Plate Heat Exchanger Installation and Operation Manual

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Description

1.1 Safety Precautions

-Always read the installation instructions thoroughly (See chapter, Installation).

-Always use a lifting crane or device when handling the heat exchanger.

Operation

-Always read the operation section thoroughly (See chapter, Operation).

-Never introduce hot fluid suddenly when heat exchanger is empty or cold.

-Never shock the heat exchanger with cold fluid when hot.

Transportation

-Always transport the heat exchanger in a protected position.

-Always ensure that the unit is securely fixed during transportation.

-Never lift or elevate in any way other than described in this manual.

1.2 Application

-Thermaline gasketed plate heat exchangers are designed to process a wide range of fluids and are hygienic in design meeting FDA and 3-A guidelines for food processing as well as rugged design for industrial uses. Corrugations on the plates may vary in pitch and depth and are optimized for performance.

1.3 Working Principle

-Plate heat exchangers all function similarly in that product flows through channels created by two mating plates with hot fluid on one side of the plates and cold fluid on the opposite side.

- All gasketed plate heat exchangers are designed to allow full disassembly of the unit for thorough cleaning. All elastomers are designed to leak to atmosphere in the event of a failure eliminating the potential for cross contamination due to seal failure.

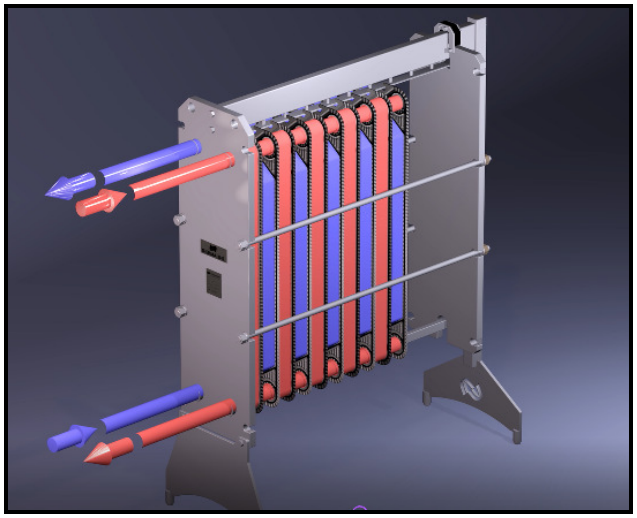

Figure 1 shows a cut away view of a typical plate heat exchanger. Gaskets are positioned to create a seal between the plates and prevent intermixing of the fluids.

Figure 1 - Plate Heat Exchanger

1.4 Corrosion

-Corrosion is a function of the process fluid and environment. Material selection is ultimately the customer's responsibility and materials selected should be compatible with the process.

Installation

Thermaline plate heat exchangers are designed to be freestanding and can include wall or ceiling mounts. Most models have provisions for lifting and transportation. Frames are built to customer specifications with either adjustable feet, mounting plates with bolting holes or wall mount brackets.

2.1 Clearance

-When installing the heat exchanger, be sure to provide sufficient clearance around the unit for tie bolt and plate removal.

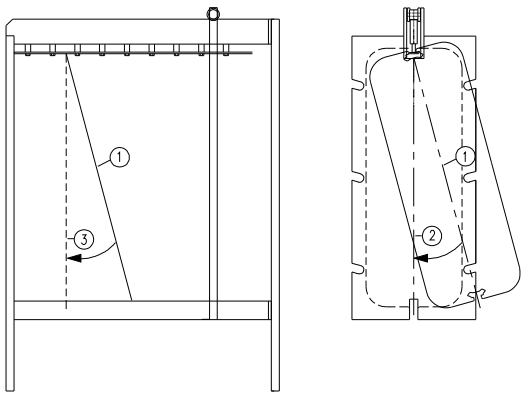

Figure 2 illustrates the access needed to remove plates from a heat exchanger.

Figure 2 – Plate Removal Example

2.2 Foundations

-Foundations must be adequate in strength to support the heat exchanger in order to prevent the unit from settling and imposing excessive strains on the exchanger. Foundation bolts should be set to allow for setting inaccuracies.

2.3 Leveling

-The heat exchanger must be set so that pipe connections can be made without the use of excessive force. However, small forces might be unavoidable, at which point small forces are then acceptable.

2.4 Cleanliness

- Protective plugs should not be removed from connections until just prior to installation.

- The entire system should be cleaned before starting operation. All exchanger openings should be inspected for foreign material before operation.

2.5 Fittings

-*By-pass valves*.
User may install valves and by-passes in the piping system to permit inspection and repairs.

-*Test connections*.
The user may opt to install a thermometer well and/or pressure gauge connections close to the exchanger.

-*Vents*.
The user may install vent valves close to the exchanger.

-*Pulsation and vibration*.
Care should be taken to eliminate or minimize transmission of fluid pulsations and mechanical vibrations into the heat exchanger.

-*Safety relief devices*.
It is the user's responsibility to install the required safety devices.

Operation

3.1 General

The heat exchanger must not be operated at conditions, which exceed those specified on the data plate.
Caution: If the heat exchanger surface temperature is expected to be hot or there are local regulations related to surface temperature, it is the users' responsibility to either insulate the unit or take precautions by labeling the unit with a warning about the hot surface temperature to avoid risk of personnel injuries

Special Instructions: Before placing the heat exchanger in operation, reference should be made to the provided technical documentation for any special instruction.

Regulations: Local safety and health regulations must be considered.

Improper start-up or shutdown sequences may cause leaking in the connections to the heat exchanger. It is the customer's responsibility to ensure a proper start-up and operation when running media with a higher risk for damages on the heat exchanger.

3.2 Startup

-**During start-up** all vent valves should be opened and left open until all passages have been purged of air and are completely filled with fluid. Fluid must be introduced in a manner to minimize differential expansion.
Caution: Adjustments of flow rates should be made slowly to avoid the risk of pressure surge or water hammer. Water hammer can cause considerable damage to the equipment.
-Shutdown operation: The heat exchanger must be shut down in a manner that minimizes different expansions. When shutting down the system, the heat exchanger should be drained completely.

-Temperature shocks: The heat exchanger should not be subjected to abrupt temperature fluctuations. Hot fluid must not be suddenly introduced when the unit is cold nor cold fluid suddenly introduced when the unit is hot.

