# **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

**Options**
Fan control switch
Serviceable internal pressure bypass

## Ratings

**Maximum Operating Pressure**
300 PSI

**Maximum Operating Temperature**
350°F

**Hydraulic Motor Displacement**
.22in$^3$/Rev.

**Maximum Hydraulic Motor Pressure**
2000 PSI

**Maximum Allowable Hydraulic Motor Back Pressure**
1000 PSI

HI-LO TURBULAROR
Low Pressure Drop
High Flow Capacity

## 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

**Model Size Selected**

**Connection Type***
1 - NPT
2 - SAE
3 - BSPP
7 - 37°Male Flare

**Motor Specification**
NM - No Motor
4A - 12 Volt DC
4B - 24 Volt DC
9 - Hydraulic Motor

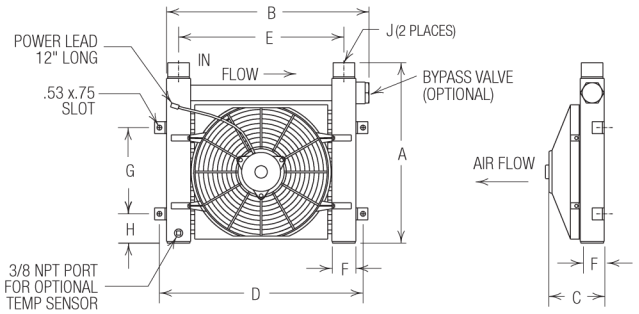
**Bypass**
Blank - No Bypass
30 - 30 PSI
60 - 60 PSI

**ADD FOR MFR MODELS ONLY**

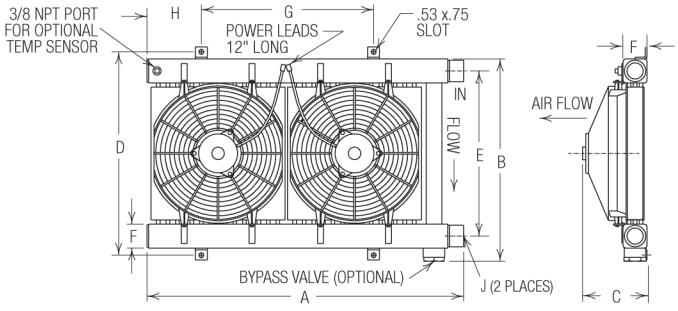
This is a partial flow pressure bypass only. It is not designed to be a full flow system bypass.

# Dimensions - 12 & 24 Volt DC Motors

## Models MF-15 and MF-30




## Model MF-60



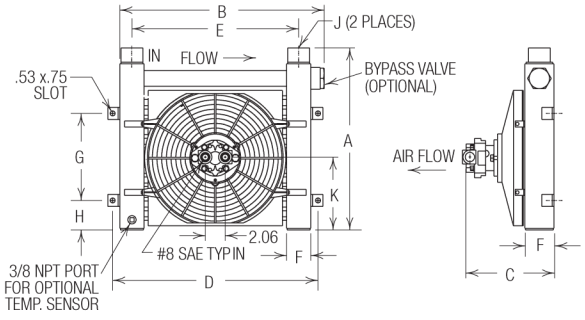

Units shown with optional internal pressure bypass

| Model | MF | MFR | MF | MFR | C | D | E | F | G | H | J NPT | J SAE | Shipping Weight (LBS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | B | | | | | | | | | | |
| 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 |

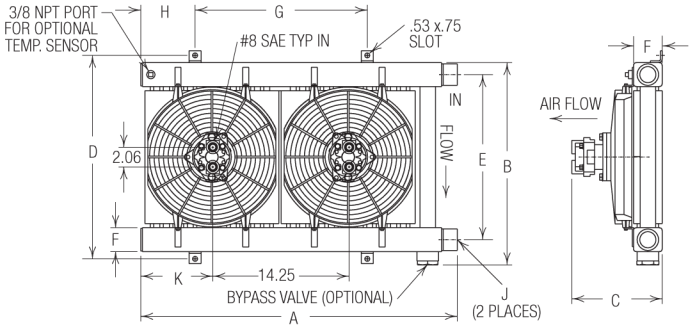
*Note: All dimensions are in inches. We reserve the right to make reasonable design changes without notice. *Inlet and Outlet connections can be reversed when the internal bypass is not used.*

