

## IRS Differential Oil Cooler Kit (OC-10)



**Updated!!** Fits vehicles with aftermarket differential cover braces.

*Read all instructions before beginning work. Following instructions in the proper sequence will ensure the best and easiest installation.*

Thank you for purchasing Maximum Motorsports' 1999-2004 Cobra IRS Differential Cooler Kit. MM designed this differential oil cooling system when we swapped a 1999 Cobra IRS unit into our 1992 Mustang road-race car. The Cobra IRS has a reputation for burning up the Traction-Lock from excessive heat. The IRS center section is subjected to more heat than a solid axle differential partly because the exhaust is routed directly underneath the center section of the IRS. Compounding the problem, the IRS center section holds less gear oil than a solid axle, and does not have the large axle tubes to act as heat sinks. According to Ford, the temperature of the gear oil in an IRS differential should be kept below 230° F. With a temperature gauge sensor installed in the bottom of the differential case, we saw gear oil temperatures as high as 250° F during track use.

The MM IRS Differential Cooling Kit includes

- Premium quality oil cooler
- Gear-oil pump, with Viton diaphragm rated at 400°F
- Electric fan pre-mounted to the cooler
- 194° F thermo-switch to actuate the pump

- Electrical relay for the gear-oil pump
- 15' of stainless steel braided hose
- AN hose fittings
- Extra AN fittings (straight and 90°) to aid in unusual installation situations
- Check valve
- Cushioned mounts for the cooler and pump
- Complete installation instructions, with photos

### Required Tools

The installation *cannot* be completed without the following tools:

- Electric drill capable of drilling up to a 3/4" diameter hole
- Flat hand file
- 1/4"-18 NPT Tap
- 3/8"-18 NPT Tap
- 7/16" Drill Bit
- 9/16" Drill Bit
- 3/4" Drill Bit

### Optional Tool Kit (MMT-7)

Maximum Motorsports offers an optional tool kit with the required taps and drill bits to install the AN fittings into the differential housing and case. The kit contains high quality drill bits and taps which are designed for multiple use. Make sure to ask your sales representative for a MMT-7 when ordering.

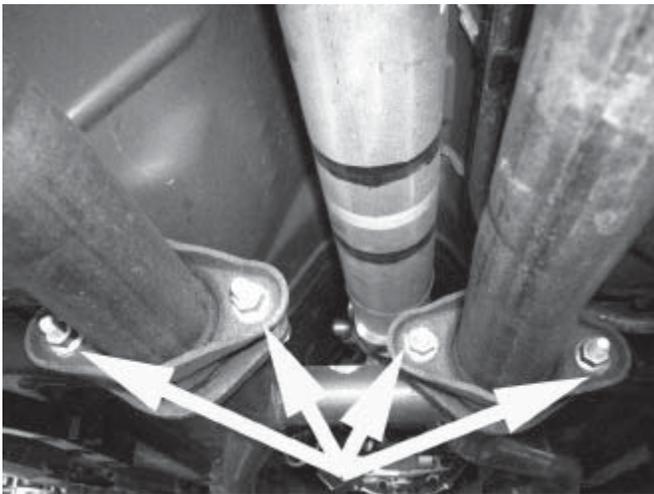
*NOTE: Installation of this product WILL require some fabrication on the part of the installer. The installer is responsible for the positioning and mounting of the oil cooler, all wiring, routing of the hoses, drilling and tapping the aluminum differential housing for the AN fittings and thermo-switch, and any desired air ducting.*

### IRS Subframe Removal

1. Safely jack the car up and support it firmly on jack stands. Place the front jack stands under the front K-member, between the pivots of the front control arms. Place the rear jack stands underneath the forward most point of the IRS subframe, near where the subframe attaches to the chassis.



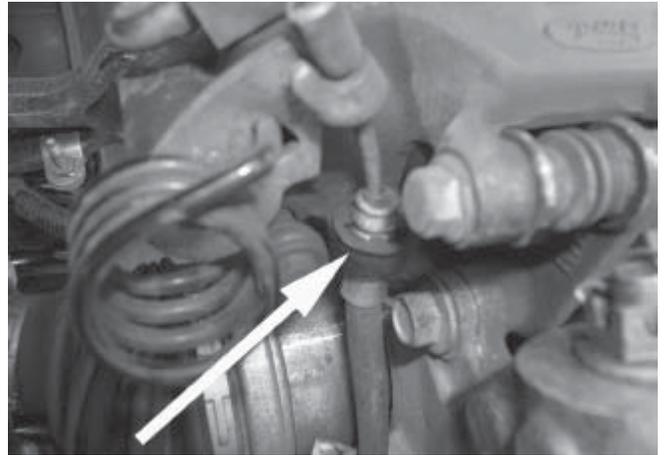
2. Remove the rear wheels from the vehicle.
3. Remove the tail section of the exhaust from the vehicle, disconnecting it at the front of the mufflers. A flat-head screwdriver is useful in prying the rubber exhaust hangers from the exhaust.



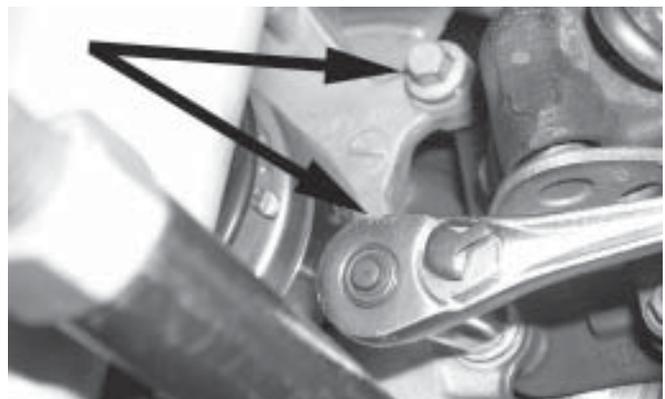
4. Make sure the parking brake is not set, and then unbolt the parking brake cable mounting-bracket from each control arm.



5. Remove the parking brake cable housing retaining clip on each caliper.



6. Disconnect the parking brake cable from the parking brake lever on each caliper.
7. Remove the cable from the locating hole in the calipers.
8. Remove the two bolts holding the caliper assembly to the spindle on each side. **DO NOT** allow the calipers to hang by the brake hose. Damage to the brake hoses may result. Using a zip-tie or safety wire, hang the caliper from the upper portion of the IRS subframe.

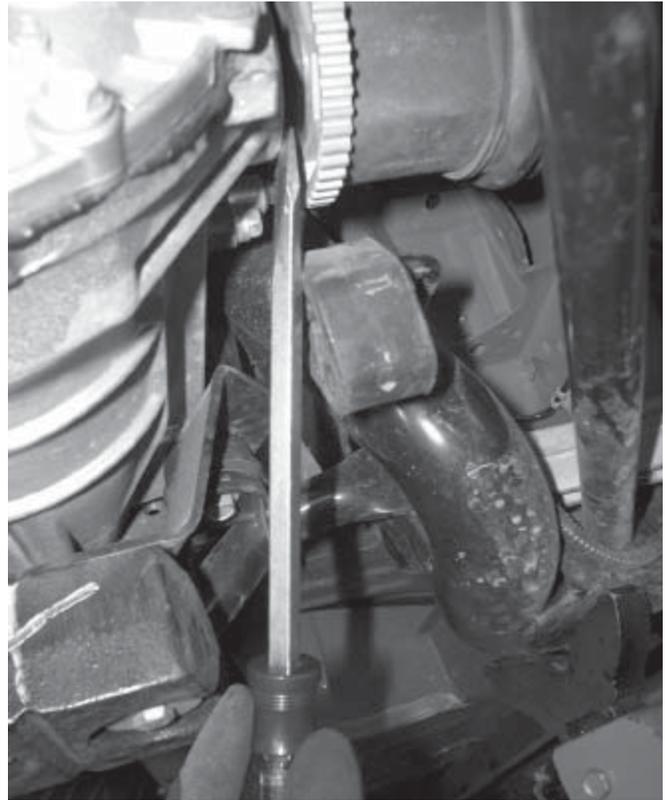




9. Remove the cotter pin and nut that secure each tie-rod end to the rear spindle.
10. Remove the tie-rod ends from the spindle. Be very careful and avoid directly striking the tie-rod end, as damage to the threads WILL occur.
11. Using an awl or other sharp object, carefully mark the position of the eccentric camber adjustment bolt on the upper control arms. Aligning these marks during reassembly will maintain the rear camber setting.