-Gaskets: The heat exchanger is pressure tested before leaving the manufacturers shop in accordance with various standards. However, normal relaxing of the gasketed joints may occur in the interval between testing in the manufacturer´s shop and installation at the job site. Therefore, all external joints may require retightening after installation and, if necessary, after the heat exchanger has reached operating temperature.

Maintenance

4.1 Inspection

At regular intervals and as frequently as experience indicates, an examination should be made of the interior and exterior condition of the unit. Neglect in keeping all plates clean may result in decreased performance of the heat exchanger.

4.2 Fouling

Heat exchangers are subject to fouling or scaling and should be cleaned periodically. A light sludge or scale coating on the plates greatly reduces its thermal efficiency not only on the product side but the media side as well. An increase in pressure drop and/or reduction in performance usually indicate that cleaning is necessary.

4.3 CIP (Clean In Place)

-Plate heat exchangers are designed to be chemically cleaned in place. CIP is a function of the process and adequate time, temperature, flow and concentrations are needed for satisfactory cleaning.

Caution: Chemicals used for cleaning must be compatible with materials of construction.

4.4 Inspection and Manual Cleaning

Before disassembly the user must assure that the unit has been locked out, de-pressurized, ambient temperature and drained.

4.5 Leaks Internal and External

-External leaks: All plate heat exchangers are designed so that an elastomer failure will leak to the ground. Identify the leaking elastomer and follow disassembly/assembly procedures to replace the elastomer.

-Internal leaks: Internal leakage can cause intermixing of fluids and will not be visible. Plate heat exchangers used in sanitary applications should be tested regularly with the Thermaline Cross Contamination Tester (CCT 4.0) Visit www.Thermaline.com/cct to find out more.

Figure 3 - Thermaline's Cross Contamination Tester 4.0

Figure 3 shows the CCT 4.0 Installed on heat exchanger testing for internal defects.

General Description

5.1 Frame

-The Thermaline TT and EZ patented automated heat exchanger frames are designed for years of trouble free operation. Hydraulic cylinders are used to pull the movable head inwards compressing the plates to a preset dimension. Once the closed dimension is set the plates cannot be over compressed. Thermalines patented “Lock Solid” cylinder locks hold the unit closed indefinitely by transferring the forces through the barrel of the cylinders. This allows for hydraulic pressure to only be used when closing the unit. The EZ and TT series frames are completely adjustable to take up elastomer decompression and are expandable for future needs.

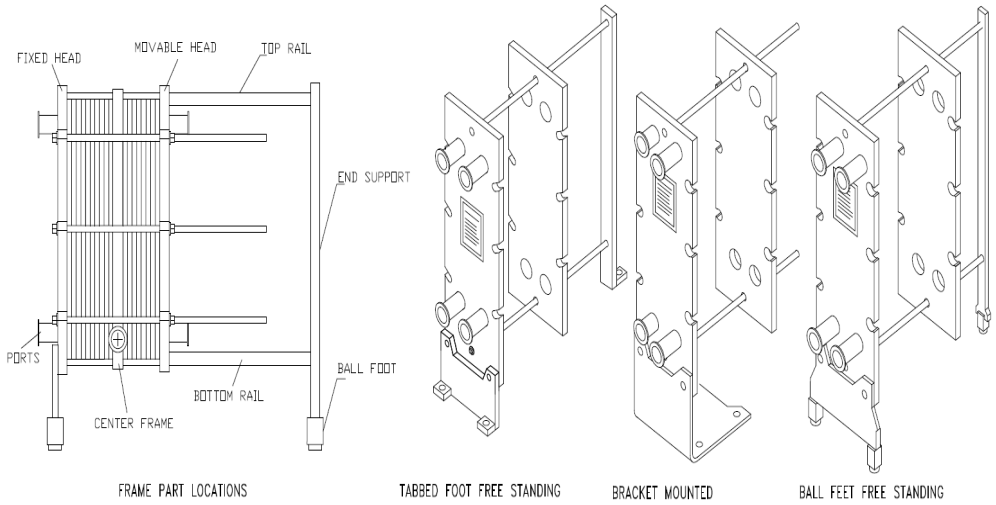

Figure 4 shows the typical frame components found on a plate heat exchanger.

Figure 4 - Plate Heat Exchanger Part Diagram

5.2 Port Identification, Location and Labeling

-Ports are labeled clockwise starting from upper left and always viewed from the front of the heat exchanger.

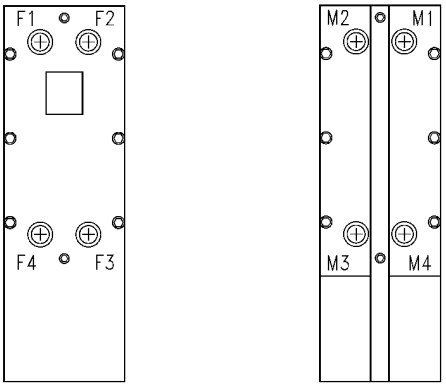

Figure 5 shows the port labels used. The Fixed head is prefixed with “F” and movable head is prefixed with “M”.

Figure 5 - Fixed and Movable Head Labeling

-Center frames are prefixed with the sections they fall between and the orientation of the port.

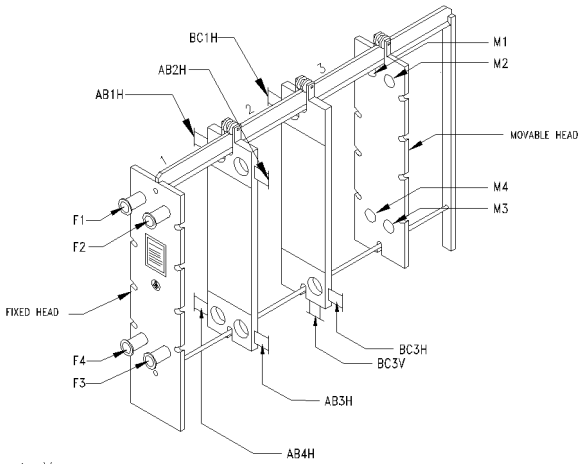

Figure 6 shows the labeling used for all Center frame ports, horizontal and vertical.

Figure 6 - Center Frame Port Labeling

5.3 Gaskets

-Gaskets are made from a variety of materials compatible with your process. Original Gasket materials are noted on assembly documentation.

