SERVICE MANUAL

MESABI®

CSC™

(CAPTURED SEAL COOLER)

HIGH PRESSURE AIR-TO-OIL COOLERS AIR-TO-AIR COOLERS

Model CSC™ 350 Coolers (Maximum 350 psi; 2413 kPa)
Model CSC™ 500 Coolers (Maximum 500 psi; 3447 kPa)

Please read and follow instructions carefully before proceeding with any service work and/or repairs. Consult factory before proceeding with any possible warranty claims.

CONTENTS

CSC™ High Pressure Coolers

This service manual is available to print online at www.MESABI.com. A service video is also available for viewing online, or request a DVD from L&M Radiator. The service video does not replace the information contained in this service manual.

CSC™ coolers for pressures up to 500 psi (3447 kPa) feature tube-to-header seals held captive in the header plate. Once a tube is in place, the seal is compressed to make a tube-to-header seal capable of withstanding design pressures.

L&M RADIATOR GENERAL WARRANTY

Consult L&M before proceeding with warranty claims or repairs. Failure to do so may void this limited warranty. This limited warranty allocates the risk of failure of the product(s) between the Buyer and L&M and is reflected in the purchase price.

L&M warrants that MESABI® products will conform to L&M's written quotation specifications and drawings. MESABI® framework components are warranted for 18 months from the date of invoice against defects in materials and workmanship during normal usage. L&M warranty against seal leakage during normal operation is stated in individual product literature.

L&M's liability is limited to the rework or replacement (at L&M's sole option) of products or parts manufactured by L&M that are determined by L&M to be defective in workmanship or material or do not meet L&M's quoted specifications.

L&M product warranty does not apply if the product has been subjected to abnormal use or conditions, unauthorized modifications or repair, corrosion, misuse, neglect, abuse, accident, improper installation, or other acts which are not the fault of L&M, including damage caused by shipping.

L&M does not warranty products incorporated into L&M products that are not manufactured by L&M. Buyer's sole recourse with respect to such products will be subject to the warranty of the individual manufacturer.

OTHER THAN AS STATED HEREIN, L&M MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR ANY OTHER MATTERS WITH RESPECT TO THE SALE OF L&M PRODUCT(S) AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. IN NO EVENT WILL L&M'S LIABILITY INCLUDE ANY SPECIAL, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES, EVEN IF L&M KNEW OF THE LIKELIHOOD OF SUCH DAMAGES.

Any action or lawsuit for breach of the limited warranty in these L&M terms and conditions must be commenced in Minnesota. This warranty supersedes all previously published warranties.

MESABI® PRODUCT SPECIFIC WARRANTIES

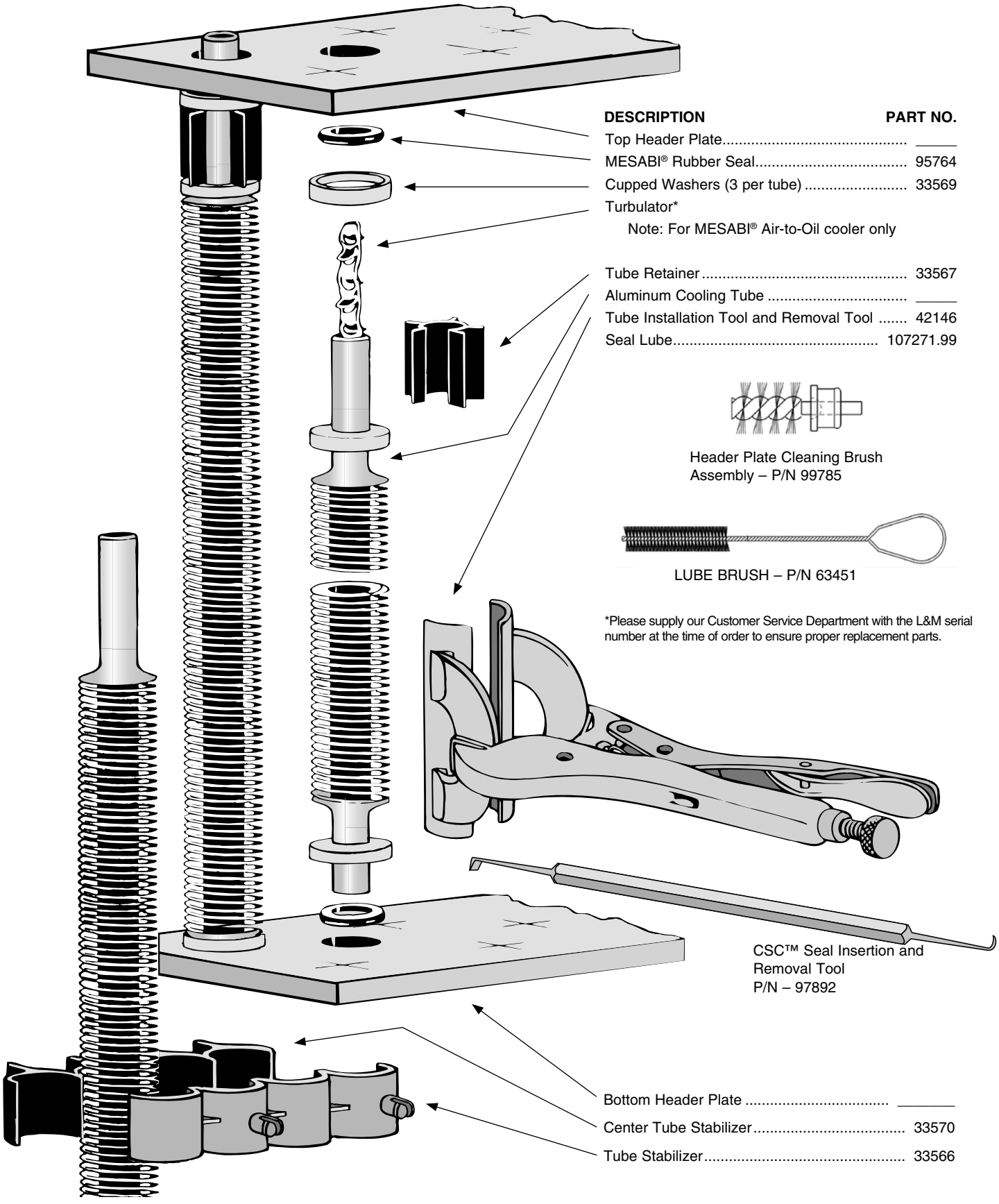
MESABI® CSC™ 350 coolers are covered by the L&M General Warranty along with the following Product Specific Warranty: L&M Radiator warrants the MESABI® CSC™ 350 cooler against seal leakage during normal operation for 48 months from date of invoice on new coolers.

MESABI® CSC™ 500 coolers are covered by the L&M General Warranty along with the following Product Specific Warranty: L&M Radiator warrants the MESABI® CSC™ 500 cooler against seal leakage during normal operation for 18 months from date of invoice on new coolers.

Standard Parts:

Models CSC™ 350 and CSC™ 500

Exploded view of a typical MESABI® Captured Seal Cooler.



DESCRIPTION	PART NO.
Top Header Plate	_____
MESABI® Rubber Seal	95764
Cupped Washers (3 per tube)	33569
Turbulator*	
Note: For MESABI® Air-to-Oil cooler only	
Tube Retainer	33567
Aluminum Cooling Tube	_____
Tube Installation Tool and Removal Tool	42146
Seal Lube	107271.99

Header Plate Cleaning Brush Assembly – P/N 99785

LUBE BRUSH – P/N 63451

*Please supply our Customer Service Department with the L&M serial number at the time of order to ensure proper replacement parts.

CSC™ Seal Insertion and Removal Tool P/N – 97892

Bottom Header Plate	_____
Center Tube Stabilizer	33570
Tube Stabilizer	33566

External Cleaning and Tube Removal

HELPFUL HINTS:

- Read this manual thoroughly
- Good lighting is a must
- Call L&M Customer Service with questions
- Work in a clean environment
- Use proper tools and lube

External Cleaning –

To maintain efficiency and assure maximum life of a MESABI® CSC™ cooler, reasonable care must be taken when cleaning.

In some cases, it may be best to blow out any dry dirt with shop air prior to washing core with the high pressure hot water washer. If there is any doubt about the cleaning method to be used, try the method on a portion of a single tube first, or contact L&M Customer Service.

For general external cleaning, a high-pressure hot water washer up to 1500 PSI (10,342 kPa) can be used. Unlike conventional cores, you can and should get right up next to the core with the wand. Starting from the air exit side, place the high pressure washer nozzle next to the fin, concentrating on a small area, slowly working from the top down. Make sure you spray straight into the core, not at an angle. Continue washing until the exit water is free of dirt. Repeat from the opposite side.

Many radiator shops use a hot alkaline soap or caustic soda in their boil-out tanks with chemical additives. Soaking in high pH solutions may damage the aluminum alloy, depending on the exact characteristics of the solution. Solutions that are either too alkaline (pH>9.0) or too acidic (pH<5.0) are not recommended.

Tube Stabilizer Bar Removal –

If your system was provided with tube stabilizer bars, remove them at this time.

Removing MESABI® Tubes –

After a thorough cleaning as described above, blow dry the core section, then remove tube retainer from top portion of tube as shown in **Fig. 1. NOTE:** Remember the proper orientation of the retainers and three cupped washers for reinstallation later.

CAUTION: Minimize the extraction angle and do not force the tube. Care must be taken not to damage tube or header plate tube hole. NOTE: To help minimize the extraction angle on coolers with three rows of tubes or more, remove two rows from one side and then turn the cooler over to remove the remaining rows.

With Installation Tool P/N 42146, grasp center portion of tube as shown in **Fig. 2.** Rotate the tool so as to break the tube free from the seal, then raise the tube only enough to clear the lower header plate and swing tube out just far enough to allow tube to be pulled down and out of the upper header plate, as shown in **Fig. 3.**

On some coolers (typically when tubes are longer than 30 inches) tube stabilizer bars will be required along with tube stabilizers between the rows. When tubes are longer than 60 inches there will be two stabilizer bars. The location of the center tube stabilizer sections should be noted and the stabilizers in each row should be collected and kept separate, row by row, to aid in the re-assembly.

Remove all tubes in the row, repeating the above procedure.

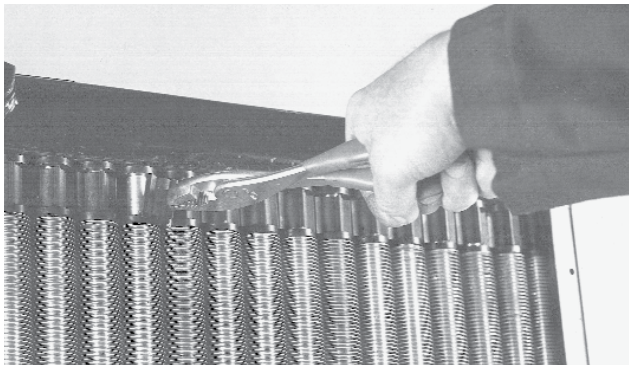


Fig. 1

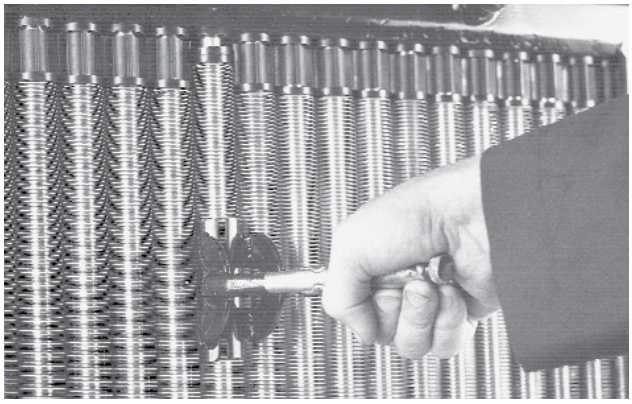


Fig. 2

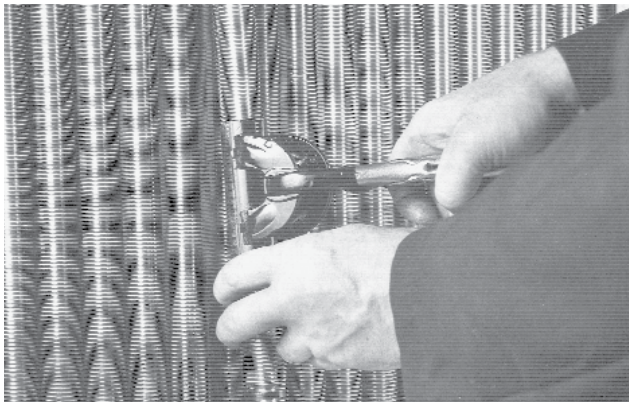


Fig. 3

Seal Removal, Header Plate Preparation and Seal Installation

CAUTION! Following these steps carefully will ensure the seals are removed properly, and that the seal groove is not scratched or marred.

After the tubes are removed, clean the header plate area again with a high-pressure washer; then blow the inside and outside surfaces of the tanks thoroughly dry with air.

Seal Removal and Header Plate Preparation –

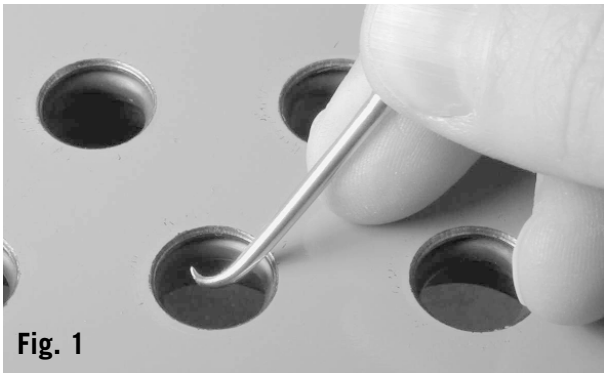


Fig. 1

Insert sharp pick end of tool P/N 97892 under the seal.

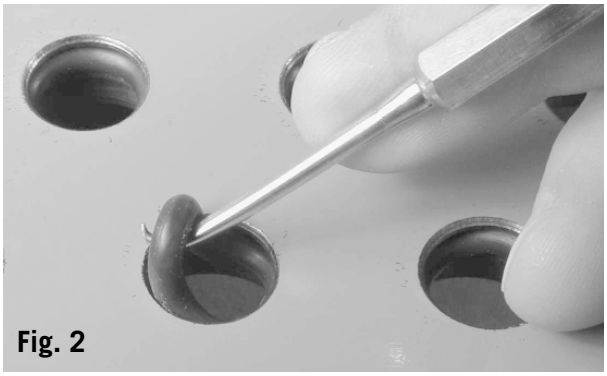


Fig. 2

Pull the seal out of the header plate; note the groove from where the seal came. **CAUTION: Seals that are inadvertently dropped into the tank must be removed.**

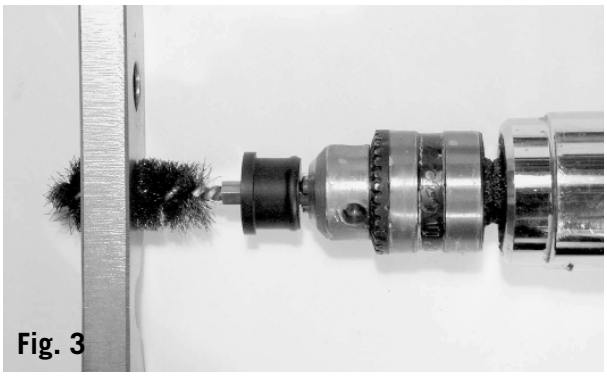


Fig. 3

Insert header plate cleaning brush P/N 99785 into a drill and clean the tube holes. Be careful not to damage the hole.

Clean the holes and tanks with air. Lube the tube holes with lube brush P/N 63451, using L&M Lube P/N 107271.99.

Seal Installation –


Fig. 4

Squeeze the seal as shown.

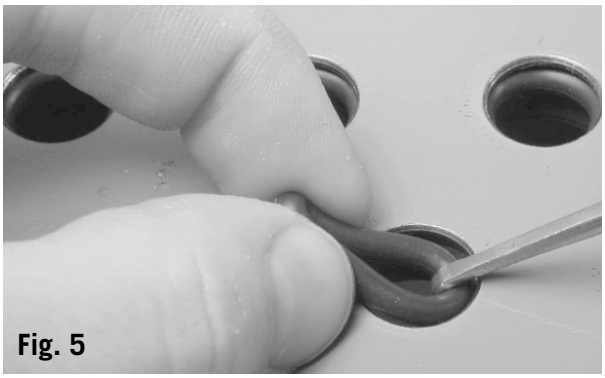


Fig. 5

Using the flattened end for the insertion tool P/N 97892, guide the seal into the header plate groove.


Fig. 6

Maintain the position of the tool to prevent the seal from dropping into the tank, and push the seal into the groove. **CAUTION: Seals that are inadvertently dropped into the tank must be removed.**

Make sure all the seals are seated properly and lube them with L&M Lube P/N 107271.99, using lube brush P/N 63451. Insert the tubes as per instructions on page 6.

