimeter - The preferred Model is a Fluke 85 or equivalent.

19. High Intensity Flashlight for observing sight glass levels. A Mini Maglite is an example of the type of flashlight necessary.

20. Thermal Mastic Heat Transfer Compound - Thermowells on the unit need to have this compound placed in them if not already in from the factory. Thermal Mastic is made by Virginia Chemicals and is available from most major refrigeration supply houses. A high temperature anti-seize compound should be used in the high temperature generator thermowells.

21. Mixed Bed De-Ionizer - This device can be rented or purchased from Culligan or other water service companies and is necessary to produce de-ionized water if it is necessary to add refrigerant to the unit. A single tank unit with an indicator light to show when recharging is necessary is usually used.

20. Normal mechanics hand tools, miscellaneous fittings and hoses.



Test Kit Instructions

Service Instructions

A. Scope - The test kit can be used for the following:

1. Determines solution alkalinity (LiOH content).

2. Determines ammonia content of refrigerant.

3. Filters are provided for obtaining small amounts of filtered solution for subsequent lab analysis of dissolved copper.

B. Refer to *ParaFlow*™ Solution Side Maintenance Manual Form 155.00-CH1 (194) for sampling procedures.

C. Procedure for testing alkalinity (LiOH content)

Note: Clean all apparatus thoroughly with de-ionized water before and after use.

1. Fill the 0 - 50 ml vial to the 10 ml mark with de-ionized water. (Replace water bottle cap with spout for best delivery.)

2. Fold a circle of #610 filter paper in quarters and place in the plastic funnel. Filter a small amount of Lithium Bromide solution into the 125 ml flask provided. Using the calibrated 1 ml pipet, add 1 ml of the filtered solution to the water in the vial.

3. Add four drops of ***160125,*** Phenolphthalein Indicator solution to the vial. Cap and swirl to mix. If the solution turns red, go to the next step. If it remains colorless, a possible acid condition is indicated. **CONTACT YORK INTERNATIONAL IMMEDIATELY.**

4. Add 080300-02, Hydrochloric Acid 0.25 N one drop at a time, swirling after each drop, until the solution remains colorless. For best accuracy and consistency, hold the dropper bottle in a fully inverted position and squeeze lightly. Record the number of drops required.

5. Calculate the alkalinity (LiOH content) as follows:

- Number of drops of acid x 0,01= LiOH, Normality (N)

Refer to "Lithium Hydroxide Replenishment Procedure" for additional instructions (APPENDIX II).

D. Instructions for determining ammonia content of refrigerant solution.

Note: Lithium Bromide content of sample must be less than 5%.

1. Using the calibrated syringe, add 0.5 cc of refrigerant to the glass color comparator tube.

Note: When using the syringe, first fill past the mark desired, invert, tap out air bubbles, and then position plunger at the desired measurement before dispensing.

2. Fill the tube with de-ionized water to the mark (5 ml). Cap and mix well.

3. Add 4 drops of Ammonia Nitrogen Reagent #1. Cap and mix well.

4. Add 8 drops of Ammonia Nitrogen Reagent #2. Cap and mix well.

5. Insert tube in the comparator block. Match color as closely as possible to a ppm standard. Use subdued light for observation.

6. The amount of refrigerant used in Step 1 (0.5 cc) is equivalent to a 10:1 dilution ratio. The color standards are therefore equivalent to 10, 20, 30, 40 and 50 ppm respectively.

Note: If the color remains out of range, greater dilutions may be made. Follow the chart below for quick reference.

Amount of Refrigerant Used in Step 1	Comparator Block Reading vs. Actual Valve ppm							
	1	2	3	4	5	6	7	8
5cc. (NO DILUTION)	1	2	3	4	5	6	7	8
0.5cc. (10:1)	10	20	30	40	50	60	70	80
0.25cc. (20:1)	20	40	60	80	100	120	140	160
0.10cc. (50:1)	50	100	150	200	250	300	350	400

E. Replacement Parts

1 - FL1400-IN Plastic carrying case with handle & insert
1 - INST / MSDS Instruction sheet with MSDS's
1 - 040100-09, Deionized water, 16 oz.
1 - 080300-02, Hydrochloric acid, 2 oz.
1 - 160125-02, Phenolphthalein, 1%, 2 oz.
2 - 822000-EA, Vial with cap, 0 -50 ml
1 - 515120-125, Filter paper #610, 12.5 cm
1 - 109561-EA, Funnel, plastic, 75 mm
1- 516110-EA, Flask, 125 ml
1 - LA0354-EA, Pipet, calibrated, 1 ml
1 - 262247-EA, Syringe, 1.0 cc
1 - 051268-EA, Squirt bottle for DI water
1 - LA-4796-EA, Ammonia Nitrogen Color Block
1 - 010189-01, Ammonia Nitrogen Reagent #1, 1 oz.
1 - 140100-01, Ammonia Nitrogen Reagent #2, 1 oz.
2 - LA-0230-EA, Color comparator tube with cap

MATERIAL SAFETY DATA SHEET

HAWK CREEK LABORATORY, INC.