-The first gasket in each section is a start gasket which has rings around all four ports in order to create a seal against the fixed head or center frame.

-Start gaskets can be made of one piece or several pieces to make up the gasket

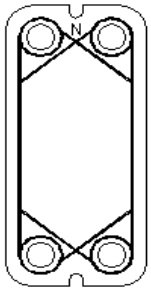

Figure 7 shows a Start gasket which is used to start each section of the heat exchanger

Figure 7 – Start Gasket

-All remaining gaskets are flow gaskets. Flow gaskets are either diagonal or parallel and are model specific.

-Flow gaskets are glueless and clip to the plate

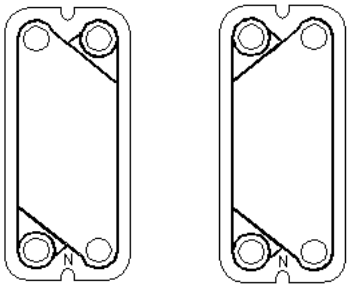

Figure 8 shows the difference between a Diagonal flow and Parallel Flow plate.

Figure 8 – Diagonal and Parallel flow plates

-Flow gaskets are equipped with a leak detect to prevent fluids from intermixing in the event of an elastomer failure.

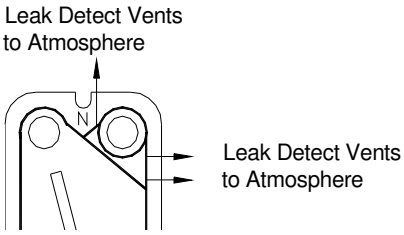

Figure 9 shows the location of Leak detect vents placed in the gasket.

Figure 9 - Gasket Leak Vents

5.4 Plates

-Plates are made from a variety of materials compatible with your process original materials are noted on assembly documentation.

-Plates have various corrugation patterns and can be mixed to optimize performance.

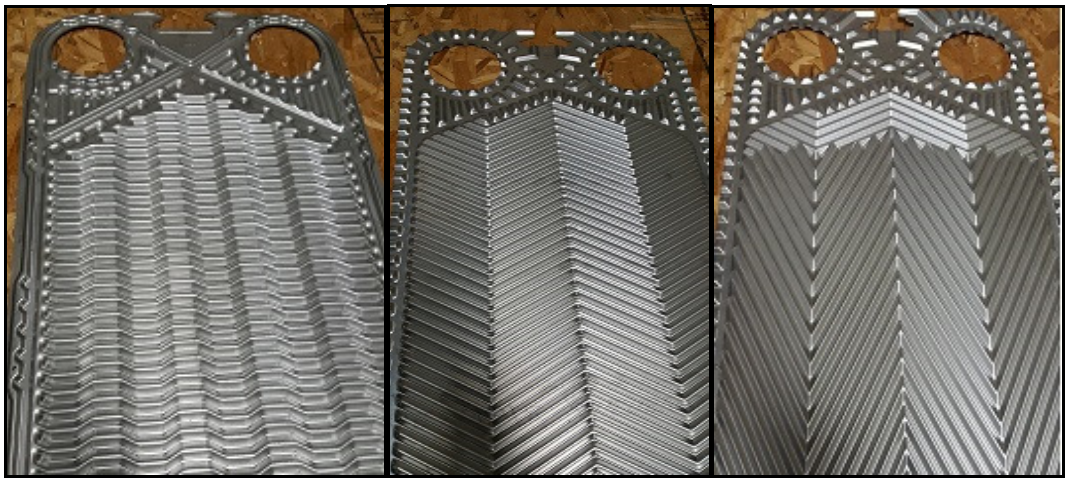

Figure 10 - Example of plate patterns.

Left: Washboard

Middle: CH

Right: CDX

Figure 10 – Plate Corrugation Patterns

-Most plate models are bi-directional with an “N” stamped on one end signifying “North”. These plates, when installed in a frame, will alternate between North and South.

Figure 11 shows an “N” Stamped on the North side of a T8 plate.

Figure 11 – “N” Stamp

-Certain plate models hang in a frame in only one direction therefore requiring two different plates to make a pair – a Left plate and a Right plate.

5.5 Flow Plates

-Plate port locations are labeled clockwise starting from upper left as 1 and always viewed from the gasketed side.

-A number in the callout represents a port hole in the location and a “0” in the location callout represents a block in the port location.

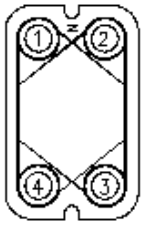

Figure 12 shows a flow plate ported 1234, with all four ports open.

Figure 12- Flow Plate Labels

5.6 Pass Plates

-Pass plates are used to direct flow internally by blocking ports.

-Plate port locations are labeled clockwise starting from upper left as 1 and always viewed from the gasketed side.

-A number in the callout represents a port hole in the location and a “0” in the location callout represents a block in the port location.

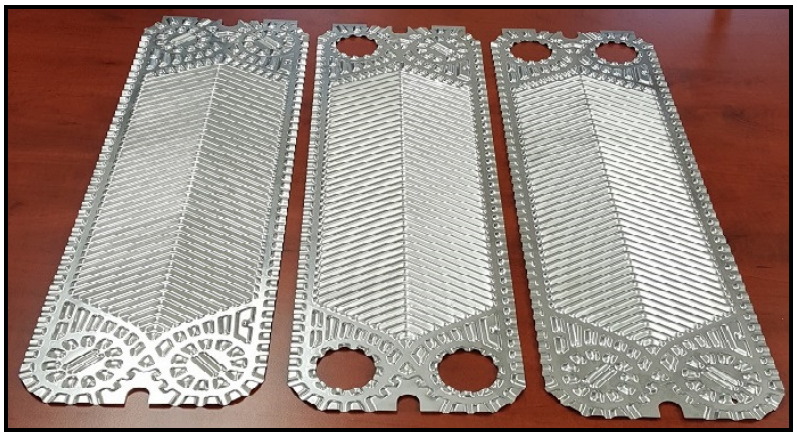

Figure 13 - Example of pass plates:

Left: 0000 all four port locations blocked

Middle: 1034 upper right port location blocked

Right: 1200 both bottom ports blocked

This is only a sample there are many other combinations

Figure 13 - Pass Plates

-Pass plates are directional and port callouts must be read with the plate in the correct direction. Bi-directional plates are read with the “N” facing up and non-directional plates called out as Left or Right.
-Models T4, T8, T13, T20 and T28 feature the Patent pending Smart Identification System (SIS). SIS is a tab protruding from the body of a plate with the location of the plate within the plate pack and the port callout.

