

State of California
AIR RESOURCES BOARD

EXECUTIVE ORDER D-176-1
Relating to Exemptions Under Section 27156
of the Vehicle Code

DINAN ENGINEERING, INC.
STAGE 1 TURBOCHARGER KIT

Pursuant to the authority vested in the Air Resources Board by Section 27156 of the Vehicle Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-45-5;

IT IS ORDERED AND RESOLVED: That the installation of the add-on Stage 1 turbocharger kit manufactured by Dinan Engineering, Inc. has been found not to reduce the effectiveness of required motor vehicle pollution control devices and, therefore, is exempt from the prohibitions of Section 27156 of the Vehicle Code for 1989-1991 model year BMW 535i, 1988-1989 model year BMW 635CSi, L6 and 1988-1991 model year BMW 735i and 735iL models. Modifications to the OEM emission-related parts due to the installation of the turbocharger kit include longer positive crankcase ventilation (PCV) tubing due to location of new intake plumbing, replacement of the air cleaner assembly and relocation of the oxygen sensor from the catalytic converter to the exhaust manifold.

This Executive Order is valid provided that installation instructions for this turbocharger kit will not recommend tuning the vehicle to specifications different from those submitted by the device manufacturer.

Changes made to the design or operating conditions of the device, as exempted by the Air Resources Board, that adversely affect the performance of a vehicle's pollution control system shall invalidate this Executive Order.

Marketing of this device using an identification other than that shown in this Executive Order or marketing of this device for an application other than those listed in this Executive Order shall be prohibited unless prior approval is obtained from the Air Resources Board. Exemption of a kit shall not be construed as an exemption to sell, offer for sale, or advertise any component of a kit as an individual device.

This Executive Order does not constitute any opinion as to the effect the use of this device may have on any warranty either expressed or implied by the vehicle manufacturer.

THIS EXECUTIVE ORDER DOES NOT CONSTITUTE A CERTIFICATION, ACCREDITATION, APPROVAL, OR ANY OTHER TYPE OF ENDORSEMENT BY THE AIR RESOURCES BOARD OF ANY CLAIMS OF THE APPLICANT CONCERNING ANTI-POLLUTION BENEFITS OR ANY ALLEGED BENEFITS OF DINAN ENGINEERING, INC'S. PHASE 1 TURBOCHARGER KIT.

No claim of any kind, such as "Approved by the Air Resources Board" may be made with respect to the action taken herein in any advertising or other oral or written communication.

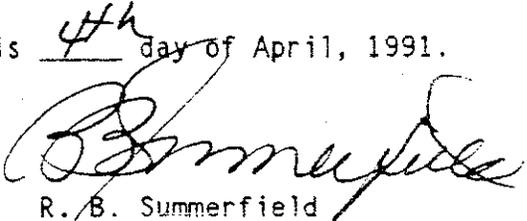
Section 17500 of the Business and Professions Code makes untrue or misleading advertising unlawful, and Section 17534 makes violation punishable as a misdemeanor.

Section 43644 of the Health and Safety Code provides as follows:

"43644, (a) No person shall install, sell, offer for sale, or advertise, or, except in an application to the state board for certification of a device, represent, any device as a motor vehicle pollution control device for use on any used motor vehicle unless that device has been certified by the state board. No person shall sell, offer for sale, advertise, or represent any motor vehicle pollution control device as a certified device which, in fact, is not a certified device. Any violation of this subdivision is a misdemeanor."

Any apparent violation of the conditions of this Executive Order will be submitted to the Attorney General of California for such action as he deems advisable.

Executed at El Monte, California, this 4th day of April, 1991.


R. B. Summerfield
Assistant Division Chief
Mobile Source Division

State of California
AIR RESOURCES BOARD

EVALUATION OF DINAN ENGINEERING, INC.'S ADD-ON STAGE 1 TURBOCHARGER KIT
FOR EXEMPTION FROM THE PROHIBITIONS OF VEHICLE CODE SECTION 27156
IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF
THE CALIFORNIA ADMINISTRATIVE CODE

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by

Mobile Source Division

State of California
AIR RESOURCES BOARD
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(This report has been reviewed by the staff of the California Air Resources Board and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.)

SUMMARY

Dinan Engineering, Inc. has applied for an exemption from the prohibitions of Vehicle Code Section 27156 for their Stage 1 Turbocharger Kit for installation on 1989-1991 model year BMW 535i, 1988-1989 model year BMW 635CSi, L6 and 1988-1991 model year BMW 735i and 735iL models. Dinan has submitted a completed application and other required information, as well as exhaust emissions test data performed at Automotive Club of Southern California Laboratory (ACSC) which shows that their kit does not have any adverse effect on the exhaust emissions. Testing performed at the Air Resources Board (ARB) confirmed the results of ACSC.

Based on the submitted information and the results of the emissions tests performed at ACSC and the ARB, the staff concludes that the installation of Dinan's Stage 1 turbocharger kit will not adversely affect exhaust emissions on the specified vehicles.

The staff recommends Dinan Engineering, Inc. be granted an exemption as requested and that Executive Order D-176-1 be issued.

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EVALUATION OF DINAN ENGINEERING, INC.'S ADD-ON STAGE 1 TURBOCHARGER KIT FOR EXEMPTION FROM THE PROHIBITIONS IN VEHICLE CODE SECTION 27156 IN ACCORDANCE WITH SECTION 2222, TITLE 13, OF THE CALIFORNIA ADMINISTRATIVE CODE.

I. INTRODUCTION

Dinan Engineering, Inc. (Dinan) of 81 Pioneer Way, Mountain View, California 94041, has applied for an exemption from the prohibitions of Vehicle Code Section 27156 for their Turbocharger Kit for installation on 1989-1991 model year BMW 535i, 1988-1989 model year BMW 635CSi, L6 and 1988-1991 model year BMW 735i and 735iL models.

Dinan has submitted a completed application and all the required information as well as exhaust emissions test data performed at Automobile Club of Southern California Laboratory (ACSC) on a 1989 model year BMW 535i. Confirmatory tests were performed on the same vehicle at the ARB.

II. CONCLUSION

Based on the submitted information and the results from exhaust emissions tests performed at ACSC and confirmatory testing conducted at the ARB, the staff concludes that Dinan's Phase 1 turbocharger kit will not adversely affect exhaust emissions from vehicles for which the exemption is requested.

III. RECOMMENDATIONS

The staff recommends that Dinan Engineering, Inc. be granted an exemption as requested and that Executive Order D-180-7 be issued.

IV. TURBOCHARGER KIT DESCRIPTION

The purpose of the Dinan turbocharger system is to increase the power output of the engine by compressing the intake charge with pressures above that of the atmosphere. The increase in pressure allows a greater charge density to enter the combustion chamber causing an increase in the

volumetric efficiency of the engine. Increased pressure allows a greater charge density to enter the combustion chamber providing more oxygen for combustion. Since the air flow increases, extra fuel is needed to maintain proper air-fuel ratios. The Dinan turbo system incorporates a fuel management system which provides precise fuel flow at different rpm's and air flows.

The major components of the system include a turbocharger, intercooler, a modified ECU prom program, electronic fuel enrichment computer, wastegate, and detonation control system. The turbocharger is a Garret/Airesearch T04B53 with an air ratio (A/R) of 0.69. The turbine, driven by exhaust gases, is linked to the compressor. The intake air is routed to the compressor through the compressor inlet pipe. It is then compressed and routed to an air-to-air intercooler to reduce the intake charge temperature and the occurrence of detonation. It is then routed to the intake plenum. Lubrication and cooling of the turbocharger bearings is provided by the engine oil. Lubricating oil from the turbocharger is returned to the oil pan.

The modified ECU PROM program is utilized to re-curve the fuel injection system and the ignition system to match the requirements of the turbocharged engine.

Proper fuel delivery under boost conditions is provided by an electronic fuel enrichment computer. Maximum positive pressure (boost) is limited to 10.0 psi for vehicles equipped with manual transmissions and 9.0 psi for cars equipped with automatic transmissions by a Rayjoy wastegate.

The detonation control system is an electronic ignition control computer that prevents the occurrence of detonation under boost conditions. It is a closed loop digital computer which retards timing when detonation is detected.

Modification to the OEM emission related parts due to the installation of the turbocharger kit include longer positive crankcase ventilation (PCV) tubing due to location of new intake plumbing, replacement of the air cleaner assembly and relocation of the oxygen sensor from the catalytic converter to the exhaust manifold. No other OEM emission control components are removed, disconnected or relocated when the turbocharger kit is installed. Installation instructions, included in every kit, show the kit installer how to properly install the turbo system. Appendix A shows the installation instructions and the parts list.

Turbocharger kit numbers for the various BMW vehicle models are:

1. 1989-1991 535i: D-800-5351 for manual transmission and D-800-5352 for automatic transmission.
2. 1988-1989 635CSi, L6: D-800-6351 for manual transmission and D-800-6352 for automatic transmission.
3. 1988-1991 735i and 735iL: D-800-7351 for manual transmission and D-800-7352 for automatic transmission.

V. DISCUSSION

A 1989 California certified BMW 535i with a manual transmission was used for emissions testing. Dinan performed emissions testing at ACSC laboratory. The test program consisted of one FTP CVS-75 (cold start) test on the test vehicle in the modified configuration (tested against the standard). The results of the exhaust emissions test performed at ACSC are shown in Table 1.

Table 1

CVS-75 TEST RESULTS

(Automotive Club of Southern California)

	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Emission standards	0.41	7.00	0.7
Turbocharged	0.35	5.71	0.08

Confirmatory testing was performed at the ARB. The results are shown in Table 2.

Table 2

CVS-75 TEST RESULTS

(Haagen-Smit Laboratory)

	<u>HC</u>	<u>CO</u>	<u>NOx</u>
Turbocharged 1	0.19	4.48	0.08
Turbocharged 2	0.24	4.02	0.07
Average	0.21	4.25	0.07

The CVS-75 emissions test results at ACSC and confirmatory testing at the ARB indicate that HC, CO and NOx emissions of Dinan's Stage 1 turbocharger system is well below the emission standards. This demonstrates that the installation of the Dinan turbo system on specified vehicles will not adversely affect the exhaust emissions.

Dinan submitted all the required information and fulfilled the requirements for an exemption. The test results confirms that Dinan's turbo system meets the requirements for the exemption.

APPENDIX A

Installation Instructions and Parts List

TURBO SYSTEM INSTALLATION

1989→ 535i

1988→ 735i, 735iL

1. Disconnect the negative battery ground cable that is behind the small plastic cover below the front of the passenger side rear seat.
2. Unbolt the airbox-airflow meter assembly from the engine valve cover and fenderwell and remove from car with the main airboot and PCV hose connected. Be sure to disconnect the small vacuum hose from the PCV hose, leaving small hose on engine.
3. Remove the black plastic cover from behind the right side headlights.
4. Remove the two fuel hoses and vacuum hose that connect to the fuel pressure regulator on engine. Unbolt and remove fuel pressure regulator.
5. Loosen the two hose clamps at the rear of the fuel rail that connect the short hose between the fuel rail and fuel inlet pipe. Push hose forward off of fuel rail.
6. Carefully lift the long plastic top piece off of the fuel injector wire rail while gently prying on the lock tabs.
7. Unplug the two front pulley magnetic sensor wire plugs from the front right side of the injector wire plug rail.
8. Remove the two Allen head bolts that hold down the wire rail.
9. Pull the wire rail up away from the injectors.
10. Remove the three plastic clips that hold the inlet and return fuel pipes to fuel rail.
11. Note position of the two metal nut tabs that are mounted under two of the three injector fuel rail hold down bolts. Remove the three bolts and carefully remove the injector fuel rail with the injectors.
12. On workbench remove the injector retaining clips and remove injectors.
13. Locate the turbo injectors from kit and install them using a little grease on the rubber o-rings to protect them from damage during installation.

14. Reinstall fuel rail with the injectors using a little grease on the injector o-rings. Correctly position the metal nut tabs.
15. Locate the new turbo fuel pressure regulator from kit and install on fuel rail using a little grease on the rubber o-ring.
16. Connect the fuel hoses and vacuum hose to the fuel pressure regulator. Reconnect the short hose between the fuel rail and the fuel inlet pipe.
17. Reinstall the three plastic clips that hold the inlet and return pipes to the fuel rail.
18. Carefully line up the wire rail plugs with the injector sockets and push down until all are correctly mated. Reinstall the two Allen head bolts. Do not reinstall the plastic wire rail top piece at this time.
19. Reconnect the magnetic sensor plugs to the wire rail.
20. Remove the black plastic cover that is above the oil filler cap and just behind ignition coil that is secured by two large plastic slot head screws.
21. Remove the plastic distributor cap cover and refer to Figure 1 to see how the cover must be cut to allow for intercooler clearance. Mark the cover as shown using a sharp scribe and cut out the corner piece using hacksaw or a fiberglass cutting disc held in a rotary die grinder clean up rough edges with file. Do not reinstall cover yet.
22. Unplug the washer pump wire plug and the washer fluid level sensor wire plug from the windshield washer fluid reservoir. Mark these plugs to identify them in a later step. Cut the small clear hose at the washer pump and remove the washer fluid reservoir from car. You may want to save the fluid in a clean container until after you install the fluid reservoir on the other side of engine compartment.
23. Remove the large plastic cover under the front of the engine.
24. Remove the front sway bar.
25. Unbolt the front swaybar mount braces and allow the tubular crossbrace to hang for now.

26. Unplug the oxygen sensor wire plug which is located at the lower rear left side of the engine block.

27. Unbolt the small curved metal tube that holds the oxygen sensor wire to the bottom of the car.

28. Remove the heatshield from the far right side of the tubular crossbrace.

29. Remove the heatshield from the right side of the front subframe.

30. Remove the transmission to exhaust bracket and save all pieces for reuse later.

31. Remove the entire exhaust system from the car.

32. Remove the oxygen sensor from the catalyst and plug the hole with the 18mm Allen head plug and sealing ring from kit. Keep the oxygen sensor in safe place until it is time to install it in the turbo exhaust manifold.

33. Remove the exhaust manifolds.

34. Remove the twelve 8mm exhaust studs from the cylinder head using two 8mm nuts jammed together on the threads then using a wrench to turn the inside nut.

35. Use an 8mm x 1.25mm tap to clean out the threads in the head so that the new shouldered studs can be installed to correct depth. Blow out each hole with compressed air after tapping.

36. Install the new shouldered exhaust studs using two 8mm nuts jammed together on the longer threaded portion of the studs. Use a little red Loctite on the shorter threaded end of studs to help keep studs from coming out. Tighten studs well with the shouldered section partially jammed into the threads.

37. Apply a little copper antisieze compound to the threads of the exhaust studs in preparation for manifold installation.

38. Apply a little antisieze compound on the two wastegate studs on exhaust manifold.

39. Install the wastegate on the exhaust manifold using two 10mm knurled washers and two 10mm copper locknuts. The adjustment screw for the wastegate should point up with the outlet flange pointing away from the exhaust ports.

40. Mount the wastegate dumppipe assembly to the wastegate using two 3/8" x 1-1/4" bolts, two 10mm wave washers and two 10mm copper lock nuts. Use a little antisieze on the bolt threads. The dumppipe should point down and backwards.

41. Apply a little antisieze compound to the threads of the oxygen sensor that you previously removed from the catalyst and install it in the exhaust manifold.

42. Locate the 1/8" pipe to -4, 90° fitting from kit. Apply a little antisieze to the pipe threads of the fitting and install fitting in the front threaded hole of the wastegate. Tighten fitting with the -4 portion pointing toward the 10mm hole in the wastegate outlet flange.

43. Place the exhaust manifold assembly in position on head. Check to see that the clearance between the dumppipe and the underbody insulation is at least 3/8". If clearance is insufficient, remove the manifold and use a hammer to beat up the insulation a little to gain proper clearance.

44. Install the exhaust manifold on the head using six new exhaust gaskets, twelve 8mm knurled washers and twelve 8mm copper locknuts. Start all nuts by hand first before tightening any. Make sure that each gasket lines up correctly with each port, gasket flat spot points down. Make nuts fairly tight since these nuts are subjected to a lot of heat and vibration.

45. Refer to Figure 2 to see where the oil return hole is to be drilled in the lower right rear side of the engine block. Carefully measure and mark the spot to be drilled. Mark the spot with a center punch.

46. Drill the marked spot with a small pilot hole using a drill bit about 1/8". Try to drill hole perpendicular to surface being drilled.

47. Now start to drill the hole using a $45/64$ " drill bit, but stop drilling before the bit is nearly through block. ($45/64$ " is the correct tap drill size for a $1/2$ " NPT tap. You may use an $11/16$ " drill bit if you don't have the correct bit.) Pack the tip of the drill bit with grease to help catch the flying metal chips and prevent them from entering engine. Drill a little then clean and regrease drill bit a few times until hole is completed.

48. Tap the hole using a $1/2$ " pipe tap packed with grease. Make sure you keep tap perpendicular to the surface being tapped. Clean and repack the tap a few times until tapping is completed. Be very careful not to run the tap in too deep. Correct threading depth is determined by screwing the oil return block fitting into the threaded hole by hand and observing how many turns fitting will make with finger pressure only. The oil return block fitting is the $1/2$ " pipe to $5/8$ " tube 45° fitting from kit. This should turn about $1-1/2$ to 2 turns in by hand for correct threading depth.

49. Clean out the remaining chips from the oil return hole using a flexible head magnet tool. Now use the magnet tool to reach into the oil pan to retrieve as many stray chips as possible. Clean magnet and repeat process several times until magnet comes up clean.

50. Install the oil return fitting with pipe thread sealant on the pipe threads. Hose tube should point straight up and away from engine.

51. Locate the detonation sensor and detonation sensor mounting bolt from the Turbotronics 4, Dinan Detonation Control System (DDCS). Refer to Figure 3 to note the location of the sensor. Mount the mounting bolt to the block using 10mm wave washer.

52. Mount the detonation sensor on to the the bolt with 8mm wave washers on each side of the sensor. Secure with one 8mm nylock nut, but do not tighten nut yet.

53. Apply a little copper antisieze to the four 10mm turbocharger mounting studs on the exhaust manifold. Mount the turbocharger assembly to the exhaust manifold using four 10mm knurled washers and four 10mm copper lock nuts. Make these nuts very tight. There is no gasket needed between the turbocharger and manifold.

54. Install the 3" long piece of 5/8" oil return hose between turbo oil return fitting and fitting you installed in block. The secret to installing this hose is to turn the lower fitting until the hose slides onto the turbo fitting. Slide the two #10 hose clamps onto the lower fitting. Then push hose up onto turbo fitting and push it over to start it onto lower fitting. Now turn lower fitting into hose. This job is made easier if a little spray lubricant such as spray silicone is applied to the inside of each end of hose. Center the hose between the fittings and tighten the clamps.

55. See Figure 4 to see where to mark and drill the oil filter housing base for installing the turbo oiler fitting. Unbolt the oil filter canister top and discard the filter. Unbolt the oil filter housing from the side of engine block being careful not to damage the gasket.

56. Wash the oil filter housing out using solvent. Mark the rear flat surface of the base flange as shown, then center punch spot. Drill base flange with a 21/64" drill.

57. Tap the hole you drilled in the base flange using a 1/8" pipe tap, but be very careful not to tap hole too deep. Check the threading depth using the 1/8" pipe to -4, straight fitting from kit. This fitting should turn in no more than 1 to 1-1/2 turns by hand when threading depth is correct. Clean out the hole and then use compressed air to blow out the entire housing.

58. Install the 1/8" pipe to -4, straight fitting into the tapped hole using some pipe thread sealant. Be sure to tighten fitting well.

59. Reinstall the oil filter housing on engine with original gasket.

60. Install a new oil filter and replace canister top.

61. Change engine oil now unless it was just changed. If not changing oil, add 1/2 quart. Install the oil temperature sender at this time if a Dinan gauge panel is to be installed.

62. Reattach the spark plug wire harness to the valve cover and spark plugs.

63. Find where #1, #2 and #3 spark plug wires come out of the plastic tube near the distributor cap, pull each of these wires forward to use up the slack wire between the spark plugs and plastic tube.

64. Replace the plastic distributor cap cover that you modified in an earlier step.

65. Connect the 45", -4 oiler between the turbocharger oiler fitting and the -4 fitting you installed in the oil filter housing. Apply a little antisieze to the threads and sealing surface of both -4 fittings. Route the oiler line up from the turbocharger then back across the rear of engine toward the intake manifold, run the hose under the intake runners forward to the fitting on the oil filter housing. Make sure that the hose does not touch or get close to vital items such as brake and fuel lines.

66. Connect the 17", -4 wastegate hose between the -4 fitting on the wastegate and the -4 fitting on the front of the turbocharger compressor. Use a little antisieze on both fittings. You may want to turn the wastegate fitting farther away from the exhaust manifold to keep the hose away from the heat of the manifold, but maintain a minimum clearance of 1/2" between hose and frame rail. This hose should be at least 1-1/4" away from the exhaust manifold.