RD 1 BOX 686 SIMPSON RD. - GLEN ROCK, PA 17327
TELEPHONE # 717-235-3849

NFPA Hazard Rating: Health - 1 / Flammability - 0 / Reactivity - 0

1. General Information

Trade Name: Ammonia Nitrogen Rgt. 1

Code #: 010189

Chemical Name: Potassium Sodium Tartrate in Water

Chemical Family: Organic Salt

2. Hazardous Ingredients

POTASSIUM SODIUM TARTRATE

CAS #6381-59-5 50% W/V

TLV/PEL: Not Established

TXDS: N/A

Carcinogenicity: Not Listed (IARC)

3. Health Hazard Data

To the best of our knowledge the toxic properties have not been thoroughly investigated. Ingestion and skin absorption may be harmful. Contact may cause irritation.

FIRST AID:

Eyes: Flush with water for at least 15 min.; get immediate medical assistance.

Skin: Remove contaminated clothing and wash with soap and water.

Inhalation: Move to fresh air and give artificial respiration if breathing has stopped.

Ingestion: Induce vomiting if conscious.

GET MEDICAL ASSISTANCE
FOR ALL CASES OF OVEREXPOSURE!

4. Physical Data

Appearance: Colorless Solution **Odor:** None

Vapor Density: N/A **Specific Gravity:** N/A

Water Solubility: Miscible **Boiling Point:** N/A

5. Fire & Explosion Hazard Data

Flash Point: N/A

Extinguishing Media: Foam, CO2, Dry Chemical

Special Procedures: Wear self-contained breathing apparatus and protective clothing if necessary.

Unusual Fire & Explosion Hazards: None Indicated

6. Reactivity Data

Conditions to Avoid: Extreme Heat

Hazardous Combustion & Decomposition Products: Na20, COx, K20

7. Special Protection

Provide adequate general and local exhaust ventilation.
Protect eyes and skin with safety goggles and gloves.
Do not get in eyes, on skin or clothing.
Wear self-contained breathing apparatus in high vapor areas.
Do not breath vapors or mists.

8. Handling & Storage Precautions

Keep container tightly closed.
Store in cool, dry, well ventilated area.
Keep away from ignition source.
Wash thoroughly after handling.
Empty containers may be hazardous due to retained residue.

DOT - Not Regulated

9. Environmental Protection

Spill Response: Absorb with sand or vermiculite and scoop up and containerize for proper disposal.

Waste Disposal: Comply with all local, state and federal regulations.

SERVICE PROCEDURES

Material Safety Data Sheet (Cont.)

NFPA Hazard Rating: Health - 3 / Flammability - 0 / Reactivity - 0

1. General Information

Trade Name: Ammonia Nitrogen Rgt. 2 or Nessler Reagent

Code #: 140100

Chemical Name: Sodium Hydroxide / Mercuric Iodide / Potassium Iodide in Water

Chemical Family: Inorganic Base & Salts in Solution

2. Hazardous Ingredients

SODIUM HYDROXIDE

CAS #1310-73-2 16% W/V

TLV/PEL: 2 mg/m3

TXDS: orl-mus LDLo: 500 mg/kg

Carcinogenicity: Not Listed (IARC)

MERCURIC IODIDE

CAS #7774-29-0 8% W/V

TLV/PEL: .01 mg/m3 (as Hg)

TXDS: orl-mus LDLo: 357 mg/kg

Carcinogenicity: Not Listed (IARC)

POTASSIUM IODIDE

CAS #7861-11-0 6% W/V

TLV/PEL: Not Established

TXDS: orl-mus LDLo: 1862 mg/kg

Carcinogenicity: Not Listed (IARC)

3. Health Hazard Data

Harmful if swallowed or inhaled. Burns eyes, skin, nasal and respiratory passages on contact. Vapor irritates eyes and respiratory passages. Severe eye hazard! Toxic by ingestion and inhalation.

FIRST AID:

Eyes: Flush with water for at least 15 min.; get immediate medical assistance.

Skin: Remove contaminated clothing and wash with soap and water.

Inhalation: Move to fresh air and give artificial respiration if breathing has stopped.