Figure 14 shows the Smart Identification System (SIS) Identifying a pass plates port callout and location.

Figure 14 – Smart Identification System Plate

Figure 15 shows the (SIS) Plates installed in a frame.

Figure 15 – SIS plates Installed in Frame

5.7 Gasket Installation and Orientation on the Plate

Parallel flow Bi-directional plates: (Bi-directional plates can be installed with either end up and will alternate between North and South during assembly)

-All plates are viewed from the gasket side.

-Each plate is stamped with an “N” denoting the North side of the plate. The plates will alternate between North and South orientation when installed into the unit.

-The first plate in each section is the start plate and requires a start gasket which has port rings around all four ports. Start gaskets may be a single piece or made up of several pieces.

-All remaining plates in the unit require a flow gasket. With the “N” facing up the gasket port rings will cover the left ports leaving the right open to flow.

-All odd numbered plates (1,3,5,7 etc.) including the start plate, will be installed “N” (North) facing up just below the top rail.

-All even numbered plates (2,4,6,8 etc.) will be installed in the South orientation by rotating the plate 180° so the “N” faces downward above the bottom rail.

*Figure **16*** shows two Bi-directional parallel flow plates. The Left plate is in the “South” orientation and is considered an even numbered plate. The Right plate is in the “North” orientation and is considered an odd numbered plate. The pictured plates have identical gaskets and gasket orientation. The left and right plates are simply rotated to the South and North orientation respectively.

Figure 16 – Parallel Bi-Directional Flow Plates

Diagonal flow Bi-directional plates: (Bi-directional plates can be installed either end up and will alternate between North and South during assembly)
-All plates are viewed from the gasket side.
-Each plate is stamped with an “N” denoting the North side of the plate. The plates will alternate between North and South when installed into the unit.
- The first plate in each section is the start plate and requires a start gasket which has port rings around all four ports. Start gaskets may be a single piece or made up of several pieces.
-All remaining plates require a flow gasket. The flow gasket is the same for North and South plates – it is the orientation in which the gasket is installed onto the plate that determines if the plate is a North plate or South plate.
-All odd numbered plates (1,3,5,7 etc.) including the start plate, will be installed “N” (North) facing up just below the top rail. For all North plates, the flow gaskets MUST be installed with the port rings around the upper right port and lower left port.
-All even numbered plates (2,4,6,8 etc.) will be installed South by flipping the plate so the “N” faces downward above the bottom rail. For all South plates, the flow gaskets MUST be installed with the port rings around the upper left port and lower right port.

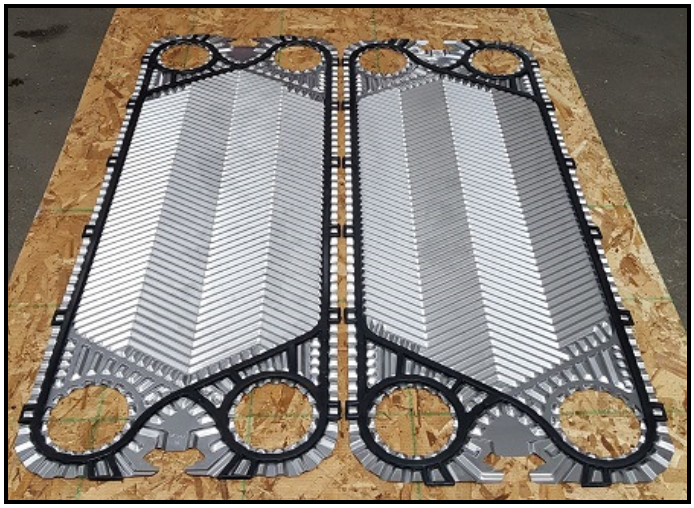

Figure 17- Diagonal Bi-direction Flow Plates

Figure 17 shows two Bi-directional diagonal flow plates. The Left plate is in the “South” orientation and is considered an even numbered plate. The Right plate is in the “North” orientation and is considered an odd numbered plate. Each plate requires the same gasket but the gasket must be installed in a different orientation to make a “South” or “North” plate.

Diagonal flow directional plates: (Directional plates can only be installed in one orientation)
-All plates are viewed from the gasket side.
-**Left Plates and Right Plates are different!** Plates are pressed as either a left or right plate and require a left or right gasket respectively.
Left plates: With the gasket installed flow will connect between the upper right port and the lower left port.
Right plates: With the gasket installed flow will connect between the upper left port and the lower right port.
-The first plate in each section is the start plate and requires a start gasket which has port rings around all four ports and may be made up of several pieces.
-All remaining plates require a flow gasket. The flow gaskets are Left and Right gaskets and can only be installed onto their respective plates.
-All odd numbered plates (1,3,5,7 etc.) including the start plates are typically Left plates
-All even numbered plates (2,4,6,8 etc.) are typically Right plates.

Figure 18 – Directional Flow Plates

Figure 18 shows Directional diagonal flow plates. These plates hang in only one direction and gaskets are not interchangeable between a left plate and right plate. A Left plate permits flow across the plate from the upper right port to the lower left port. A Right plate permits flow across the plate from the upper left port to the lower right port.

5.8 Double Wall Plates

-Double Wall Plates are two plates nested together to form a safety barrier between the fluids in the event a plate fails the fluid will leak externally rather than into the adjacent fluid.
-Plate pairs have large apposing cutouts in the port area and require a thick ring gasket to seal through the large cutouts.
-Double wall plates can be either diagonal or parallel flow.