12. Loosen the upper and lower spindle mounting bolts.
13. Remove the passenger side lower spindle-mounting bolt from the control arm.
14. Place a large flat-head screwdriver or pry bar between the differential housing and passenger side axle half-shaft. Carefully pry the half-shaft out of the differential. Apply enough pressure to overcome the internal circlip. Care must be taken to avoid damaging the axle seal and axle bearing surfaces.



15. Use a floor jack to support the passenger side lower control arm, and remove the lower shock-mounting bolt.



16. Pull out the upper spindle-to-control arm mounting bolt and carefully remove the axle half-shaft/spindle assembly. Take care to avoid damage to the differential seal.
17. Remount the lower shock bolt and tighten.
18. Lower the floor jack.
19. Using tape, cover the axle half-shaft hole in the differential to avoid spilling the oil during removal.



20. Repeat Steps 13-19 for the other side.
21. Mark the orientation of the drive shaft flange to the pinion flange.
22. Remove the four bolts retaining the drive shaft to the pinion flange. It may be helpful to place the car in first gear to stop the drive shaft from rotating, or place a pry bar through the U-joint.
23. Using safety wire, secure the drive shaft to the parking brake cable bracket, located slightly forward of the rear bulkhead. **AVOID** removing the drive shaft; doing so will allow oil to drain from around the output shaft of the transmission.



24. Unbolt the ABS sensors from each side of the differential housing. These attachment bolts have a head with both an external hex and an internal Torx.

**NOTE:** If your car has a Heavy Duty IRS Crossmember, or is a 2003-04 Cobra that came equipped with a Heavy Duty IRS Crossmember, skip to Step 29. The Crossmember can be identified by the mounting tabs indicated in the photo below.

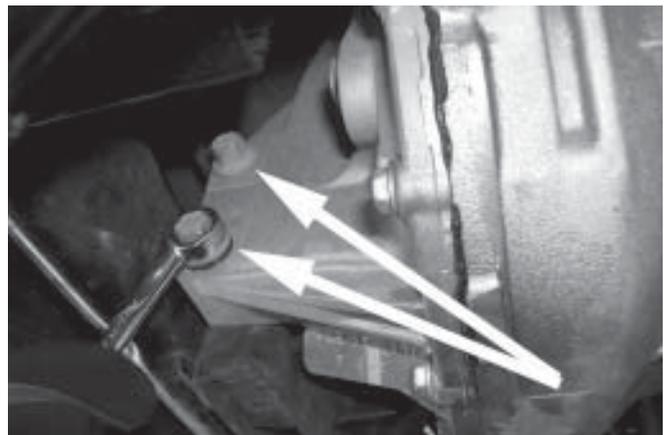


**Vehicles *without* a Heavy Duty IRS Crossmember**

25. Support the differential with a floor jack.



26. Remove the two mounting bolts, located on the differential cover, that attach the cover to the rearward differential bushing.



27. Remove the two mounting bolts that secure the forward differential mounting flanges to the IRS subframe, along with the vibration damper and stock bushings.
28. Lower the differential to the ground using the floor jack. This step may require an extra person to help secure the differential as it is lowered. Proceed to Step 37.

## Vehicles with a Heavy Duty IRS Crossmember

29. Remove the two nuts holding the differential crossmember/lower control arm forward mounting bolts to the vehicle.
30. Remove the two mounting bolts that secure the forward differential mounting flanges to the IRS subframe.
31. Support the differential with a floor jack. Use a spring compressor to compress the spring on the driver side of the vehicle. The spring does not need to be removed from the vehicle, but the spring must be compressed to reduce the pressure on the differential cross member/lower control arm pivot bolt. Then, slowly pull out the mounting bolt so that only a 1/4" extends past the differential cross member. Release the spring compressor. **DO NOT** completely remove the bolt as the spring will still be under compression and damage to the IRS may occur.

NOTE: While it is possible to back the bolt out without compressing the spring, we do not recommend doing this because damage to the bolt threads may occur.

32. Repeat Step 31 for the passenger side.
33. Remove the differential crossmember from the vehicle.
34. Remove the vibration damper along with the front differential bushings.
35. Remove the two mounting bolts that hold the differential cover to the rearward differential bushing.
36. Lower the differential to the ground using the floor jack. This step may require an extra person to help secure the differential as it is lowered.

## Differential Preparation

37. Remove the differential cover bolts and carefully pry the cover from the differential housing.

NOTE: We recommend placing a tray or oil drain pan beneath the differential, as the oil will drain out when the cover is removed.

38. Stand the differential case up for 15 minutes or longer while you continue with the next steps. This will allow any remaining oil to drain out of the case.

## Differential Cover Modification

### Vehicles Using a Differential Cover Brace

If you are using an aftermarket differential cover brace or intend to use one, **DO NOT** follow Steps 39-54. Instead, place some of the supplied Loctite® 545 Thread Sealant onto the first few threads of the provided steel AN to NPT fitting and install it into the differential drain plug hole and tighten.



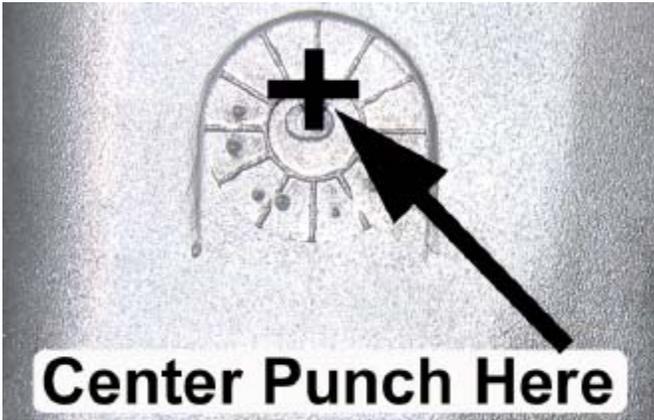
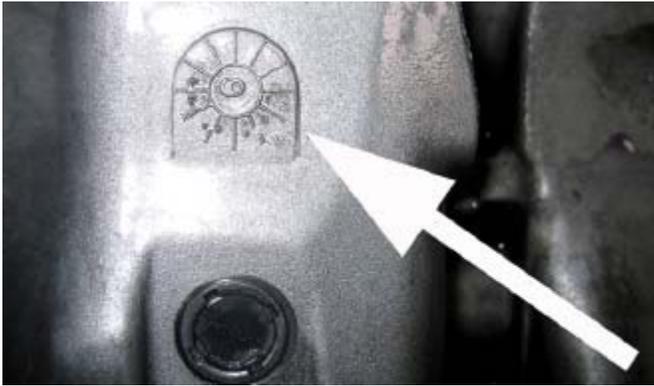
### Vehicles NOT Using a Differential Cover Brace

39. Place the differential cover on your work surface with the differential case mating surface facing upwards.

NOTE: It may be helpful to rest the differential cover on two blocks of wood to prevent it from rocking on your work surface.