Ingestion: Do not induce vomiting, if conscious give water and get immediate medical attention.

GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE!

4. Physical Data

Appearance: Light yellow liquid **Odor:** None

Vapor Density: N/A **Specific Gravity:** 1.20

Water Solubility: Miscible **Boiling Point:** N/A

5. Fire & Explosion Hazard Data

Flash Point: N/A

Extinguishing Media: Media suitable for surrounding material.

Special Procedures: Wear self-contained breathing apparatus and protective clothing if necessary.

Unusual Fire & Explosion Hazards: Can react with certain metals (Al, Zn, Sn) to form explosive hydrogen gas.

6. Reactivity Data

Conditions to Avoid: Strong acids, Aluminum, Tin, Zinc, Organic Halogens & Nitro Compounds.

Hazardous Combustion & Decomposition Products: Na20, Mercury & Iodine Compounds.

7. Special Protection

Provide adequate general and local exhaust ventilation.
Protect eyes and skin with safety goggles and gloves.
Do not get in eyes, on skin or clothing.
Wear self-contained breathing apparatus in high vapor areas.
Do not breath vapors or mists.

8. Handling & Storage Precautions

Keep container tightly closed.
Store in cool, dry, well ventilated area.
Keep away from ignition source, acids, oxidizers.
Wash thoroughly after handling.
Empty containers may be hazardous due to retained residue.

DOT - Poisonous Liquid, Corrosive, N.O.S., UN2927

9. Environmental Protection

Spill Response: Absorb with sand or vermiculite and scoop up and containerize for proper disposal.

Waste Disposal: Comply with all local, state and federal regulations.

* Toxic chemical or chemicals subject to the reporting requirements of Section 313, SARA Title III.

NFPA Hazard Rating: Health - 0 / Flammability - 0 / Reactivity - 0

1. General Information

Trade Name: Deionized Water

Code #: 040100

Chemical Name: Dihydrogen Oxide

Chemical Family: Inorganic Compound

2. Hazardous Ingredients

DIHYDROGEN OXIDE, PURIFIED

CAS #7732-18-5

100% W/N

TLV/PEL: Not Established

TXDS: N/A

Carcinogenicity: Not Listed as cancer causing (IARC)

3. Health Hazard Data

Over exposure can lead to excessive hydration and death by drowning.

FIRST AID:

Eyes: Dry with soft cloth or tissue.

Skin: Remove wet clothing and dry.

Inhalation: Move to fresh air and give artificial respiration if breathing has stopped.

Ingestion: N/A

GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE!

4. Physical Data

Appearance: Colorless Solution	**Odor:** None
Vapor Density: N/A	**Specific Gravity:** N/A
Water Solubility: Miscible	**Boiling Point:** N/A

5. Fire & Explosion Hazard Data

Flash Point: Nonflammable

Extinguishing Media: Use media compatible with surrounding Material.

Special Procedures: Wear self-contained breathing apparatus and protective clothing if necessary.

Unusual Fire & Explosion Hazards: None Indicated. Electrolysis can lead to explosive concentrations of hydrogen and oxygen.

6. Reactivity Data

Conditions to Avoid: None Indicated.

Hazardous Combustion & Decomposition Products: Hydrogen and Oxygen

7. Special Protection

Provide adequate general and local exhaust ventilation.
Protect eyes and skin with safety goggles and gloves.
Do not get in eyes, on skin or clothing.
Wear self-contained breathing apparatus in high vapor areas.
Do not breath vapors or mists.

8. Handling & Storage Precautions

Keep container tightly closed.
Store in cool, dry, well ventilated area.
Keep away from ignition source.
Wash thoroughly after handling.
Empty containers may be hazardous due to retained residue.

DOT - Not Regulated

9. Environmental Protection

Spill Response: Mop up or flush to drain.

Waste Disposal: Comply with all local, state and federal regulations.

*** The above information is to be used as a guide, and does not profess to be all inclusive. Hawk Creek Laboratory shall not be held liable for any damage resulting from the handling or contact with the above product.*

How To Handle Aqueous Lithium Bromide Solution

Lithium bromide solution is free of odor, non-combustible, non-explosive and chemically stable. It is extremely corrosive, however, and all items that come in contact with the solution should be promptly rinsed off. Refer to the following list for safety precautions.

CAUTION!

1. Always wear protective gloves, shoes, apron and full face shield or safety goggles when handling solution.

2. If solution comes in contact with skin, eyes or mucous membranes immediately flush with water. Use soap and water for hands and eyes should be flushed out for a minimum of 15 minutes. Refer to Material Safety Data Sheet (MSDS) for additional safety information.