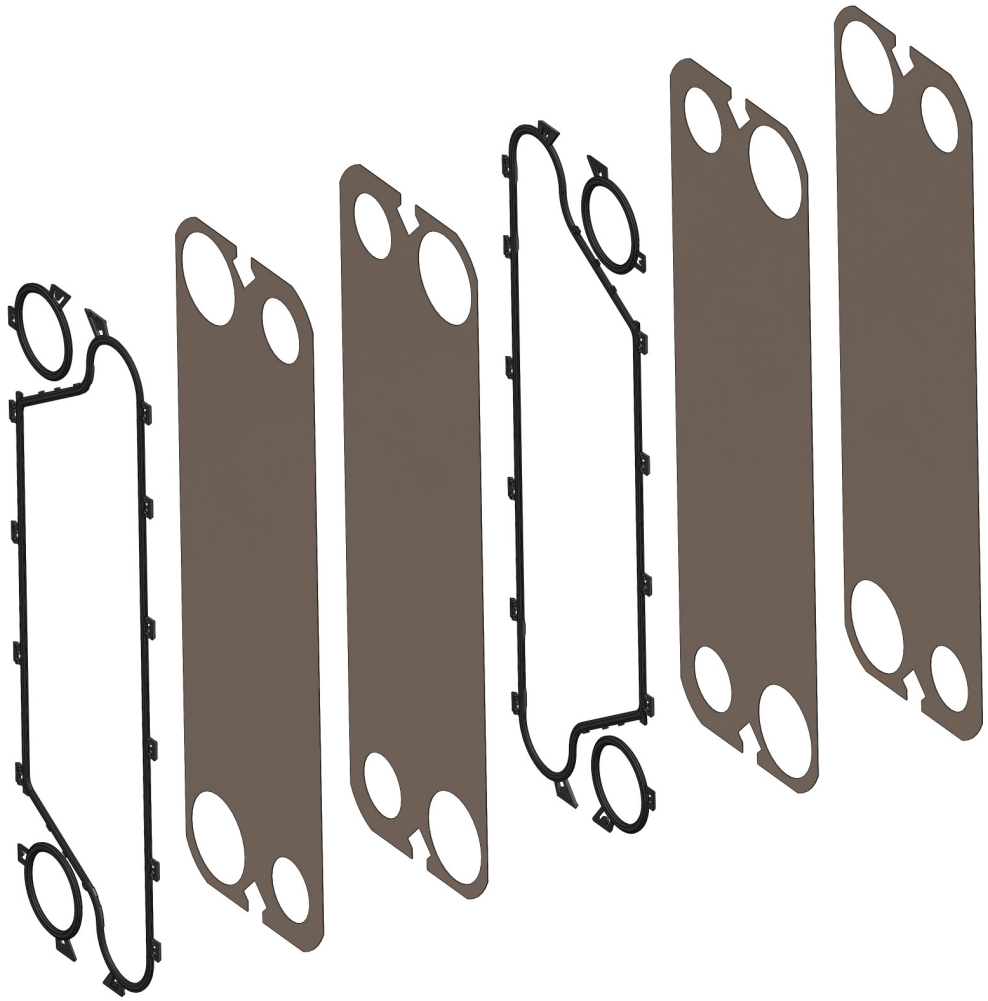

Figure 19- Double Wall Plates

Figure 19 depicts an exploded view of Thermaline's double wall plate configuration.

5.9 Drain Holes

-Certain process applications require a drain hole in lower blocked pass plates for self-draining.
-Drain holes are noted on a units assembly drawing with an *.
-Drain holes are also labeled on SIS plate ID tabs.

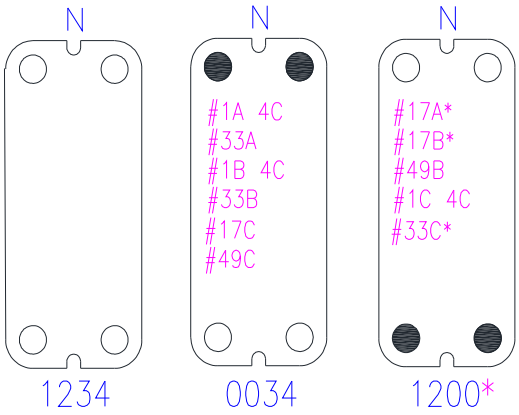

Figure 20 is an example of drawing block denoting pass plates with drain holes (*) and their numbered location within the plate pack.

Figure 20- Block Plate ID for Technical Drawings

Figure 21 shows a 3/16” Drain hole in a plate with the lower ports blocked.

Figure 21 – Drain Hole in a Block Plate

5.10 Port Rings

-Fluids exiting the movable head or an intermediate grid require port ring(s) to seal the rear of the plate to the heads or intermediate grid.

-Port rings are typically the same materials as the gasket. Refer to assembly documentation.

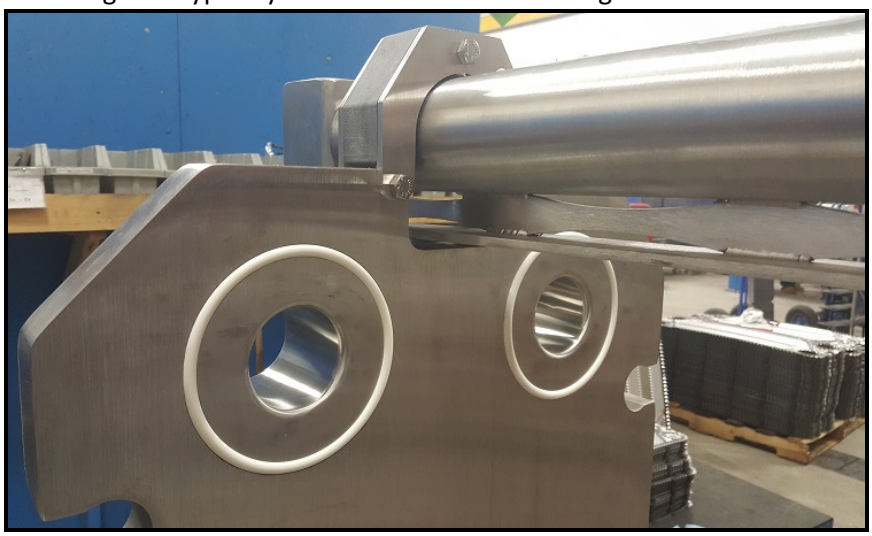

Figure 22 shows Port rings in movable head used to create a seal between the head and the adjacent plate.

Figure 22 – Port Rings on a Movable Head

Plate and Gasket Documentation

-Technical specifications pertaining to the heat exchanger can be found on a unit's technical drawing under the gasket text block.

-The gasket text block notes the plate type, plate material, gasket type and gasket material.