67. The windshield washer fluid reservoir must be relocated to the left side of the engine compartment after minor modifications. Remove the two nuts that secure the cruise control cable modulator, power steering reservoir, and the charcoal canister to the bracket that is on the left wheel well. Lift both the charcoal canister and the cruise control modulator off of the mounting studs and move them out of the way of the forward section of wheel well bracket with the two small square holes.

68. Use a fiberglass cutting disc held in a rotary die grinder to cut off the unused section of the wheel well bracket as shown in Figure 5. Clean up rough edges using die grinder bit. Use appropriate color touch up paint to cover the bare metal surfaces.

69. Cut off the lower alignment tab from the bottom of the washer bottle as shown in Figure 6 using bandsaw or hacksaw.

70. Place the washer bottle in its new position behind the far left headlight resting on the left front wheel well. Hold washer bottle with the large upper mounting tab pressed against the wheel well, and with about a 1/8" gap between the bottle and the left hood hinge pivot stud and nut. The washer bottle should be parallel to the frame rail. With the washer bottle held in this correct position use a sharp scribe to mark the oval shape of the mounting tab hole on the wheel well top. Remove washer bottle from car.

71. Use a center punch to mark the center of the oval slot you marked on wheel well. Drill mounting hole 9/32". Deburr hole.

72. Connect the new piece of washer hose from kit to the washer pump outlet tube.

73. Mount washer bottle to wheel well using one 6mm x 25mm bolt, two extra large 6mm flat washers and one 6mm nylock nut.

74. Locate the wiring harness for the washer pump and fluid level sensor from kit.

75. Locate both the fluid level sensor plug and washer pump plugs that were originally connected to the pump and sensor. Cut each wire about 1" from plugs.

76. Peel the tape back from the cut ends of the plugs and the wires that went to the plugs. You will use the wiring harness to extend the plugs to reach the new washer bottle location.

77. Slide the 3-1/4" long pieces of 3/8" shrink tubing onto the wires before crimping so that they can cover each pair of red butt connectors after crimping. Connect the wires as follows. Pump: Violet to violet/black, blue to violet/brown. Sensor: brown to brown, black to brown/black.

78. Slide the shrink tubing over the wires and connectors then shrink the tubing using a cigarette lighter or heatgun.

79. Route the harness down under the radiator in the sheet metal channel, then over and up to the washer reservoir. Wire tie the harness in place at the center of the sheet metal channel utilizing the existing hole in channel. Also wire tie the harness at both ends of the radiator to keep the wires away from the engine drive belts. You may wish to drill two more holes in the sheet metal channel for a more secure harness.

80. Connect the plugs to the washer pump and fluid level sensor. Make sure that the fluid level sensor plug points straight up. (See flat spot on sensor flange and washer reservoir recess.)

81. Find the washer hose that you previously removed from the washer pump when you removed the washer reservoir from its original position. Route this hose and the new washer hose along the same route as the new wire harness until they meet. Cut off the excess hose and connect the two hoses using the 3/16" barbed connector.

82. Loosely wire tie the washer hose to the wire harness.

83. Refill the washer reservoir with a normal dilution of washer fluid.

84. Locate the plastic cover you removed from behind the left headlights. Use Figure 7 to mark and cut this cover to make clearance for the windshield washer bottle. Use a bandsaw or similar tool to cut the plastic. File the rough edges smooth.

85. Reinstall the plastic cover behind the left headlights.

86. Loosen the hose clamp on the lower radiator hose at the radiator tube. Now slide the hose away from the radiator until the gap between the far right edge of the fan shroud and the front side of the lower radiator hose is about 3-7/8". Retighten clamp in new position making sure clamp is not on top of the radiator tube lip. This procedure provides additional room for the intercooler that will occupy the space between the fan shroud and the lower radiator hose.

87. Use Figure 8 for location of intercooler and positioning of mounting brackets. Locate the three rubber intercooler mounts which have 8mm studs. Attach two of the rubber mounts to the bottoms of the upper and lower mounting tab. Use an 8mm nut and one 8mm wave washer for each mount. Attach the remaining rubber mount to the top of the middle mounting tab.

88. Connect the lower intercooler bracket to the lower rubber mount using an 8mm nut and wave washer. Do not tighten this nut all the way for adjustment purposes. The two hole mounting leg of this bracket rests against the top of the right front frame rail.

89. Locate the upper intercooler bracket and connect it to the top rubber mount using one 8mm wave washer and 8mm nut. This bracket is connected with the two hole mounting leg rising up from the rubber mount as opposed to hanging below. Tighten nut only finger tight now.

90. Connect the middle intercooler bracket to its rubber mount using one 6mm wave washer and one 8mm nut. The curved mounting leg of this bracket points up from the rubber mount. Again don't fully tighten nut.

91. Hold intercooler in position as shown in Figure 8 with the intercooler vertical and the left tank pressed against the fan shroud. Hold the lower intercooler bracket firmly against the top of the frame rail, and hold the middle intercooler bracket against the front of the right side wheel well. Also note the position of the upper intercooler bracket. With the intercooler held in this correct position mark onto the wheel well the two bracket mounting holes for the middle bracket using a sharp scribe. Remove intercooler for now. Allow about 1/8" gap between the right side of intercooler and the hood support hinge.

92. Center punch and drill the two holes for the middle bracket using a 9/32" drill bit.

93. Use two 6mm x 16mm bolts, four 6mm flat washers and two 6mm nylock nuts to temporarily mount the intercooler to the wheel well.

94. Again hold the intercooler in the correct position and carefully mark the mounting holes for the lower and upper intercooler mounting brackets. Remove intercooler for now.

95. Center punch and drill the two holes in the frame rail using a 3/16" drill bit. These holes are smaller for using self tapping screws.

96. Use the two 10mm head sheet metal screws to go ahead and tap the two 3/16" holes. Apply a little grease to the tips of the screws and install them about halfway using a 10mm socket and long extension while pushing down on ratchet fairly hard. Remove screws.

97. Center punch and drill the two mounting holes for the upper intercooler mount using a 9/32" drill bit.

98. Permanently install the intercooler using two 6mm x 16mm bolts, four 6mm flat washers and two 6mm nylock nuts for the upper intercooler bracket. Use the previously mentioned hardware for mounting the other two brackets. Make sure all the 8mm nuts for the rubber mounts are tightened now.

electronics: Steps 99-204 involve the wiring of the Dinan Engineering electronic control systems and installing a computer chip. Please follow these directions carefully. Make sure that all connections are secure and under no circumstances should 3M scotch lock type connectors be used in place of the supplied wire connectors. See Figure 9 for a wiring diagram of all the Dinan Engineering components.

99. Locate the four 13" long wires for lengthening the wire plug that connects to the airflow meter. These wires are colored: white, yellow, blue and violet. Also locate the eight 1" long pieces of 1/8" shrink tubing and the 16" long piece of 3/8" shrink tubing. Find the wire plug that was connected to the airflow meter.

100. Slide the rubber boot off of the plug and back down the wires about 3".

101. Cut the four wires about 1" back from the back of the plug.

102. Solder the four wires to the four wires still connected to the wiring harness keeping the wires colors matched. Crossing or miss matching of the wires colors will result in a car that doesn't run, and possible computer damage. Cut back the outer sleeve a little if necessary.

103. Slide one 1" long piece of 1/8" shrink tubing onto each wire and shrink the tubing over the solder joints. Use a heat gun or cigarette lighter to shrink tubing.

104. Slip the 16" long piece of 3/8" shrink tubing over the four wires and onto the original wire sleeve, leaving the new wires hanging out a few inches for stripping and soldering.

105. Slide one 1" long piece of 1/8" shrink tubing onto each of the four wires then solder the airflow meter plug to the four new wires keeping the wire colors matched.

106. Shrink the 1" pieces of tubing over the solder joints.

107. Slide the 16" long piece of shrink tubing up to the plug and carefully shrink the entire piece of tubing.

108. Spray a little silicone spray lubricant inside the rubber plug boot and a little on the shrink tube, then slide the boot back onto the plug.

See Figure 10 for location of the Motronic electronic control unit (ECU). Remove the four phillips head screws that secure the large plastic cover that is above the Motronic ECU. Remove cover.

110. Unbolt and remove the Motronic ECU.

111. Open glovebox and remove the small locking clips that hold the two glovebox straps to the glovebox. Let the glovebox hang down for now.

112. Remove the plastic cover that is in the top of the glovebox area, and disconnect the glovebox light wires, and unplug the small switch from cover.

113. Remove the plastic cover that is at the far left side of glovebox mounted to the side of the center console if you are installing a Dinan gauge panel.

114. **1990 and newer 535i models only: Steps 114 to 118:** Find the 2" diameter black rubber plug that is installed in the firewall just behind spot where the Motronic ECU is normally mounted. Remove this rubber plug. Push out the round piece of foam insulation that is under the hole in firewall.

115. Locate the tall hump shaped black rubber part that is right behind the spot where the Motronic ECU is normally mounted. Pull straight up on this rubber piece to remove it from car. Notice the 1-3/4" round circle at top of hump piece that is partially punched out. Use a pointed sharp knife or similar cutting tool to cut out this round piece completely.

116. Locate the "Rubber duct for ECU installation". Connect the flexible bellow end of this duct to the hole in the firewall using the three extended rubber tabs to pull the grommet end into place.

117. Replace the rubber hump piece into its original position on the two studs.

118. Connect the duct to the hump piece utilizing the hole you just cut. This duct will be used to route the Turboelectronics 4 wiring from the glovebox area into the ECU compartment in the rear of the engine compartment. If you are installing a gauge panel at this time you will also run the oil temperature sender wire through this duct.

Turbo Power Chip Installation:

ON THE WORK BENCH:

119. Read Bosch part number on ECU. The number should be 0-261-200-179. If your computer does not display this part number, call Dinan Engineering at (415) 962-9417. DO NOT install the power chip!

120. See Figure 11. Place ECU on workbench with part number label face down and using the pocket screwdriver pry the ten lock tabs that hold the unit together up slightly. Just enough to get the small screwdriver under the tabs and finish prying the tabs straight up. Separate case, set cover aside. Check to make sure your ECU has one printed circuit (PC) board. If you have a two PC board ECU, you have an older design ECU and this chip will not work. Call Dinan Engineering at (415) 962-9417.

121. See Figure 12. Find the socketed chip on the board. This chip can be identified by the black plastic "H" shaped retaining chip locking it into the socket and that it is elevated higher than any similar chip on the board.

122. See Figure 13. Remove the "H" shaped retaining clip by inserting the pocket screwdriver into one of the small slots in the retaining clip and prying towards the other slot. The retaining clip will pop up on the side the screwdriver is inserted in, use a finger to hold that side up while you insert the screwdriver in the other slot and release the other side. Lift retaining clip off of the chip and set aside.

123. Remove chip from socket by inserting the pocket screwdriver between the chip and the socket and prying up gently. Pry up in stages switching ends as you go until the chip is totally loose. Set stock chip aside.

124. See Figure 14. Notice the small divot on one end of the the power chip. Notice a similar divot on one end of the socket. The chip must be inserted so that both divots are on the same side. First insert one row of pins in one side of the socket part-way. With two fingers push on the other side of the chip until the other row of pins line up with the socket and then push down on chip and make sure that it is inserted all the way. **Caution: BE CAREFUL NOT TO BEND ANY PINS.** Visually verify that all the pins are in a socket hole and that all socket holes are filled with pins.

125. Reinstall retaining clip. Reinstall cover on ECU; use pliers to bend cover lock tabs back into place. Leave ECU out at this time.

126. Unbolt and remove the ABS-ECU which is the farthest forward of the main ECU's. See Figure 10.

127. Locate the Turbotronics 6 (Oxygen Sensor Control) packet from kit. Pull out the control unit and the Velcro adhesive stripping. You will be mounting the Turbotronics 6 (T6) control unit to the bottom of the main ECU compartment under the black relay mounting bracket and the ABS-ECU. Cut two 3" long pieces of the male/female Velcro strip. Mount the two fuzzy pieces to the bottom of the T6 control unit about 1-1/4" apart.

128. Cut a 12" long piece of the black 3.5mm vacuum hose from kit. Push this piece of hose onto the small vacuum hose nipple on the T6 control unit.

129. Hold the T6 control unit down against the bottom panel of the ECU compartment to see where it will fit nicely even after the ABS-ECU is reinstalled. The wire harness and hose end of the T6 ECU should point toward the engine. Scribe a line around the T6 control unit onto the bottom panel of the ECU compartment. Clean the plastic panel with some oil free degreasing spray such as Brake Kleen or even a little lacquer thinner to ensure that the Velcro adhesive will stick well. Attach the two remaining 3" long Velcro pieces in the scribed outline with the proper spacing and push down hard on strips.

130. Mount the T6 ECU in position with the wiring harness and vacuum hose routed up and toward engine for now.

131. Reinstall the ABS-ECU.

132. Locate the Turbotronics 4 - Dinan Detonation Control System (DDCS) kit. Remove the DDCS ECU from kit. Plug the wiring harness onto the DDCS ECU. This unit will be installed in the glovebox at the far left corner. Set the ECU in position in glovebox with the wiring harness toward the driver side of car and pushed all the way forward towards the front of the car. The ECU should be pushed to the left until the wiring harness is pushed against the left side of the glovebox, this helps hold the harness plug in position and leaves more glovebox space for gloves! The harness wires should point up and toward the front of car. With the ECU held in this position mark the four small mounting holes with a black felt tip pen. Pull the ECU out of the way for now. You may remove the glovebox from the car for the next few steps, see the plastic pivoting clamps that hold the glovebox to the pivoting shaft.

133. Mark the four mounting hole centers for the DDCS ECU using a sharp scribe by pushing and rotating it until it makes a nice pilot mark.

134. You will drill these four mounting holes with a 7/64" drill bit to a depth of 3/8". You may want to wrap your drill bit with duct tape leaving only 3/8" of it exposed so you can tell how deep you are drilling. Carefully drill the four holes.

135. Locate the four #6 x 3/8" phillips head screws that will be used to mount the DDCS ECU. Before actually installing the ECU you should screw one of the self tapping screws into each hole about halfway in to begin the threads. Remove screws and install the DDCS ECU permanently.

136. Reinstall the glovebox but don't reconnect the glovebox straps.

137. If you are going to install a Dinan gauge panel now is the time to do it.

138. The large green and white wires from the DDCS, the detonation sensor wires (black sleeve), the red power wire for DDCS and the nylon vacuum hose from the DDCS pressure switch will all be routed through the rubber duct for ECU wiring. You should also route the oil temperature sender wire through this duct if you are installing the Dinan gauge panel.

You should tape the ends of these wires and the nylon vacuum hose together so you can run them through at the same time. Push the wires up through the lower end of the duct then pull them through the other end. Pull enough slack through to allow you to carefully route the wires out of the glovebox area in such a way that when the glovebox is up the plastic cover for the glovebox area can be reinstalled without interference.

139. Notice the three 10mm head bolts that secure the dash supporting bracket above the center of the glovebox. Remove the far left bolt and attach the black DDCS ground wire under bolt. You should also mount the ground wire for the Dinan gauge panel on this bolt.

140. Remove the far right side bolt (see previous step) and mount the yellow and brown ground wires under this bolt.

141. Use one or two wire ties to mount the pressure switch to the dash support bracket in a manner that will allow the reinstallation of the plastic glove box cover.

142. Wire tie the wires in the glovebox area to keep them away from any moving parts.

143. Set the Motronic ECU in position in compartment but don't secure with nuts yet.

144. Notice the large rubber grommet that the ABS-ECU wire harness runs through from the ECU compartment. Directly below the ABS wiring on the engine side of grommet is a small rubber nipple pointing toward engine. Cut off this nipple to create a hole for some wires.

145. Route the detonation sensor wires (black plastic sleeve) around the left side of the Motronic ECU towards the small hole you just uncovered under the ABS wiring grommet.

146. Route the green and orange wires from the T6 ECU up towards the small grommet hole also. These will be in a black sleeve.

147. Tape the ends of the detonation sensor and T6 wires together using some plastic electrical tape. Spray some silicone spray lubricant into the small hole in grommet and on the end of the taped wires. Push wires through hole into engine compartment. Pull the slack wire through hole so wires route neatly to the grommet. Remember that the large ECU compartment cover will be reinstalled later, so route all ECU compartment wiring accordingly.

148. Locate the Turboelectronics 5 (T5) package from kit. The T5 ECU mounts in the main ECU compartment. The ECU should be positioned with the wire harness pointing toward the engine and with the bottom front edge of ECU resting on the top of the rear side of the ABS-ECU. Notice that the rear side of the T5 ECU will rest on the top of the relays. Attach one 5-1/2" long piece of fuzzy Velcro to the front bottom edge of the T5 ECU. Attach a 5-1/2" long piece of the grabbing Velcro to the appropriate spot on top of the ABS ECU. Set the T5 ECU in position on the ABS ECU and notice where the relays touch the bottom of the T5 ECU. Attach the remaining fuzzy piece to the bottom of the T5 ECU to make a cushion between the ECU and the relays.

149. You can now connect the red power wires for the DDCS harness, the T5 harness and the T6 harness to their power source. Lift up the T5 control unit to expose the main fuel injection relay. This relay is usually white and has one red wire with a blue tracer connected to terminal #87 (center prong). Automatic cars will have two wires on this prong.

150. Cut one of these red/blue wires about 1" from the relay. Twist together the stripped ends of the red DDCS power wire and the red/blue wire that was cut from the relay red/blue wire. Crimp the yellow butt connector onto these two wires.

151. Slide one 2" long piece of 3/8" shrink tubing over this yellow butt connector onto the two wires.

152. Connect the stripped ends of the red/blue wire from the relay and the red wires from the T5 and T6 ECUs to the other end of the yellow butt connector.

153. Slide the shrink tubing over the yellow butt connector and shrink the tubing.

154. Cut a 3" long piece of 3.5mm vacuum hose and connect it to the vacuum hose nipple on the T5 ECU.

155. Locate the nut that connects the plastic ECU wiring grommet support piece to the aluminum ECU compartment housing. This will be a 10mm head nut and it may have a black plastic cover on it. You will use this nut for grounding the black T5 and T6 ground wires.

156. Route the T5 and T6 black ground wires up to the grounding nut and cut the wires to length. Crimp one 1/4" blue lug connector to each wire end.

157. Remove the grounding nut.

158. Connect each wire nut end under the nut and tighten nut.

159. Remove the Motronic ECU from the ECU compartment.

160. The nylon vacuum hose, the large green and white DDCS wires, the oil temperature sender wire (gauge panel) and the T5 brown and yellow wires will all be routed through the same grommet as the Motronic ECU wires. This will bring the wires from the ECU compartment into the engine compartment. To get all of these wires through the grommet at the same time you will have to use a "snake" to pull them through. You can make a snake from a piece of stiff wire such as a coat hanger that is about one foot long. Bend back one end of your snake about 1-1/2" from end. Bend your wires and hose about 1-1/2" from each end. Interlock the snake bend with the hose and wire bends and wrap the union tightly with some smooth electrical tape. Spray the wrapped connection generously with silicone spray lubricant. Push the bare end of the snake under the ABS wires, through the grommet until it comes out the other side. Push hard to get your snake under the grommet "collar" next to the Motronic wiring harness. Pull the wires and hose through grommet using up any unnecessary slack.

161. Permanently install the Motronic ECU.

162. Remove the snake from the wires and hose.

163. You are now ready to connect the wires and vacuum hose in the engine compartment. The detonation sensor wires that you ran through the ABS grommet will need to be routed to the detonation sensor. Avoid running these wires near any ignition parts or wiring such as ignition coil, coil primary and secondary wires and the DDCS green and white wires. Also avoid running any of the wires near the exhaust manifold, turbocharger and wastegate. Route the wires straight down from grommet then forward along the wheel well to the spot where the large AC (air conditioning) hose crosses over to AC compressor. Route wires along the large AC hose then over to the detonation sensor. Do not wire tie the sensor wires to the upper metal portion of the AC lines because you will bend these metal lines away from each other in a later step.

164. Hold the sensor wires up to the detonation sensor allowing some slack for engine movement. Now cut the wires about 4-1/2" past the point where the wires meet the detonation sensor.

165. Carefully remove about 5-1/2" of the plastic cover sleeve from the sensor wires.

166. Twist together the bare shield wire and fold over double the last 1/4" of this wire. Slide the 5-1/4" long piece of 1/8" shrink tubing down over the bare shield wire. Push the red 5/16" hole wire lug into the piece of shrink tube with the shield wire going through the wire end of lug. Crimp the wire lug using plenty of force to tighten on this small wire.

167. Shrink the tubing on the wire.

168. Locate the Bosch type plug kit from the DDCS package.

169. Cut 4-1/2" off of the two sensor wires from harness. Then strip about 1/8" of the insulation from the end of each sensor wire.

170. Slide the 2-1/2" long piece of 3/8" shrink tubing over the bare shielded wire and sensor wires.

171. Slide the small end of the black rubber boot over the two sensor wires then on up over the main insulated wire portion until the stripped wire ends stick out of the large end of boot about 3/4". The bare shielding wire will not be coming out of the smaller end of boot.

