

Fluid Cooling Mobile MF Series

Performance Notes

- Similar to M Series with DC fan or hydraulic motor
- 3/8" tube size
- Aluminum fins
- Low amp draw 12 or 24 volt DC motor
- Heavy duty construction
- Long life hydraulic motors
- Heat removal to 50,000 BTU/HR
- Oil flows to 150 GPM
- Mounting brackets included
- SAE, NPT or 37° flare oil connections
- Rugged steel manifolds



Ratings

Maximum Operating Pressure
 300 PSI

Maximum Operating Temperature
 350°F

Hydraulic Motor Displacement
 .22in³/Rev.

Maximum Hydraulic Motor Pressure
 2000 PSI

Maximum Allowable Hydraulic Motor Back Pressure
 1000 PSI

Materials

Tubes Copper

Fins Aluminum

Turbulators Steel

Manifolds Steel

Fan Assembly High Impact Plastic

Internal Pressure Bypass Options

MFR-15
 3/4", external, all steel valve. Available in either 30 PSI or 60 PSI settings. May be removed for servicing.

MFR-30, MFR-60
 1½", external, all steel valve. Available in either 30 PSI or 60 PSI settings. May be removed for servicing.



Number of Fans	DC Current Required		Hydraulic Motor Data		
	12 V	24 V	Oil Flow Required (GPM)	Minimum Operating Pressure (PSI)	Maximum Fan Speed (RPM)
1	12.5 amps	6.3 amps	2.1	300	2200
2	25 amps	12.6 amps	4.2	300	2200

How to Order

Model Series

MF

MFR - Internal pressure bypass included

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Model Size Selected

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Connection Type*

1 - NPT

2 - SAE

3 - BSPP

7 - 37° Male Flare

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Motor Specification

NM - No Motor

4A - 12 Volt DC

4B - 24 Volt DC

9 - Hydraulic Motor

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Bypass

Blank - No Bypass

30 - 30 PSI

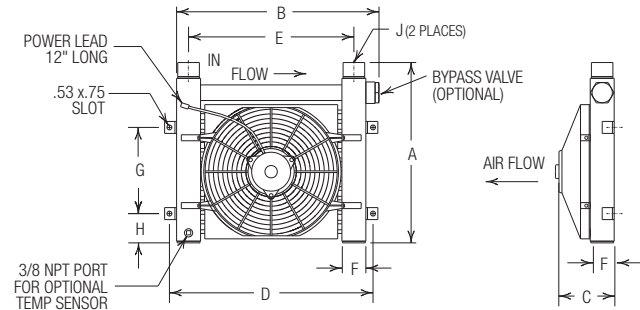
60 - 60 PSI

ADD FOR MFR MODELS ONLY

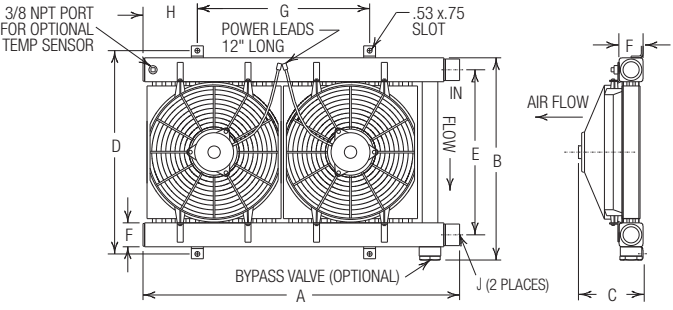
This is a partial flow pressure bypass only. It is not designed to be a full flow system bypass.

Dimensions - 12 & 24 Volt DC Motors

Models MF-15 and MF-30



Model MF-60



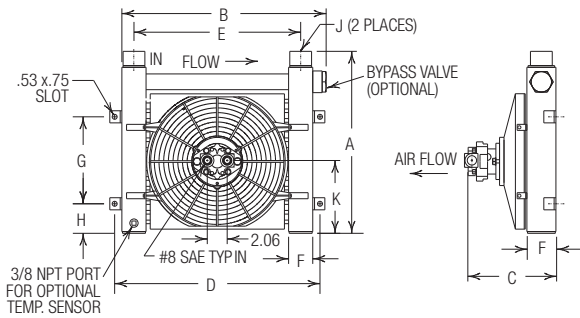
Units shown with optional internal pressure bypass

