

DS1 Radiator Installation, Operation, and Maintenance Instructions

Installation

- 1) Inspect units for shipping damage before removing them from the pallet. Pay close attention to the core to ensure that there hasn't been any fin and tube damage.
- 2) Exercise care when moving the system. The radiators are on pallets that allow easy forklift handling.
- 3) The units will typically have a semi-black paint finish. If additional paint is required, it may be applied to all external ferrous surfaces, making sure all tank connections are covered. Do not add paint to the core itself, for it will impede airflow and heat transfer.
- 4) To remove the unit from the pallet, remove the lag screws on the pallet.
- 5) The unit can now be lifted with an overhead crane using holes located on the sides of the radiator. Lift the core slowly to ensure that it is properly balanced.
- 6) Locate the system where there are few obstructions impeding discharge or inlet airflow. If the unit is connected to a duct, the ducting should be larger in area than the core face and contain only straight runs with long radius turns. If the system is located inside, ensure that the room is properly ventilated. If the system is outside, orient the unit in order to take advantage of prevailing winds and to prevent recirculation of the air, which could hurt the heat transfer capabilities.
- 7) Remove all caps on the tank connections.
- 8) Flexible connections or non-rigid plumbing should be used to allow thermal expansion of the core, insulation from vibration, and freedom from static loading.
- 9) If the radiator design incorporates a sealed deaeration baffle in the top tank, there is a "fill line" fitting which must be piped to allow for filling. A suggested method for piping to allow for this filling process to occur is as follows:
 - 9a) Install piping, tubing, or hose, from the "fill line" fitting down to the Suction (inlet) side of the engine pump. This is typically done with a tee into the piping at the pump inlet. Doing this will allow water entering the "fill line" to flow down the "fill line" and to fill the engine water jacket from the bottom up. Additionally, a line should be installed from the pump side of the thermostat housing to the high point of the system (quite often the radiator top tank). This will allow air to vent from the engine as it fills from the bottom up.
 - 9b) Other acceptable procedures may be available from the engine manufacturer or dealer. Failure to fill the radiator and engine properly may lead to air blockages causing damage to the engine, radiator, and other components.
- 10) **Do not constrain the top tank in any way.** It must be free to allow for thermal expansion.

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- 11) For units with electric motors - Ensure that the motor voltage and frequency match the electrical supply. Connect motor leads so that rotation of forced draft blower fan is counter-clockwise when viewed from fan side of unit unless fan is supplied with left-handed blades. Wiring of motor, control, overload protection and grounding should meet the National Electric Code and local building codes.
- 12) Proper precautions must be taken when radiator is stored in a damp or salt-laden atmosphere, particularly with electric motors, which may have had their drain holes become corroded and clogged, allowing for accumulation of moisture within the motor housing.
- 13) For FR (Fan on Radiator – Engine Driven) Units - Belt tension and deflection should be set to the belt manufacturer's specifications. Tensioning the belt over these specifications can cause damage to the system. Proper sheave alignment and belt tension ensures that sufficient power will be transmitted to the fan, and prevents belt and / or bearing wear. Note: The radiator is designed for the use of a Poly-V belt system. Types of belts other than Poly-V may require higher belt tensions, creating more force on the radiator support structure than what it is designed to handle. Therefore, a Poly-V belt system should be used.
- 14) For FE (Fan on Engine) Units - When inserting the fan into the fan shroud, the fan should be oriented parallel with the core face and centered in the opening. Please note that the shroud allows vertical adjustment, but not horizontal. The shroud is designed as a sharp edge orifice; therefore, the leading edge and two thirds of the fan should be on the outside of the shroud opening.

Operation

- 1) If the cooling fluid is water, fill the unit from a clean and chemical free source. Use antifreeze if freezing is possible. If antifreeze is not used, the water should be treated with a suitable corrosion inhibitor.
- 2) Dry out motors thoroughly which have been stored in a damp location before operating. Do not exceed a temperature of 185 °F while drying.
- 3) Ensure that the unit is not exposed to excessive vibration resulting from a fan imbalance.

Maintenance

- 1) Periodically check for leakage from the core or tank connections.
- 2) Inspect the liquid level at regular intervals using the top tank level gauge.
- 3) Test antifreeze before cold weather periods.
- 4) If unit is on stand-by for long periods of time, check the interior of the top tank through the fill neck for signs of scale or rust every one to three months. If necessary, the radiator should be cleaned, flushed, and treated. Contact vendor if needed.