172. Use the correct type crimper for installing the two metal wire ends onto the ends of sensor wires. NOTE: This connection is extremely important. If you don't have the correct type crimper you should purchase one. This type crimper can be purchased from any major tool dealer such as Mac Tools or Snap-on. See inserted picture on Figure 3. Crimp both wire ends onto the two sensor wire ends. Pull on wire ends to check for positive connection.

173. Push the wire ends into the back end of the plug with the locking tabs lined up with the slots. The wires can go into either hole since this is not a polarity conscious connection. Slide rubber boot up to and over back end of plug.

174. Slide the piece of shrink tubing about 1-1/4" over the small end of rubber boot with the bare shield wire between the shrink tube and boot and pointing towards the plug. Now shrink the tubing in this position with heat gun or cigarette lighter.

175. Connect the plug to the detonation sensor and install the shield wire under the sensor mounting nut and washer. Tighten the nut to 9 ft. lbs. or 108 in. lbs. Do not over tighten. The plug end of the sensor should point straight down and away from engine.

176. Remove the two plastic nuts that connect the coolant reservoir to the firewall. Unplug the wire plug from the coolant level sensor. Pull the coolant reservoir forward to expose the main engine wiring harness and metal cover.

177. Route the oxygen sensor wire harness up from the oxygen sensor behind the two AC lines. Pull harness back a little until it meets with the existing wire harness that are above the two AC lines. Wire tie oxygen sensor harness in one spot where it first meets the above wiring harnesses leaving some slack to allow for engine movement. Lay the oxygen sensor wire harness back towards the firewall for now.

178. Refer to Figure 9 for connecting the green and orange T6 wires to the oxygen sensor harness.

179. Cut the green and orange wires about 3" past the rubber grommet on the engine side of grommet.

180. Use a razor blade or sharp knife to carefully make a 2" length wise cut in the outer sleeve of the oxygen sensor wire harness, just above the hole where the green and orange wires come through.

181. Remove about 2" of the outer sleeve that covers the end of the green and orange wires.

182. Cut the black oxygen sensor wire in preparation for splicing and strip about 3/8" of wire insulation off of both cut ends.

183. Strip about 3/8" of insulation off of the ends of the green and orange wires.

184. Cut two 1" pieces of shrink tubing from the enclosed pieces of shrink tubing and slide one onto the green wire and one on the orange wire.

185. Use the two non-insulated butt connectors from Turbotronics 6 package to connect the green and orange wires exactly as shown in the Turbotronics 6 diagram.

186. Now solder the wires to the butt connectors to produce a positive connection which is very important since this is a very critical millivolt circuit.

187. Slide the shrink tubing over the solder joints and shrink the tubing in place.

188. Thoroughly wrap the spliced tee connection using electrical friction tape.

189. Wire tie the oxygen sensor wire harness to the wire harnesses above the AC lines then route it across the firewall on top of the main wiring harness cover. Run oxygen sensor wire harness down to its original mating plug at the lower left rear of engine block. Wire tie harness to the main wiring harness cover in about three spots. Connect oxygen sensor plug.

190. Refer to Figure 9 for wiring the T6 brown and yellow wires. Run these wires along the same route as the oxygen sensor wire harness until you get to the spot directly behind the fuel injector wire rail. The cover for the injector wire rail should be off at this time.

191. Find the spot in the bottom front of the plastic injector wire rail where the two wires for the FI coolant temperature sender come up and into rail. The wires are colored brown/red and brown/orange, on some vehicles the second wire may be plain brown. Never cut the brown/red wire.

192. Run the brown and yellow wires into the injector wire rail via the large rubber sleeve for the main engine wire harness at rear of rail. Use a small screwdriver to open up the hole where the wires for the idle control valve go down into the rubber sleeve. Carefully route the brown and yellow wires forward to the front of the wire rail.

193. You may have to cut one of the small existing wire ties that hold the brown/orange wire to the plastic rail to gain better access to the wire. Cut the brown/orange wire and slide one piece of shrink tubing onto each cut wire. Use the small non-insulated wire butt connectors to connect the brown and yellow wires exactly as shown in the Turboelectronics 5 wiring diagram removing excess length if necessary. Solder both connections for a perfect fit then shrink the tubing over the solder joints using a heat gun or cigarette lighter.

194. Position the wires in the injector wire rail so that the top can be replaced without obstruction. Replace wire rail top.

195. Route the oil temperature sender wire down to the sender now if you are installing a Dinan gauge panel.

196. Refer to Figure 9 for wiring the T4 (DDCS) green and white wires.

197. Remove the secondary ignition wire from the coil.

198. Remove the plastic wire cover from the top of the coil.

199. Remove the wire from the negative side of the coil. Cut this wire about 1" from the connector.

200. Route the green and white T4 wires to the coil avoiding the small detonation sensor wires. Cut these wires to remove any excess length.

201. Use a blue butt connector to connect the cut off original wire and connector to the white T4 wire with a 2" long piece of 3/16" shrink tubing on wire.

202. Slide the piece of shrink tubing over the connector and shrink the tubing.

203. Connect the white wire and connector to negative side of coil.

204. Use a blue butt connector to connect the green T4 wire to the cut original wire that went to the negative side of the coil, with a 2" piece of 3/16" shrink tubing on wire.

205. Slide the piece of shrink tubing over the connector and shrink it.

206. Replace the plastic coil cover and secondary wire.
207. Route the nylon vacuum hose across the rear of engine compartment next to the oxygen sensor harness until you get to the spot where the plastic injector rail is. Cut the nylon hose at this point.
208. Slip the 28" long piece of 1/8" vacuum hose on to the end of the nylon hose about 3/4". Use a little saliva or liquid soap to accomplish this, do not use any type of slippery or oily lubricants that will allow the hose to pop off.
209. Route the 1/8" vacuum hose forward to the fuel pressure regulator. Cut the vacuum hose that connects to the fuel pressure regulator about 2" from regulator.
210. Use a four-way vacuum tee from kit to connect the 1/8" vacuum hose to the fuel regulator vacuum hose. Again a little saliva will help get the hose onto the tee. The remaining leg of the tee will be for the compressor bypass valve.
211. Replace the coolant reservoir and level sensor plug.
212. Use two of the 1" long pieces of 1/8" vacuum hose from the T4 hardware kit to connect the remaining four way vacuum tee to the nylon vacuum hose where it goes through the ECU compartment. The two vacuum legs will be for the T5 and T6 ECUs.
213. Route the T5 and T6 vacuum hoses to the four way vacuum tee and cut hoses to correct length if necessary.
214. Connect hoses to tee.
215. All connections for the T4, T5 and T6 should now be complete. Leave the ECU compartment cover off for now as you will need to test each system for proper functioning before road testing.
216. Locate the large air conditioning (AC) hose that connects between the top of the AC compressor and the firewall. Notice the holddown clamp that holds this line to the frame rail. Unbolt and remove this holddown clamp.

217. The lower turbo inlet pipe will be coming up from the front of the turbocharger and then between the large and the small AC lines as shown in Figure 15. You will have to bend the larger line toward the engine and the smaller line toward the right front wheel well. You must be extremely careful when bending these lines to make sure you don't let them bend where they meet the dual line coupler that is mounted to the ends of the metal lines that come from the interior of the car. Carefully read the following steps before doing any bending.

218. For bending the large AC line it is best to use two long pry bars. The key to bending the lines is to support the straight section of each line as it comes out of the dual line coupler then do your bending on the forward portion of the lines. If any bending occurs at the line coupler the rubber o-rings can be pushed out by the high pressure that is constantly in the lines, this destroys the o-ring and releases all the freon and a lot of the oil from AC system.

219. To bend the large AC line first position pry bar #1 about 1-1/2" forward of the line coupler on the engine side of line with the lower end of pry bar against exhaust manifold. Position pry bar #2 on the wheel well side of large line at point where the line bends down with the lower end of pry bar against the frame rail. Use pry bar #1 to support line and keep it from moving toward engine and push the forward section of line toward engine as far as you can. You want to get the large line bent toward engine so that there is about 1 to 1-1/4" clearance between the plastic spark plug tube and the outer insulation on large line at the point where the line is bent.

220. To bend the small line, position pry bar #1 about 2-1/2" forward of the line coupler on the wheel well side of line with lower end of pry bar against the bottom corner of the inner wheel well. Position pry bar #2 on the engine side of small line about 1" to 2" below the downward bent part of line with the lower end of pry bar against exhaust manifold. Support the section of line near the line coupler and bend the small line toward the wheel well until it touches the bottom of the ignition coil and the extended lip on the side of the strut tower just below ignition coil. You should now have about a 3-1/2" gap between the large and small line at the spot where the inlet pipes will come through.

221. Use three wire ties to tie the large AC line to the small AC line where they run parallel under the original airbox bracket above frame rail. Try to pull the large AC line forward before pulling wire ties tight.

222. Locate the upper and lower turbo inlet pipes, two 2" long 2-3/4" silicone hoses and four #44 hose clamps. The lower turbo inlet pipe connects to the front of the turbocharger then points up through the space between the two AC lines. With this position in mind slide one of the 2-3/4" silicone hoses onto the lower end of the lower turbo inlet pipe and secure with one #44 hose clamp with clamp screw pointing up and on the wheel well side of pipe. Slide another #44 hose clamp onto the hose with the clamp screw in the same position as the existing clamp. Place lower inlet pipe assembly in position on the inlet throat of the turbocharger. Try to position the lower inlet pipe so that the silicone hose connects straight and square on the turbo inlet throat. Reposition the loose hose clamp so it points up. Tighten the clamp using a 5/16" - 1/4" drive socket on a long extension. Do not over tighten clamp.

223. Use the remaining 2" long 2-3/4" silicone hose and two #44 hose clamps to connect the upper turbo inlet pipe to the lower turbo inlet pipe. The upper turbo inlet pipe points forward with the small hose nipple pointing towards the engine. Position the hose clamps so that they can later be adjusted to help fit the upper turbo inlet pipe to the outlet throat of the airflow meter.

224. Use Figure 15 to note the positioning of the airflow meter-airbox assembly. Locate the airflow meter-airbox assembly, airflow meter support bracket, the rubber airbox mount, one 6mm x 16mm bolt, three 6mm wave washers, one extra large 6mm flat washer and two 6mm nuts. Mount the airflow meter support bracket to the threaded hole in the top of the airflow meter as shown using the 6mm x 16mm bolt and one 6mm wave washer. Don't fully tighten nut yet.

225. Connect the rubber airbox mount to the lower end of the airflow meter support bracket as shown using one 6mm wave washer and one 6mm nut.

226. Slide the extra large 6mm flat washer onto the remaining 6mm stud on the rubber airbox mount then one 6mm wave washer. Take one 6mm nut and turn it onto the stud a few turns.

227. Locate the two black rubber U-shaped rubber airbox mounts that went between the original airbox and the airbox mounting bracket on right inner fender well. These rubber mounts will either have stayed on the airbox or airbox bracket, or may even have fallen off. Place both of these rubber mounts back into the airbox bracket and spray a little spray silicone lubricant into the top slots of each mount.

228. Locate the 2-3/4" to 3" straight bellow hose, one #44 hose clamp and one #48 hose clamp. Slide the #44 hose clamp onto the top end of the upper turbo inlet pipe. Slip the 2-3/4" to 3" bellow hose onto the upper turbo inlet pipe. Place the #48 hose clamp onto the larger end of bellow hose. Leave clamps loose for now.

229. Set the new airflow meter-airbox assembly with the bracket and rubber mount you installed, in position between the upper inlet pipe and intercooler. See Figure 15. The steel strap mounted to the bottom of the airbox rests in the two original rubber airbox mounts with the rubber mount from the airflow meter support bracket attached to the slotted upper section of the original airbox bracket.

230. Connect the bellow hose between the inlet pipe and the airflow meter with the #44 and #48 hose clamp already in place.

231. Locate the intercooler to throttle pipe. This is a long curved 2-1/4" chrome pipe with one 1" nipple near one end. Also locate the 2-1/4" 45° bellow hose, one 2-1/4" to 3" silicone hose, three #32 hose clamps and one #44 hose clamp. This pipe mounts between the throttle body and the intercooler outlet pipe. Connect the end of pipe with the 1" nipple to the throttle body using the 2-1/4" to 3" composite hose, one #44 hose clamp and one #32 hose clamp. Connect the other end using one 2-1/4" 45° bellow hose and two #32 hose clamps. Adjust pipe so that there is at least a 1/4" gap between the pipe and both the airflow meter and bellow hose for the upper inlet pipe. Tighten hose clamps.

232. Find the idle control valve to turbo pipe hose from kit. This is a 1-3/4" long piece of 1" I.D. hose. Also find two #16 hose clamps. Use this hose to connect the idle control valve to the intercooler to throttle pipe. Adjust the valve so there is at least a 1/4" gap between the valve plug and the coolant reservoir. Tighten hose clamps.

233. Locate the PCV hose assembly from kit. Also locate one #12 hose clamp. The larger end of this hose connects to the valve cover using the original hose clamp to secure. The smaller end of the hose goes to the hose nipple on the turbo upper inlet pipe. Use the #12 hose clamp for the smaller end of the hose. Attach the small vacuum hose that you previously disconnected from the original PCV hose to the small vacuum hose nipple on the barbed coupler. The vacuum hose nipple points straight down.

234. Locate the turbo to intercooler pipe from kit. Also locate four #32 hose clamps and two 2-1/4" bellow composite hoses. This pipe connects between the lower inlet pipe of intercooler and the discharge pipe of the turbo compressor. Try to center the pipe between the AC compressor and the right side motor mount. Position the hose clamps so that the clamp screws are easily accessible.

235. Locate the compressor bypass valve assembly, two #16 hose clamps and the remaining long piece of 3.5mm vacuum hose. This assembly mounts between the 1" hose nipple on the turbo to intercooler pipe and the 1" hose nipple at the bottom of the turbo lower inlet pipe. Mount the assembly with the bypass valve near the turbo to intercooler pipe. Make sure the plastic valve has sufficient clearance between it and all other parts. Secure assembly with the two #16 hose clamps.

236. Connect the vacuum hose to the four way tee at fuel regulator.

237. Route the vacuum hose down from the four way vacuum tee to the compressor bypass valve keeping the hose safely away from moving parts. Cut to proper length and connect to bypass valve. Wire tie the vacuum hose in place but don't make wire ties tight.

238. Run the airflow meter plug wire harness along the back side of the PCV hose then forward to the airflow meter. Snap on the plug, then use three evenly spaced wire ties to attach the wire harness to the PCV hose. Please keep the airflow meter wires away from the spark plug wires to prevent the electromagnetic field from disturbing the normal functioning of airflow meter.

239. Locate the 3" exhaust downpipe. This mounts to the back of the turbocharger using three 3/8" x 1" bolts, one 3/8" x 1-1/4" bolt and four 10mm knurled lock washers. This is the correct hardware for turbo exhaust housings with four holes threaded with 3/8" NC thread.

Occasionally we use turbochargers with four holes that are drilled out larger than 3/8". For these you will need three 3/8" x 1-1/4" bolts, one 3/8" x 1-1/2" bolt, four 10mm knurled lock washers, four 10mm copper locknuts and one #16 hose clamp. Before mounting, the downpipe must first be held in the correct installed position to determine where you might need to gain more downpipe to chassis clearance.

Hold the four hole flange up to the turbo outlet flange pressing mating surfaces together. Measure the center to center distance between the transmission and outlet end of the downpipe, this measurement must be 8-1/2". Measure from the bottom center rib of the transmission to the center of the outlet end of downpipe.

With the downpipe held in this position check to see where the large 3" downpipe either touches or is less than 1/2" away from any chassis insulation piece. Use a large hammer to beat back the insulation to gain a minimum clearance of 1/2".

240. Locate the turbo support bracket, 10mm x 100mm bolt, two 10mm wave washers and one 10mm nylock nut. Remove the lower right transmission bell housing bolt that screws into the slightly extended piece of the right rear end of engine block. This is a Torx head bolt.

241. Install the 10mm x 100mm bolt from kit with 10mm wave washer into the bolt hole you must removed the bolt from. This longer bolt will protrude past the threaded portion of block. The protruding part of the bolt will be the lower mounting point for the turbo support bracket.

242. Apply a little copper antisieze compound to the downpipe bolt threads. Install the downpipe on the turbo without installing a bolt in the lower left hole yet. Leave the bolts slightly loose for now. The three shorter bolts will be used now. Align the wastegate dump pipe flex tube with the small inlet pipe on downpipe with a #16 hose clamp on inlet pipe.

243. When using the non-threaded type turbo housing it is easy to install the two top copper locknuts and knurled washers if you this simple method: Apply a little contact cement to the inside jaws of a 14 mm 60° offset open end wrench. Now apply a little contact cement to the outside of two of your 10mm copper locknuts. Glue one 10mm knurled washer to the larger end of each nut. Let nuts and wrench sit for about 5 minutes to allow cement to dry partially.

You can now stick the nut/washer assemblies into you wrench to hold them in place while you run the bolt through the downpipe flange and the turbo outlet flange.

244. Hold the turbo support bracket in position between the transmission bolt and the lower left hole of the downpipe. The thicker end of the bracket goes to the engine block. Install the remaining longer bolt through the turbo support bracket and the lower left downpipe flange hole. Don't fully tighten bolt yet.

245. Secure the lower end of the turbo support bracket using one 10mm wave washer and 10mm nylock nut.

246. Check the center to center distance between the transmission center rib and the center of the downpipe outlet tube. This measurement should be 8-1/2", adjust downpipe accordingly. Fully tighten downpipe bolts.

247. The wastegate flex tube should be now at least 1/2" onto the inlet pipe on downpipe. Position the #16 hose clamp over the lower end of the steel flex hose and tighten clamp.

248. Refer to Figure 16 for cutting the catalytic converter inlet pipes. These should be cut right at the rear edge of the inlet pipe insulation. This cut should be made straight and square. You can cut the inlet pipes using a hand saw, hack saw or fiberglass cutting disc held in a rotary die grinder. You may want to unbolt the resonator from the catalyst to make the catalyst more mobile. You will not be reusing the long inlet pipes.

The fuel injection system for this turbo system is specifically suited for use with the original catalytic converter. Any attempt to run the car without the catalyst in the exhaust will result in a lean fuel mixture under boost situations that will damage your engine from excess heat and possible detonation. The boost level is also determined by exhaust flow and the wastegate used in this system will only work properly with the catalyst in the exhaust system.

It is imperative that all steps in these instructions are followed precisely using all of the stated equipment and parts. Failure to comply with these instructions will result in the voiding of the warranty on the turbo system parts against defects. Not complying with these instructions will also prevent your car from being smog legal which will prevent you from getting your car registered.

Clean air is good for everybody, so do your share and maintain all emission control systems as instructed.

249. Sand the cut ends of the catalyst inlet pipes square (90°) and flat. Remove any burrs.

250. Use a wire wheel or some sand paper to remove the heat scale from the two inlet pipes in preparation for welding.

251. Reconnect the catalyst to the resonator using the original bolts and four new 8mm copper lock nuts with four new 8mm knurled washers.

252. Reinstall the catalyst-resonator assembly in car using a screw jack to support the catalyst for now. The catalyst should be about 1/2" to 3/4" away from the transmission support bracket at its closest point.

253. Place the exhaust Y-pipe between the 3" exhaust flange and the catalyst inlet pipes. You will probably have to grind the Y-pipe a little to get a perfect fit between the flange, Y-pipe and catalyst. Sand or grind the Y-pipe to achieve a good fit without gaps.

254. The catalyst inlet pipes are made of stainless steel and therefore the Y-pipe must be welded in place using a TIG or MIG welder. Trying to weld this Y-pipe with an acetylene torch would be a big mistake with extremely poor results. Check to see that the exhaust system fits properly in car with sufficient clearance between the catalyst and the under body insulation. The muffler tailpipes must also be level.

Carefully tack weld the Y-pipe in position on car. When you have the Y-pipe tack welded to the flange and catalyst with at least three 1/2" long welds per joint you can remove the exhaust system from the car and complete the welds.

255. Clean off any heat scale from Y-pipe that may have developed during the welding process using some sandpaper.

256. Use some high heat spray paint to paint the Y-pipe to protect the piece from rust. Use at least two good coats of paint.

257. Reinstall the exhaust system using the 3" flange gasket, three 8mm x 25mm bolts, three 8mm knurled washers and three 8mm copper lock nuts.

258. Reinstall the original transmission to exhaust hanger assembly. If the exhaust system is now a little higher than its original position you may need to slot the left hole of the transmission bracket up a little to allow the other end of bracket to rise up.

259. Reinstall the tubular chassis brace and front sway bar braces.

260. Reinstall the front sway bar.

261. Start engine and let idle. Check over the engine from the top and bottom for any water, fuel, oil or vacuum leaks. Correct as necessary.

262. Listen closely for any abnormal noises. Shut off engine and correct problem if necessary.

263. Testing the Turbotronics 4 system: Plug the light bar display tester into the small female plug jack on the control unit. Peel back the duct tape on the T4 pressure switch and disconnect one of the brown wires to simulate boost conditions. Start engine. Take a medium size hammer and tap engine block somewhere near the detonation sensor. The first few lights on the display should briefly flicker and the engine speed should momentarily drop slightly. This indicates that the system is functioning properly. If nothing happens, recheck all connections or call Dinan Engineering for further assistance if necessary.