Model	MF	MFR	MF	MFR	C	D	E	F	G	H	J		Shipping Weight (LBS)
											NPT	SAE	
MF-15	13.88	15.88	15.75	17.41	4.99	17.25	14.25	1.50	9.00	1.88	1.00	#16	27
MF-30	16.58	18.83	19.75	21.12	6.10	21.25	17.25	2.50	9.00	3.06	1.50	#24	41
MF-60	30.83	33.08	19.75	21.12	6.10	21.25	17.25	2.50	18.00	5.68	1.50	#24	78

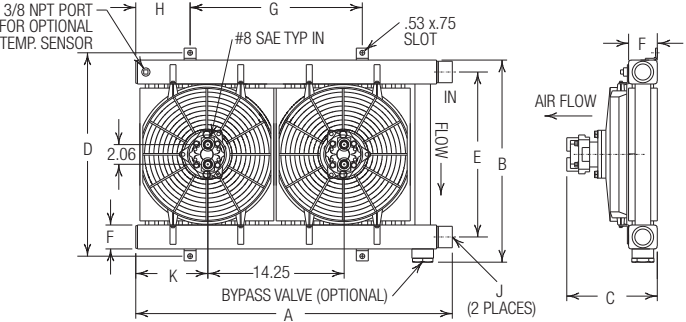
Note: All dimensions are in inches. We reserve the right to make reasonable design changes without notice. *Inlet and Outlet connections can be reversed when the internal bypass is not used.

Dimensions - Hydraulic Motors

Models MF-15 and MF-30



Model MF-60

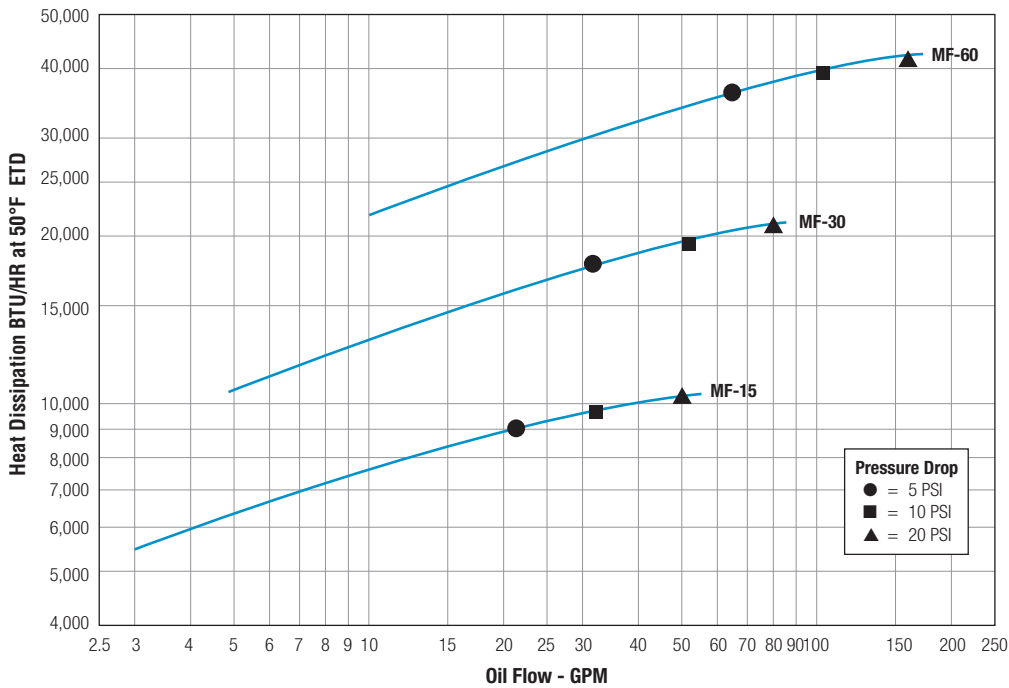


Units shown with optional internal pressure bypass

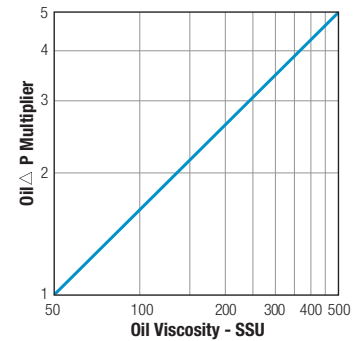
Model	A		B		C	D	E	F	G	H	J		Shipping Weight (LBS)
	MF	MFR	MF	MFR							NPT	SAE	
MF-15	13.88	15.88	15.75	17.41	7.87	17.25	14.25	1.50	9.00	1.88	1.00	#16	27
MF-30	16.58	18.83	19.75	21.12	8.96	21.25	17.25	2.50	9.00	3.06	1.50	#24	41
MF-60	30.83	33.08	19.75	21.12	8.96	21.25	17.25	2.50	18.00	5.68	1.50	#24	78

