

MacBone

INDUSTRIES LTD.

MODEL MH16-3

Serial No. 001 & Up

**Self Contained, Hydraulically Driven
Rooftop Air Conditioning and Heating Unit**

- **INSTALLATION**
- **OPERATION**
- **MAINTENANCE**

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HELPFUL HINTS FROM THE TRACKS

1. The MacBone MH16 series hydraulically driven air conditioning unit is, new, innovative, very different and can be messed up six ways from Sunday in a wrench turn, so please read the book before you install, operate or mess with it. Questions, call us 24/7, toll free, at 888-MACBONE.
2. On all external hydraulic hose fittings, USE TWO WRENCHES. For quiet and smooth operation, the entire hydraulic circuit inside the unit, including the motors, shafts, compressor, fans and couplings are a single shock mounted assembly. Twisting the fittings on the end of the steel tubes can distort the adjustment of the assembly resulting in motor bearing failure, noisy operation and hydraulic fitting leaks.
3. Power is 12 or 24 VDC. Wire it wrong, it won't run long. Check the book.
4. Don't run the compressor for cooling with the top off. With no top, cooling air does not flow through the condenser. With no air, the condenser overheats, the head pressure rises and the safety plug blows out of the back of the compressor in a giant cloud of white smoke. Call 888-MACBONE for shipping instructions.
5. The device with the black knob on it is a comfort thermostat, NOT a freeze stat. DO NOT unwrap the capillary tube from around the thermostat and stick it in the evaporator coil. Forget why, just don't mess with it.
6. The discharge air into the cab is sensitive to being restricted so don't attach any ducts, deflectors or other gadgets without giving us a call for comments, 24/7, 888-MACBONE.
7. There is a suction line fitting in the refrigeration circuit which we use to fill the unit with a total of 9 ounces, plus or minus ½ ounce, of R134 A refrigerant but this port is not for field use. NEVER even get close to this unit with a gas jug and gauges. If it does not cool, call us, 24/7, at 888-MACBONE.
8. This unit has no belts, idlers, side loaded bearings, grease fittings or items to oil, adjust, tweak, replace or repair. If it blows cool and heats, it's OK. If not, or if it makes any terrible noises, call 888-MACBONE for assistance.
9. The most frequent deviation from our specific instructions is in providing the hydraulic drive oil supply. Please use a dedicated pump sized to deliver 3.25 to 6.00 GPM at MAXIMUM engine speed, or, tap a compensated pressure source between 2700 and 4000 PSI capable of sustaining a flow rate of 3.25 GPM. Bootleg oil, taken from shared pumps using priority valves, flow controllers and the like will rarely work. Call 888-MACBONE for assistance if you must use bootleg oil.
10. The end of both condensate drains supplied with the unit ends in a "U" bend and the "U" bend must be filled with water. If the "U" bends are not used and not filled with water, water will blow out of the discharge air hole into the cab. Strange, but true!
11. Questions or issues, don't do it alone, call 888-MACBONE!

INSTALLATION, OPERATION & MAINTENANCE

MACBONE MODEL MH16-3

Serial No. 001 & Up

PRODUCT DESCRIPTION

The *MacBone* Series MH16, 16,000 BTU/hr., air conditioning unit, is an overhead mounted, unitary, or self-contained unit, with a closed, precharged refrigeration circuit, driven by two, integral, hydraulic motors. Heating is derived from the circulation of hot engine coolant, engine oil or hydraulic oil through the unit. Heating capacity is 18,000 BTU/Hr. at a fluid flow rate of 1.0 GPM at 140° F. The design concept is derived from the need for an operator's cab air conditioning unit for industrial machines and vehicles where the unit can be quickly removed for service without involving the sealed refrigeration circuit. Cooling is provided by a thermostatically controlled refrigeration system, using refrigerant 134A. The condenser and evaporator blowers share a common shaft, driven by a hydraulic motor with sufficient power to produce substantial condenser air flow even with a filter on the outside coil, thus insuring reliable performance even in a heavily dust laden environment. Substantial power delivered to the inside air blower also assures delivery of full system capacity under all conditions. Induction of 10% outside air provides cab pressurization to exclude dust and other contaminants from entering the cab environment. An auxiliary outside air filter and cab pressurizer is available.