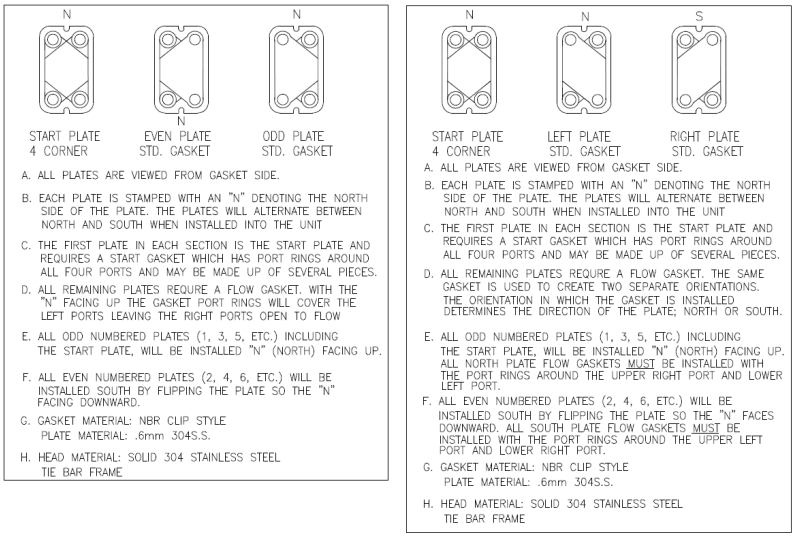

Figure 23 shows the gasket text block found in a technical drawing which identifies the parts used in a unit and proper orientation of the heat exchangers plates.

Figure 23 – Gasket Text Block

6.0 Disassembly

-To disassemble a unit be sure to, drain fluids, lock out as necessary, cool to ambient temperature and remove pipes.

-Loosen one Tie bolt at a time no more than ¼" moving in a star pattern until the plates are decompressed.
-Once the movable head is loosened, plates are ready to be removed.
-Please visit www.Thermaline.com/common/videos and watch the Thermaline's plate heat exchanger maintenance videos.

6.1 Installing the plate pack

-Once all the plates are installed into the heat exchanger frame ensure the port rings, if applicable are installed in the movable head and intermediate grids.
-Slide all plates to the rear of the heat exchanger and one at a time inspect the gasket to ensure the gasket attachments are attached properly and the gasket is set in the gasket groove. Ensure the first plate has the proper start gasket, move it to the front and continue to inspect each plate one at a time moving it to the front of the unit until all plates have been inspected for proper sequencing and gasket attachment.
-Make one last check that the port rings, if applicable, are installed.

6.2 Automated Frame Operation

Opening the heat exchanger:

-Shut down and lock out all fluids to the heat exchanger.
-Allow the heat exchanger to cool down.
-Remove all pipes connected to the heat exchanger.
-Ensure the path that the movable head travels is clear of all brackets, tools and any other obstructions
-Arm the unit by pulling the emergency stop button out if the unit has two emergency stop buttons both need to be pulled to the on position.
-Press and hold the **CLOSE** button until system pressure is reached (Close button will cut out).
-Unlock upper and lower locks at the end of each cylinder by pushing in and twisting the lock 33° in either direction. EZ and TT series have either two locks or four depending on the model. **ENSURE ALL LOCKS ARE UNLOCKED!**

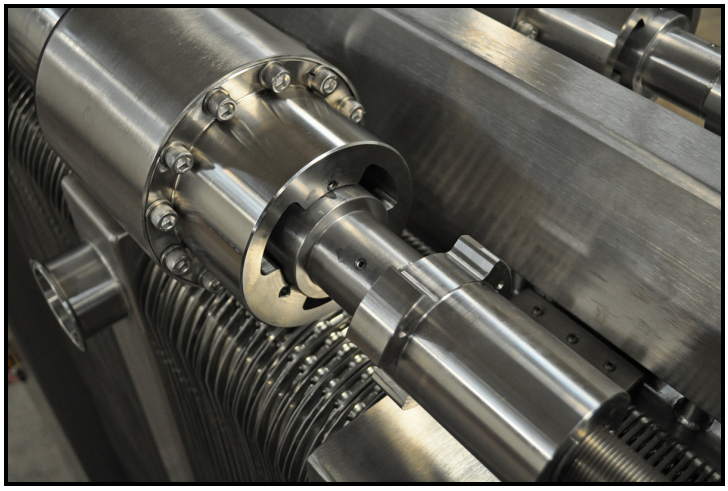

Figure 24- Cylinder Locking Mechanism

Figure 24 shows the lock disengaged from the cylinder and ready to be opened

-Once the locks are **ALL UNLOCKED** you may now press and hold the open button.

-The movable head will slowly travel away from the fixed head; ensure the path the head travels is clear of obstructions.
-Stop the movable head by releasing the button.
-Continue to open the heat exchanger until the desired distance is reached or until the cylinders reach the end of their stroke. **Caution:** Do not allow movable head to come in contact with end support

Closing the heat exchanger:
-Arm the unit by pulling the emergency stop button out, if the unit has two emergency stop buttons both need to be pulled to the on position.
-Ensure the movable head closing path is clear of all obstructions including pipes, brackets and tools etc.
-Press and hold the “close” button.
-Periodically stop and inspect all plates and gaskets for proper alignment and all gaskets are seated.
-Continue closing unit until all locks are seated and pressure is reached (close button will cutout)
-Push in and twist each lock 33° until the lock engages the detents.
-Shutdown the unit by pushing the emergency stop button.

6.3 Adjusting the movable head

-Periodic adjustments of the plate pack may be necessary to seal external leaks.
Caution: Not all leaks can be sealed by tightening the plate pack. Note the leak area and inspect the plates and gaskets carefully for defects.
-Refer to the assembly documentation for the plate pack tightening range specific to your unit.
-Measure and document the closed unit at four points upper left, upper right, lower left and lower right corners of the plates. (Tolerance between 4 points +/- 1/8”)
*** Measurement taken between the fixed and movable head near the plates***
Caution: Do not exceed the minimum tightening dimension as this may cause damage to the plate pack.
-Remove access covers from the rear of the movable head by loosening the center bolt.