264. Reconnect the brown wire to the T4 pressure switch and cover with the duct tape. Start engine. Tap the engine block in the same location with the same amount of force required to make the display light flicker on the first test. The display lights should remain off during this test. This indicates that the system is functioning properly. If any lights come on, recheck all connections or call Dinan Engineering for further assistance if necessary. Proceed if system is operating normally.

Testing the T5 and T6 Systems:

These tests must be done with the engine up to normal operating temperatures.

265. Remove the small CO plug from the exhaust manifold next to the oxygen sensor. Install a BMW type exhaust probe adaptor in the manifold (8mm x 1.00mm thread). Connect an exhaust gas analyzer to the exhaust manifold adaptor.

6. Locate or make a modified radiator pressure testing pumper or other suitable device that is capable of creating and holding pressure up to about 10 PSI.

267. Start the engine and let it idle for a couple of minutes or until the engine is brought back to normal operating temperature. Observe the CO content of the exhaust gas. This should be about .03% to .08% CO depending on the car and the accuracy of your analyzer. Write down this reading to be used as the normal reading. If your car is not in this range, you should check the calibration of your analyzer and the T6 wiring. The oxygen sensor must be connected for this test. If your car fails to fall into this range you should call Dinan Engineering at (415) 962-9417 for further assistance.

268. With engine still running, disconnect the vacuum hose from the T6 ECU and quickly plug the hose. The idle CO should not vary more than about .02%.

269. Disconnect the vacuum hose from the four way tee for the T5 ECU and use the vacuum plug cap from kit to plug off the leg of tee.

270. Try to do this step fairly quick to prevent harming catalyst with rich mixture. Connect your pressure pumper to the T5 ECU hose and pump your pumper to 5 to 6 PSI and hold it there. The CO should go up significantly. If CO does go up, go immediately to next step. If CO does not rise, please check your setup to see if you followed the test procedure correctly. Also recheck the T5 wiring. If necessary, call Dinan Engineering for further assistance.

271. With the pressure tester still on the T5 ECU hose, immediately reconnect the T6 vacuum hose to the four way tee. The CO should come back down to the original normal reading of about .03% to .08% depending on your analyzer and car. If the CO does not come back down then please recheck test procedure and if necessary, call Dinan Engineering for further assistance. Shut off engine.

These tests are extremely important because not only are these systems responsible for gaining maximum horse power, but they also are vital components that help to protect your engine from damage and unnecessary wear. Be accurate and careful when following the test procedures. Please don't hesitate to call Dinan Engineering if anything is not correct or clear.

2. Reconnect the T5 and T6 vacuum hoses and disconnect exhaust analyzer.

Road testing the car and setting the boost:

Manual transmission cars:

Maximum boost pressure is 10 PSI. Find a straight level road free of traffic and get the car rolling at about 25 MPH and put it in fourth gear. Hold it at about 2000 RPM and then open the throttle all the way. Set the boost pressure at 10 PSI between 3500 and 4000 RPM. If at any time more than 2 lights light up on the display or the boost pressure exceeds 10 PSI **immediately** back out of the throttle. Make a boost pressure adjustment and try the test again. Turn the wastegate adjusting screw clockwise to increase boost or counter clockwise to reduce boost pressure.

We suggest having an assistant ride with you when road testing to watch the boost gauge and light bar display tester. This will allow you to watch the road and concentrate on driving.

Dinan Engineering does not suggest or condone driving faster than the posted speed limit on any public road or operating a vehicle in an unsafe manner.

When boost pressure is set correctly no more than two lights should light up on light bar display tester. If you are getting too many lights, run car down to 1/8 of a tank of fuel, without going into boost. Then fill the tank with the best quality unleaded fuel available to you. Perform the test again. If you still get too many light call Dinan Engineering for specific tests which can be run to determine the problem.

If your car passes all of the tests, you may now remove the light bar display tester and replace the glovebox cover. Check over the car again for any leaks, loose bolts or loose fittings.

273. Replace the ECU compartment cover.

274. Locate the chrome DINAN trunk badge from kit. You will notice that we carefully designed this badge to match the original emblems as close as possible. See Figure 17 for position of the trunk badge.

275. Use a little "wax and silicone remover" or mild window cleaner on a clean rag to prepare the painted surface of the left rear surface of trunk lid for badge installation.

276. Use a soft pencil or non-permanent marking felt pen to make a very light horizontal line $1\frac{1}{16}$ " above lower edge of trunk lid. Measure $15\frac{1}{16}$ " over from the left edge of trunk lid on the $1\frac{1}{16}$ " line.

277. Pull off the backing membrane from the badge.

278. Carefully line up the badge with your marks and let the badge touch the trunk lid. Check badge for straightness, then press on entire length of badge for permanent installation. Excessive pressure is not necessary for affixing badge and may result in damage to the badge. Be careful to line up badge correctly before installation since the adhesive backing is designed for one use only.

IMPORTANT

Running boost too high may cause engine surging, loss of power and harmful engine detonation. If at any time detonation is heard, contact Dinan Engineering for technical assistance. Detonation can cause severe engine damage. Run only top grade unleaded premium fuel in your Dinan Engineering turbo powered car. THIS IS A MUST!

MAINTENANCE

Every 2500 miles change the oil and filter in your engine. Periodically check all bolts, hoses and clamps for tightness. A turbo stresses a vehicle more, so more service is required. It is recommended that minor services be done at 5000 and major services at 10,000. For any technical assistance call Dinan Engineering at (415) 962-9417 between 9:00 am and 4:30 pm, Pacific Coast time, Monday through Friday.

SPECIAL INSTRUCTIONS

AS with all turbocharged engines, you should always allow the exhaust manifold and turbocharger to cool down to normal temperatures before shutting engine off. This is easily done by always remembering to make your last five minutes of driving (before shutting off engine) be done at light throttle without excess speed or boost. Merely idling the engine after hard boosting doesn't allow enough airflow through the exhaust manifold to help cool it down. Shutting off the engine with the manifold and turbocharger really hot will damage the turbocharger by baking the oil in it into a rock hard substance known as "coke".

Always allow engine to idle for 30 seconds to one minute after normal driving to allow the turbocharger turbine shaft speed to return to its normal idling speed. During boost the turbine speed will reach over 100,000 RPMs! The turbocharger is lubricated and cooled with engine oil and will easily last the life of the engine if simple steps are taken to protect it.

You should also avoid running the engine hard until it has warmed up which is true of all cars and especially true of turbo cars.

Street turbos are designed to run in boost for only short bursts. If you are at a race track or on a very long section of road that enables you to run boost almost continuously, lift off occasionally for several miles allowing the engine to dissipate heat. If you are planning to run the car in this manner frequently, we recommend the following additional modifications to ensure long life; oil cooler and larger capacity radiator. Running the car from zero to its top speed at constant full throttle is something we would not recommend.

Figure 1

Cutting off corner of distributor cover.
Mark cover with scribe according to measurements.
(See dotted lines.)

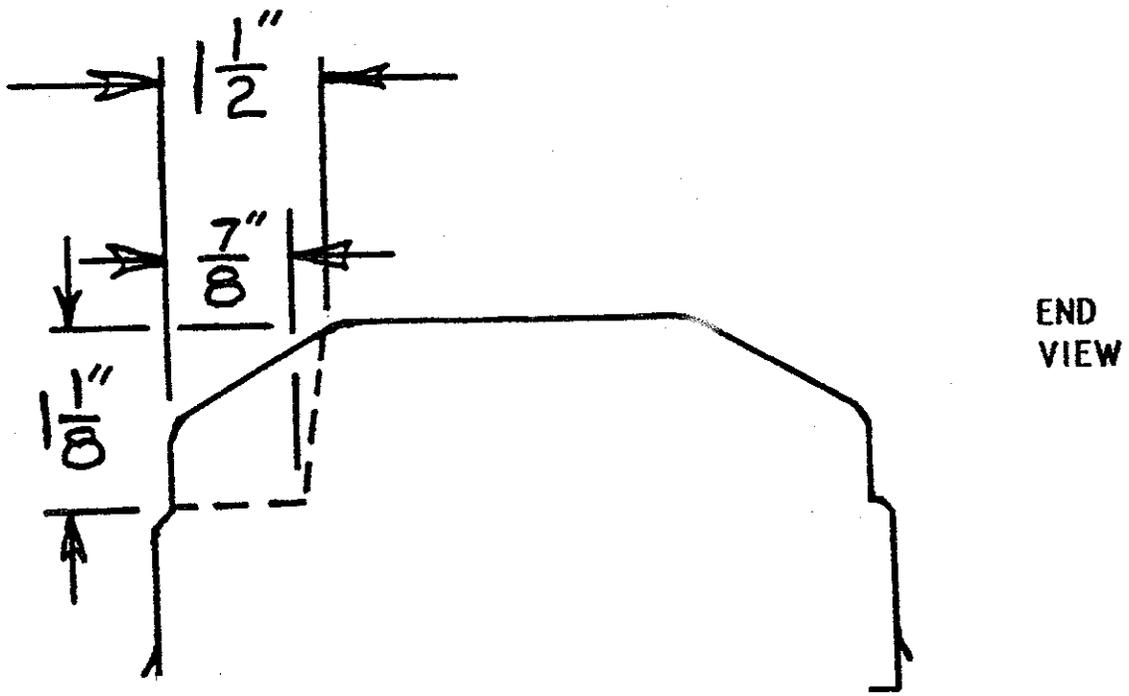
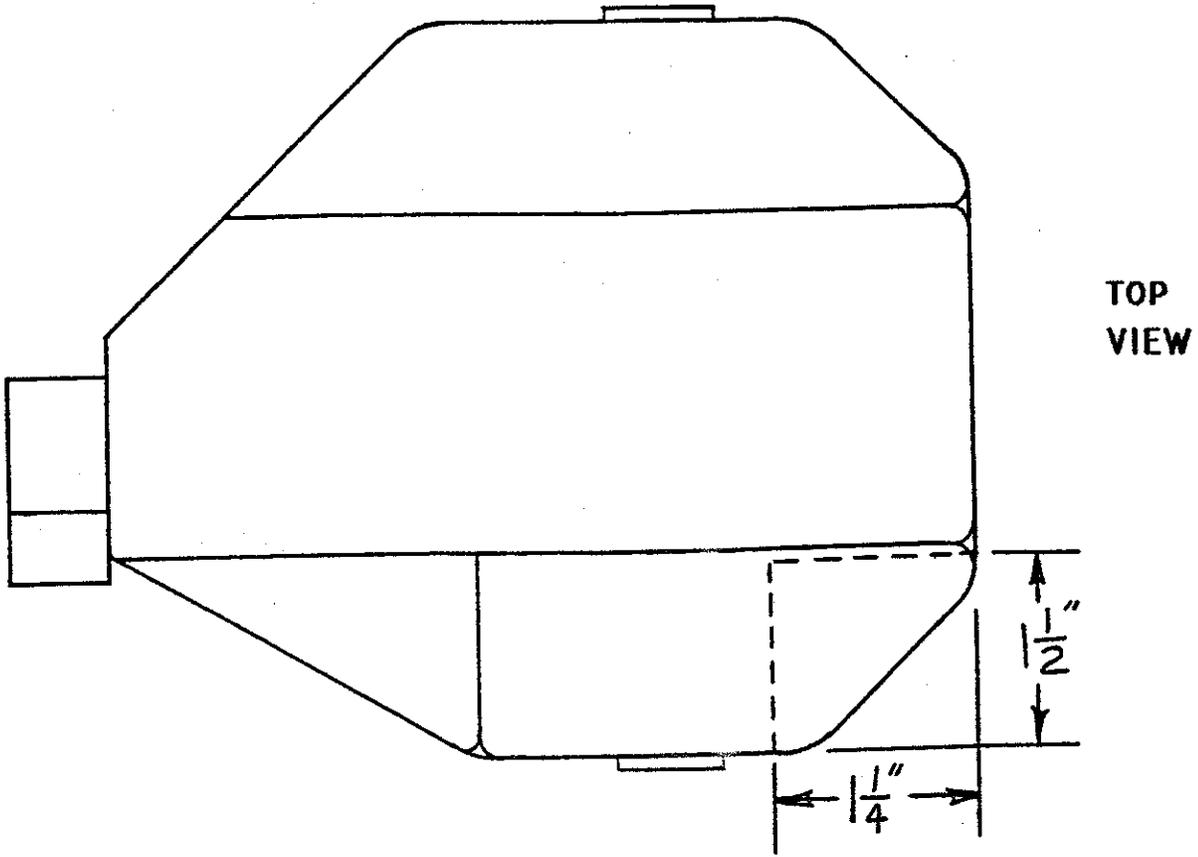


FIGURE 2

OIL DRAIN HOLE

TRANSMISSION

$6\frac{1}{4}"$

ENGINE BLOCK

$\frac{1}{16}"$

OIL PAN

MEASURE FROM THE LOWER
MACHINED EDGE OF ENGINE BLOCK

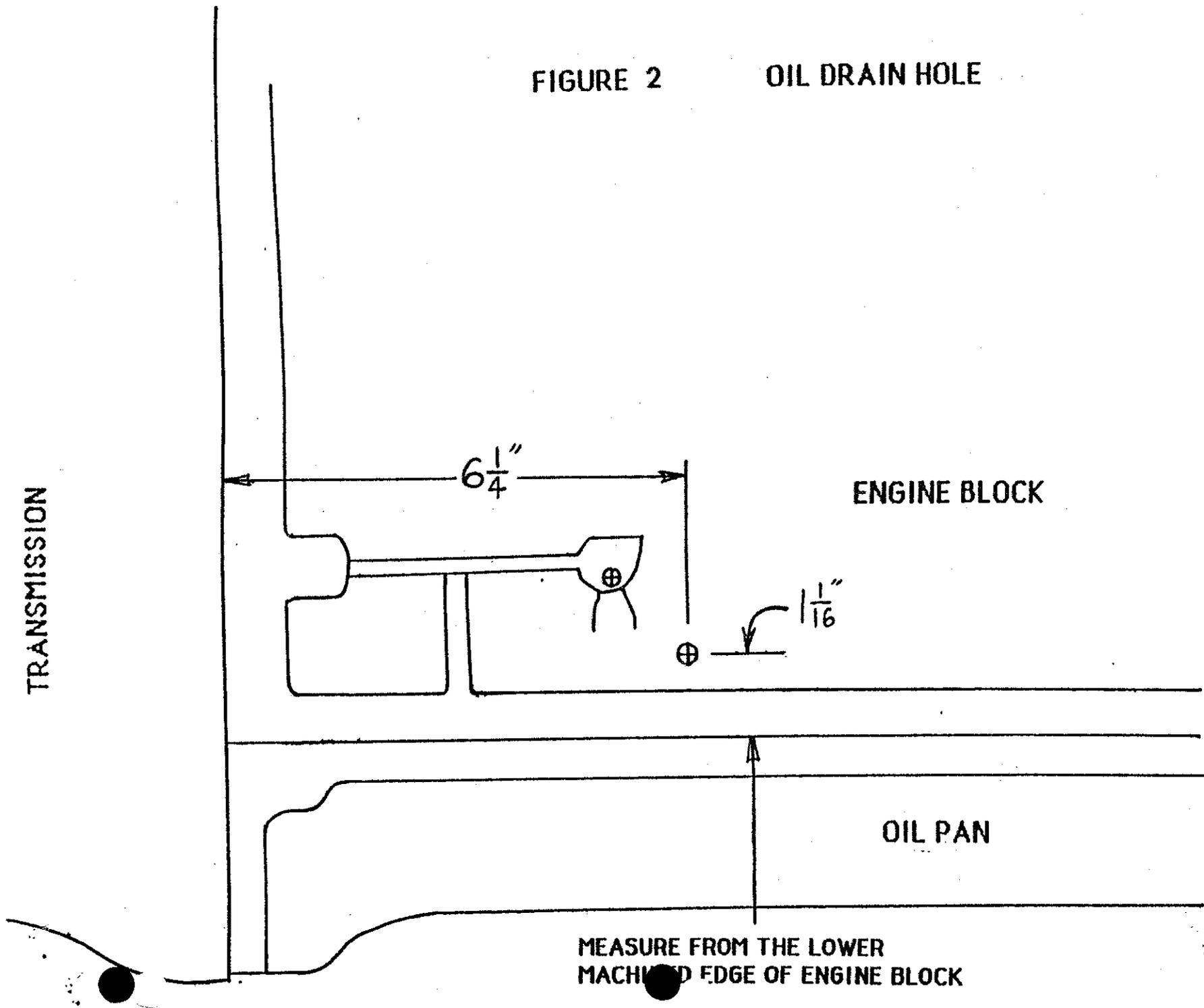
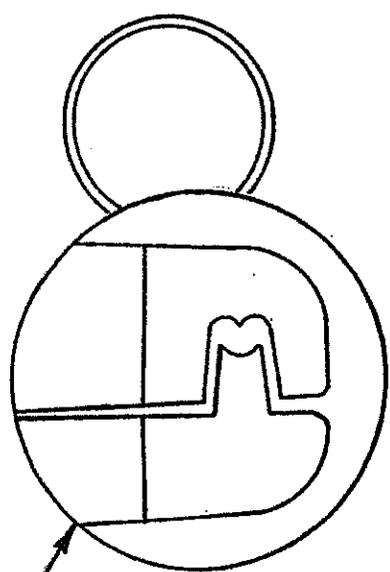
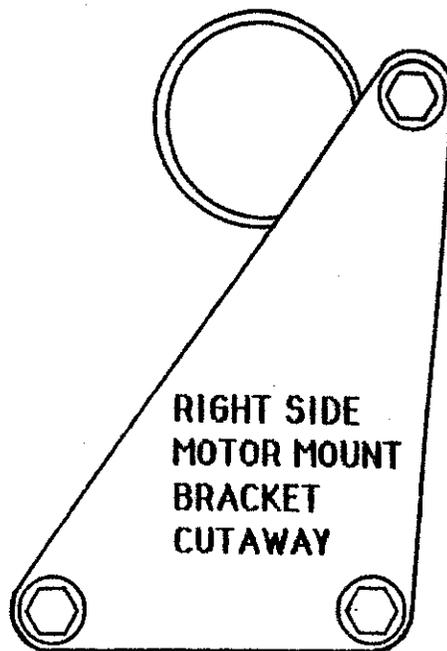