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- 5) Dirt and debris can be removed from the core face with compressed air, steam, or water, if required. If water is used, slowly increase the pressure and stand at least 3 feet away from the core. Keep the water stream parallel with the fins in order to avoid damaging them. Note: Ensure that fins and tubes are not damaged from rough brushing or excessive jet pressure of the steam, air, or water.
- 6) Clean fan blades once per year. Use a stiff brush or an air nozzle for loose dirt and a non-flammable solvent with brush for solid deposits. Care must be taken not to damage the fan blades as a resulting outof-balance condition might cause vibration and damage to fan bearings or motor bearings.
- 7) The fan drive system should be checked periodically (depending on usage) to prevent equipment damage or failure.
 - 7a) Check and maintain alignment of sheaves by adjusting their location on fan shaft and idler shaft.
 - 7b) Check and maintain correct tension of fan belts by adjusting the idler.
 - 7c) Check for frame imbalance, bearing wear, or loose drive components.
- 8) Bearings should be lubricated at regular intervals depending on usage. See table Below.

Operating Condition	Bearing Temperature	Grease Interval
Clean	32 – 120 °F	6 to 12 months
	120 – 160 °F	1 to 3 months
	160 – 200 °F	1 to 4 weeks
Dirty	32 – 160 °F	1 to 4 weeks
	160 – 200 °F	Daily to 1 week
Moisture	32 – 200 °F	Daily to 1 week

- 9) The lubricant should be a #2 Lithium-based grease formulated from a high quality mineral oil with rust and oxidation inhibitors, EP additives, and a minimum viscosity of 500 SSU at 100 °F. Examples of this type of lubricant are as follows: Texaco Multifak EP2, Mobil Mobilith AW2, Shell Alvania EP2, Chevron Dura Lite EP2, and Amoco Amolith 2EP. Re-lubrication of the bearings should be performed with the bearings rotating, and should be discontinued when clean grease has purged through the seal, regardless of the quantity added. Approximate quantities are listed below:

Shaft Size	Amount (OZ)
1-3/16 to 1-1/4	0.03
1-3/8 to 1-7/16	0.06
1-1/2 to 1-11/16	0.08
1-3/4 to 2	0.10
2-3/16 to 2-1/2	0.13
2-11/16 to 3	0.2
3-3/16 to 3-1/2	.3
3-15/16 to 4	.5
4-7/16 to 4-1/2	.6
4-15/16 to 5	.9

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- 10) Inspect motor at regular intervals. Keep the motor clean and ventilation openings clear. To clean motors use a soft brush and, if necessary, a slow acting solvent in a well-ventilated room.
- 11) Re-lubricate motors with GE grease D6A2C14 or any Polyurea thickened grease according to the intervals listed in the chart below. The motor will most likely be a Totally Enclosed Fan Cooled (TEFC) Motor. To re-lubricate these motors, remove the caps on the fan cover for access to the grease plugs. On the drive end and opposite drive end of motors with pipe plugs, insert a lubrication fitting. Remove the other plug for grease relief of all motors. Clean grease relief opening of any hardened grease. Be sure fittings are clean and free of dirt. Insert a pipe cleaner down the relief hole. Using a low-pressure, hand-operated grease gun, pump in clean recommended grease until new grease appears on the pipe cleaner. After lubricating, allow the motor to run for ten minutes before replacing the relief plug.

Application	HP Range	Lubrication Interval Horizontal	Lubrication Interval Vertical
Normal	1.0 – 7.5	4 years	1.5 years
	10 – 40	1.5 years	6 months
	50 – 150	9 months	3 months
High – Ambient and/or Dirty Environment	1.0 – 7.5	9 months	6 months
	10 – 40	4 months	3 months
	50 – 150	4 months	2 months

- 12) A clean engine cooling system prolongs the life and increases the efficiency of your power unit. A rust inhibitor should be used in new installations and after each cleaning. A radiator flush solution is also suggested for use during scheduled maintenance. Many commercially available products may be used.
- 13) Tanks are removable by unbolting all attached bolts. **DO NOT REMOVE MORE THAN ONE (1) TANK AT A TIME.**
- 14) Check the bolt torque of the motor mount at regular intervals to prevent changes in alignment and possible damage to the equipment. If bolts and nuts are replaced, be sure to use a washer and or flanged bolt and nut. Use the chart below to determine the proper torque.

Bolt Size	Torque (ft-lb)
5/16	25
3/8	45
1/2	95
5/8	195
3/4	365

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Belt Tensioning Maintenance

- 1) Measure the belt span (center line of pulley #1 to center line of pulley #2).
- 2) Determine the middle of the belt from the measurement taken in step 1.
- 3) Press on the V-Belt at the middle point and measure the deflection from its original position.
- 4) The maximum deflection needs to be between ½ inch and 1.0 inch.
- 5) Make the necessary adjustments to the motor mounts until belt deflection falls into the displacement range listed in step 4.
- 6) Check the pulley alignment on the motor shaft for angularity.
- 7) Adjust the motor and pulley to eliminate or reduce the pulley angularity.
- 8) Engage power to motor and observe belt tracking in pulley V-Groove and for excessive belt deflection during operation.
- 9) Turn OFF the power to the motor.
- 10) Make the necessary adjustments to the motor mount to achieve optimum performance.