3. If solution comes in contact with parts and/or tools, wash them with water immediately. After washing coat tools with oil to prevent corrosion.

4. The solution should be stored in a polyethylene container that can be tightly sealed. Any prolonged exposure to air will cause Li_2Co_3 to precipitate out of the solution.

5. All discarded solution should be stored in a polyethylene recovery drum.

Solution Charging Procedures

Tools Required :

1. Approx. 25' 3/4" heavy duty hose.
2. 1/2" spindle valve adapter.
3. Refrigerant removal tank
4. 1/2" ball valve.
5. 1- stainless steel dip tube.
6. Misc. Stainless Fittings

Charging Solution During Start-up

Note: This procedure requires that the unit be in a vacuum. Follow start-up procedure for further information. Under no circumstances should air be allowed to enter the unit during any procedure. The vacuum pump should be operating during charging procedures to remove any air entrained in solution.

1. Set up charging apparatus as shown in **Figure SP-1**.

2. Fill up the refrigerant removal tank (2/3-3/4 full) and hose (B) with lithium bromide solution (refrigerant may also be used).

3. Open solution sampling valve (VS14 - *G* Units, VS19 - *S* Units).

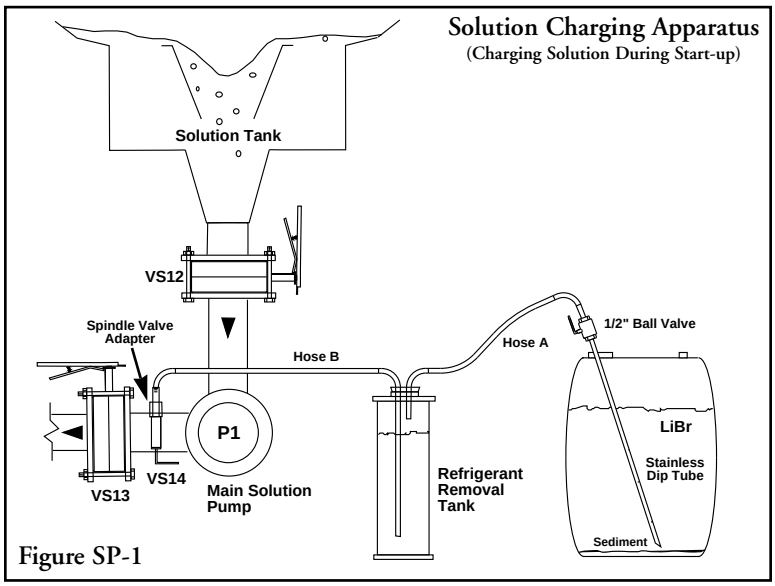


Figure SP-1

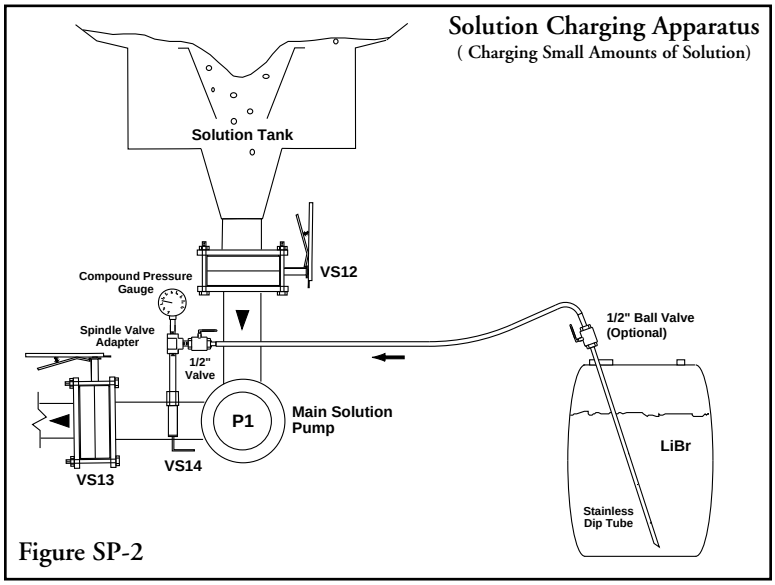


Figure SP-2

4. Open 1/2" ball valve located on top of dip tube. Vacuum in unit should draw solution out of drum.

5. Observe solution flow from drum. Do not attempt to completely empty a drum. As soon as level in barrel is as low as possible without pulling in air or sediment, quickly close the 1/2" ball valve and install dip tube in a full drum. Immediately open ball valve as soon as change is made. Keep an eye on level in removal tank. If it looks as though it may fall below the bottom tube, close the sampling valve and re-fill the tank. Continue as before until the last drum has been half drained. Pour remaining solution from previous drums into last drum. Draw the remaining solution into unit.