FIGURE 3 DETONATION SENSOR LOCATION

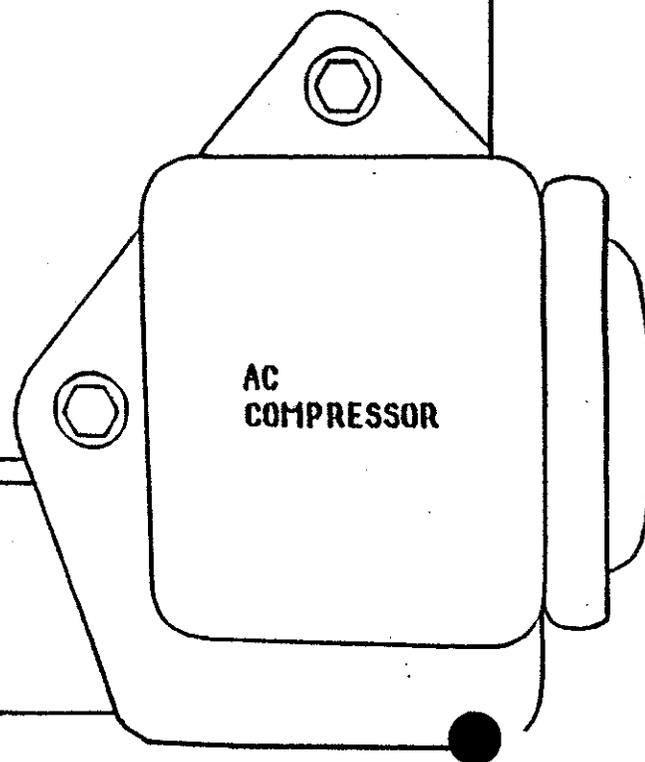
RIGHT SIDE OF ENGINE BLOCK



INSERT PICTURE OF
CRIMPING TOOL FOR
DETONATION SENSOR WIRE
ENDS. GREATLY ENLARGED



RIGHT SIDE
MOTOR MOUNT
BRACKET
CUTAWAY



AC
COMPRESSOR



DETONATION SENSOR

FIGURE 4 TURBO OILER FITTING IN OIL
FILTER HOUSING

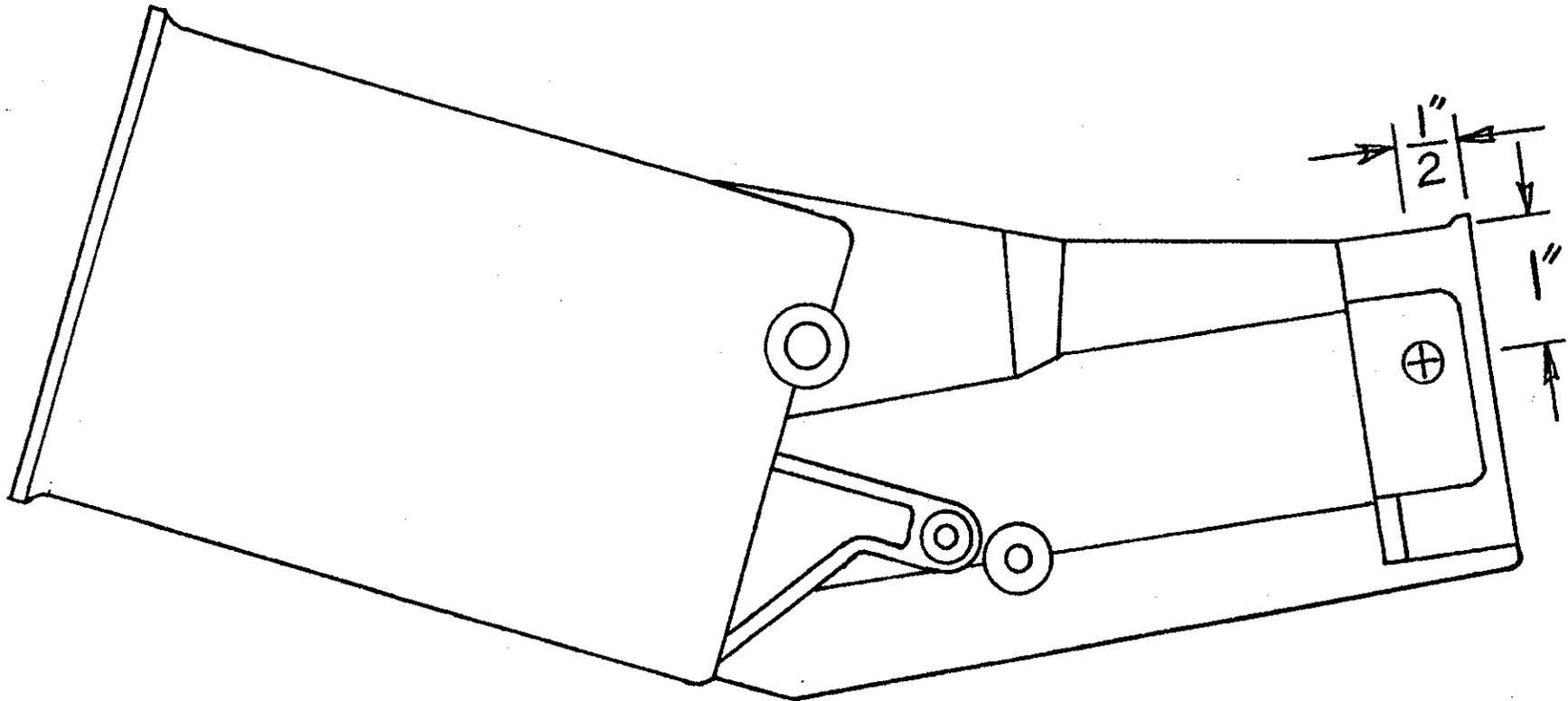
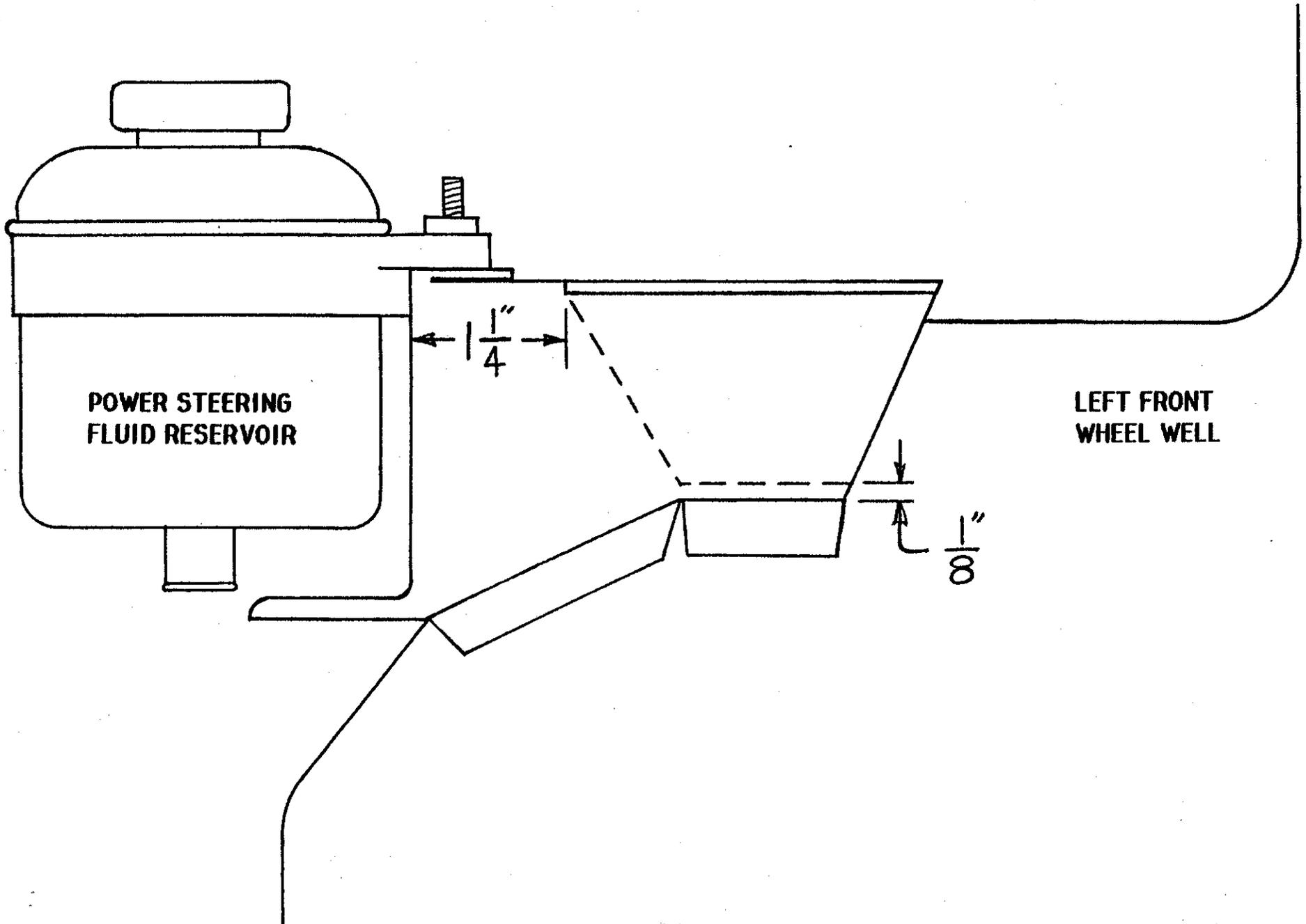
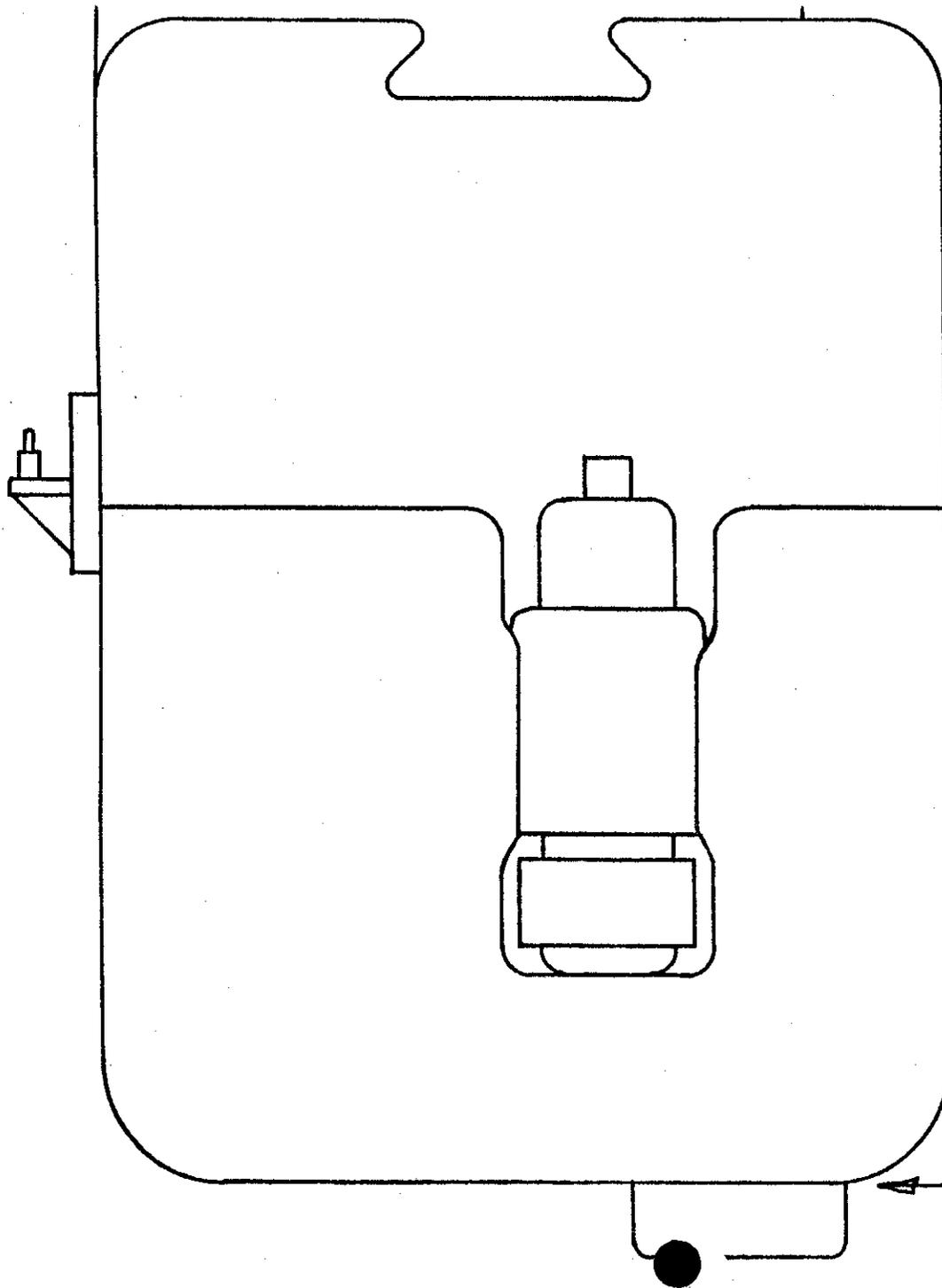


FIGURE 5 CUT WHEEL WELL BRACKET FOR WINDSHIELD WASHER BOTTLE CLEARANCE



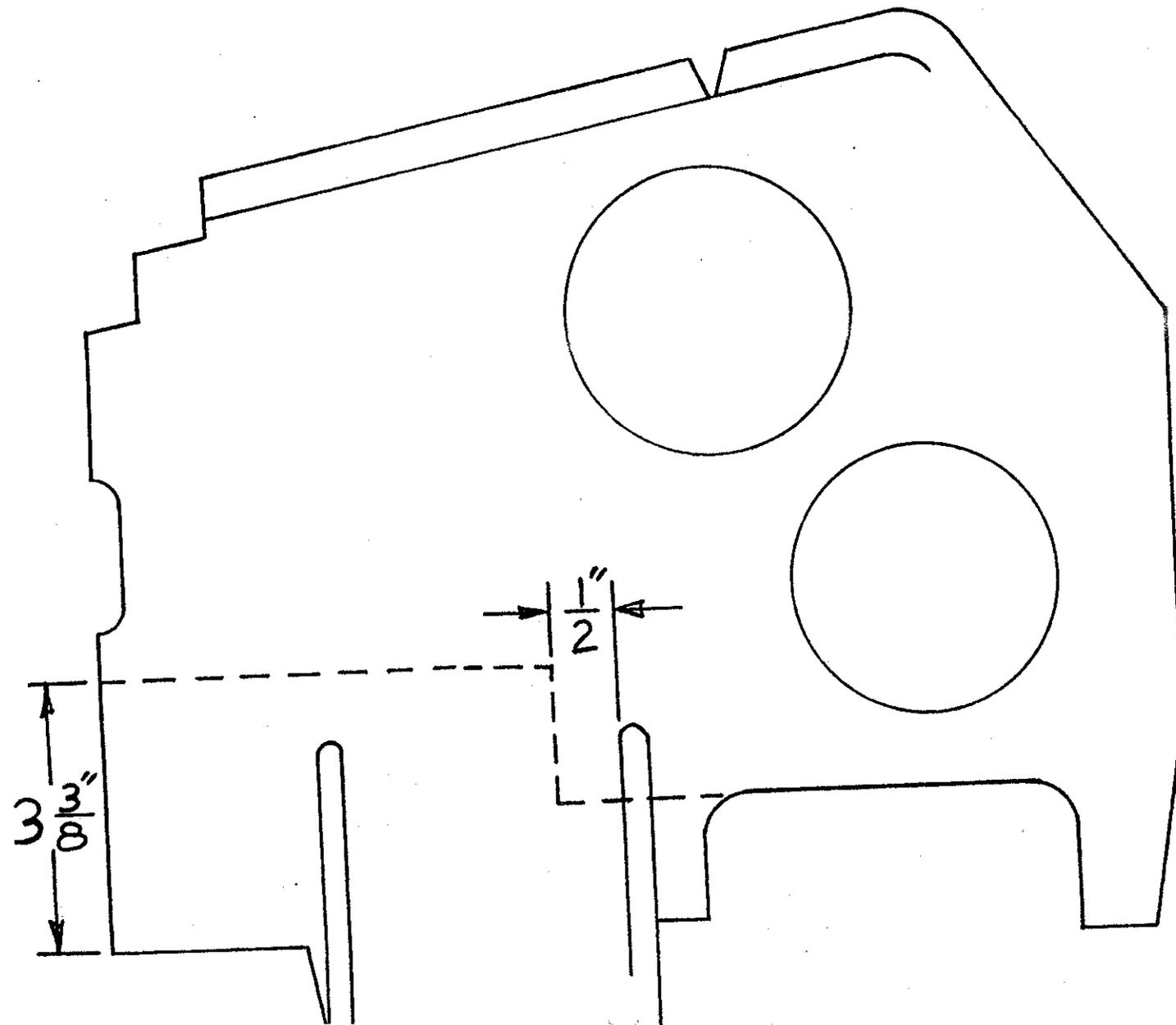
FLUID
LEVEL
SENSOR



**FIGURE 6 CUTTING ALIGNMENT TAB
FROM THE WINDSHIELD WASHER
BOTTLE**

CUT OFF ALIGNMENT TAB
EVEN WITH BOTTLE

FIGURE 7 CUT LEFT PLASTIC COVER AS SHOWN.
CUT ON DOTTED LINES ONLY.