40. Locate the raised casting circle directly above the differential fill plug. Center punch a mark 3/16" above the center of the casting circle.



41. Drill a pilot hole thru the center-punched mark, using a 1/8" or smaller drill bit.
42. Carefully enlarge the hole, using larger and larger drill bits, until the final size is drilled with a 3/4" drill bit.



43. Deburr both faces of the hole, using a hand file or deburring tool.
44. Center one of the supplied aluminum crush washers on the 3/4" hole, on the inside of the cover.

45. Using a hand file, remove any material preventing the aluminum crush washer from sitting flat against the inner surface of the differential cover. Continue until no gaps are visible between the aluminum crush washer and the differential cover.

*NOTE: Avoid removing excessive amounts of material. The aluminum crush washer will conform to very small irregularities on surface of the cover.*

46. Flip the cover over so that it is resting on the differential case mating surface.

*NOTE: Place a piece of cardboard beneath the cover to avoid marring its mounting surface.*

47. Using a flat hand file, remove the raised lettering that is within a 1/4" of the edge of the hole drilled in Step 42, so that one of the provided aluminum crush washers can rest flat against the outer surface of the differential cover. Repeat until no gaps are visible between the aluminum crush washer and the differential cover.



48. Place one of the supplied aluminum crush washers on the shorter end of the supplied AN bulkhead fitting.
49. Place the bulkhead fitting into the 3/4" hole drilled in the differential cover.

NOTE: The AN flared portion of the bulkhead fitting should be located on the outside face of the differential cover.



50. Place the remaining aluminum crush washer on the portion of the bulkhead fitting protruding through the inner face of the differential cover.



51. Place a few drops of the supplied Blue Loctite® on the threads of bulkhead fitting, adjacent to the aluminum crush washer installed in the previous step.



52. Thread the supplied AN blue aluminum nut onto the bulkhead fitting.



53. Tighten the nut as much as possible by hand, and then use a wrench to tighten the nut a further 3/8 of a turn.

NOTE: Do not over tighten the nut; its maximum allowable torque is 29 lb-ft.

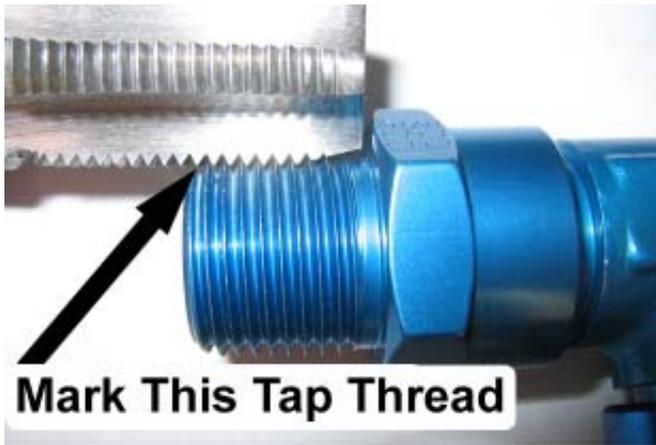
54. Thoroughly clean the cover of any metal chips or filings, and set it aside.

#### Determine 3/8" NPT Tapping Depth

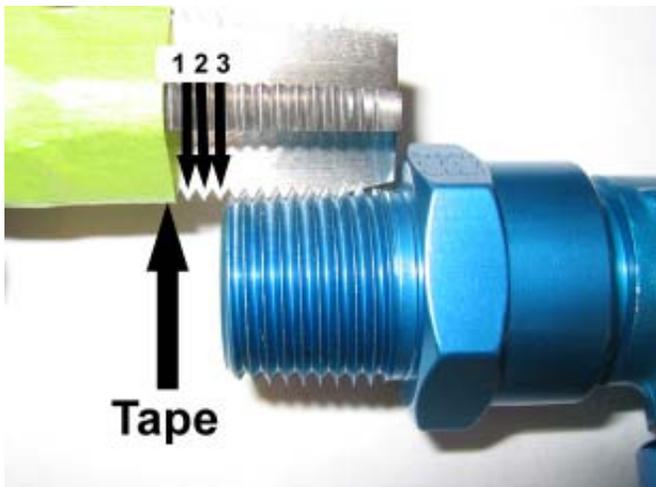
The diameter of a pipe tap is tapered so that the deeper the tap is threaded into a hole, the larger the hole's diameter becomes. If the tap is threaded too far into the hole, the diameter will be too large to properly thread in the AN fitting. To determine the proper depth to tap the hole, use the following procedure for the 3/8" NPT tap. The procedure requires the use of masking tape wrapped around the tap to act as a "stop" when tapping the hole.

55. Hold the nose of the 3/8" NPT pipe tap against the hex located on the 90° swivel fitting so that the threads on the tap and the threads on the swivel fitting mesh.

56. Place a mark on the last thread on the pipe tap that touches the threads on the 90° swivel fitting.



57. Count three full threads on the 3/8" NPT pipe tap, above the mark previously made, and wrap a piece of masking tape around the tap. The masking tape should be wrapped above the third thread. The 3/8" NPT tap is now ready for use.



### **Differential Case Oil Outlet Installation**

*NOTE: You MUST read through this entire section before continuing. Failure to read this entire section before beginning the sequence of taping the oil outlet hole, and damage your differential housing.*

58. Place the differential case on your workbench surface so that the opening is facing towards you, and the bottom of the differential case is facing upwards.



59. Locate the bottom, center mounting-hole for the differential case cover.

*NOTE: Because the differential case is upside down, this would be the hole furthest away from the workbench surface.*

60. Using a marker, mark a vertical line on the right side of the mounting-hole that is approximately 1/4" away from the outside diameter of the mounting-hole. This would be towards the driver side of the car, when the case is in the vehicle.



61. Stand the differential case up on two blocks of wood with the bottom of the case facing towards you.

62. Continue the mark made in Step 60 vertically along the bottom side of the differential case for approximately 2".

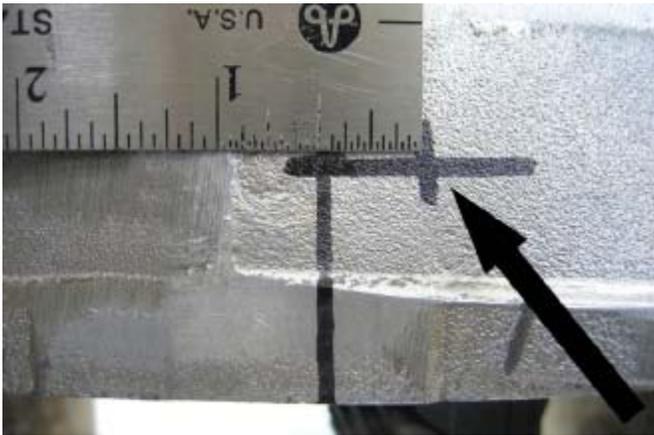
*NOTE: The line should be perpendicular to the workbench surface.*

63. Using a ruler, make a horizontal line that intersects the vertical line 1-1/8" up from the differential cover mounting face.



64. Next, measure over  $\frac{1}{2}$ " to the right of the vertical line, along the horizontal line made in the previous step, and make a small, vertical mark.

NOTE: You should now have a small "X" marked on the differential case.