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Performance Curves



Oil Pressure Correction



Selection Procedure

Performance Curves are based on 50 SSU oil entering the cooler 50°F higher than the ambient air temperature used for cooling. This is referred to as a 50°F ETD

STEP 1 Determine the Heat Load. Heat load may be expressed as either horsepower or BTU/HR To convert horsepower to BTU/HR:
 $\text{BTU/HR} = \text{Horsepower} \times 2545$

STEP 2 Determine Entering Temperature Difference. The entering oil temperature is generally the maximum desired oil temperature.
 Entering oil temperature – Ambient air temperature = ETD

STEP 3 Determine the Corrected Heat Dissipation to use the curves.

$$\text{Corrected Heat Dissipation} = \text{BTU/HR heat load} \times \frac{50^\circ\text{F} \times \text{Cv}}{\text{ETD}}$$

STEP 4 Enter curves at oil flow through cooler and curve heat dissipation. Any curve above the intersecting point will work.

STEP 5 Determine Oil Pressure Drop from Curves:

● = 5 PSI ■ = 10 PSI ▲ = 20 PSI Multiply pressure drop from curve by correction factor found in oil Δ P correction curve.

Oil Temperature

Typical operating temperature ranges are:

Hydraulic Motor Oil	120°F - 180°F
Hydrostatic Drive Oil	160°F - 180°F
Engine Lube Oil	180°F - 200°F
Automatic Transmission Fluid	200°F - 300°F

C_v Viscosity Correction

Average Oil Temp °F	OIL				
	SAE 5 110 SSU at 100°F 40 SSU at 210°F	SAE 10 150 SSU at 100°F 43 SSU at 210°F	SAE 20 275 SSU at 100°F 50 SSU at 210°F	SAE 30 500 SSU at 100°F 65 SSU at 210°F	SAE 40 750 SSU at 100°F 75 SSU at 210°F
100	1.14	1.22	1.35	1.58	1.77
150	1.01	1.05	1.11	1.21	1.31
200	.99	1.00	1.01	1.08	1.10
250	.95	.98	.99	1.00	1.00

Thermostatic Temperature Control Option (DC)

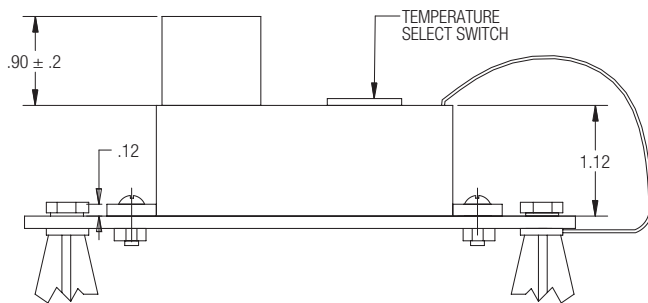
This controller was designed to mount on the cooler without requiring extensive wiring or plumbing. It provides accurate temperature control by cycling the cooling fan(s) to maintain desired oil temperature.

- 12 or 24 volt operation
- Adjustable temperature settings range from 100°F thru 210°F
- For use with one or two fan models — two fans need additional relay
- Temperature sensor provided
- Wiring provided for remote manual override
- Mounting hardware included

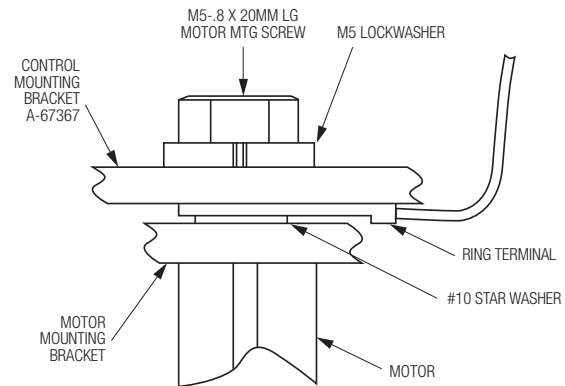
Part Number	Description
96171	Electronic Fan Control Kit
68790	Replacement Control Only
67699	Replacement Sensor Only