Hydraulic drive input is from a dedicated pump driven by the vehicle's engine or from a compensated pressure source ranging from 2700 PSI to 4000 PSI, capable of a sustained flow rate of 3.25 GPM. Electrical input of 0.8 amps, at 12 or 24 VDC, is used to activate the compressor bypass valve, which allows for the compressor to be cycled by the thermostat. If the MacBone outside air filter / cab pressurizer is used, it will operate at an additional 4.0 amps at 12 or 24 VDC.

All units utilize non-CFC, R-134A refrigerant, measure 26 ¼ x 16 ¼ x 9 1/4 inches high and weigh 85 pounds. Hydraulic lines are #6, supply and return. The motors have external case drains to protect the shaft seals. These are teed together inside the unit and require a #4 drain line back to tank up to 20'. Over 20', use #6 drain line. Four mounting studs provide for quick removal for service or replacement. Recommended operating time before overhaul is 6,000 hours. Recommended unit life is four overhaul cycles.

The MH16 series MacBone units are recommended for operator's cabs in the 3' wide x 5' long range, even if nearly all windows with marginal insulation. With fewer windows and / or significant insulation, the MH16 has proven to be satisfactory on cabs in the 4' x 6' range but, to date, we have none on larger cabs.

PERFORMANCE DATA

As this product is installed and its performance evaluated, we would like very much to have such information from which to develop application guidelines.

UNCRATING

The *MacBone* Series MH16 shipping pallet usually contains the following:

1. The subbase.
2. The MH16 Series unit. (With securing studs in place securing it to the subbase)
3. The unit weather cover. (With securing bolts in place securing it to the unit)
4. External wiring harness. (Plugged into the unit with 3 conductor cable protruding)

Remove the unit from the pallet. On top of the unit, with a 9/16 wrench, remove the (6) 3/8" bolts and weather sealing washers. Remove the weather cover and set it aside. Remove (4) tall studs to release the unit from the subbase. Using a suitable hoist, lift the unit clear of the subbase by the green lifting ring. There are (8) holes, in the subbase, marked by the green dots, and are to be used to secure the subbase to the roof. Do not put fasteners in any other locations – only the (8) points marked by the green dots. Stored in a bag inside the unit are (2) drain line assembly's.

SUBBASE INSTALLATION

GENERAL: The subbase is designed to be secured to the rooftop of the cab to be cooled, flat side down, rubber pad up. The rooftop surface must be flat, continuous, and strong enough to support the 90 pound total weight of the MH16 Series air conditioning unit and subbase. For installation on surfaces which are not flat or continuous, consult *MacBone* directly for specific instructions. Installation of the subbase on other than a FLAT surface will distort the subbase resulting in air leaks, rainwater leaks condensate leaks, and poor performance. Also, the securing studs will not line up with the bolt holes in the top cover if the subbase is distorted.

LOCATION: The subbase is 1/4 inch smaller all around than the maximum dimensions of the installed unit. When installed, the area around the unit must be open on all sides except the plain side and end, which may be placed within one inch of a vertical obstruction. Do not obstruct the condenser air discharge located next to the connecting hoses or the face of the condenser coil where condenser cooling air enters the unit. If the roof is caved in or sloped, fashion a spacer which will be placed between the roof and the subbase to level the unit and raise it at least as high as the point where the condensate drain will be routed off the roof.

- THEORY -

No Water Don't Run Up No Hill!

When installed, holes will be cut in the roof to match the rectangular return air hole and the square discharge air hole in the subbase. Be sure this cutting will not sever vital roof structures. Since the system controls are accessed by the operator by reaching into the return air area, this area must be accessible by the operator from the cab. The supply air, at full fan speed, is discharged at very high velocity, so the discharge air should not be located where it will blow directly onto an operator's station. Not even an Eskimo would want a MacBone unit blowing directly on his head.

SECURING THE SUBBASE: When a suitable location has been selected, using the subbase as a template, mark the (8) holes noted by the green dots (these are the subbase to rooftop securing bolt or screw holes) and mark the square and rectangular air holes. Remove the subbase and drill for the securing bolts and cut the air holes the same size as, or up to ¼” larger than the marks made. **DO NOT EXCEED ¼” larger and DO NOT go smaller.**

Clean the roof well, and on the metal side of the subbase, run a bead of caulking, like silicone, around the outside edge, around the return air and supply air holes and around each of the bolt holes.

Flip the subbase over and secure it with the fasteners inserted **FROM THE TOP**. Fastener heads must not exceed 3/8” in height to insure they will not hit the bottom of the unit when the unit is secured to the subbase. If the nuts must be up, cut the bolts flush with the tops of the nuts but don't tear up the rubber shock mounting pad in the process. If the unit does not mate with the rubber pad, rain water and condensate will leak into the cab.

ADDED FEATURE: When the subbase is first installed, or if the MH16 Series unit is removed from the subbase for service, the unit weather cover may be placed directly over the subbase to secure the cab from the weather. To do this, use (4) of the (6) top bolts which secured the weather cover to the unit. Place the top over the subbase and screw the bolts through the weather cover holes into where the four studs would normally go. When using this approach, you will have to find a safe place for two left over top bolts and the four studs. Another approach is to put the (6) top bolts in the condensate trough, then place the cover on the subbase and secure it with the (4) studs. This way, you will have nothing left over to get lost, but you won't be able to go under a real low bridge.

CONDENSATE DRAIN INSTALLATION

The MH16 series units have (2) 3” plugged condensate tubes, one on each side of the subbase near the front. Either or both can be extended to provide condensate removal.

This must be done as follows:

1. Unplug **ONLY** the drain you will use. If you will use both drains, unplug both. Remember, each drain must be plugged or used. If an unused drain is not plugged, the condensate pan will fill up and run over. Strange, but true!
2. Supplied with the unit, stuffed in front of the evaporator inside the unit are (2) drain hose extension assembly's consisting of (1) hose connector, (1) 4 foot drain hose, (1) “U” bend, (2) clamps and (2) self drilling screws located inside the drain hose. Install one or both of these hoses by carefully removing the plug from the unit's short drain hose and inserting the plastic

connector on the end of the drain hose extension assembly and secure it to the roof with the clamp. Route the drain hose off the roof and down and, with the other clamp and screw, secure the “U” bend, open end UP, to the cab side. You may lengthen the condensate hose if you wish. The two screws mentioned are inside the drain hose. Whoever can get them out the quickest, without disconnecting anything, wins.

FILL THE “U” BEND WITH WATER, COKE, PEPSI, BEER OR WHATEVER IS HANDY. IF YOU DON’T PRIME IT, THE DRAIN WON’T WORK.

ALTERNATIVE CONDENSATE DISPOSAL: In dry climates where minimum condensate is produced, the two condensate drains can be left plugged and the condensate directed beneath the condenser blower where it will be picked up and discharged from the unit horizontally along with the warm condenser cooling air.

To do this, leave the plugs in both of the condensate drain lines. In about the center of the rubber pad, toward the front of the subbase is a trough which is denoted by a blue dot. With a screwdriver pushed underneath, and the sides cut with a knife, remove the section of rubber beside the blue dot so as to provide a path for condensate to flow beside the blue dot. This will open up a path which will allow condensate to flow from the drip pan to a point under the condenser blower to be picked up and blown out of the unit.

- CAUTION –

Trying to use both condensate removal methods at the same time will not work. Use only one or the other.

UNIT INSTALLATION, MODEL MH16-2

GENERAL: The MH16 series unit is designed to be installed on the special subbase and will not operate satisfactorily unless the special subbase as described beginning on page 4 is used.

SETTING THE UNIT IN PLACE: Make sure the bottom of the unit is clean and clear of debris. Hold the unit directly over the subbase and lower it onto the subbase pad. As the unit is lowered, use the rectangular air hole as a guide. After the unit is in place, jog it to get the (4) holes in the unit chassis to line up with the (4) threaded nuts welded onto the subbase. The holes will match exactly – just jog it until they do. If you can’t thread the securing studs by hand, jog the unit until you can.

SECURING THE UNIT IN PLACE: Secure the unit to the subbase with the (4) special studs removed earlier, threaded end and sealing washer down. On the upper end of each stud is a number. Referring to the decal on top of the blower, put the studs in the right spots. Make sure the sealing washer is in place on the threaded end of the stud, rubber down. By hand, the studs must bottom out, then torque to about 10 foot pounds. (About 1/16 of a turn) No need to go real tight. Leave the top and the (6) top retaining bolts aside until later.

-WARNING-

If the studs are over tightened, the nut which is welded to the subbase, can be jacked up off the base, breaking the welds. Then the subbase has to be replaced.

ELECTRICAL CONNECTIONS

GENERAL: The electrical requirement is either 12 or 24 VDC at 0.8 amps to operate the solenoid actuated compressor motor bypass valve. This valve is cycled by the 60° to 90° F comfort thermostat. When de-energized, the valve is open (bypass position) so the compressor does not run. When energized, the valve closes and diverts drive oil through the motor which drives the compressor. In the electrical circuit are the following elements:

1. An operator accessible toggle switch which when up, or on, activates the compressor run circuit for cooling. Switch down, no cooling.
2. An operator accessible, adjustable thermostat, which cycles the compressor at the operator selected set point within its temperature range of 60° to 90° F, to maintain cab temperature.
3. A micro switch, which activates the compressor circuit when the fan reaches about 1/3 speed, which prevents the compressor from operating at low fan speeds.

- NOTE -

The compressor will not run for cooling until the switch is on, the unit speed is up to about 1/3, and the thermostat is set lower than the cab temperature. If the cab temperature is below 60° F, the compressor will not run.

MAKING ELECTRICAL CONNECTIONS:

1. The external wiring harness has a 3 conductor plug on one end and 3 plain wires on the other. If not already in place, route the plug from outside of the unit through the round hole on the hose connection side near the front, and mate it with the matching plug just inside the unit. The additional four conductor square plug inside the unit is to power the optional filter / pressurizer.
2. Slide the round black plastic cover along the wire, up to the hole you put the plug through, and snap it in place. WD40 helps! DO NOT leave the hole open.
3. To the wire harness, run a 2 conductor, #14 AWG cable, with one wire grounded and the other from the machine's engine ignition switch or an auxiliary switch which will be off when the engine is off, 12 or 24 VDC, fused at 2 amps. If the P75-1 pressurizer is used, use a 5 amp fuse.
4. Connect the MacBone cable WHITE wire to the machine ground. Usually negative.
5. If the power is 12 VDC, connect the MacBone cable black wire to the 12 VDC positive wire, then trim the red wire back and tape it off.
6. If the machine is 24 VDC, connect the MacBone cable red wire to the 24 VDC positive wire, then trim the black wire back and tape it off.
7. Secure the wires to the roof in an appropriate manner, bearing in mind that when the unit is removed, the wire harness is unplugged from the MacBone unit and stays with the machine.

- NOTE -

When the MH16 series unit is removed for service

or replacement, unplug the wire and leave the wire, hole cover and plug on the machine to be plugged back into the unit when it is reinstalled.

8. With the cooling toggle switch off (down), and the machine ignition switch on, test the circuit by checking for machine voltage, 12 or 24, between the machine's ground and either end of the 3 inch long brown resistor located just above the control switch.

- CAUTION -

This test must be made with the ignition switch ON and with the COOLING SWITCH OFF or the results will be confusing.

MAKING HYDRAULIC CONNECTIONS

WARNING – WARNING – WARNING

When tightening or loosening the four hydraulic hose connections on the MH16 series units

USE TWO WRENCHES

The fittings are attached to the unit internally and if turned without a second wrench they will be twisted resulting in motor and control valve damage.

USE TWO WRENCHES OR SUFFER THE CONSEQUENCES!

GENERAL: The MH16 series units may be operated in either of two ways. Constant pressure, from a 2700 to 4000 PSI compensated pressure source, at a flow rate from 0 to 3.25 GPM, or from a constant volume source from 0 to 2800 PSI at a flow rate from 3.25 to 6 GPM. In the constant pressure mode, the unit is connected directly to a compensated pressure source and in the constant volume mode, the unit is connected directly to a constant or variable volume, dedicated pump. Please note that pressure requirements increase as temperature loads increase.