65. Use a center punch to mark the center of the "X".



66. Using a  $\frac{1}{8}$ " drill bit, drill a pilot hole through the center punched mark.

NOTE: Make sure that the drill is perpendicular to the surface of the differential case where you are drilling. Failure to do so will result in difficulties while tapping the hole.

NOTE: The differential ring gear is extremely close to the differential case housing where the pilot hole is being drilled. DO NOT run the drill bit into the ring gear, as damage to both items will result.



67. Carefully enlarge the hole, using larger and larger drill bits, until the final size is drilled with a  $\frac{9}{16}$ " drill bit.

NOTE: The differential ring gear is extremely close to the differential case housing where the  $\frac{9}{16}$ " hole is being drilled. DO NOT run the drill bit into the ring gear, as damage to both items will result.



68. Coat the threads of the supplied  $\frac{3}{8}$ " NPT pipe tap with tapping oil. Motor oil or gear oil can also be used.

69. Carefully begin to thread the supplied  $\frac{3}{8}$ " NPT pipe tap into the  $\frac{9}{16}$ " hole by hand.

NOTE: Make sure that the tap is running parallel to the hole. Failure to do so may lead to a broken tap and damage to your differential housing.

70. Use a wrench, or tapping handle if available, and slowly thread the tap into the hole.

NOTE: Continue to check that the tap is parallel to the hole. If using a wrench to rotate the tap, take care, as there will be a greater chance of threading the tap in at an angle.



71. Periodically unthread the tap and clean the threads of any metal chips. After cleaning, apply more lubricant to the tap.
72. Continue to thread the tap into the hole until you have reached the tape placed on the tap in Step 57.

NOTE: Make sure that the tap does not run into the differential ring gear! If more clearance is required, slightly rotate the ring gear so that the tap is centered between the teeth of the ring.



73. Clean the newly formed threads of any oil or debris.
74. Clean out any chips and debris from the inside of the differential case.

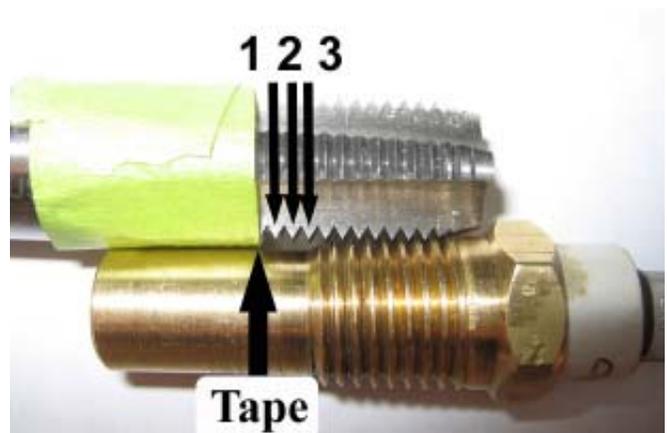
### Determine 1/4" NPT Tapping Depth

The diameter of a pipe tap is tapered so that the deeper the tap is threaded into a hole, the larger the hole's diameter becomes. If the tap is threaded too far into the hole, the diameter will be too large to properly thread in the AN fitting. To determine the proper depth to tap the hole, use the following procedure for the 1/4" NPT tap. The procedure requires the use of masking tape wrapped around the tap to act as a "stop" when tapping the hole.

75. Hold the nose of the 1/4" NPT pipe tap against the hex located on the Thermal Activation Switch so that the threads on the tap and the threads on the switch mesh.
76. Place a mark on the last thread on the pipe tap that touches the threads on the Thermal Activation Switch.



77. Count three full threads on the 1/4" NPT pipe tap, above the mark previously made, and wrap a piece of masking tape around the tap. The masking tape should be wrapped above the third thread. The 1/4" NPT tap is now ready for use.



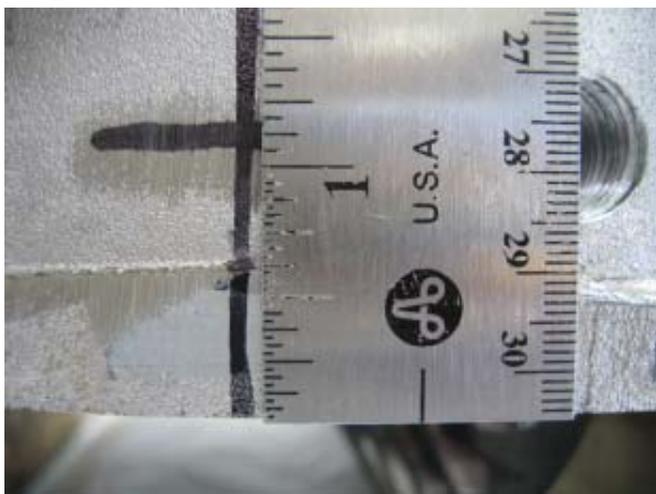
## **Differential Pump Thermal Activation Switch Installation**

*NOTE: You MUST read through this entire section before continuing. Failure to read this entire section before beginning the sequence of taping the oil outlet hole may cause you to incorrectly tap the oil outlet hole, and damage your differential housing.*

78. Place the differential case on your workbench surface so that the opening is facing towards you, and the bottom of the differential case is facing upwards.
79. Locate the bottom, center mounting-hole for the differential case cover.

*NOTE: Because the differential case is upside down, this would be the hole furthest away from the workbench surface.*

80. Using a marker, mark a vertical line on the left side of the mounting-hole, that is also approximately  $\frac{1}{4}$ " away from the outside diameter of the mounting-hole.
  81. Stand the differential case up on two blocks of wood, with the bottom of the case facing towards you.
  82. Continue the mark made in Step 80, vertically along the bottom side of the differential case, for approximately 2".
- NOTE: The line should be perpendicular to the workbench surface.*
83. Using a ruler, make a horizontal line that intersects the vertical line 1- $\frac{1}{8}$ " up from the differential cover mounting face.



84. Next, measure over  $\frac{3}{8}$ " to the left of the vertical line along the horizontal line made in the previous step and make a small, vertical mark. This would be towards the passenger side of the car, when the case is in the vehicle.

*NOTE: You should now have a small "X" marked on the differential case.*



85. Use a center punch to mark the center of the "X".
  86. Using a  $\frac{1}{8}$ " drill bit, drill a pilot hole through the center punched mark.
- NOTE: Make sure that the drill is perpendicular to the surface of the differential case where you are drilling. Failure to do so will result in difficulties while taping the hole.*
87. Carefully enlarge the hole, using larger and larger drill bits, until the final size is drilled with the supplied  $\frac{7}{16}$ " drill bit.
  88. Coat the threads of the supplied  $\frac{1}{4}$ " NPT pipe tap with tapping oil. Motor or gear oil can also be used.

89. Carefully begin to thread the supplied  $\frac{1}{4}$ " NPT pipe tap into the  $\frac{7}{16}$ " hole by hand.

*NOTE: Make sure that the tap is running parallel to the hole. Failure to do so may lead to a broken tap and damage to your differential housing.*

90. Use a wrench, or tapping handle if available, and slowly thread the tap into the hole.

NOTE: Continue to check that the tap is parallel to the hole. If using a wrench to rotate the tap, take care, as there will be a greater chance of threading the tap in at an angle.



91. Periodically unthread the tap and clean the threads of any metal chips. After cleaning, apply more lubricant to the tap.
92. Continue to thread the tap into the hole until you have reached the tape placed on the tap in Step 77.

NOTE: Make sure that the tap does not run into the differential ring gear! If more clearance is required, slightly rotate the ring gear so that the tap is centered between the teeth of the ring.



93. Clean the newly formed threads of any oil or debris.
94. Thoroughly clean the inside of the differential case of any metal debris.