Figure 25- Movable Head Access cover

Figure 25 shows the movable head access cover and center bolt

-Open the unit until the movable head is free of the plate pack. (See operation instructions for opening procedure)
-Loosen the jam nuts on the pull bar. The jam nuts are located on the outside of the movable head. (Ensure the jam nuts are loosened beyond the distance the unit is to be adjusted)

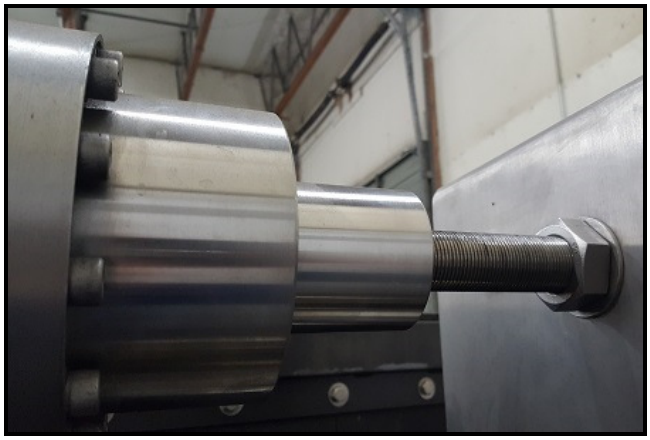

Figure 26- Jam Nut Location

Figure 26 shows the jam nut's location on the outside of the movable head

-Insert the extended adjustment socket through the access hole onto the pressure nut. Turn the nut clockwise to tighten the nut and washer against the movable head.

Figure 27 shows the pressure nut's location within the movable head viewed from the access hole

Figure 27- Pressure Nut Location

-Count the revolutions that the nut is turned and turn the remaining pull bar pressure nuts the same revolutions.
-The pitch of a standard 1-1/4" pull bar is twelve threads per inch (12TPI). Three full revolutions of the pressure nut is equal to a ¼" of travel along the pull bar.

Revolutions	Travel Distance
3/4	**1/16"**
1-1/2	**1/8"**
2-1/4	**3/16"**
3	**1/4"**

-Start by tightening approximately 15%-25% of the difference between the current dimension and the maximum dimension.
Example:
Unit is currently tightened to 72-1/4".
Assembly documentation states a tightening range of 70-3/4" Max. / 73-7/8" Min.
72-1/4" – 70-3/4"= 1-1/2"
1-1/2" x 15% = 3/8"
In this example the start of unit would be tightened 3/8" which is equal to 4-1/2 revolutions of each pressure nut.
-Close and lock the heat exchanger (See section 6.2 for instructions on opening and closing the unit)
Caution: Tightening the plate pack may require an increase in hydraulic pressures (See adjusting hydraulic pressures)
-Test the heat exchanger for leaks.
-If the unit leaks note the problem area, re-open the unit and inspect the area of the leak. Repeat the tightening procedure if necessary.
-With the unit in the closed position tighten the jam nuts and reinstall the access covers.

6.4 Adjusting the hydraulic pressure

EZ and TT series automated frames utilize hydraulic pressure to compress the plate pack. If plate pack dimension changes it may be necessary to increase the hydraulic pressures.
-Open the heat exchanger (see operation instructions for opening procedure).
-Shut the unit off.
-Loosen the jam nut on the pressure relief valve located on the valve body manifold.

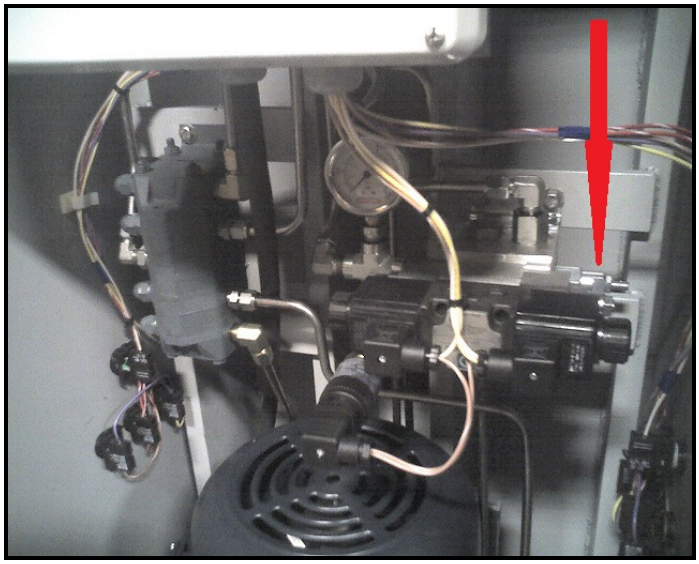

Figure 28 shows the location of the Pressure relief valve within the fixed head

Figure 28- Pressure Relief Valve

-Using a 3/16" size hex key wrench turn the pressure relief stem clockwise against spring pressure until the relief valve stops and is lightly seated into the bore. Lock the jam nut. (Pressure relief may already be seated)

Figure 29 shows the pressure switch location within the fixed head

Figure 29- Pressure Switch Location

-Locate the electrical pressure switch
Check proof pressure of switch on name plate or catalog. NEVER EXCEED THIS PROOF PRESSURE.
CAUTION! -ALWAYS CHANGE PRESSURE SETTING GRADUALLY. -ALWAYS check pressure switch setting before making any adjustments.
-Using a maximum of ¼ turn at a time, adjust the pressure switch by turning the serrated body of the switch. Turning the switch inwards to increase pressure, and outwards to decrease pressure.

-Close the heat exchanger until the pressure switch cuts out.
-Engage lock assemblies.
-If needed repeat this process until all of the locks engage.
Caution: The starting dimension must be equal at all points In order for locks to engage. (See setting the movable head dimension)

6.5 Pre-setting movable head

-With the plates removed from the frame retract the cylinders completely and engage locks.
-Remove access covers from rear of the movable head
-Loosen the jam nuts on the pull bar located on the outside of the movable head.
-Set the movable head to the desired distance measured between the fixed head and the movable head.
-Adjust pressure nuts until they contact the movable head.
-Tighten jam nuts and re-measure between the fixed and movable heads and re-adjust if necessary.
-Reinstall access covers.