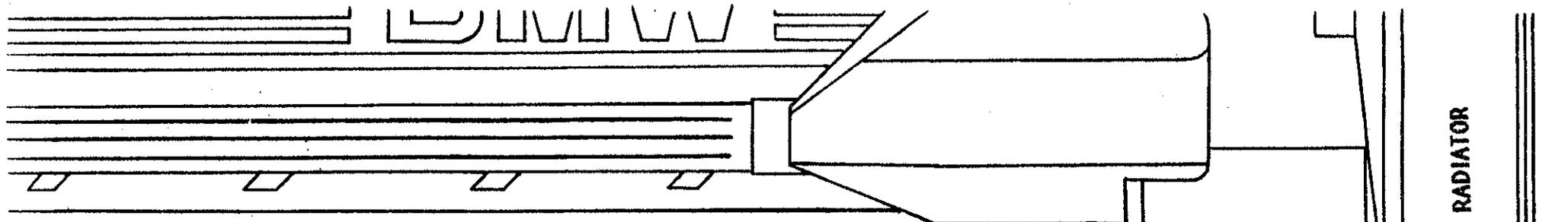


FIGURE 8 INTERCOOLER POSITIONING

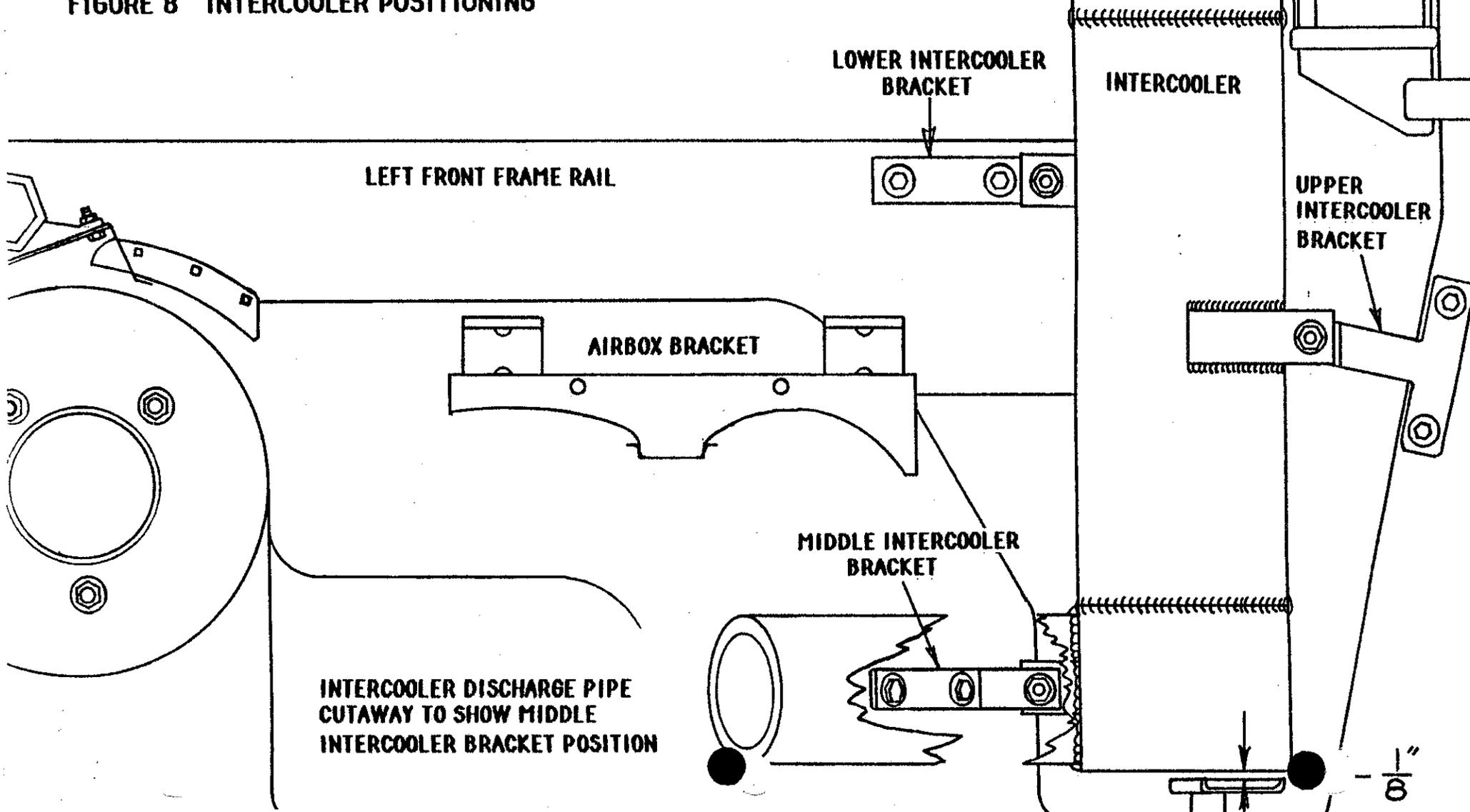
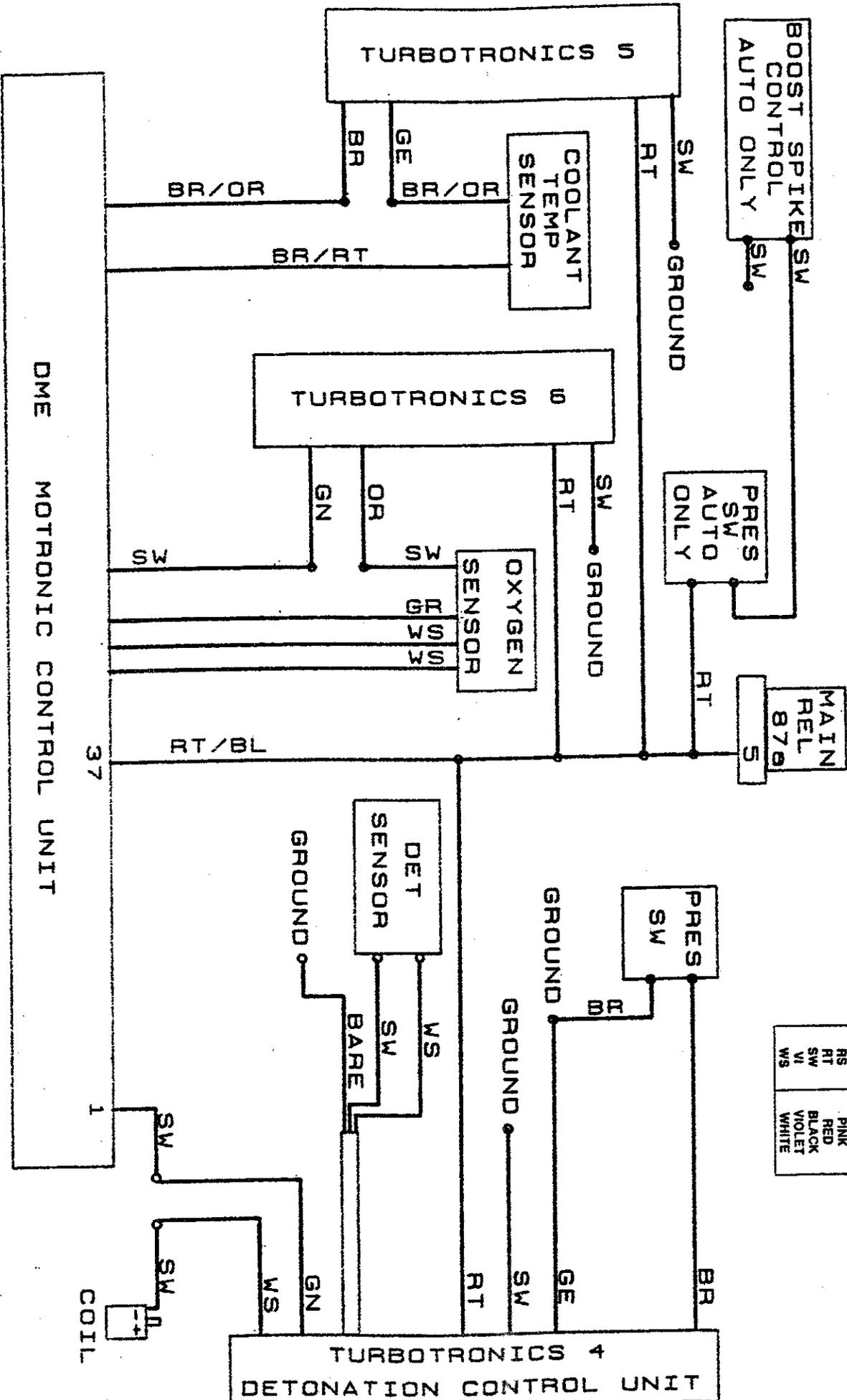
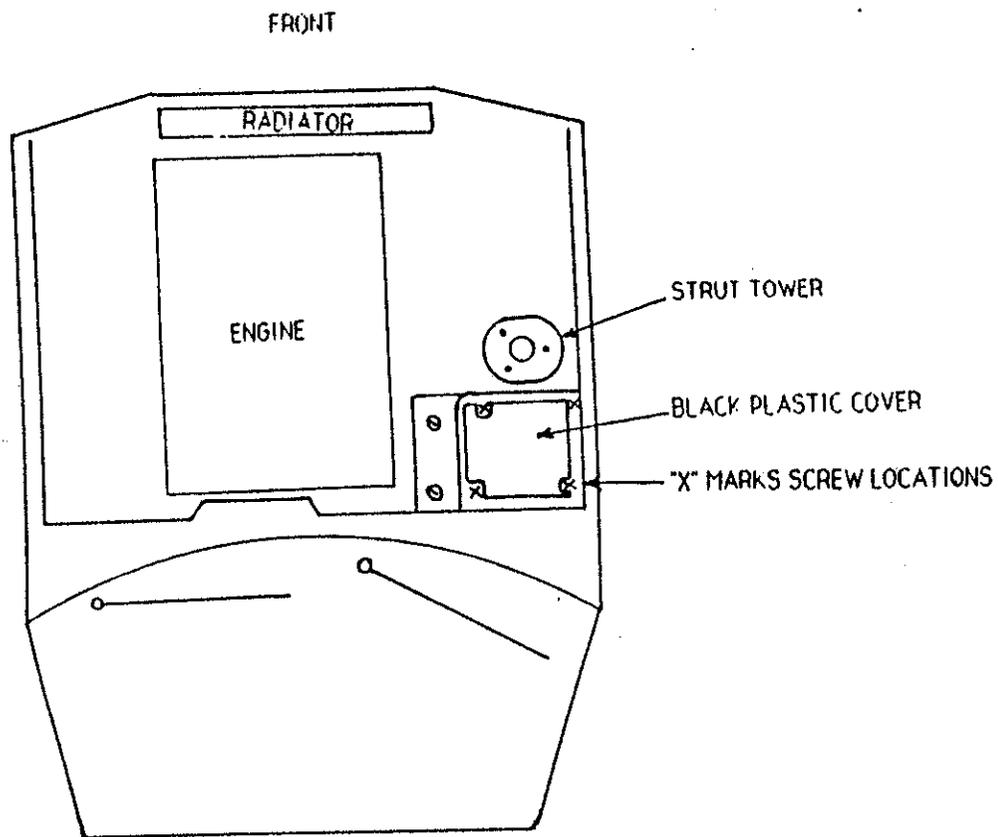


FIGURE 9
WIRING DIAGRAM





535i and 735i ONLY

FRONT

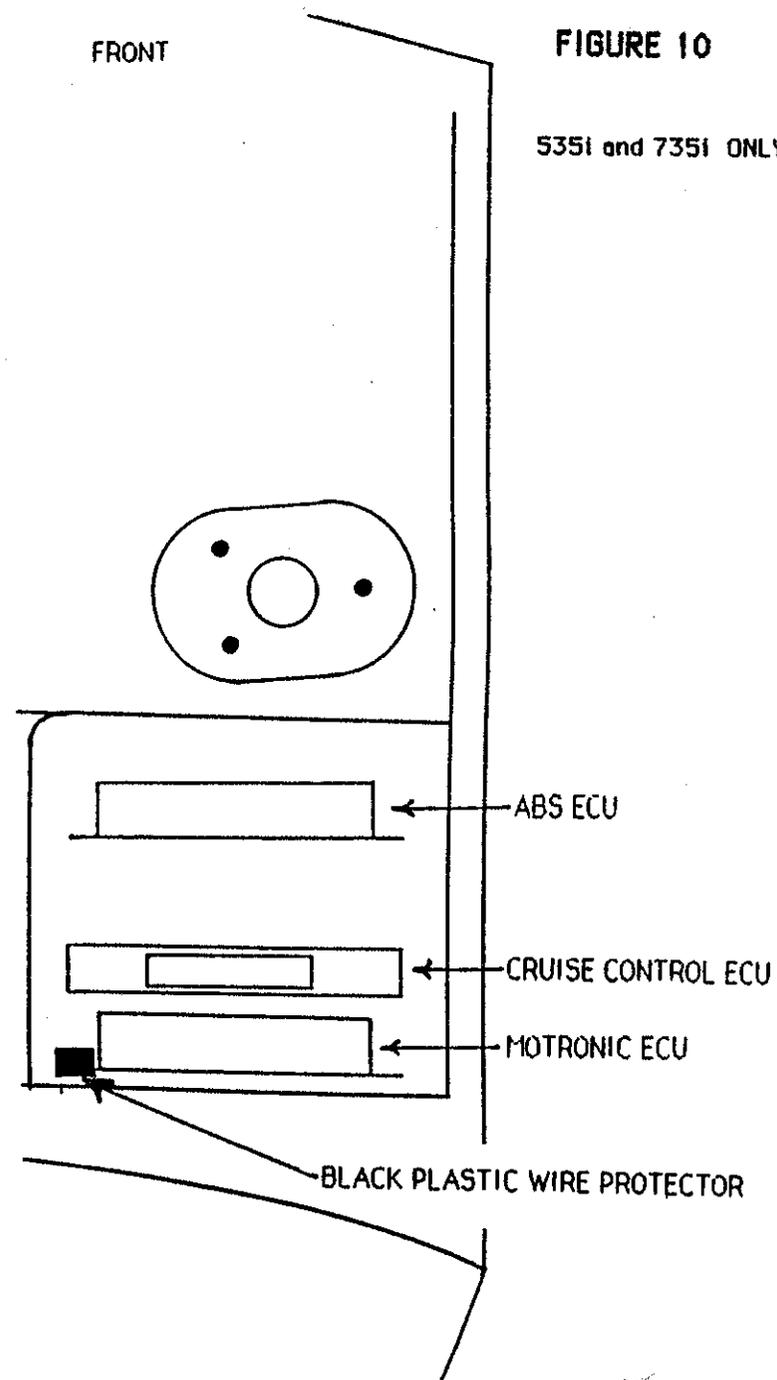


FIGURE 10

535i and 735i ONLY

FIGURE 11

BEND UP LOCK TABS AS SHOWN

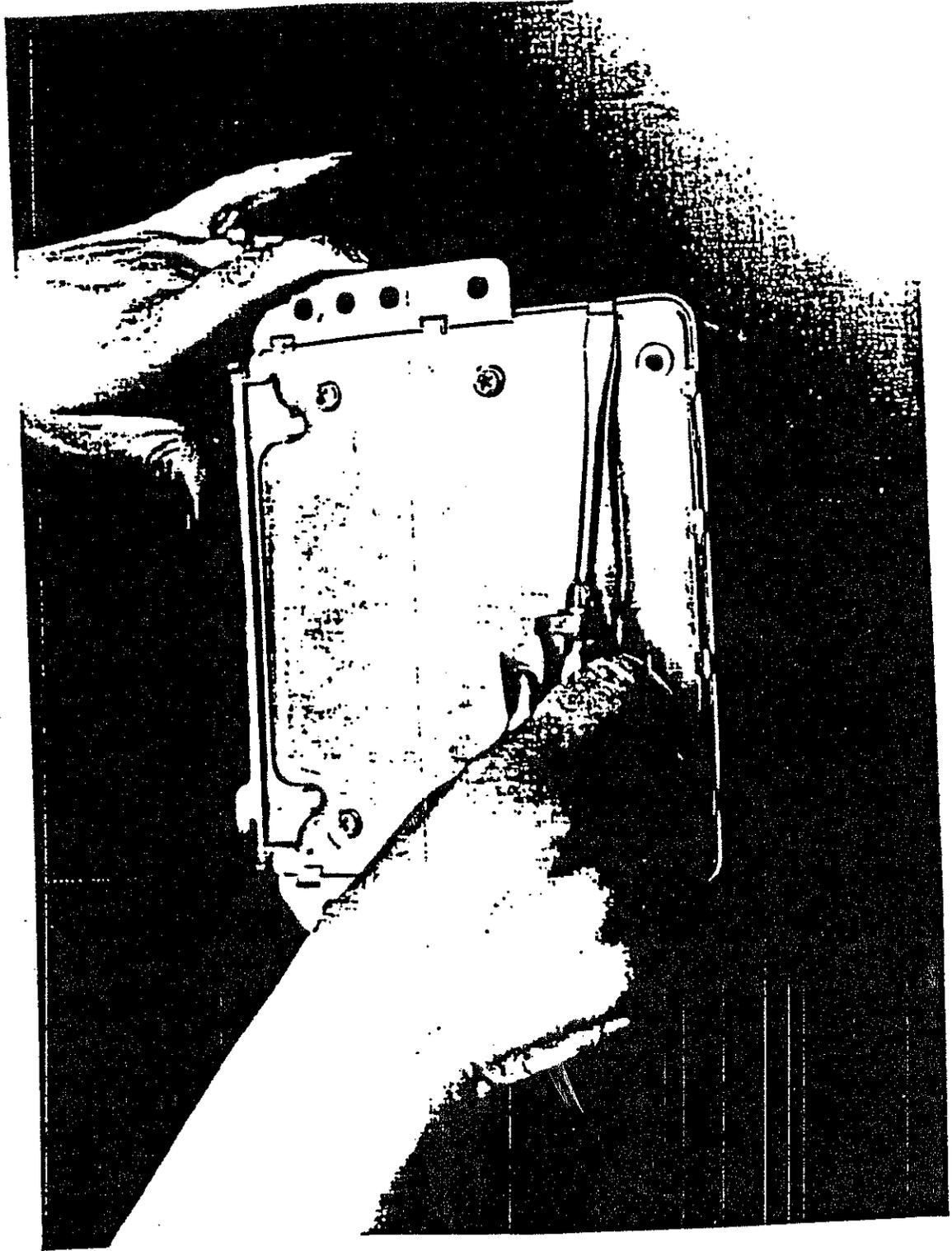


FIGURE 13

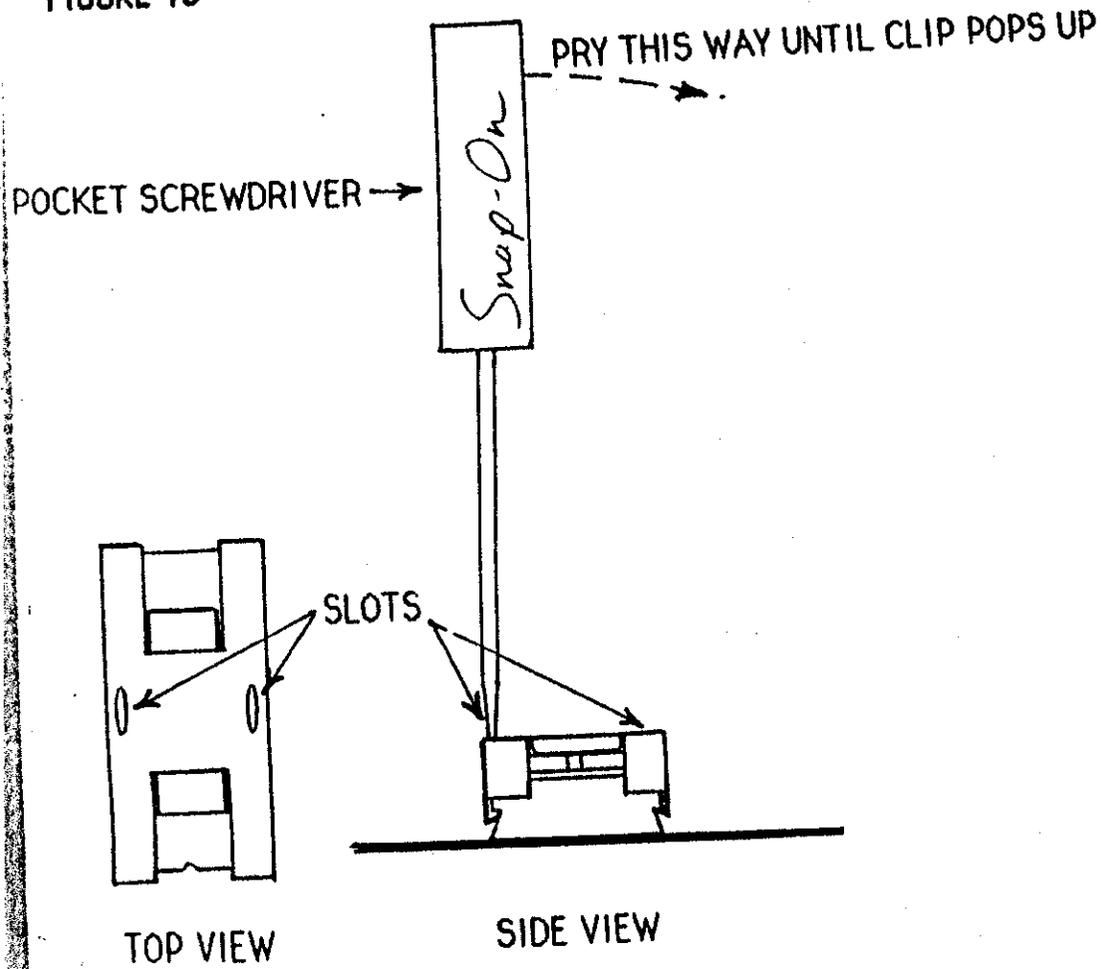
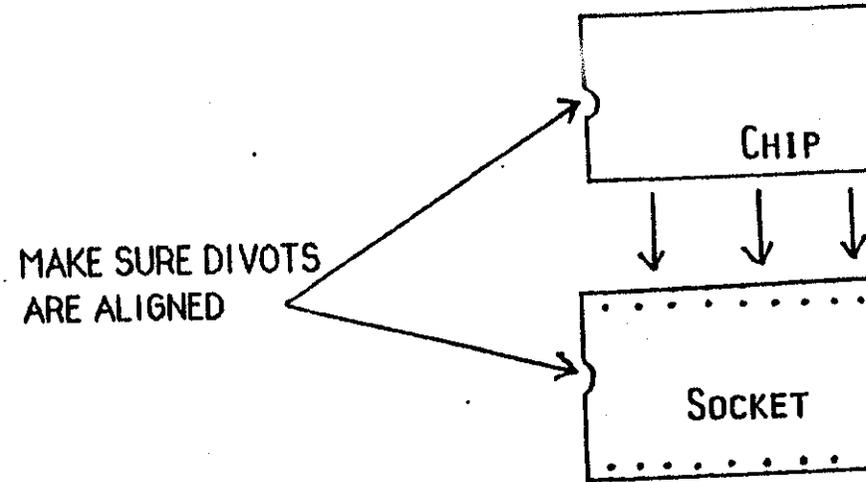
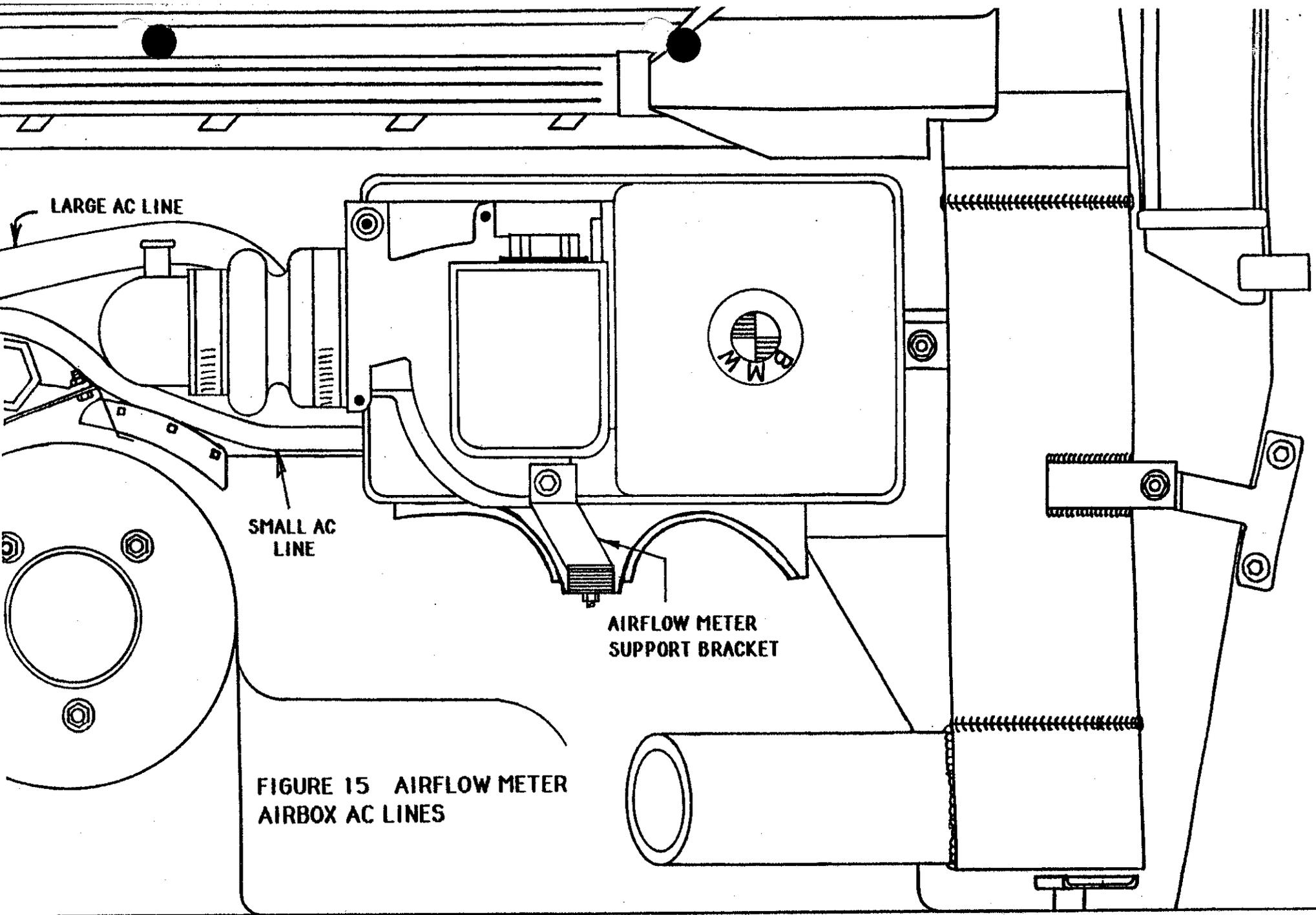