## Differential Assembly

95. Clean the mating faces of the differential cover and differential case of any oil or silicon sealant.
96. Apply a light coating of silicon RTV sealant to the opening of the differential case.
97. Wait five minutes for the sealant to skin-over before continuing.
98. Attach the differential cover to the differential case using the factory mounting bolts and torque to 25 lb-ft.
99. Set the differential case aside, with the pinion flange facing down to prevent any oil from contacting the newly applied sealant.

NOTE: In order to prevent your differential case from leaking, we highly recommend allowing the sealant to dry overnight before filling the differential with oil.

## Installation Planning

Now is the perfect time to determine where to mount the differential oil cooler and oil pump. Every installation will be different. Here are things to consider:

- Are they protected from debris if mounted externally?
- Are they in a confined space with no airflow?
- Are they easily accessible?
- The oil cooler should be mounted so that the input/output ports are vertical. That will allow air to escape the cooler, preventing air pockets from forming and being trapped inside it.
- The supplied rubber isolator mounts should be mounted vertically, to load them in compression/tension. If they are mounted horizontally, they will eventually fail by shearing apart.
- The oil lines should be routed so there are no kinks in any of the hoses.

Shown below is a sample of how we mounted the OC-10 kit on our #91 American Iron™ racecar. Notice that the **OC-11** external temperature sensor kit installed on the driver side of the spare tire well.



### **Differential Oil Cooler Mounting**

100. Choose an area that allows the oil cooler inlet/outlet ports to face vertically.

*NOTE: If the oil cooler inlet/outlet ports are horizontal, or facing downwards, air may become trapped in the oil cooler, causing a significant decrease in efficiency.*

101. Fabricate mounting tabs that will allow the oil cooler to mount with four of the provided rubber isolators. We recommend bending 4 four L-shaped brackets and bolting them to each corner of the vertical mounting face on the oil cooler.

NOTE: Make sure that the weight of the oil cooler will be resting on the rubber isolators.



102. Attach four of the provided rubber isolators to the four oil cooler mounting tabs made in the previous step, with one 3/16" fender washer and one M4 nylock nut on each rubber isolator.

103. Carefully tighten the M4 nylock nuts until they are snug.

NOTE: Do NOT over tighten the nylock nuts. The plastic inserts on the nuts will prevent them from loosening.

104. Fabricate a bracket for the oil cooler to mount in the vehicle.

NOTE: The bracket must be sturdy enough to withstand a crash. If the bracket is attached to the sheet metal of the vehicle, Do NOT use screws, as these WILL pull out during a crash. We recommend using large fender washers and bolts to spread the load across the sheet metal, or permanently welding the bracket to the vehicle.

105. Mount the oil cooler to the bracket made in the previous step, using the rubber isolators installed in Step 102.

106. Install one 3/16" fender washer and one M4 nylock nut on each rubber isolator.



107. Carefully tighten the M4 nylock nuts until they are snug.

NOTE: Do NOT over tighten the nylock nuts. The plastic inserts on the nuts will prevent them from loosening.

### **Differential Oil Pump Mounting**

The differential oil pump can be mounted in any position. The pump also has the ability to rotate the inlet and outlet ports 180° for multiple installation options. Refer to the pump manufacturer's instruction sheet for more details.

### **Installation**

If mounted vertically, we highly recommend that the pump body sit above the inlet/outlet ports on the pump so that any oil that may ever leak out from the hose connections will not damage the pump's electric motor.

108. Locate a flat mounting area that is at least 3.75" wide by 2.75" tall and provides adequate clearance for the pump and the inlet/outlet lines.

NOTE: The pump must be mounted using bolts. If sheet metal screws are used, the pump WILL come loose during a crash.

NOTE: Choose a mounting area that has access from the front and back, so that the bolts attaching the pump can be easily tightened.



109. Remove the two screws retaining the differential oil pump mounting bracket to the differential oil pump.



110. Use the mounting bracket as a template, and center punch the four mounting hole locations onto the mounting area.



111. Starting with a small pilot hole, drill the center punched marks out to a 1/4" diameter hole.
112. Re-mount the differential oil cooler to its mounting bracket and tighten the two screws.
113. Install the provided 1/4" bolts through the differential oil cooler mounting bracket rubber isolators with a 1/4" washer beneath each bolt head.

NOTE: Some force may be required to pass the 1/4" bolts through the rubber isolators.



114. Place the differential oil pump in its final mounting location so that the four bolts pass through the holes drilled in Step 111.
115. Install a 1/4" washer and nylock nut onto each bolt.
116. Carefully tighten the 1/4" nylock nuts until they are snug.

NOTE: Do NOT over tighten the nylock nuts. The differential pump must be allowed to move slightly on the rubber isolators.

### **Differential Oil Pump AN Adapter Fitting Installation**

117. Thread the two supplied NPT to AN adapter fittings into the inlet and outlet port of the differential oil pump.
118. Once the adapter fittings can no longer be turned by hand, use a wrench to rotate each fitting another 1/2 to 3/4 of a turn.

NOTE: DO NOT over tighten the adapter fittings, as damage to the pump housing will occur. If you find that oil leaks around the threads of the adapter fitting during use, tighten the fittings another 1/4 turn.

### **Differential Installation**

#### **Vehicles *without* a Heavy Duty IRS Crossmember**

119. Raise the differential back into the vehicle using a floor jack.
120. Install the two mounting bolts that secure the differential cover to the rearward differential bushing.
121. Proceed to Step 127.

#### **Vehicles with a Heavy Duty IRS Crossmember (includes 2003-04 Cobras)**

122. Raise the differential back into the vehicle using a floor jack.
123. Install the two mounting bolts that secure the differential cover to the rearward differential bushing.
124. Install the differential crossmember into the vehicle.

125. Identical to the removal procedure for the differential crossmember, use a spring compressor to compress the spring on the passenger side of the vehicle. Then, push the mounting bolt back in, being sure that it passes through the differential crossmember mounting hole. Release the spring compressor and repeat on the driver side of the vehicle.
126. Install the nuts onto the lower control arm/differential crossmember mounting bolts, but do not tighten at this time.
127. Reinstall the two mounting bolts that secure the forward differential mounting flanges to the IRS subframe, along with the vibration damper and stock bushings if applicable. If MM or other aftermarket differential bushings are fitted, refer to those installation instructions.
128. Thread the nuts onto the bolts and snug them down.
129. Remove the floor jack from underneath the differential.
130. Torque the forward differential mounting bolts to 52 lb-ft.
131. Torque the differential cover-to-rearward differential bolts to 76 lb-ft.
132. Reinstall the ABS sensors onto the differential housing. Torque the Torx bolts to 5 lb-ft. Note that these have both an internal Torx and an external hex head.
133. Connect the drive shaft to the differential. Use the mark made in Step 21 to correctly orient the drive shaft. Torque the bolts to 83 lb-ft.  
  
NOTE: We recommend using some of the supplied Blue Loctite® on the drive shaft bolts to prevent them from loosening.
134. Use a floor jack to support the passenger side lower control arm, and remove the lower shock-mounting bolt.
135. Remove the tape covering the differential half-shaft input hole.
136. Install the axle half-shaft/spindle assembly. Insert the half-shaft into the differential. Take care to avoid damage to the differential seal. Make sure the circlip is seated, securing the half shaft in place. Install the upper spindle-to-control-arm mounting bolt.
137. Remount the lower shock bolt and torque to 98 lb-ft.
138. Carefully lower the floor jack.
139. Double-check to make sure the internal circlip is engaged by pulling on the axle half-shaft inner CV joints (not the axle itself); no movement should occur.
140. Install the lower spindle mounting bolt and torque to 85 lb-ft.
141. Repeat Steps 134-140 for the driver side.
142. Use the marks previously made on the eccentric cam alignment bolts to realign them. Torque the bolts to 66 lb-ft.
143. Reinstall the brake calipers and rotors. Torque the caliper mounting bolts to 76 lb-ft.
144. Reinstall the parking brake cable and retaining clip.
145. Reinstall the parking brake cable holder to the lower control arm and torque the bolt to 9 lb-ft.
146. Reinstall the outer tie-rod ends. Stock outer tie-rod ends should have the nuts torqued to 35 lb-ft.  
  