6.6 Troubleshooting

EZ/TT Automated frame trouble shooting:

All locks will not engage	Check plate pack tighten dimension. Increase hydraulic pressure.
One lock will not engage	Check plate pack tighten dimension. Adjust individual lock.
Close switch does not cutout	Adjust pressure switch
Noisy Operation	Check hydraulic fluid level. Add fluid if necessary.

Figure 30 shows the proper tightening dimension measurements taken from inside the fixed and movable heads.

Figure 30-Tightening Dimension for a Plate Heat Exchanger

-The tightening dimension on the assembly drawing is expressed as a range of maximum and minimum distance for which the gaskets will seal. Tighten the unit to the average of the two dimensions. Measurement should be taken at each tie bolt adjusting the tie bolts within (+/-) 1/16” of each other.

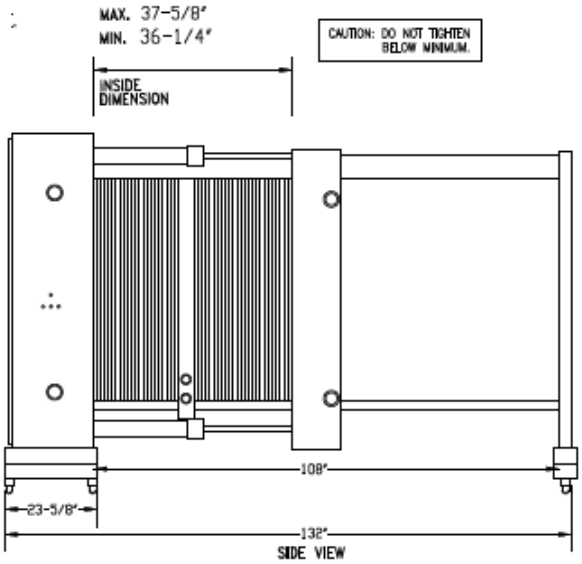

Figure 31 is an example tightening dimension from an assembly drawing. Refer to your assembly documentation for your tightening dimension.

Figure 31-Technical Drawing Tightening Dimension

6.7 Hydro Testing

-Once the unit is tightened to the average tightening dimension, install the pipes and test with water by operating the system.

-Units may also be tested with tap water or other means not exceeding the MAWP (Maximum Allowable Working Pressure).

-If the unit leaks externally, inspect the leaking area to ensure the gasket is seated and there are no visible defects in the area. If a defect is found, shutdown system and relieve pressure from the unit. Then remove pipes to the unit, disassemble the unit, repair the defect, reassemble and retest.

-If no visible defect is found shutdown the system and relieve the pressure. Tighten the unit to the recommended tightening dimension.

6.8 Plate Cleaning

-Plates can be cleaned with a soft bristled brush and cleaning solutions compatible with the plate materials. Stubborn glues and foulants may need to be soaked in heated baths of 20% caustic or phosphoric acid baths.
-Thermaline service centers provide chemical cleaning services.

6.9 Plate Inspection

-Plates are susceptible to corrosion attacks that may leave pinholes and cause fluids to intermix.
-Visually inspect the plate for any obvious defects paying close attention to the points where the plates come in contact with one another. If a pinhole exists, most it is commonly found to be at the contact points.
-To aid in the visual inspection of pinholes and cracks, hold the plate to a bright light to perform a visual light inspection.

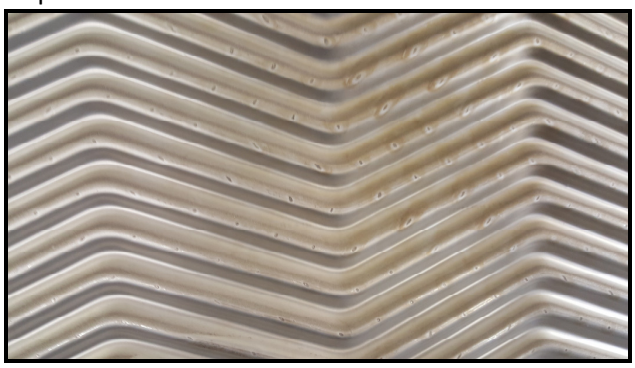

Figure 32 –Plate Contact Points

Figure 32 shows the contact points on a plate after a plate has been in service.

-A visual and light inspection may not reveal all defects. A dye test may be used to locate smaller defects.

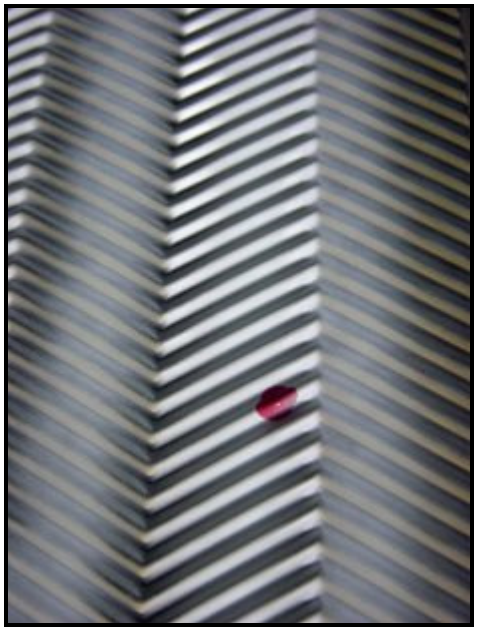

Figure 33 – Results of a Plate Dye Test

Figure 33 shows the results of a Pin hole detected with 2 part dye test system.

6.10 Plate Testing While Assembled in the Heat Exchanger

-Plates may be tested for cross contamination while assembled in the unit as an entire plate pack using the Thermaline CCT 4.0.

-CCT 4.0 is a pass/fail test or a primary test. If the unit passes there is no need proceed with secondary testing such as dye testing.

Figure 34 shows Thermaline's CCT 4.0 testing a two section heat exchanger for leaks and pinhole cracks.

Figure 34 – Thermaline's CCT 4.0

-CCT 4.0 can be operated by any trained personnel through Thermaline's online CCT training exercise.
-Visit Thermaline.com for maintenance plan options and more information on the CCT program.

6.11 Gasket Inspection

-Gaskets have a widely varying service life and their service life is dependent on your process.
-Gaskets should be inspected for cracks and defects when inspecting the unit.
-Pinch or roll the gasket to expose defects. Visit www.Thermaline.com/common/videos for a maintenance video about gasket inspection.
-Replace defective gaskets as necessary.

Notes: