

## SERVICE MANUAL



# High Efficiency Aluminum Tube CHARGE AIR COOLER

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

# MESABI® High Efficiency Aluminum Tube Charge Air Cooler



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### Captured seal provides dependable service

The MESABI® Charge Air Cooler (CAC) features a tube-to-header rubber seal that is held captive in the header plate by a special sealing process. The flexible seals absorb stresses and thermal expansion that can cause conventional coolers to fail.

The CAC has all the features of MESABI® flexible core heat exchangers.

- Lightweight aluminum cooling tubes and frame.
- Field-repairable using simple hand tools.
- For air-to-air heat exchange.

This service manual is available to print online at [www.MESABI.com](http://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.

### L&M RADIATOR, INC. 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.

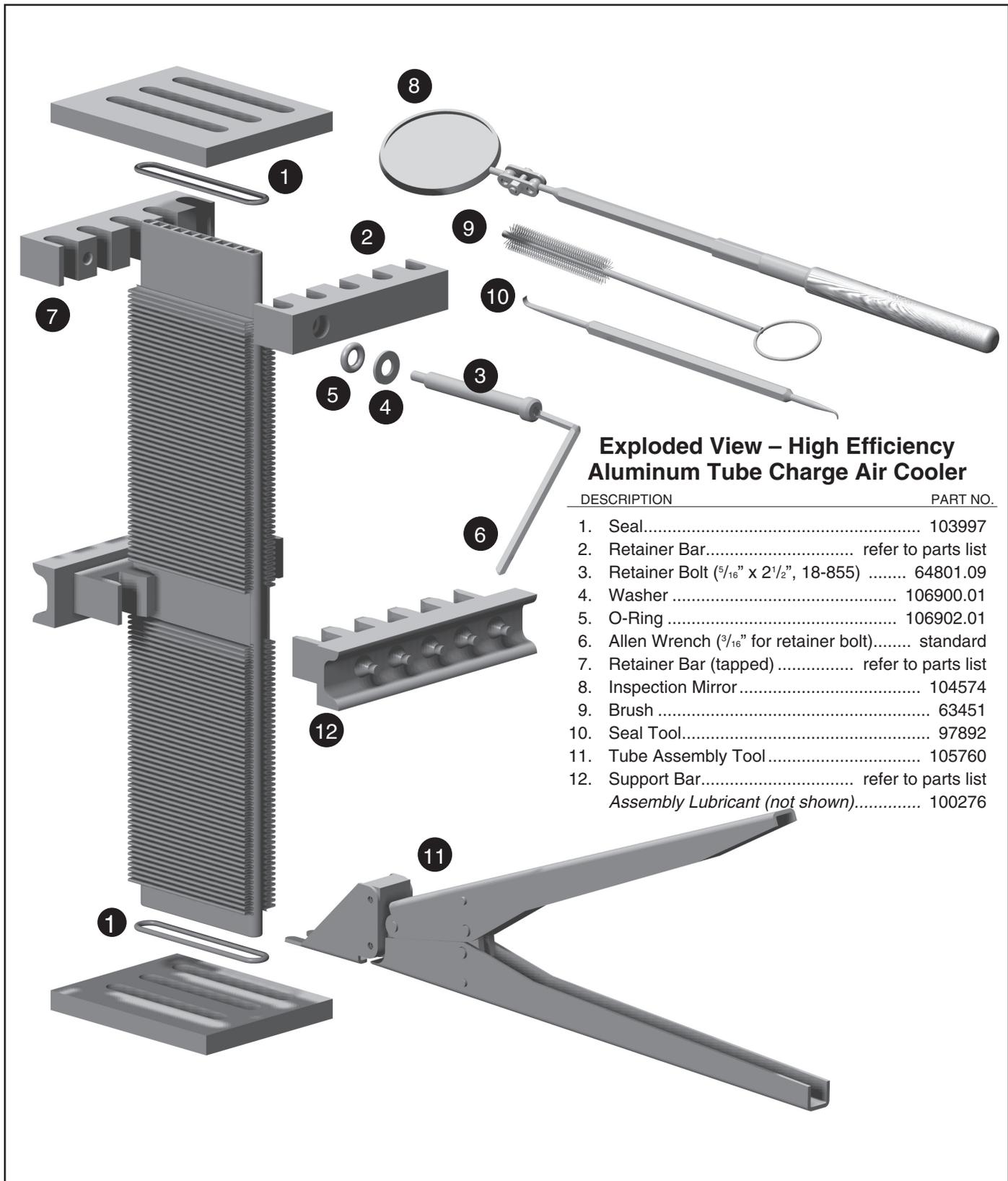
Any action or lawsuit for breach of the limited warranty in these L&M terms and conditions must be commenced in Minnesota. This warranty supersedes all previously published warranties.

### MESABI® PRODUCT SPECIFIC WARRANTY ALUMINUM TUBE CHARGE AIR COOLER

MESABI® aluminum tube charge air coolers are covered by the L&M General Warranty along with the following Product Specific Warranty:

L&M Radiator warrants MESABI® aluminum tube charge air coolers against seal leakage during normal operation for 18 months from date of invoice.

# Standard Parts – MESABI® Charge Air Cooler



**Exploded View – High Efficiency Aluminum Tube Charge Air Cooler**

DESCRIPTION	PART NO.
1. Seal.....	103997
2. Retainer Bar.....	refer to parts list
3. Retainer Bolt ( $\frac{5}{16}$ " x $2\frac{1}{2}$ ", 18-855) .....	64801.09
4. Washer .....	106900.01
5. O-Ring .....	106902.01
6. Allen Wrench ( $\frac{3}{16}$ " for retainer bolt).....	standard
7. Retainer Bar (tapped) .....	refer to parts list
8. Inspection Mirror .....	104574
9. Brush .....	63451
10. Seal Tool.....	97892
11. Tube Assembly Tool.....	105760
12. Support Bar.....	refer to parts list
Assembly Lubricant (not shown).....	100276

## External Cleaning and Tube Removal

### HELPFUL HINTS:

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

### External Cleaning

To maintain efficiency and assure maximum life of a MESABI® Charge Air 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 the core with a high pressure hot water wash. 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, high pressure hot water (with or without soap) can be used at pressures up to 1200 psi (8274 kPa). **(CAUTION! To prevent fin deformation, stay at least 6" away from the core and you must spray straight into the core – not at an angle. If the cooler is still in the machine, you may have to use an offset angled nozzle so that you can spray straight into the core. If there is any doubt, try your cleaning method on a small portion of the core first.)**

It is important to start on the air exit side. Work from the top to the bottom. Concentrate on small areas and work slowly. Wash until the water exiting the opposite side is free from dirt and debris. Complete this side and then repeat the process from the other 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.



Fig.1

### Removing MESABI® Tubes

After a thorough cleaning as described previously, blow the cooler dry, then remove the retainer bar from tubes as shown. When reinstalling tubes, the long unfinned tube end and retainer bar will need to be installed at this tank – see figure 14, page 6. Use a standard 3/16" Allen wrench to remove bolts from retainer bar. **NOTE: Mark the tank from which the retainer bar is removed.**

Fig.2



Fig.3



Slide the front end of the tube assembly tool between the header plate and the fin on a single tube. Then squeeze the handle together. The tube will become free from the lower seal. With the tube tool still on the tube, pull the tube out of the core as shown in Fig 2. Then remove tool and use hands to pull tube from upper seal as shown in Fig 3.

**CAUTION: Minimize the removal angle and do not force the tube out. Care must be taken to not damage the tube.**

## Seal Removal and Header Plate Preparation

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

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

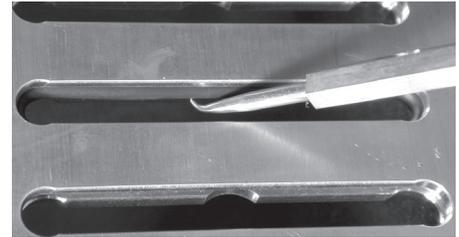


Fig. 4 Insert the pick end of the seal tool under the seal and pull out slightly. ▶

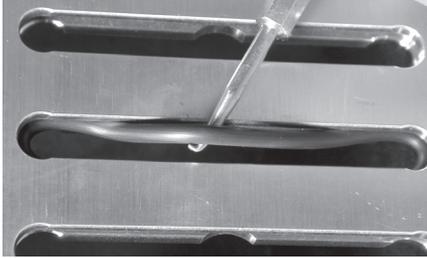


Fig. 5 Insert the seal tool between the seal and groove then remove the seal from the groove.

**(Seals that are inadvertently dropped into tank must be removed.)**

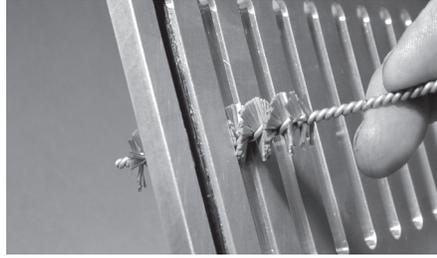


Fig. 6 Insert a clean brush into the header plate tube hole. Rotate the brush to remove any debris that may be in the groove. Use clean compressed air to blow tanks clean.



Fig. 7 With a clean brush apply assembly lubricant to the seal groove. Do this by putting lubricant on the brush, and inserting it into the seal groove and use a twisting motion to spread an even coat in groove. (Use a pea sized amount of lubricant per hole.)

## New Seal Installation



Fig. 8 Use the flat hooked end of the seal tool, pull the seal into an oval shape and insert one end of seal into the seal groove.



Fig. 9 With your finger, push the other end of the seal into the groove while controlling the opposing end with the flat end of the seal tool.



Fig. 10 Use the back of the seal tool to press the seal firmly into the groove.



◀ Fig. 11 To avoid pinching the seal between the tube and groove, a small amount of lubricant may be needed to hold the seal tightly to the long sides of the groove.

Fig.12 Use the brush to smooth any excess lubricant. ▶

**NOTE:** The seal needs to be completely seated into the groove in order for tube to be installed properly.



## Tube Installation

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

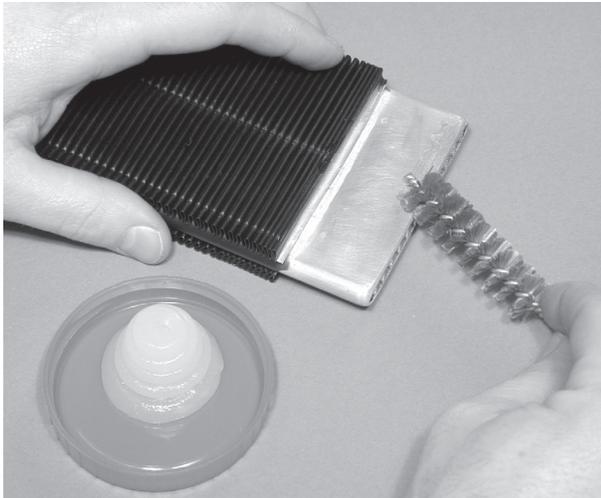


Fig. 13 Prior to installing tubes, the tube ends must be clean and undamaged. (A cloth buffing wheel can be used.) Precaution should be taken when buffing so as not to mar the tube finish. Use a brush and assembly lubricant to apply a thin film on the first 1/4" of tube ends.

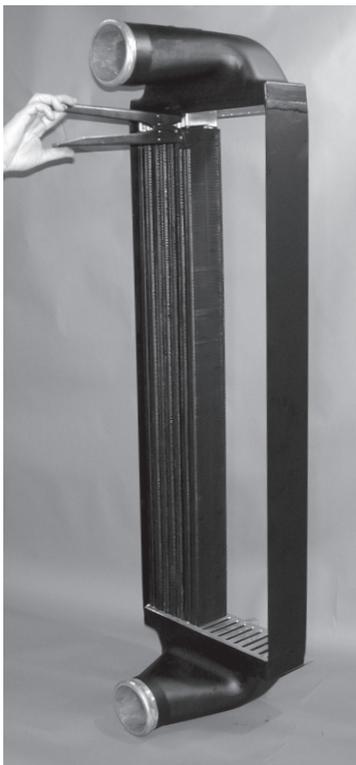


Fig. 14 At a convenient starting point, push the top end of the tube (end with the longest unfinned section) into the tank marked earlier when the retainer bar was removed. See Figure 1.



Fig. 15 Place the bottom end of the tube into respective seal in the bottom header plate.

**CAUTION:** Minimize the insertion angle and do not force the tube. Care must be taken not to damage seal or tube.



◀ Fig. 16 Push the tube down and into the seal until the fin 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 the tube assembly tool.

**CAUTION:** Be sure the tube is properly centered in the seal before pushing the tube into place.



Fig. 17 Using a light and inspection mirror, inspect each seal after tube insertion. Look for seal protruding into the tank.

## Retainer Bar Installation and Final Assembly

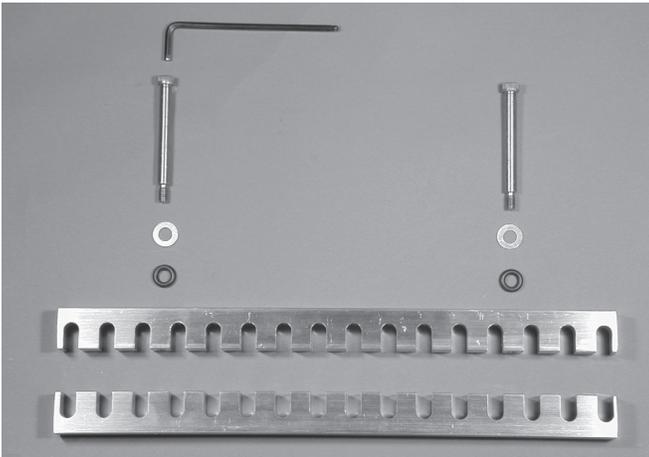


Fig. 18 RETAINER BAR SYSTEM.

**NOTE:** Use high temperature anti-seize product on threads to aid in removal.

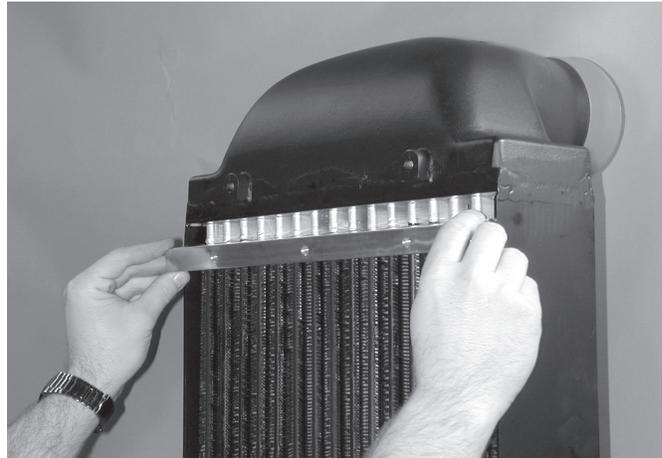


Fig. 19 Insert the tapped (threaded) retainer bar into the back side of the cooler.

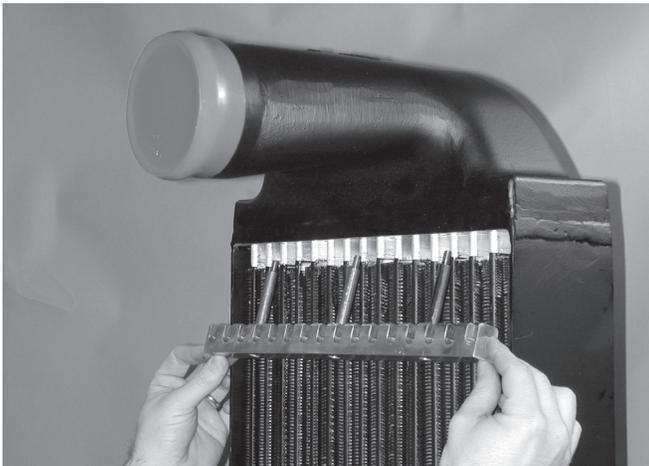


Fig. 20 Insert the front retainer bar, with retainer bolts, washers and o-rings through cooler.

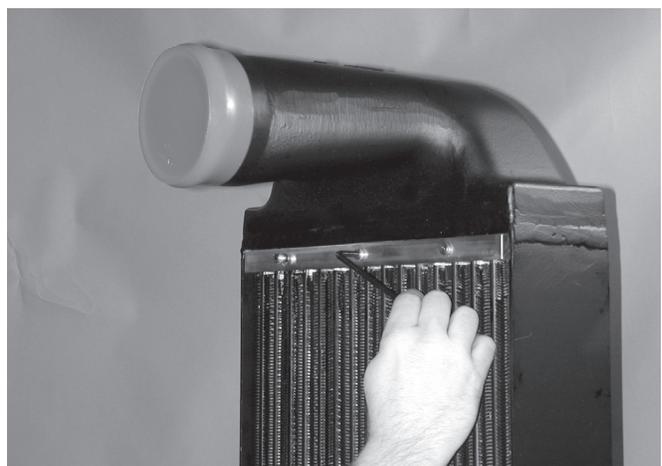


Fig. 21 With a 3/16" Allen wrench, tighten bolts to 45 inch pounds of torque.

## Pressure Testing

**Pressure testing procedure that follows recommends testing to 50 psi (345 kPa). You should test to pressure rating specified on tag attached to your cooler. If there is no pressure rating specified, please contact L&M Customer Service with the part number of your cooler. Always bring pressure up slowly and use personal protection gear. Tube retainer and support bars (if applicable) must be installed prior to testing.**

1. Install fittings or cover plates in or over all ports. One port to have an air supply connector.
2. Pressurize with shop line pressure not exceeding 50 psi (345 kPa) and submerge in water. Repair or tighten fittings

to eliminate leaking. Note that air bubbles from trapped air in exterior pockets could appear for 10 to 15 minutes. This is normal. Repeat as needed until no leaks are detected.

3. After successful pre-testing to find and repair major leaks, then cycle test. Pressurize to 50 psi (345 kPa) and hold submerged for 15 minutes. Repair any leaks that occur and repeat until you have reached a 15 minute time period successfully. Then cycle to zero and pressure back to 50 psi (345 kPa) and hold for one minute. Repeat this process three more times and hold the last cycle for five minutes. After any repairs in this stage, start the cycling testing over from the beginning until you have a successful test.

• If you have any questions regarding the procedures described in this Service Manual, please contact L&M Radiator and ask for Customer Service. See back page for contact information.

• All information, illustrations and specifications in this Service Manual are based on the latest information at the time of publication or posting online at [www.MESABI.com](http://www.MESABI.com). The right is reserved to make changes at any time without notice.

# MESABI<sup>®</sup> 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."*



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