Note: If you notice a great deal of sediment in last drum, let it sit until all the sediment falls to the bottom. Do not draw it into the unit.

6. Remove charging apparatus and rinse parts with water.

Charging Small Amounts of Solution Once the Unit Has Been Operating.

1. Set up charging apparatus as shown in **Figure SP-2** on previous page.

2. Open 1/2" ball valve.

3. Manually operate Main Solution Pump (P1) and open solution sampling valve (VS14 - *G* Units, VS19 - *S* Units). Once flow is observed from unit to drum and all air has been purged from the lines, shut off solution pump (P1). Flow should reverse direction drawing solution from drum into the sampling valve.

4. Charge desired amount of solution.

5. Close 1/2" ball valve.

6. Close Sampling Valve.

7. Remove charging apparatus and rinse parts with water.

Extracting Solution

Extracting Small Amounts of Solution

Set-up extracting apparatus as shown in **Figure SP-3**.

1. Install a compound gauge mounted on the supply side of solution pump (P1).

2. Manually operate solution pump (P1) in the service mode.

3. Open solution sampling valve (VS14 - *G* Units, VS19 - *S* Units). Solution should flow from the sampling valve to the holding drum.

4. When the desired amount of solution is extracted , close the sampling valve and shut off the pump.

5. Remove extracting apparatus and rinse parts with water.

6. Seal drum when process is complete.

Note: If the supply pump pressure is in danger of falling below atmospheric, close the sampling valve and stop the pump. If additional solution extraction is needed, go to next procedure.

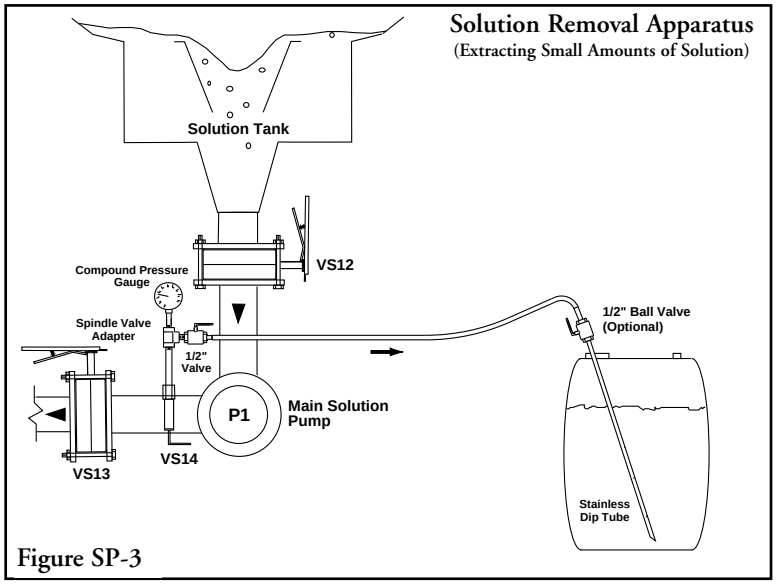


Figure SP-3

Extracting Large Amounts of Solution

Set-up extracting apparatus as shown in **Figure SP-4**.

Valve VP5 should remain closed during this procedure.

1. Charge nitrogen into unit through the purge piping. It may be convenient to remove the mercury manometer hose and pressurize the unit from this point. Purge charging line of air before proceeding.

2. Open valves VP2 and VP3 (if unit is cool) until the internal pressure increases to approximately 3 PSIG.

3. Open solution sampling valve (V14 - Units, V19 - *S* Units) . The internal pressure will force the solution out of the unit and into the holding drum(s).