NOTE: If an MMIRSTR-1 adjustable tie-rod end kit has been installed to correct bumpsteer, a different torque value is required. If the tapered stud was removed, torque the ½"-20 lock nut to 50 ft-lb. If the tie-rod end was removed from the stud, replace the tie-rod spacer stack as it was before removal, and torque the 5/8"-18 lock nut to 65 lb-ft.
147. Install new cotter pins if you are using the stock outer tie-rod ends.
148. Vehicles equipped with rear lower control arm bushings made of Delrin, urethane, or rod ends may torque the lower control arm bolts to 184 lb-ft and proceed to Step 149. However, if the bolts were loosened and the vehicle has the stock rubber lower control arm bushings, the vehicle suspension must be compressed as when placed at normal ride height. After doing so, torque the bolts to 184 lb-ft.

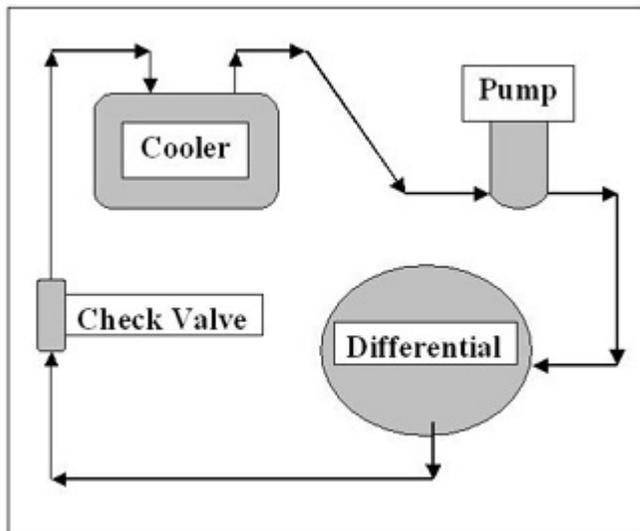
NOTE: A significant amount of preload will be placed on the stock rubber lower control arm bushings if the lower control arm/differential crossmember mounting bolts are tightened with the suspension at full droop. This can lead to premature failure of the bushings as well as reduce the handling capability of the vehicle.

## Oil Line Routing

Routing of the oil lines should be relatively straightforward once the oil cooler and differential oil pump have been installed in their final locations. The basic rule of thumb is to route the lines in the most direct and efficient manner in order to minimize any tight radius bends in the lines. Use the supplied straight and 90° AN fittings to help achieve this goal. Below is a diagram and a general guideline of how to route the oil lines. The next section describes how to properly assemble AN fittings onto the stainless steel braided hose.

NOTE: We highly recommend having the differential oil pass through the oil cooler before the oil reaches the differential oil pump to help reduce the temperature of the oil passing through the pump.

NOTE: One important consideration is that the oil lines DO NOT rest directly on each other without some sort of insulation present between the lines, as they WILL rub through each other.



149. Locate the AN to NPT 90° swivel fitting and hand thread the fitting one to two turns into the outlet port on the bottom of the differential housing that was made in Step 69.

NOTE: Do NOT tighten the fitting yet, as it must be removed in a later step.

150. Install two straight AN fittings onto the supplied check valve.

151. Install the remaining straight and 90° AN fittings onto the ports on the differential oil cooler, differential oil pump, and differential cover and hand tighten.

NOTE: There will be two extra AN fittings. They may be straight fittings, 90° fittings, or both depending on how the oil lines were routed.

152. Next, determine the length of AN stainless steel braided hose required to reach from the 90° swivel fitting installed in Step 149 to the input port on the differential oil cooler.

NOTE: We highly recommend adding at least an extra foot in length to the two lines going to the differential case. By leaving extra line, the subframe can be slightly lowered for future maintenance or upgrades without having to disconnect the lines to the differential.

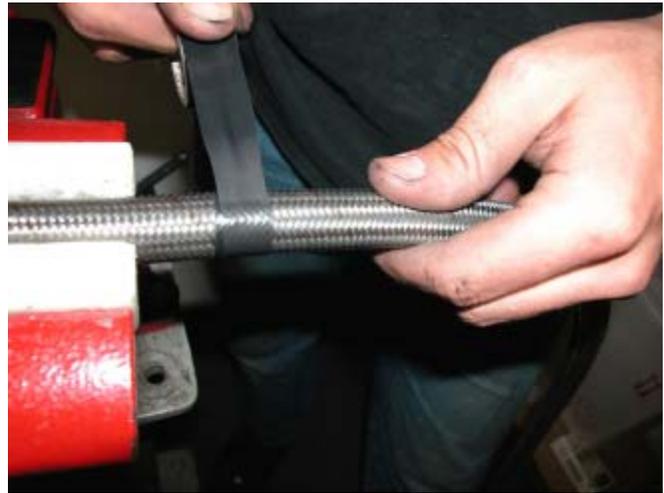
NOTE: The direction of oil flow through the oil cooler does not matter. Either of the two ports can be used as the inlet port.

153. Subtract 2.5" from the determined length and mark this as the location to cut the hose.

NOTE: The stainless steel braided hose needs to be made 2.5" shorter to accommodate the installation of the check valve on this line in Step 171. It is important that the check valve be positioned between the differential case oil outlet and the differential oil cooler.

154. Determine where on the stainless steel braided hose above you wish to install the check valve, and mark the location.

155. Tightly wrap a piece of masking tape or electrical tape around the stainless steel braided hose where it is to be cut.



156. Squarely cut through the tape-wrapped sections of the hose using a sharp 32 TPI (or finer) hacksaw blade.



157. Trim the frayed wire ends of the stainless steel braid using a pair of snips, and remove the tape.

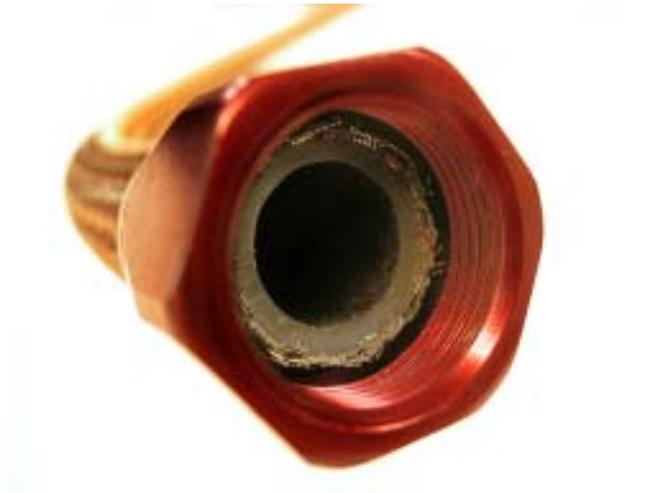
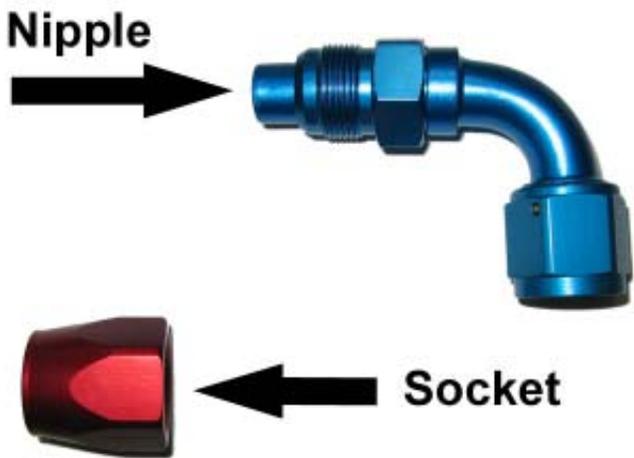
158. Repeat Steps 155-157 to make the remaining connecting lines between the differential oil cooler, differential oil pump, and differential cover inlet.