Tube Installation, Final Assembly and Testing

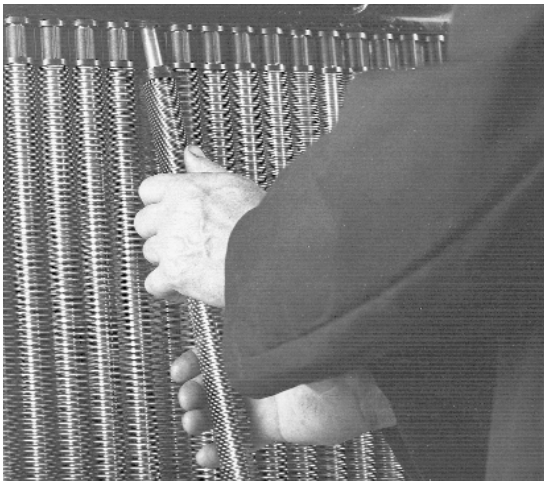


Fig. 1

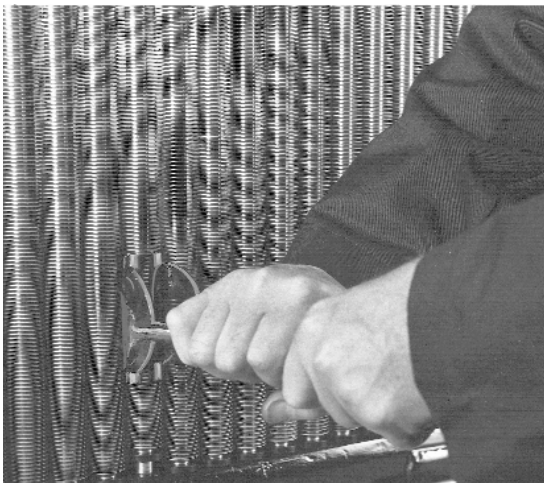


Fig. 2

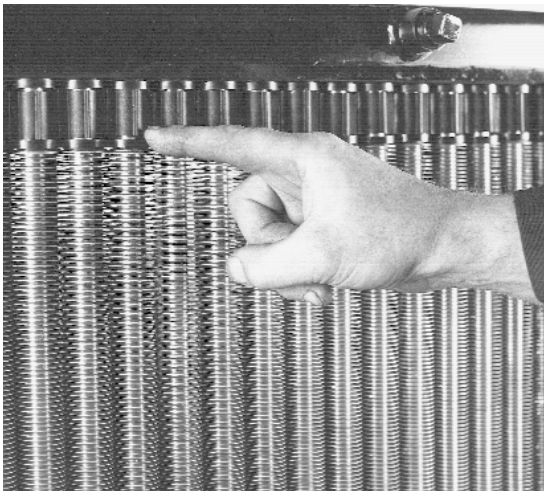


Fig. 3

Installing MESABI® Tubes –

IMPORTANT: Before inserting new or original tubes into header plates, new seals must be installed and lubed properly.

Prior to installing original tubes, tube ends must be clean of foreign material. A buffing wheel can be used. Precaution should be taken when buffing so as not to mar the tube end. Make sure the tube ends are wiped clean prior to lubrication.

Coat the outside ends of each tube with a small amount of Lube P/N 107271.99. Cupped washers should be installed as shown in the exploded view on pg. 3, prior to installing tubes. CAUTION: Minimize the insertion angle and do not force the tube. Care must be taken not to damage seal or tube. NOTE: To help minimize the insertion angle on coolers with three rows of tubes or more, push two rows from one side and then turn the cooler over to push the remaining rows. At a convenient starting point, push the top end of a tube (the top end of the tube is the end with the longest un-finned section) into the inlet side header plate seal, as shown in **Fig. 1.** Place bottom end of tube into respective seal in the bottom header plate. Push tube down and into seal until the washer is located on top of the header plate. This can usually be done by grasping the tube with your hands and pulling downward until seated, or by using Installation Tool P/N 42146, as shown in **Fig. 2.** Note: Be sure tube is properly centered in the seal before pushing the tube into place. Once the tube is in place, rotate it 180 degrees (this will allow the seal to seat).

Reinstall retainer clip between upper two washers, as shown in **Fig. 3**. Make sure wings on the retainer clips are positioned to block bypassing air.

Tube Stabilizer Assembly –

On some coolers (typically when tubes are longer than 30 inches) tube stabilizers will be required. When tubes are longer than 60 inches there will be two stabilizer bars. Before starting a second row of tubes, place the center tube stabilizer, P/N 33570, in position. Stabilizers should be lined up with the support bar location. Proceed with installation of the next row of tubes, using same procedure as when installing the first row.

Remember that a center tube stabilizer should be located BETWEEN each row of tubes before starting another row of tubes.

When tubes are completely installed, fasten the tube stabilizer bars to the sidemembers.