FIGURE 14





LARGE AC LINE

SMALL AC LINE

AIRFLOW METER
SUPPORT BRACKET

FIGURE 15 AIRFLOW METER
AIRBOX AC LINES

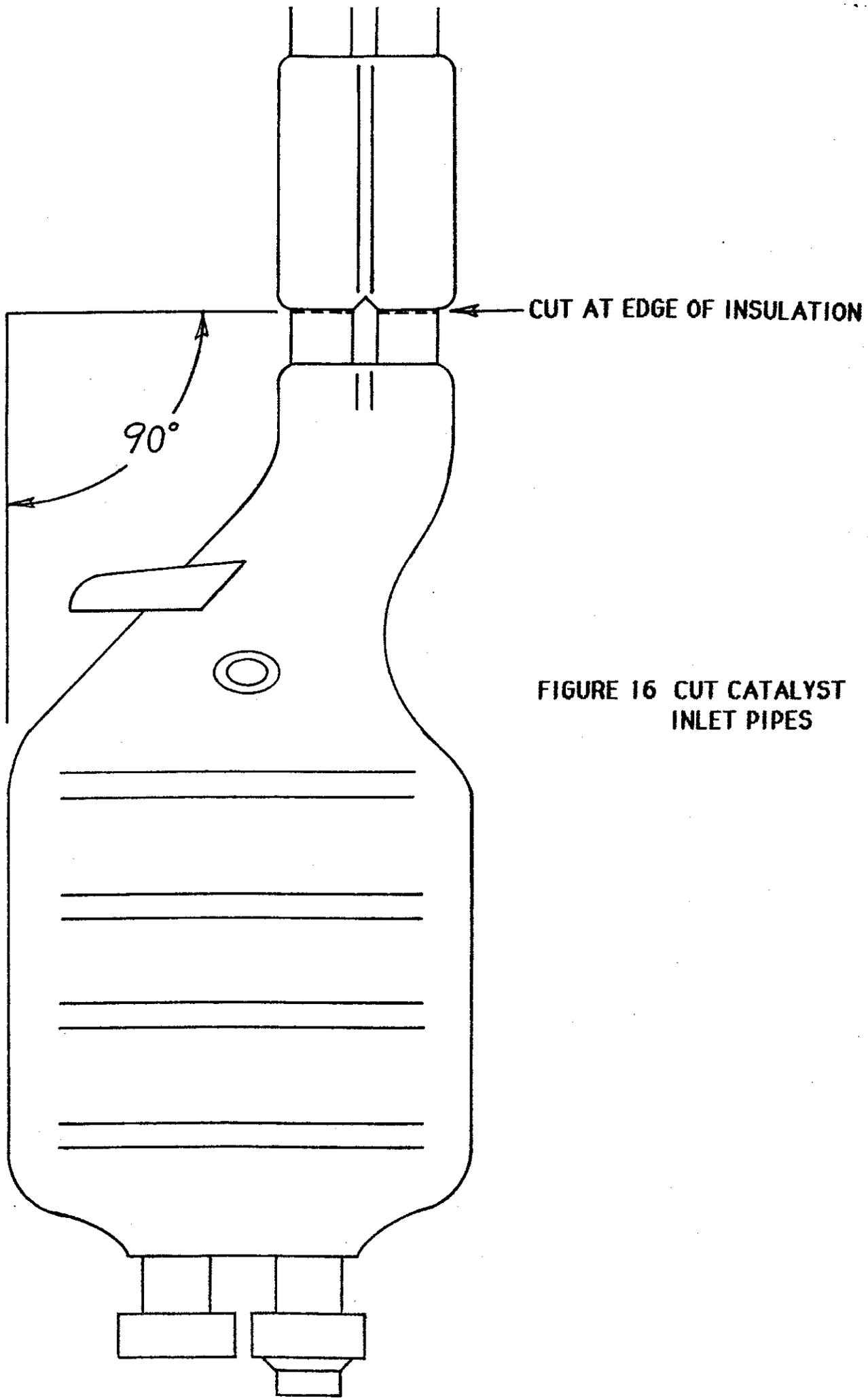
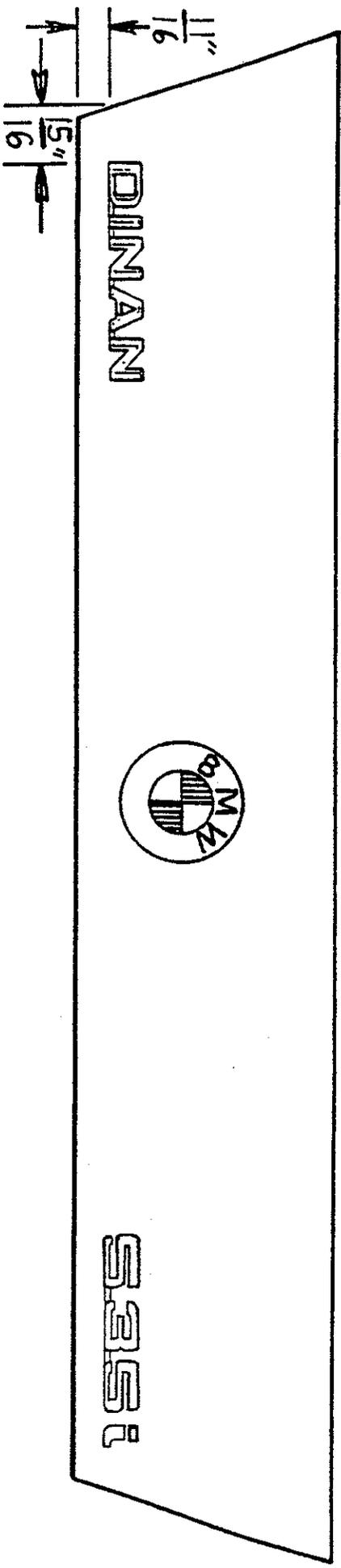


FIGURE 16 CUT CATALYST
INLET PIPES

Figure 17 Dinan Trunk Badge Placement



Turbo System Parts
89-> 535i
88-> 735i,735iL

Qty.	Part Number	Description
1	D300-0400	Turbo exhaust manifold assembly
1	D310-0102	Turbocharger assembly
1	D330-0200	Intercooler
1	D360-0120	3" Exhaust downpipe
1	D360-0127	3" Catalyst y-pipe
1	D321-0100	Wastegate
1	3.5L2VM3.1/2	Turbo Power chips
1	D400-0110	Air flow meter/Air filter box assembly
1	D450-0252	Turbo Fuel Pressure Regulator
6	D410-0101	Turbo fuel injectors
1	D360-0121	Wastegate dump pipe assembly
1	D470-0105	Compressor bypass valve assembly
1	D350-0116	Turbo upper inlet pipe
1	D350-0115	Turbo lower inlet pipe
1	D350-0112	Turbo to intercooler pipe
1	D350-0113	Intercooler to throttle pipe
1	D610-0115	Turbo support bracket
1	D610-0114	Lower intercooler bracket
1	D610-0113	Middle intercooler bracket
1	D610-0112	Upper intercooler bracket
1	D610-0110	Air flow meter support bracket
1	D620-0105	Idle control valve to turbo pipe hose
1	D620-0125	PCV hose assembly-manual trans.
1	D690-0100	Windshield washer wiring harness
1	D370-0110	17" long -4 wastegate hose with straight ends
1	D310-0111	45" long -4 oiler hose with straight ends
1	D390-0104	3-1/2" long 5/8" I.D. oil return hose
1	D710-0100	DINAN decklid badge

WHERE APPLICABLE (see salesman) the following items.

1	12 90 1 716 926	Rubber duct for ECU wiring (1990-> only)
1	D420 0101	Light bar display testor (SEE SALESMAN)

OPTIONAL EQUIPMENT the following items

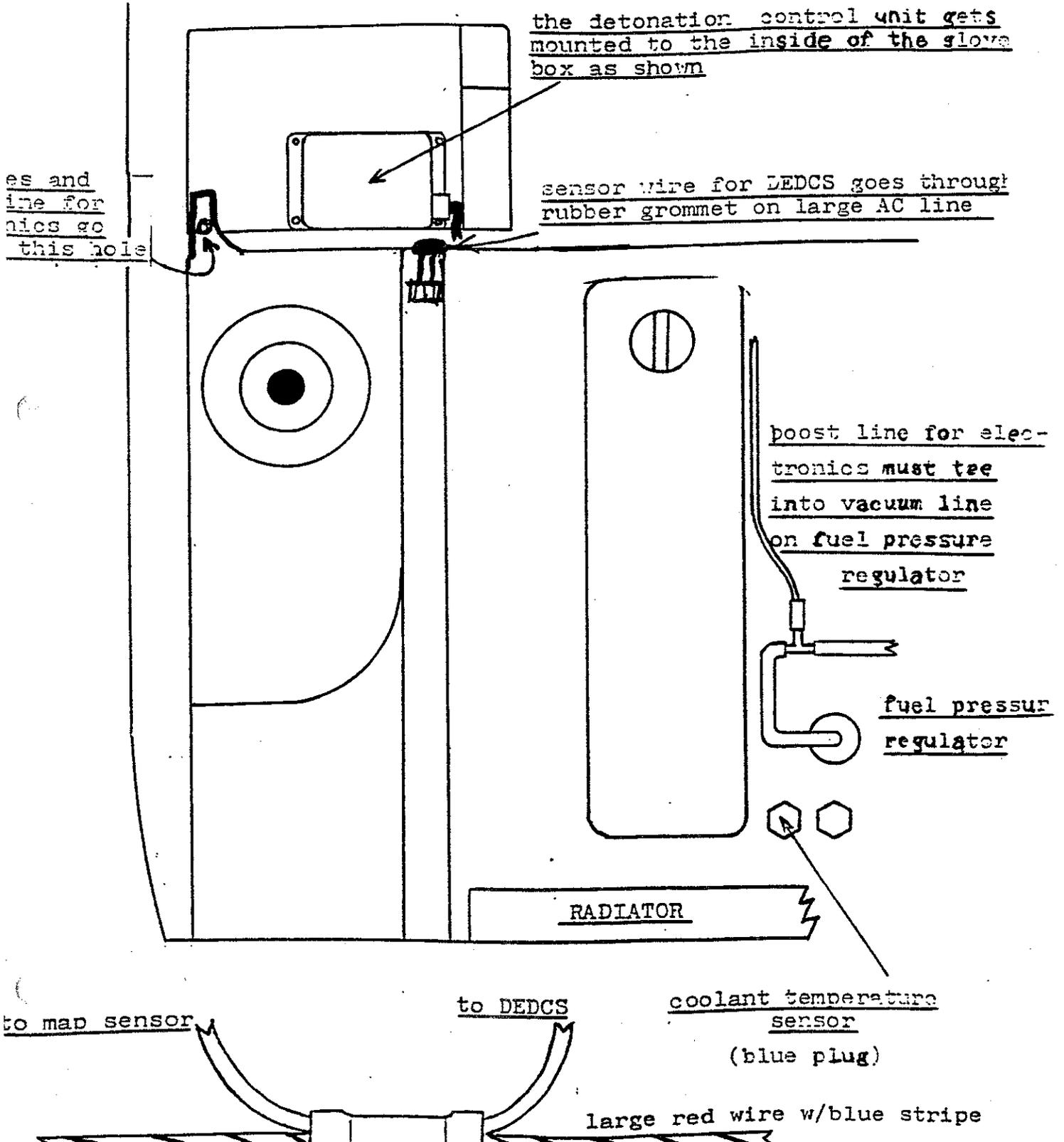
1	D	High flow muffler kit	(SEE SALESMAN)
1	D490-5351	Gauge panel	(SEE SALESMAN)

HARDWARE

1	*48 hose clamp
5	*44 hose clamps
7	*32 hose clamps
6	*16 hose clamps
2	*10 hose clamps
1	3/8" x 1-1/2" bolt
5	3/8" x 1-1/4" bolts
4	3/8" x 1" bolts
3	8mm x 25mm bolts
1	6mm x 25mm bolt
5	6mm x 16mm bolts
12	10mm knurled washers
2	10mm wave washers
6	8mm wave washers
19	8mm knurled washers
4	6mm wave washers
8	6mm flat washers
3	6mm X-large flat washers
19	8mm copper lock nuts
12	10mm copper lock nuts
2	6mm nuts
9	8mm nuts (13mm heads)
1	10mm nylock nut
2	10mm head sheet metal screws
5	6mm nylock nuts
4	13" long pieces of 20 Ga. wire-white, yellow, violet, blue
8	1" long pieces of 1/8" shrink tubing
4	3 1/4" long pieces of 3/8" shrink tubing
1	16" long piece of 3/8" shrink tubing
1	2" long piece of 3/8" shrink tube
1	Yellow butt connector
12	8" long wire ties
4	14" wire ties

LOCATION OF ELECTRONICS
85-87 735i

FIG 13



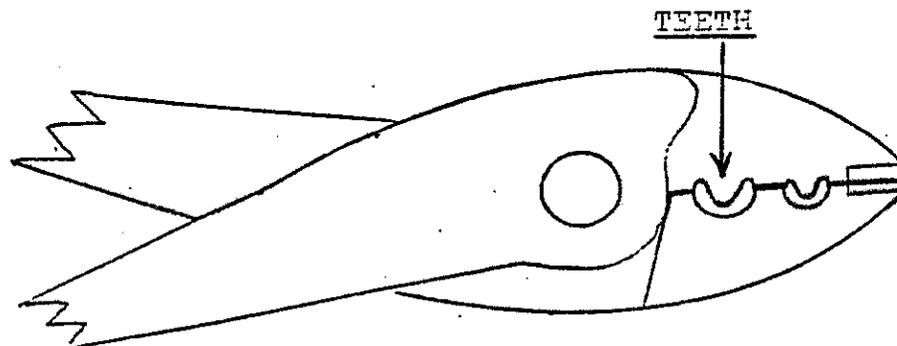
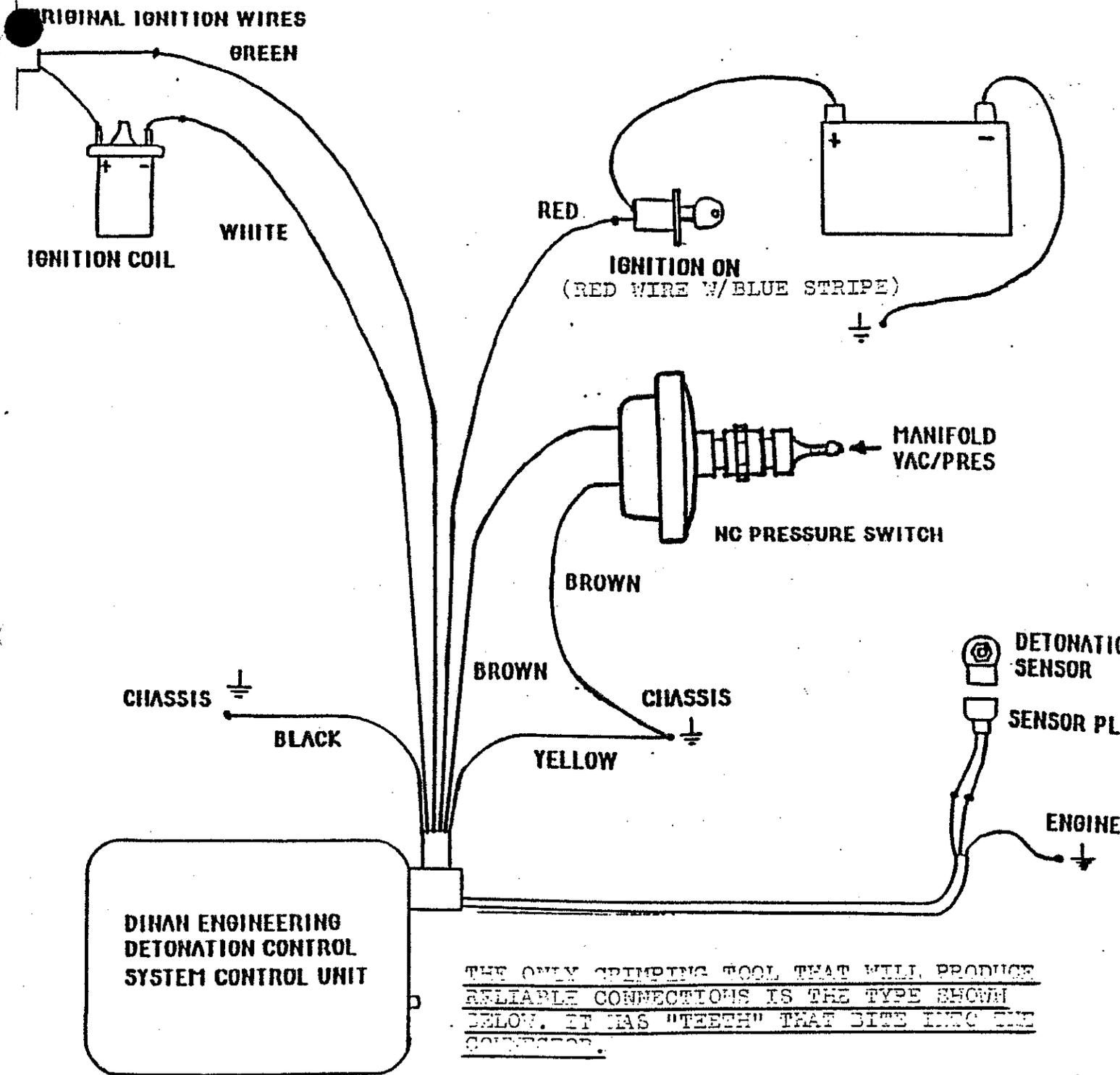
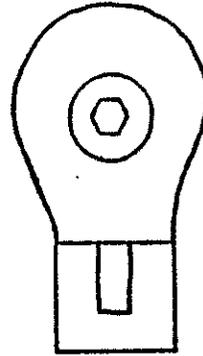


FIGURE 15

**USE THE EXISTING THREADED-->
HOLE FOR SENSOR MOUNTING**

**(ON CARS WITH 2 HOLES, USE
THE HOLE CLOSEST TO #3 AND
#4 CYLINDERS)**

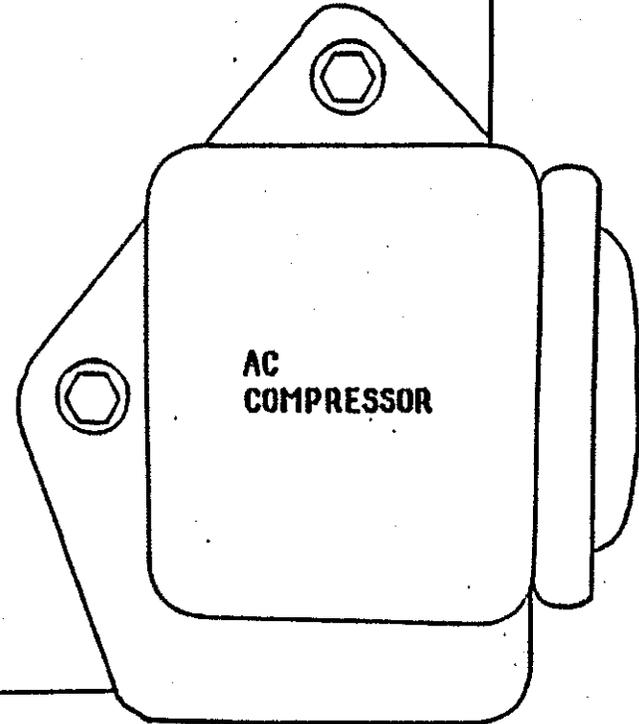


**<- DETONATION
SENSOR**

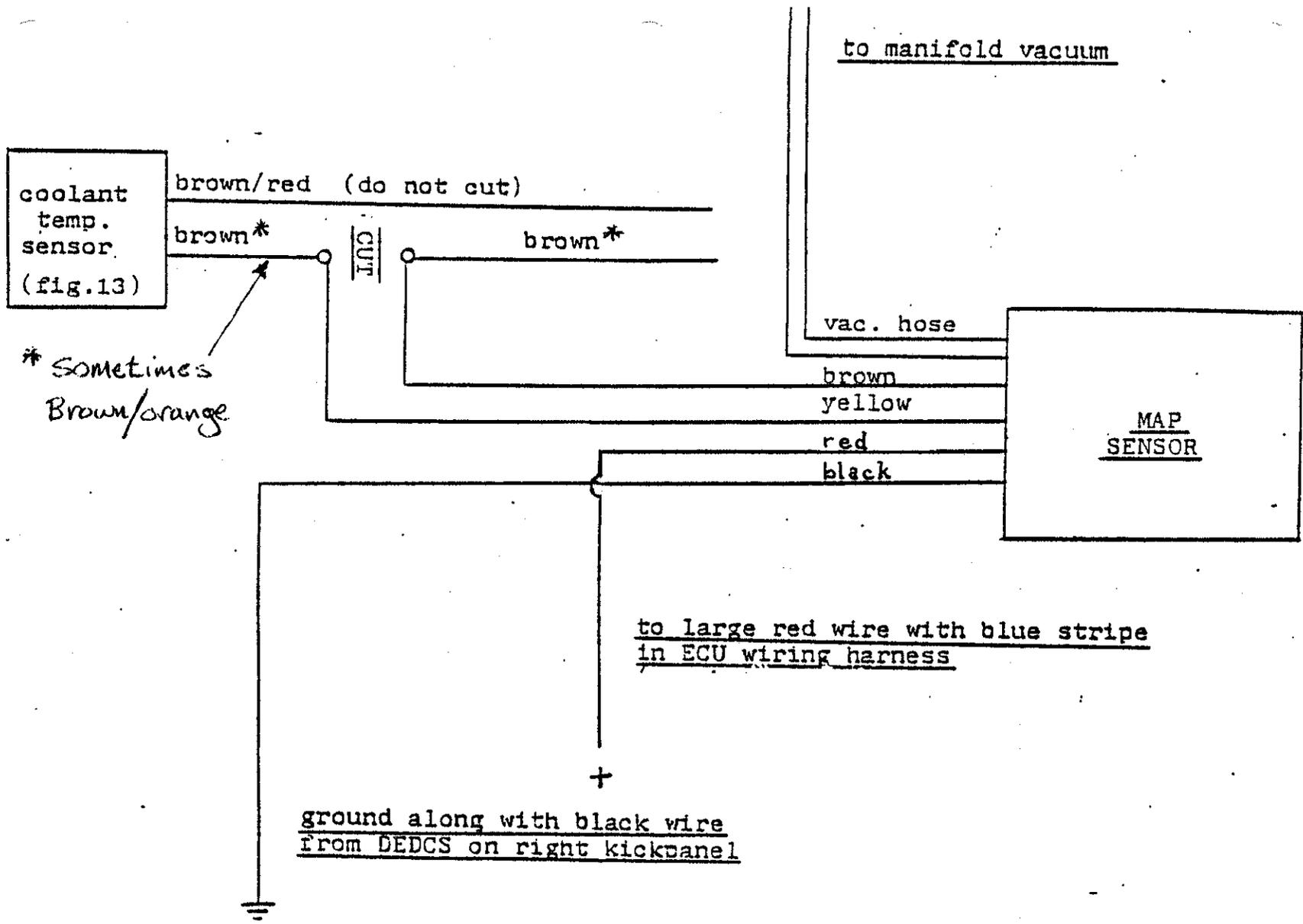
TRANSMISSION

ENGINE BLOCK

**ATTACH SENSOR
SHIELD WIRE HERE-->**



**AC
COMPRESSOR**



WIRING DIAGRAM FOR TURBO TROPICS 5 (MAP SENSOR) (FIG. 16)