### **AN Fitting Installation**

NOTE: Before assembling the AN fittings onto the differential oil pick-up line, slide the entire length of the supplied aluminized heat shield tubing onto the stainless steel braided line. The heat shield tubing will protect the oil pick-up line from excessive exhaust heat. Once the AN fittings have been installed on the line, use the two supplied hose clamps to secure the ends of the heat shield tubing.



159. Disassemble the red socket from the blue nipple on the fitting to be installed on the stainless steel braided line.



160. Use motor or gear oil to lubricate the inside threads of the socket.

161. Install the socket onto the hose by twisting the socket COUNTER-CLOCKWISE. Butt the end of the hose up to the base of the threads of the red socket.

162. Use a felt pen to mark the hose at the base of the socket, so that you can tell if the hose is getting pushed out during the rest of the assembly.



163. Use motor or gear oil to lubricate the threads on the nipple and place the nipple in a vise. Hold the HOSE, not the socket, and push the hose and socket onto the nipple until the socket threads can be started. Again, holding the

HOSE, start the threads and go as far as you can by hand.

164. When you can no longer tighten the fitting by hand, put one end in the vise and an appropriate wrench on the other end. Tighten the fitting until the socket is within 1/16" of bottoming on the nipple.

NOTE: Do NOT use an adjustable or oversize wrench or you will damage the fitting.



165. Make sure your mark at the end of the socket has not moved more than 1/16", if it has return to Step 161 and repeat the process.
166. Repeat Steps 159-165 to install each required AN fitting.

### Oil Line Installation

167. Apply some of the supplied Loctite® 545 Thread Sealant to the first few 3/8" pipe threads of the AN to NPT 90° swivel fitting.

NOTE: The threads on the differential and the swivel fitting must be clean and oil-free for the Loctite to work properly. We recommend using brake cleaner or acetone to clean the threads.



168. Thread the fitting into the bottom of the differential case and hand tighten.
169. Using the proper sized wrench, rotate the fitting approximately one turn, or until snug.

NOTE: A pipe fitting is tapered in such a manner that the outer diameter of the fitting increases in size the further away from the end it is measured. Similar to a bottle cork, the further into a hole the fitting is threaded, the tighter the seal. Because of this feature, it is not necessary to completely thread the fitting into the differential case housing until no threads are visible. The depth the fitting threads into the differential case housing will be determined by how deep the hole was tapped in Step 71.

NOTE: If you find that oil does leak around the threads, tighten the fitting another ¼ turn.

NOTE: If further tightening is required, the fitting must be removed and the previously applied Loctite cleaned out before reapplying new Loctite and tightening the fitting further. Simply tightening a fitting that has cured Loctite will destroy the seal the Loctite was intended to provide.

170. Attach the assembled stainless steel braided lines to their previously determined ports, and hand tighten.
171. Install the check valve onto the line connecting the oil cooler inlet port to the differential case outlet port, and hand tighten the AN fittings. Make sure that the arrow indicating the flow direction of the check valve is pointing towards the oil cooler inlet port.

NOTE: Failure to properly orient the check valve may cause damage to the differential oil pump.



172. Using the proper size wrenches, tighten all of the AN fittings.

NOTE: You *MUST* use a wrench to hold the adapter fittings installed in the differential oil pump when tightening the AN fittings onto them. The differential pump housing is plastic and is easily damaged from over tightening.

### **Thermal Activation Switch Installation**

173. Locate the Thermal Activation Switch, and apply some of the supplied Loctite® 545 Thread Sealant to the first few threads.

NOTE: The threads on the differential and the Thermal Activation Switch must be clean and oil-free for the Loctite to work properly. We recommend using brake cleaner or acetone to clean the threads.



174. Thread the switch into the previously tapped hole in the bottom of the differential case, and hand tighten.
175. Using the proper sized wrench, rotate the switch approximately 1 ½ turns, or until snug.

NOTE: The Thermal Activation Switch uses pipe threads. A pipe fitting is tapered in such a manner that the outer diameter of the fitting increases in size the further away from the end it is measured. Similar to a bottle cork, the further into a hole the fitting is threaded, the tighter the seal. Because of this feature, it is not necessary to completely thread the Thermal Activation Switch into the differential case housing until no threads are visible. The depth the fitting threads into the differential case housing will be determined by how deep the hole was tapped in Step 92.

NOTE: If you find that oil does leak around the threads, tighten the fitting another ¼ turn.

NOTE: If further tightening is required, the fitting must be removed and the previously applied Loctite cleaned out before reapplying new Loctite and tightening the fitting further. Simply tightening a fitting that has cured Loctite will destroy the seal the Loctite was intended to provide.

### **Oil Cooler Fan Wiring**

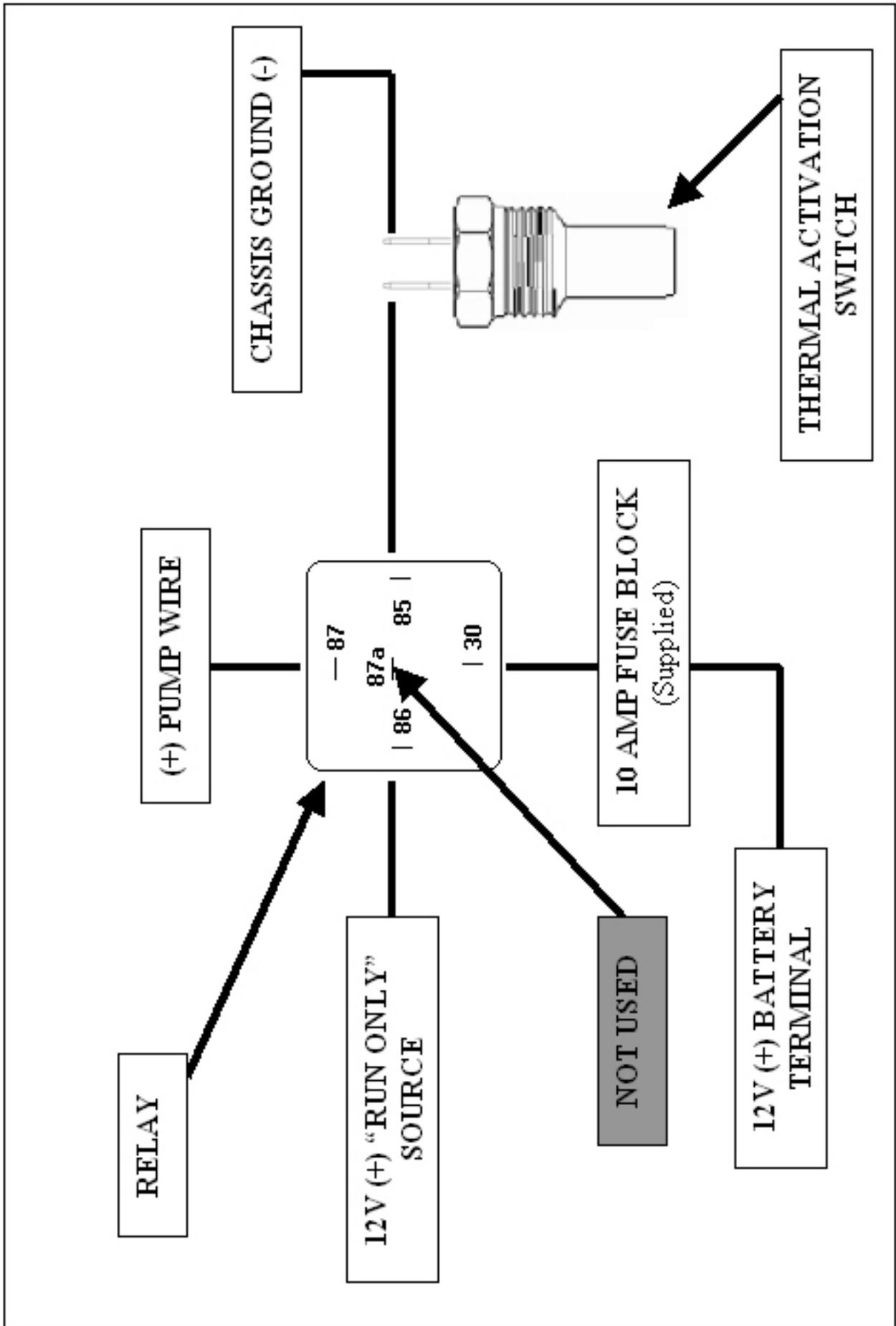
176. Connect the black wire from the fan motor to a suitable chassis ground.
177. Connect the blue wire from the fan motor to a switched +12V power supply.

NOTE: There must be a 10A fuse on the power supply going to the electric fan.

### **Differential Oil Pump Wiring**

The Thermal Activation Switch is a low amperage switch designed to close when a temperature of approximately 194°F is reached. The supplied relay must be used in conjunction with the Thermal Activation Switch to deliver power to the pump. We recommend connecting Relay Terminal 86 to a “Run Only” power source, so that the pump can only run when the key is in the “ON” position. Below is the recommended way to correctly wire the differential oil pump.

- *Relay Terminal 30-* Connects to the supplied 10A fuse block, and then to a +12V power supply such as the battery.
- *Relay Terminal 87-* Connects to the positive side of the differential oil pump.



- *Relay Terminal 87a*- NOT USED
- *Relay Terminal 85*- Connects to one of the two posts on the Thermal Activation Switch.
- *Relay Terminal 86*- Connects to a +12V “Run Only” source, or to a manually switched +12V source.

NOTE: This terminal only energizes the power relay. If the Thermal Activation Switch has not reached 194°F and closed the circuit, the pump will not turn on.

- *Thermal Activation Switch*- There are two male spades. One must connect to a chassis ground, and the other to Relay Terminal 85.

NOTE: The IRS Subframe is NOT a chassis ground, as it is isolated from the chassis with rubber or urethane bushings.

NOTE: Make sure to install the supplied silicon heat shielding tube over the wires connecting to the Thermal Activation Switch terminals. Failure to protect the wires from exhaust heat may cause the plastic wire insulation to melt.



- *Differential Oil Pump*- There is a positive and a negative wire on the pump. The negative wire must be connected to a chassis ground, and the positive wire should be connected to Relay Terminal 87.

NOTE: If you choose to wire the pump in a manner differently than described above, make sure to use a 10A fuse in-line with the positive wire of the differential oil pump.

## Setting the Differential Oil Level

In order to properly set the differential oil level it is necessary to manually run the differential oil pump. A procedure to active the pump is outlined below. If you did not follow the recommended wiring procedure described above, you must determine how to manually active the pump before proceeding.

178. Before setting the differential oil level, make sure that the vehicle is as close to level as possible. If necessary, raise or lower the front jack stands to get the vehicle level.

179. Remove the differential fill plug.

NOTE: If the steel AN to NPT adapter fitting was installed in place of the differential fill plug prior to Step 39, simply disconnect the return line from the adapter fitting.

180. Fill the differential with your manufacturer’s specified oil until the level just reaches the bottom of the differential fill plug hole, or AN to NPT adapter fitting if it was installed. Reconnect the return line to the adapter fitting once the fluid has been added.

181. On the Thermal Activation Switch, locate the wire that connects to Relay Terminal 85, and disconnect this wire from the Thermal Activation Switch.

182. Create a temporary jumper wire to ground the wire disconnected from the Thermal Activation Switch in the previous step.

NOTE: Make sure to ground the wire to the chassis, and not to the IRS subframe.

183. Temporarily turn the ignition key to the “ON” position. If the system is wired correctly, the differential oil pump should begin running. Make sure the pump is running before proceeding.

184. Allow the pump to run for approximately 20 seconds, and then turn the ignition to the “OFF” position.

NOTE: The fluid level in the differential should have decreased. If the level has not changed, allow the pump to run for another 20 seconds.

NOTE: The gear-oil pump is capable of self-priming up to 8 vertical feet. If the fluid level has not changed after running the pump for a total of

one minute, double check that all of the AN fittings are tight and that there are no restrictions.

185. Refill the differential with more oil until it just reaches the bottom of the differential fill plug hole. If the AN to NPT adapter fitting was installed, the oil should just begin to seep out of the fitting when the return line is removed.
186. Repeat Steps 183-185 until the fluid level in the differential does not change.

NOTE: Installation of the MM IRS Differential Cooler Kit will increase the fluid capacity of the differential by one quart or more, depending on the amount of the stainless steel braided oil line used.

187. Reinstall the differential fill plug and tighten. If the steel AN to NPT adapter fitting was installed in place of the differential fill plug, reconnect the return line to the adapter fitting and tighten.
188. Remove the temporary jumper made in Step 182, and reconnect the wire from Relay Terminal 85 to the Thermal Activation Switch.

### **Final Assembly**

189. Reinstall the exhaust system and torque the exhaust flange bolts to 34 lb-ft.
190. Reinstall the rear wheels, and torque the lug nuts to the manufacturer's specifications.
191. Safely lower the vehicle to the ground.
192. Remember to torque the lower control arm mounting bolts to 148 lb-ft with the car at ride height, if the bolts were not tightened in Step 148.

Test drive and enjoy!

### **Optional Tool Kit (MMT-7)**

Maximum Motorsports offers an optional tool kit with the required taps and drill bits to install the AN fittings into the differential housing and case. The kit contains high quality drill bits and taps which are designed for multiple use. Make sure to ask your sales representative for a MMT-7 when ordering.

### **This kit includes:**

- 1 Oil Cooler w/electric fan
- 1 Gear-oil Pump
- 1 Thermal Activation Switch
- 1 Electrical Relay
- 1 Relay Electrical Socket
- 2 In-line Fuse Holder
- 2 10A Fuse
- 4 90° AN Fitting
- 5 Straight AN Fitting
- 1 90° Swivel AN to NPT Fitting
- 2 NPT to AN Adapter Fitting
- 1 NPT to AN Steel Adapter Fitting
- 1 AN Bulkhead Fitting
- 1 AN Bulkhead Nut
- 2 AN Aluminum Crush Washer
- 1 15' Stainless Steel Braided Hose
- 1 Check Valve
- 1 Aluminized Heat Shielding
- 1 Silicone Heat Shielding
- 2 Hose Clamps