Testing –

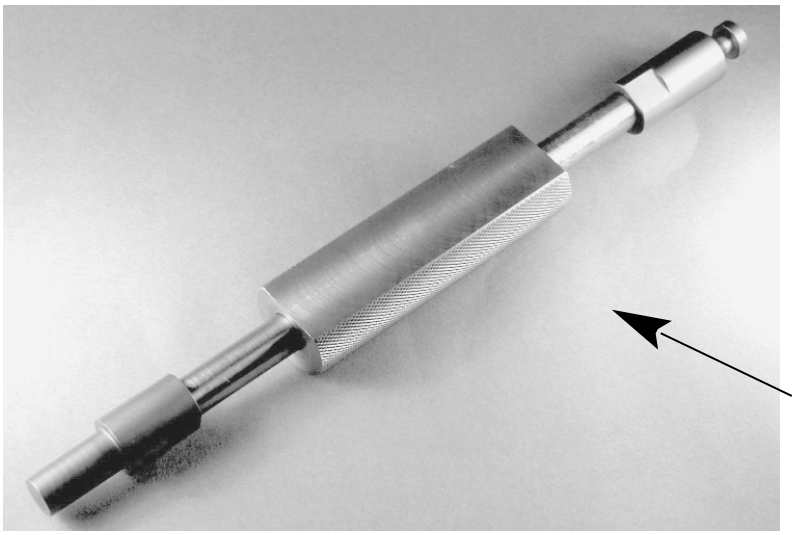
IMPORTANT: Coolers will be marked with the maximum operating pressure near the inlet. Call L&M if you are unsure. CAUTION: Full face protection must be worn when working on pressurized units. Test with stabilizer bars in place (if applicable). Use only appropriate high pressure fittings. Submerge the entire unit under water prior to applying any pressure. Keep unnecessary personnel away from the test area. **SAFETY FIRST!**

CSC™ 350 coolers can be tested to 400 psi (2760 KPa) maximum and CSC™ 500 coolers to 550 psi (3800 KPa) maximum. If you do not have equipment to test to these levels, test to the highest pressure your equipment is capable of, following manufacturer's guidelines.

During testing, note that air bubbles from trapped air in exterior pockets could appear for 10 to 15 minutes. This is normal. **Pressure should be applied slowly!** Cycle test four times by bringing the pressure up to the maximum (slowly) and down to zero and then back up to maximum pressure. On the last cycle, hold the pressure at maximum for 15 minutes. Stop the test immediately if any leaks are noted. Repair and test again.

Special Header Plate Repair

Note: The header plate on the CSC™ cooler is designed to withstand physical abuse. However, upon inspection, if a tube hole appears damaged, it may be repaired using the header plate repair tool P/N 99734 shown below. **Call L&M Customer Service for analysis of the damage before attempting repair.**



MESABI® Header Plate
Repair Tool P/N – 99734

Fig. 1

Fig. 2

When a header plate is determined to be repairable, the tool serves two purposes. First, one end slips under the damaged lip (**Fig. 1)** and by gently tapping (or pulling) the integral slide hammer up, the tool brings the lip back up to the desired flatness (**Fig. 2)**.

Once this is done, the other end of the tool is inserted into the hole (**Fig. 3)** and by gently tapping down with the slide hammer, the tool is forced into the hole. This action creates a hole of optimum diameter and roundess (**Fig. 4)**.

Fig. 3

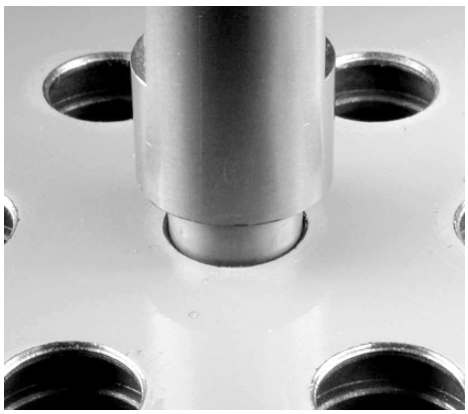


Fig. 4

MESABI® heat exchangers are the world standard for heat exchanger reliability

L&M RADIATOR FACTORY-DIRECT SALES AND SERVICE

Because so many of our radiators and heat exchangers are a custom design, all sales are on a factory-direct basis. This assures that our customers receive a product that meets their cooling / heating requirements, offered to them at the least possible price.

We ship most parts within 24 hours. On-site technical and engineering assistance is available almost anywhere in the world within a few days notice.

L&M QUALITY POLICY

"The Quality Policy of L&M Radiator is to produce a quality engineered, quality manufactured product through continuous improvement that we deliver to the customer's satisfaction."

Manufactured and distributed by:

L&M Radiator

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