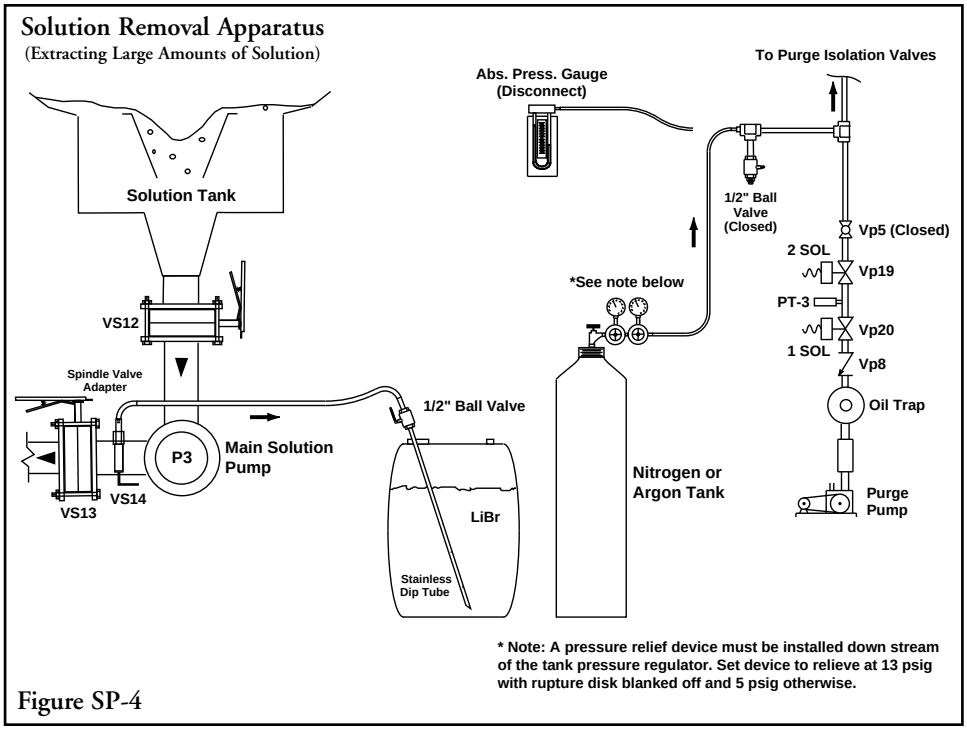


Figure SP-4

4. When the desired amount of solution is extracted , close the sampling valve.

5. Remove extracting apparatus and rinse parts with water.

6. Seal drum when process is complete.

Extracting Solution From High Temperature Generator

The above two procedures will remove all the solution except for that which is trapped at the bottom of the High Temperature Generator. Use the following procedure to remove this additional solution. This procedure may be done in conjunction with Procedure: **Extracting large amounts of solution** or as a stand alone procedure when service is required on the high temperature generator only only.

Set-up extracting apparatus as shown in **Figures SP-5** and **SP-6**. Do not open dip tube plug yet. Valve VP5 should remain closed during this procedure.

1. Charge nitrogen into unit through the purge piping. It may be convenient to remove the mercury manometer hose and pressurize the unit from this point. Purge charging line of air before proceeding.

2. Open valves VP2 and VP3 (if unit is cool) until the internal pressure increases to just slightly above atmospheric.

3. Open dip tube plug and attach apparatus as applicable.

4. Again open valves VP2 and VP3 until the pressure increases to approximately 3 PSIG.

5. Open ball valve. The pressure will force the solution up and out the dip tube into the holding tank.

6. When the generator is empty, continue to bleed off pressure until it is once again reduced to just slightly above atmospheric.

7. Remove apparatus, plug dip tube opening and maintain the unit in a slightly positive pressure until the repair is finished.

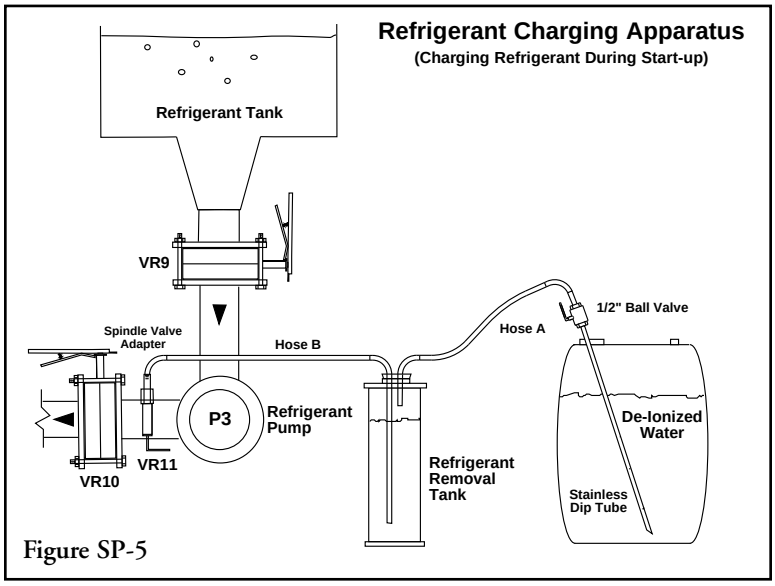


Figure SP-5

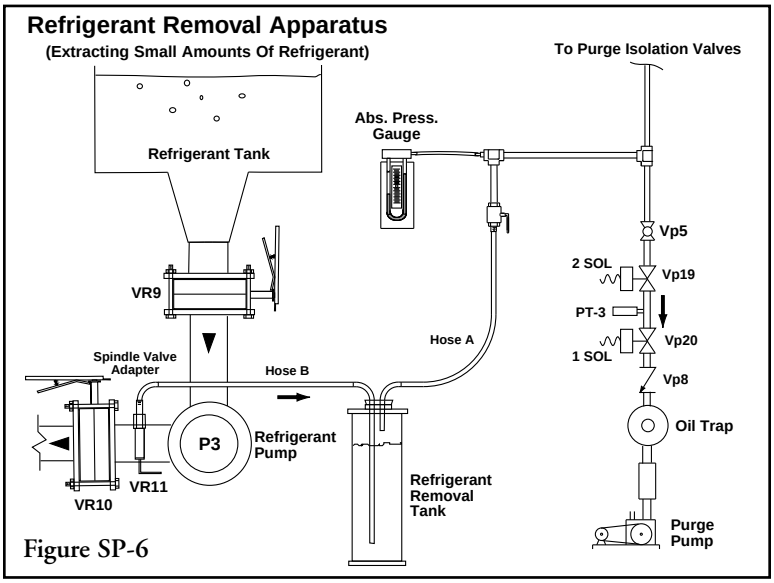


Figure SP-6

8. Seal solution drums when process is complete.

If work is to be performed on only the high temperature generator, appropriate isolation valves may be used to pressurize only this section of the unit. The valves used will vary depending on the type of unit.

Refrigerant Charging Procedures

Tools Required :

1 - approx. 25' 3/4" heavy duty hose.
2 - 1/2" spindle valve adapter.
3 - soln. and referring. charging tank..
4 - 1/2" ball valve.

Note: This procedure requires that the unit be in a vacuum. Follow start-up procedure for further information. Under no circumstances should air be allowed to enter the unit during any procedure. The vacuum pump should be operating during charging procedures to remove any air entrained in refrigerant.

Set-up refrigerant charging apparatus as shown in **Figure SP-5**

1. Purge the chiller.

2. Fill both hoses (A and B) and charging tank with refrigerant.

3. Open 1/2" ball valve located at refrigerant drum.

4. Open the refrigerant sampling valve VR11. Vacuum in unit should draw refrigerant out of drum.

5. Observe refrigerant flow from drum. Do not attempt to completely empty a drum. As soon as level in barrel is as low as possible without pulling in air, close the 1/2" ball valve and install in a new drum. Immediately open ball valve as soon as change is made. Keep an eye on level in refrigerant removal tank. If it looks as though it may fall below the bottom hose, close the sampling valve and re-fill the tank. Continue as before until the last drum has been half drained. Pour remaining refrigerant from previous drums into last drum. Draw the remaining refrigerant into unit.

6. When the last drum is close to empty, begin to throttle VR11. Slowly allow the remaining refrigerant in both drum and charging tank to be drawn into unit.

7. Close refrigerant sampling valve VR11.

8. Remove charging apparatus.

Extracting Refrigerant

Extracting Large Amounts of Refrigerant

Set-up extracting apparatus as shown in **Figure SP-6**.

Valve VP5 should remain closed during this procedure.

1. Charge nitrogen into unit through the purge piping. It may be convenient to remove the mercury manometer hose and pressurize the unit from this point. Purge charging line of air before proceeding.

2. Open valves VP2 and VP3 (if unit is cool) until the internal pressure increases to approximately 3 PSIG.

3. Open refrigerant sampling valve (VR11) . The internal pressure will force the solution out of the unit and into the holding drum(s).

4. When the desired amount of refrigerant is extracted , close the sampling valve.

5. Remove extracting apparatus.

6. Re-connect all purge piping after slowly releasing pressure.

7. Seal drum when process is complete.

Extracting Small Amounts of Refrigerant

1. Start the purge pump in the service mode.

2. After approximately 1 minute, open VP5 and check to make sure that the purge pump is capable of pulling a vacuum below 10mmHg.

3. Not Complete

BZT Charging Procedure

BZT is used in the first stage generator of steam units only. Because the tubes in the first stage generator are cupro-nickel, it is necessary to initially coat the tubes with this substance for added corrosion protection.

BZT is to be added only in the case of a first stage generator tube bundle replacement or tube failure. (Contact York Service Before Adding BZT)

The unit must be in the cooling mode and the first stage generator temperature must be in excess of 212°F.

1. Determine the Qnty. of BZT that needs to be added using the equation below.

Solution Qnty. (lbs) X .0000426 = BZT Qnty to be added (lbs)

To convert this value to grams, multiply the above result by 454.

2. Prepare approximately 5 gallons (20 liters) of refrigerant and heat it between 190°F and 212°F. An electric or other heating apparatus may be used for this purpose. This quantity of refrigerant can hold a maximum of 1.4 lbs (300g) of BZT. Any more will not go into solution. If the calculated amount is greater than 1.4 lbs, this procedure will have to be done more than once.

3. Add the BZT into the heated refrigerant just prior to adding it to the machine. Should the solution of BZT and refrigerant cool before adding to the machine, some BZT will precipitate out and the solution will have to be re-heated.

4. Using the charging valve located at the top surface of the first stage generator (V37), connect a vinyl hose and fill it with the BZT solution before charging to prevent the ingress of entrapped air into the machine.

5. Charging rate should be kept below 2.6 gal./min (10 liters/min). It should take two minutes to empty a 5 gallon bucket.

6. Leave the unit operating in the cooling mode for at least 30 minutes after completion of charging.

Alcohol Charging Procedure

A sufficient amount of alcohol is added to the unit at the factory. Over time, some of the alcohol will exit the unit via the purge gas discharge. This amount is generally very small and seldom is it necessary to alcohol to the unit.

If the charges were shipped separately than the shipped alcohol will have to be added to the unit.

The procedure for adding alcohol is the same as for adding solution (refer to solution charging procedures for adding alcohol).

When charging the solution into the unit on start-up, mix the alcohol with the solution and charge it in the same sampling valve.

Thread Joint Sealing Procedures

Absorption units operating in a deep vacuum are severely affected by air leaks. Accelerated corrosion, copper plating, and performance problems are several of the reasons the ingress of air must be eliminated. It is for these reasons that the following procedures must be adhered to when making up a threaded joint on a *Paraflow*™ unit.

1. Brush threaded joints with a wire brush to clean any previous sealant or corrosion off.

2. Check threads (both male and female) for any damage that may promote leaking. Replace fitting if necessary.

3. Clean all threads with **Loctite Cleaner 7070**.

4. Spray Locquic Primer Type "N" (**Loctite N7649**) on both male and female threads and allow time to dry.

5. Apply **Loctite 567** to threads on male fitting only, being careful to avoid the lead thread of the fitting so that no Locktite is exposed to the inside of the system. Work the thread sealant into the threads so that the entire area between the threads is filled with sealant.

Note: Use Loctite (instead of 567) on threads located on the high temperature generature (i.e. generator sight glass). Locktite 567 will break down at high temperatures.

6. Tighten fittings using standard piping practice. Ensure thread engagement is correct (1/3 by hand, 1/3 by wrench and approximately 1/3 exposed). Too much thread engagement is a sign of incorrect tapers and may be a potential leak.

Caution: A Six Point Socket must be used when tightening sightglasses or they will break.

7. Leak check using no more than 12 psig of nitrogen or Argon and soap solution.

Table SPT-1 - Globe Valve Torquing Requirements

Valve Size (inches)	Packing Gland Torque (ft/lb)	Seal Cap Torque (ft/lb)
1	58	50
1 1/2	58	50
2	73	40
2 1/2	87	48
3	87	48
4	87	57

Note: The old carbon type rupture disk is rated to burst between 6 psig and 8 psig. The new stainless steel type rupture disk is rated between 8 and 12 psig.

The rupture disk should be removed and blanked off or equalized if the unit is being pressurized above the following:

Carbon Type - 5psig
Stainless Type - 9 psig

The stainless steel rupture disk will be destroyed if it is removed. The disk will have to be replaced. Only remove the disk if absolutely necessary.

The components listed below are needed for this procedure:

1. Loctite Primer Type "N7649" in 6 oz. aerosol can. (**013-01753-000**)

2. Loctite 567 Thread Sealant in 250 ml tube. (**013-02280-000**)

3. Loctite Cleaner 7070 (**013-02899-000**)

Valve Torquing Requirements

Globe and Angle Valves

The Globe and Angle Valves used on *ParaFlow*™ units require proper torquing to maintain an adequate leak free seal.

Note: It is not necessary to back off of the packing gland on these valves when opening or closing the valve as is the general practice with conventional refrigeration valves. **This practice may in fact cause the valve to leak.**

When replacing the valve caps, coat the threads and around the stem with Dow Corning High Vacuum Grease (Silicone Grease Only!!!). Do not use petroleum base grease.

Torquing Procedure

Torque packing glands of globe valves. Apply silicone vacuum grease to threads, cap seal and stem packing gland and finally torque valve caps when re-installing. Refer to **Table SPT-1** for torque requirements.