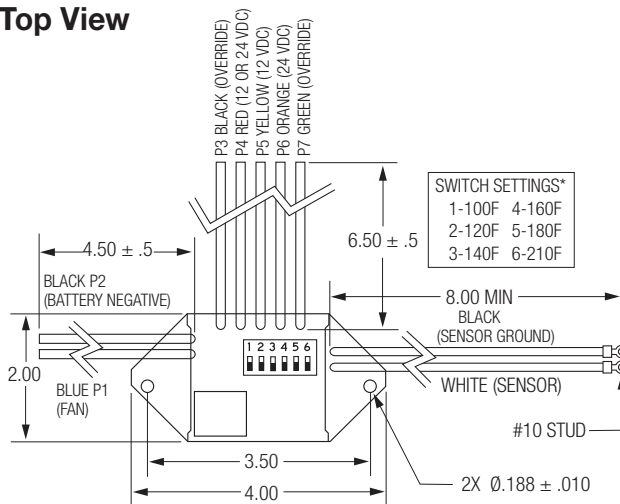
Side View



Connection Assembly

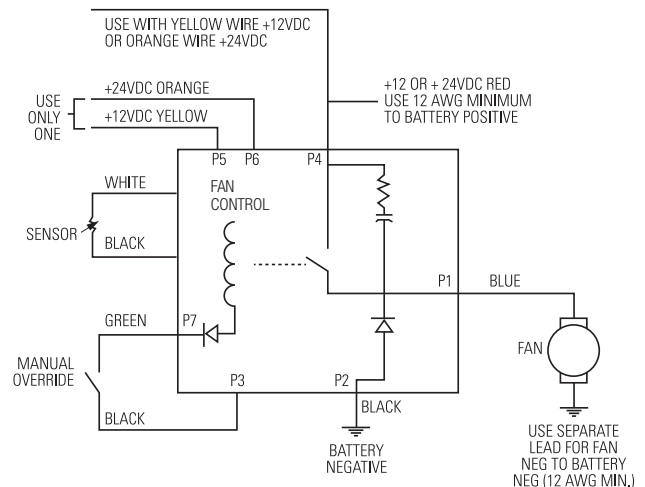


Top View



*Only one temperature setting can be activated at a time.

Electrical Schematic



NOTE: This switch should be fused to prevent damage if ground is lost. A 30 amp fuse is required in the power supply.

MF / DF Series

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General Information

1. Air Cooled "MF and "DF" Mobile Series coolers are built for operation with maximum oil pressures to 300 PSI and temperatures to 350°F.
2. Care must be taken to reduce or eliminate dirt and debris from blocking the cooling surface as overheating could result.

Installation

1. These coolers are designed for mounting by "L" shaped brackets attached to the sides of the manifolds.
2. It is recommended that these units be installed with the oil ports positioned as shown below.
3. Units should **not** be located in corrosive atmospheres as rapid deterioration of cooling coil, and/or manifolds may take place resulting in reduced service life.
4. Piping should be sized based on oil flow and pressure drop requirements, not on the oil coolers port sizes.
5. Turn fan blade manually to assure proper clearance before motor start-up in case it has been damaged in shipment.

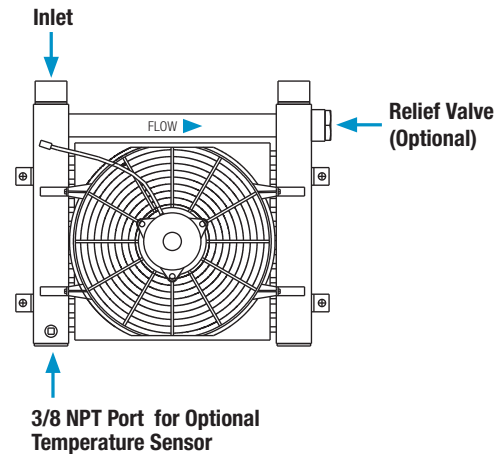
NOTE: Oil port position is at customer option, however, the cooler must be flooded with oil to take full advantage of cooling potential.

Maintenance

1. The cooler should be inspected regularly for corrosion and dirty or clogged heat transfer surface. Dirt and dust can be removed by washing, brushing or blowing out with compressed air. Should the surface be greasy, the fins and tubes can be brushed or sprayed with a non-flammable degreasing fluid which is safe on copper, steel and aluminum. Follow with a hot wash rinse and dry thoroughly. A steam cleaner can also be used effectively.
2. Once a year, or as required by the application, piping should be disconnected and a degreasing agent circulated through the unit to remove sludge from turbulators and internal tube surfaces to return the unit to full capacity. A thorough cleaning of the entire system in the same manner is preferable to avoid carry-over from uncleaned piping, pump and accessories. The strainer or any filtering devices should also be serviced following this operation.
3. **12 Volt DC motors are not serviceable** and must be replaced if problems occur.
4. When ordering replacement parts or inquiring on service, mention the model number, serial number, and the original purchase order number.

Piping Hook-up

Models MF-15, MF-30, DF-11, DF-12



Models MF-160, DF-11, DF-22