CONSTANT VOLUME OPERATION

The oil flow for a constant volume drive oil supply is best accomplished with a dedicated, engine driven, hydraulic pump. Sharing a pump with other functions usually results in a lot of unneeded aggravation so do your best not to go that way. However, if you must, please talk with us. In the most basic form, the dedicated pump can be sized to deliver 3.25 GPM whenever air conditioning is needed. This can occur using an inexpensive, fixed displacement pump being driven at a constant and proper speed whenever the air conditioning is intended to be used. The difficulty here is finding a pump which will deliver exactly 3.25 GPM at the designated engine speed and the disadvantage of not being able to sustain full air conditioning capacity at lower engine speeds. However, this is the most hydraulically efficient approach.

The next constant volume option is to use a bit larger pump which will deliver between 3.25 and no more than 6 GPM at full engine speed and then utilize the unit's internal priority valve to use 3.25 GPM

and bypass the excess to tank. This will allow full engine speed setting to be varied a bit or full air conditioning capacity to be sustained at engine speeds from full, down to about half of full speed. This option is the best balance of cost, efficiency and performance.

CONSTANT VOLUME HOSE CONNECTIONS: Form the drive oil pump, a #6 hose with a working pressure no less than 3500 PSI connects to a relief valve, set at 3250 PSI, sized to handle the full capacity of the pump.

From the relief valve to the unit's input, marked SUPPLY, a #6 hose rated at 3250 PSI is required. Unit fitting is #6, 37° male flare.

For constant volume operation, the BYPASS and RETURN ports must be teed together and routed to tank. This hose must be rated for a minimum working pressure of 250 PSI. Unit fittings are #6, 37° male flare.

From the CASE DRAIN directly to tank, a #4 hose is needed, rated for a minimum working pressure of 250 PSI. Unit fitting is #4, 37° male flare. Case drain back pressure at the unit must not exceed 100 PSIG.

- WARNING -

Do not fail to tee the bypass and return together.

CONSTANT VOLUME HYDRAULIC DRIVE OIL CHECKOUT: Temporally, place a 0-5000 PSI pressure gauge, a ball valve, and a 0-6 GPM flow meter, all piped in series, in that order, in the SUPPLY line at the unit.

Set the system relief valve to its lowest pressure setting.

Close the temporary ball valve which will dead head the pump.

Place the unit's red handle in the vertical position so the heat will be off.

Place the unit's blue handle in the vertical position so the fan will be off.

Place the cooling toggle switch in the off position (Down) so the compressor will not run.

Start the vehicle's engine at idle to bring on the drive oil pump and observe that the pressure is consistent with the low setting on the relief valve.

**CHECK FOR LEAKS
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Remedy any leaks found.

Bring the hydraulic oil temperature to at least 100° F.

Increase the engine speed to max operating RPM.

At full RPM, adjust the relief valve until the gauge reads 3250 PSI. Lock the relief valve in place and double check for 3250 PSI as the engine is operated between idle and full speed.

- NOTE -

If the pressure varies very much with engine speed, the relief valve is too small in capacity for the application.

Idle the engine and then open the temporary ball valve to its full open position to allow drive oil to flow through the MacBone unit. Oil flow should be less than 2 GPM. Increase engine speed to maximum. Oil flow should not exceed 6 GPM. At full engine speed, flow anywhere between 3.25 and 6 GPM is good.

UNIT OPERATION CHECKOUT: Before operating the unit, install the top by securing it with the six bolts and sealing washers which were removed when the unit was first unpacked. If the tops of the studs do not line up with the bolt holes in the top, double check to see that the studs, stamped 1, 2, 3 and 4, are in the right place. If still not lined up, lift the top and deflect the studs enough to bend them slightly to come into alignment. If the subbase was screwed down on an un-flat surface, the studs will probably not line up with the bolt holes in the top.

- WARNING -

*DO NOT OPERATE THE
COMPRESSOR FOR COOLING
WITH THE TOP REMOVED.*

With the top removed, air will not flow through the condenser resulting in a blowout of the high pressure safety plug, located in the rear of the compressor, which is not repairable in the field.

Before starting the MacBone unit, confirm that the drive oil, at full normal operating engine speed, is flowing through the unit between 3.25 and 6 GPM with the pressure gauge showing very little pressure. This rate of flow, whatever it is, as setup on this particular machine, is the “normal constant” flow rate. With constant engine speed, this flow should remain constant whether the MacBone unit is off, running fan only or at full cooling.

To start the unit, leave the cooling switch off (down) and move the blue handle clockwise. As the unit fan starts to run slowly, the flow should remain constant but the pressure should rise. At full fan speed, with the blue handle horizontal, the pressure should be around 1000 PSI, with the flow unchanged. **THE BLUE HANDLE CONTROLS FAN SPEED.**

To start the compressor for cooling, turn the thermostat fully clockwise and push the cooling toggle switch up for ON. The compressor should start, the unit should blow cold air and the drive oil flow should remain constant, but the pressure should rise to between 2400 and 2800 PSI.

- IMPORTANT -

If flow rate and pressures are not as described, call MacBone, 888-MACBONE, for assistance. Don't look for adjustments to make in the unit – there are none.

When the cab temperature reaches a satisfactory level, turn the thermostat counterclockwise until you hear the compressor cycle off. In this position, the compressor will cycle to maintain cab temperature. The arrow on the thermostat knob points straight down at a setting of 75° F.

- NOTE -

The thermostat fully clockwise controls at 60° F. Fully counterclockwise controls at 90° F. In the middle, is 75° F.

With the unit at full speed and the compressor on, slow the engine gradually until the flow drops to 3.25 GPM. Note the engine RPM. This is the lowest engine speed which will give the operator full air conditioning capacity. As engine speed drops below this level, oil flow will drop below 3.25 GPM, the fan will slow down and cooling output will drop.

This completes the constant volume hydraulic drive oil and unit checkout. Stop the unit by moving the blue handle to the vertical position. Turn the cooling switch off. Remove the temporary flow meter gauge/valve test assembly and connect the supply hose directly to the unit. See the bottom of page 12 for unit operation.

CONSTANT PRESSURE OPERATION

In the constant pressure mode, the MacBone unit's supply port is connected directly to a compensated pressure source with a minimum sustained pressure of 2700 PSI and a continuous flow capability of 3.25 GPM. Maximum supply pressure is 4000 PSI. Inside the unit is an operator controlled valve which operates as a flow controller in the constant pressure mode. Be sure to consider the hydraulic inefficiency when using a compensated pressure source with an operating pressure greater than the 3000 PSI minimum required. **DO NOT EXCEED 4000 PSI.**

CONSTANT PRESSURE HOSE CONNECTIONS

From the compensated pressure source, a #6 hose with a working pressure rating to match the source pressure, will connect directly to the unit's input marked SUPPLY. Unit fitting is #6, 37° male flare.

From the unit's RETURN port, a #6 hose rated at a minimum working pressure of 250 PSI must be routed to tank. The unit fitting is #6, 37° male flare.

The unit's BYPASS port must be capped with a cap rated to match the source pressure. The unit fitting is #6, 37° male flare.

From the CASE DRAIN fitting, directly to tank, a #4 hose is needed, rated for a minimum working pressure of 250 PSI. Unit fitting is #4, 37° male flare.

HYDRAULIC DRIVE OIL CHECKOUT: Temporarily place a 0-5000 PSI pressure gauge, a ball valve, and a 0-6 GPM flow meter, all piped in series, in that order, in the supply line at the unit. Close the temporary ball valve which will prevent oil flow to the unit.

Place the unit's red handle in the vertical position so the heat will be off.

Place the unit's blue handle in the vertical position so the fan will be off.

Place the cooling toggle switch in the off position (DOWN) so the compressor will not run.

Start the vehicles engine at idle to bring up the pressure of the compensated pressure source. Check the gauge to verify the system pressure is between 2700 and 4000 PSI. If the pressure is less or more, adjust the pressure source to be between 2700 and 4000 PSI or change to the constant volume approach using a dedicated pump. Bring the oil temperature up to at least 100° F.