# Dimensions - Hydraulic Motors

## Models MF-15 and MF-30




## Model MF-60




Units shown with optional internal pressure bypass

| Model | A MF | A MFR | B MF | B MFR | C | D | E | F | G | H | J NPT | J SAE | Shipping Weight (LBS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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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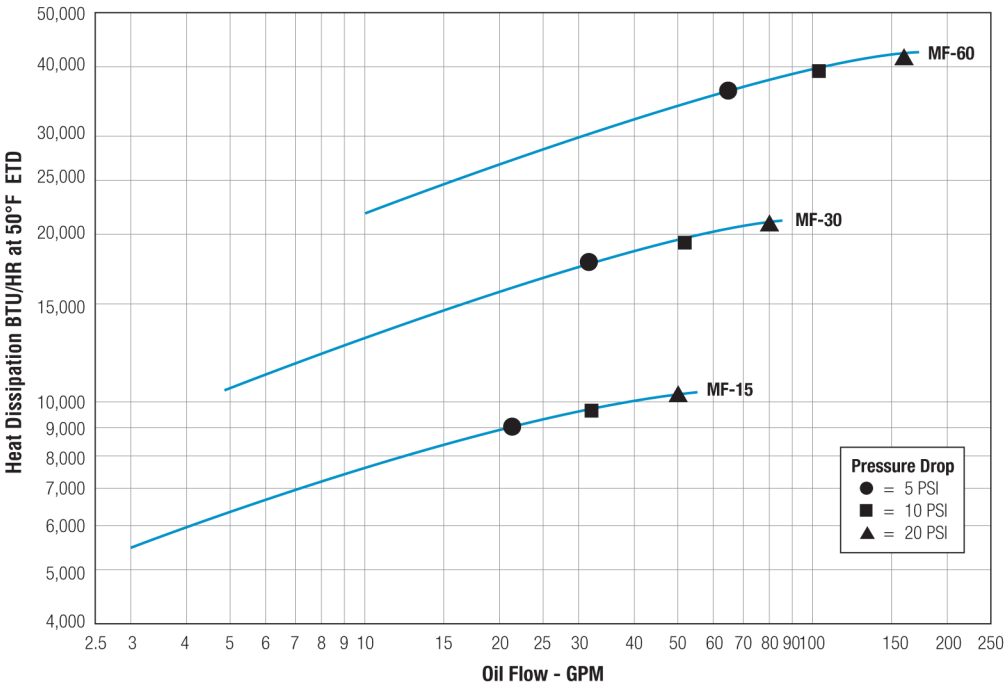
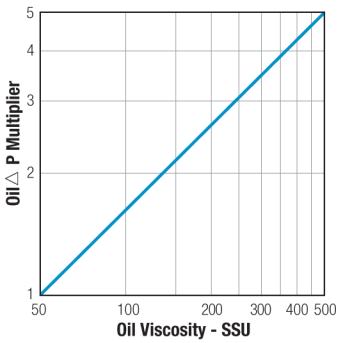
# Performance Curves




## 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: BTU/HR = Horsepower x 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.**

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

**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 △ 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

| | OIL | | | | |
|---|---|---|---|---|---|
| **Average Oil Temp °F** | **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 |

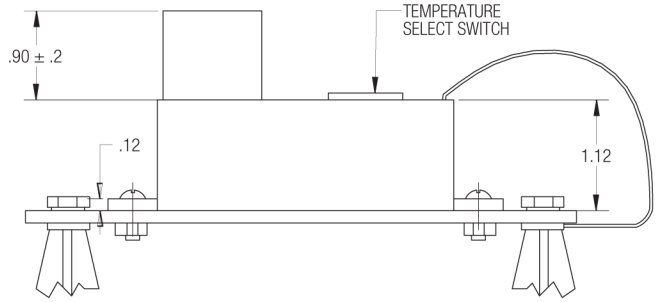
# Thermostatic Temperature Control Option (DC)

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.

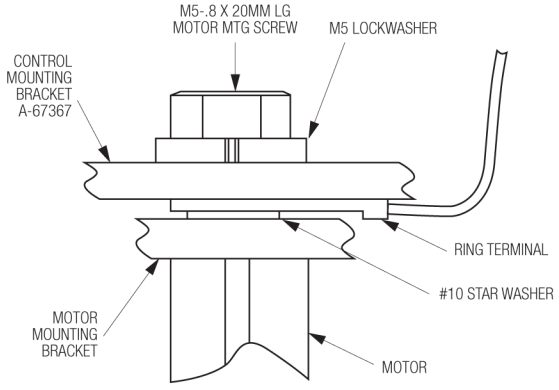
- 12 or 24 volt operation
- Adjustable temperature settings range from 100°F thru 210°F
- For use with one or two fan models — two fans need additional relay
- Temperature sensor provided
- Wiring provided for remote manual override
- Mounting hardware included

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

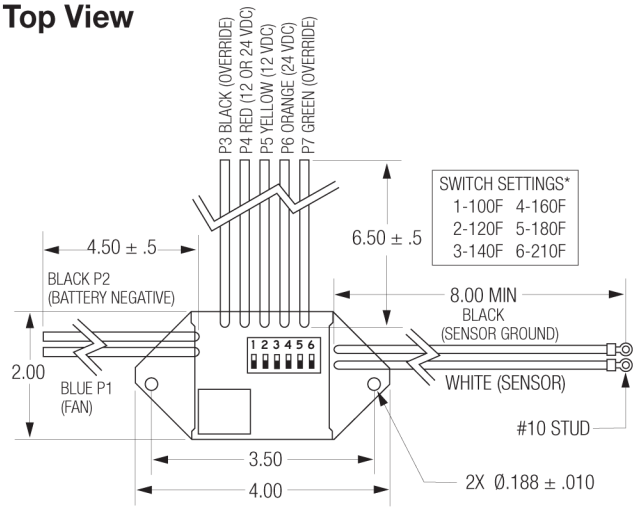
## Side View



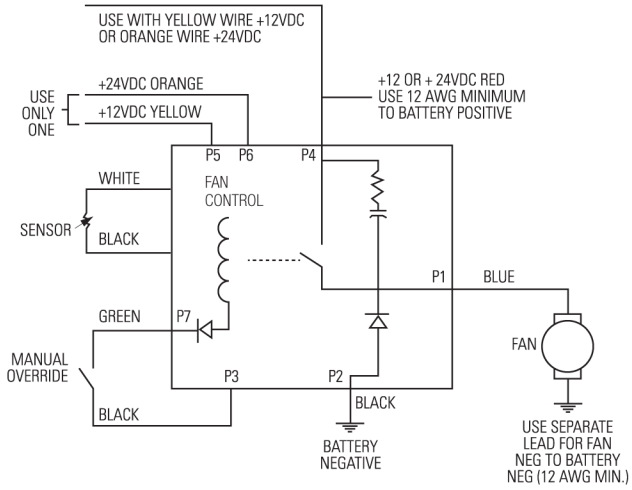

## Connection Assembly




## Top View




## Electrical Schematic




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

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