Open the ball valve to admit system pressure to the unit.

CHECK FOR LEAKS
CHECK FOR LEAKS
CHECK FOR LEAKS

Remedy any leaks found.

With the engine still at idle speed, move the blue handle, which controls the unit's fan speed, all the way clockwise.

Note the rate of flow. If it is below 3.25 GPM, increase the engine speed until the flow reaches 3.25 GPM. Note this engine RPM which will provide a clue as to how well the compensated pressure source will be able to handle the unit's flow requirements 3.25 GPM at a low engine speed indicates good reserves and a high speed indicates low reserves.

HEATING CONNECTIONS

GENERAL: The MH16 series units have one section of heating tubes as part of the evaporator / heater coil. Hot fluid, water or oil, is circulated through this section by the engine water circulating pump or other means. The MH16 unit does not have its own pump. The heating circuit consists of #8 male flare brass fittings piped to the copper coil by rubber hose rated for oil or water not to exceed 180° F or a static pressure of 60 PSIG. The differential pressure required for full flow of 1 GPM is about 6 PSI. Heating capacity is manually controlled by an operator accessible ball valve with a red handle. Handle vertical is off, handle horizontal is full heating capacity. Midway is mid heat.

HOT FLUID OPTIONS: Within the 180° and 60 PSIG limits, the heating fluid may be water, water and antifreeze, engine oil or hydraulic oil.

- CAUTION -

If engine oil or hydraulic oil is used
as the heating fluid, use appropriate
controls to ensure that high pressure does
not inadvertently reach the heating coil circuit.

HOSE CONNECTIONS: Connect the heating fluid supply hose to the lower of the two #8 male, brass 45° flare fittings located on the side of the unit near the bottom. The return hose connects to the #8 male, brass 45° flare return fitting just above the supply fitting. Since these fittings are brass, they will accommodate steel 37° JIC female flare fittings if 45° fittings are not available.

- NOTE -

When using engine coolant, the differential pressure across the engine's cooling water circulation pump typically generates more than sufficient differential pressure for circulation.

MACBONE UNIT OPERATION

1. Set the RED handle and BLUE handle to vertical and the cooling toggle switch DOWN.
2. Start the machine's engine, warm the oil to 100° F minimum and set the speed at working RPM. (Old oil will result in low unit fan speed.)
3. To bring on the MacBone air conditioning unit's fan, move the BLUE handle slowly clockwise toward horizontal. As the handle is moved, the fan speed will increase to maximum when the handle reaches horizontal or slightly further. Set the handle for the desired fan speed.
4. For cooling, turn the black knob on the comfort thermostat all the way clockwise so the pointer is at 9 o'clock. This is the 60° F cab air temperature setting. Push the toggle switch, just to the left of the thermostat, UP to start the compressor for cooling. If the MH16 unit is equipped with the P75-1 filter / pressurizer, turn the pressurizer on by moving the toggle switch to the left of the cooling toggle switch UP. Move it DOWN for off.

- NOTE -

When the filter / pressurizer is on, 75 CFM of filtered outside air will be pumped into the cab to provide pressurization and ventilation. However this will add to the heat load on the unit and decrease the unit's ability to cool the cab.

5. To turn the MacBone unit off, you may leave the toggle switch in the UP or on position and simply pull the blue handle down to the vertical position. As the blue handle is moved to reduce fan speed, at about 1/3 fan speed, a microswitch will turn the compressor off. When the unit is restarted, as the blue handle is pushed toward horizontal, at about 1/3 fans speed, the microswitch will turn the compressor back on.

- VERY IMPORTANT -

Please get in the habit of turning the MacBone unit off before stopping the vehicle's engine. If you don't, when the engine is restarted, the unit will come on line with full torque on all of the drive components which is an abusive procedure. In your truck, you can wind up the engine and drop the clutch but it's dumb to do so. Same with the air conditioning unit. Make sure it's off, blue handle vertical, before starting the engine and then bring the unit on line slowly.

SPECIFICATIONS

Refer to the drawings following this page.