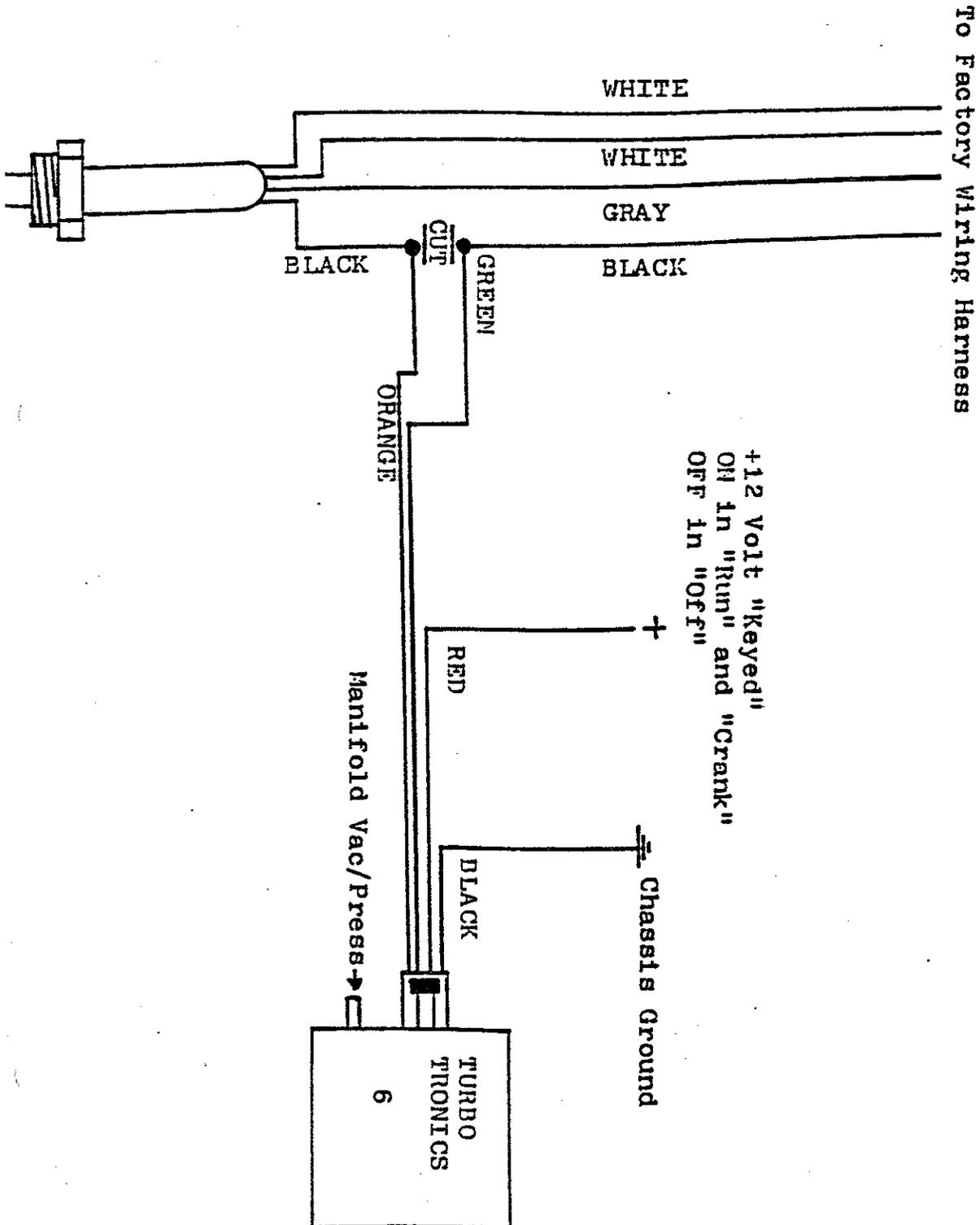
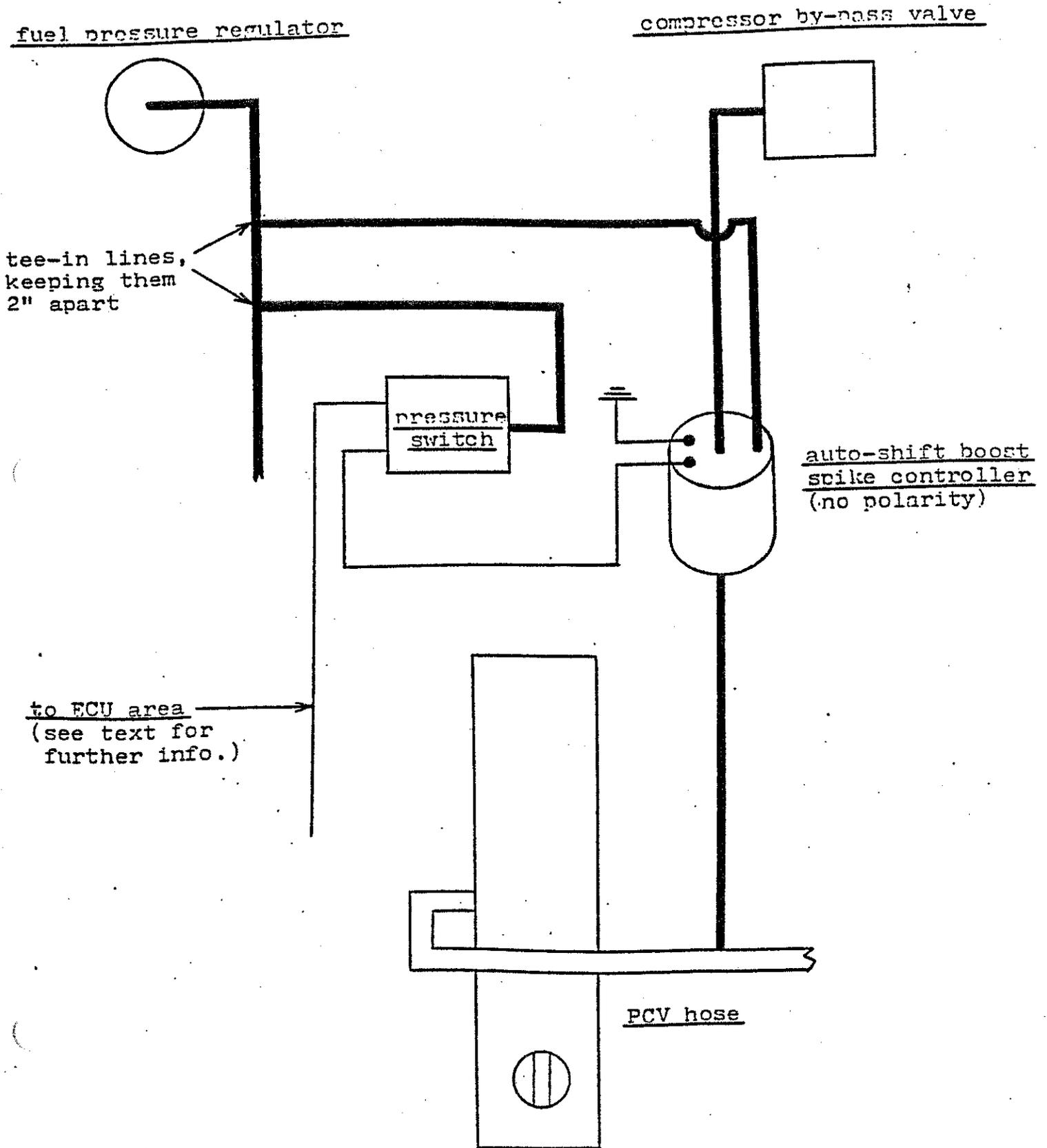
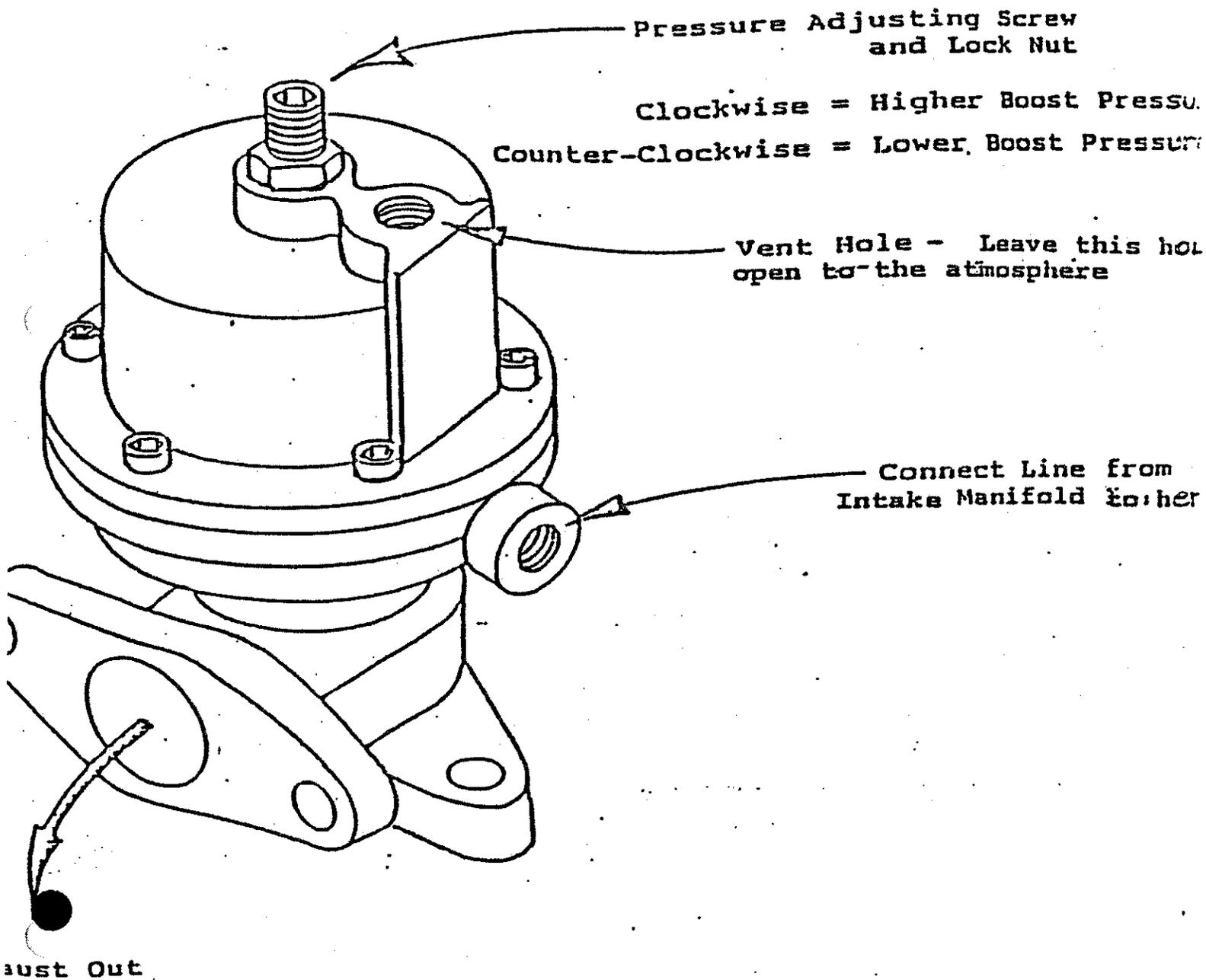


FIG. 18b

Auto Shift Boost Spike Control Schematic



Supplemental Wastegate Manifold Connection and adjustment procedure



Shipping Check-Off List 88-89 635CSi Stage 1

Qty.

Bag & Label: "IDLE CONTROL VALVE HOSE"

- 1 idle control valve hose *D620-0105
- 1 *10 hose clamp
- 2 *12 hose clamp

- 1 **LABEL: Turbocharger assembly *D310-7357**

- 1 **LABEL: Airflow meter *D400-0115**

Bag & Label: "OIL FITTINGS & HARDWARE"

- 2 *8 hose clamps
- 1 oil return flange and fitting *D610-0120
- 1 3-1/2" piece of 5/8" I.D. blue silicone hose *D390-0104
- 1 flange gasket *D311-0201
- 2 3/8" x 1-1/8" bolts
- 2 10mm flat washers
- 2 10mm wave washers
- 1 45° fitting *D381-0121
- 1 1/8" pipe to -4 straight fitting *D371-0120

- 1 **LABEL: exhaust manifold *D300-0300**

Bag & Label: "EXHAUST MANIFOLD HARDWARE"

- 12 8mm exhaust studs *D670-0100
- 12 8mm copper locknuts
- 12 8mm knurled washers
- 6 gaskets *D530-0220
- 4 10 mm copper locknuts
- 4 10mm knurled washers

BAG & LABEL: "WASTEGATE HARDWARE"

- 2 10mm copper locknuts
- 2 knurled washers

- 1 **LABEL: Wastegate *D320-0100**

1 **LABEL: Exhaust downpipe *D360-0140**

Bag & Label: "EXHAUST DOWNPIPE HARDWARE"

3 3/8" x 1-1/4" bolts
1 3/8" x 1-7/16" bolts
4 10mm copper locknuts
4 10mm knurled washers

1 **Label: "WASTEGATE DUMP-PIPE *D360-0141"**

Label: "WASTEGATE DUMP-PIPE HARDWARE"

2 3/8" x 1-1/4" bolts
2 10mm copper locknuts
2 10mm knurled washers
2 *16 hose clamps
1 1-1/4" x 7" piece of stainless flex tubing *D363-0217

1 **LABEL: "Y PIPE *D360-0127"**

Bag & Label: "3 HOLE FLANGE & HARDWARE"

1 3 hole 2-1/2" gasket *D530-0225
1 2-1/2" exhaust flange *D361-0400
3 8mm x 25mm bolts
3 8mm copper locknuts
3 8mm knurled washers

1 **LABEL: compressor by-pass valve *D470-0115**

Bag & Label: "COMPRESSOR BY-PASS HARDWARE"

2 *16 hose clamps
1 45" piece of black vacuum hose *D393-0119
1 vacuum "T" *D381-0262

Bag & Label: "TURBO SUPPORT BRACKET"

1 turbo support bracket *D610-0124
1 10mm x 30mm bolt
2 10mm flat washers
1 10mm wave washer

1 LABEL: A/C line #D570-0500

1 LABEL: A/C line #D570-0510

1 LABEL: A/C line #D570-0520

1 LABEL: A/C line #D570-0530

Bag & Label: "HOOD SHOCK MOUNT & HARDWARE"

1 hood shock mount #D610-0135

4 8mm flat washer

1 8mm locknut

1 6.9 X 20-10mm hex head SCREWS W/ROTATING WASHERS

1 LABEL -4 oiler hose #D370-0115

1 LABEL -4 wastegate hose #D370-0100

1 LABEL "intercooler #D330-0110"

Bag & Label: "INTERCOOLER HARDWARE"

3 rubber mounts #D611-0100

6 8mm nuts

6 8mm wave washers

6 8mm flat washers

Bag & Label: "INTERCOOLER UPPER BRACKET #D610-0136"

Bag & Label: "INTERCOOLER MIDDLE BRACKET #D610-0137"

Bag & Label: "TRANSMISSION TO EXHAUST BRACKET"

1 trans. to exhaust bracket #D360-0142

Bag & Label: "INTERCOOLER TO THROTTLE PIPE RUBBER MOUNT"

1 rubber mount #D610-0125

1 6mm nylok nut

1 6mm flat washer

Bag & Label: "AIR FILTER BOX CLAMP SCREW"

2 small black sheet metal screw with large head

BAG & LABEL SILICONE HOSES AND CLAMPS

- 1 2-3/4" to 3" *D340-0330
- 1 2-1/4" straight bellows *D340-0400
- 1 2-1/4" 45° bellows *D340-0560
- 1 2-1/4" to 3" *D340-0270
- 1 2-1/4" 45° non-bellows type *D340-0500
- 2 2-3/4" STRAIGHT 2"LONG *D340-0150
- 2 *48 hose clamps
- 5 *44 hose clamps
- 7 *32 hose clamps

1 **LABEL: intercooler to throttle pipe *D350-0104**

1 **LABEL: "TURBO DISCHARGE TO INTERCOOLER *D350-0105"**

1 **LABEL: INLET CASTING LOWER *D350-0115**

1 **LABEL: INLET CASTING UPPER *D350-0116**

1 **LABEL: air flow meter/filter bracket *D610-0127**

Bag & label: "AIR FLOW METER/FILTER BRACKET HARDWARE"

- 3 6mm nuts
- 4 6mm flat washers
- 4 6mm wave washers
- 1 6mm x 15mm bolt
- 1 6mm x 20mm bolt
- 1 6mm large flat washers

Bag & Label: "CLIMATE CONTROL CHECK VALVE"

- 1 check valve *D620-0110
- 1 1-1/4" pieces of small vacuum hose *D393-0110

BAG & LABEL: TURBOTRONICS 4 MOUNTING SCREWS

- 3 3/8" long black sheet metal Screws

BAG & LABEL GROUND WIRE SCREWS TURBOTRONICS 4 5 6

- 2 6.9 X 20-10mm hex head SCREWS W/ROTATING WASHERS

FUEL MANAGEMENT

- 6 LABEL: "TURBO FUEL INJECTORS #D410-0103"
- 1 LABEL: "TURBO FUEL PRESSURE REGULATOR"
- 1 LABEL: "TURBOTRONICS 3 (CHIP)"
- 1 BAG & LABEL: "TURBOTRONICS 4 ASSEMBLY(DEDCS)
#D420-0100"
- 1 BAG & LABEL: "TURBOTRONICS 5 ASSEMBLY (MAP SENSOR)
#D440-0500"
- 1 BAG & LABEL: "TURBOTRONICS 6 ASSEMBLY #D440-0600

IF THE CAR IS EQUIPPED WITH A MANUAL TRANSMISSION IT RECEIVES A HIGH PERFORMANCE PRESSURE PLATE AND THE MANUAL PCV HOSE ASSEMBLY LISTED BELOW.

- 1 PRESSURE PLATE #D551-0110

BAG & LABEL: "PCV hose assembly & HARDWARE" (MANUAL)

- 1 PCV HOSE ASSEMBLY #D620-0135
- 1 #6 THIN HOSE CLAMP

IF THE CAR IS EQUIPPED WITH AN AUTOMATIC TRANSMISSION IT RECEIVES A BOOST SPIKE CONTROLLER, A SHIFT KIT AND AN AUTOMATIC PCV HOSE ASSEMBLY. THE BOOST SPIKE CONTROLLER AND PCV HOSE ASSEMBLY ARE INCLUDED KNOW. THE SHIFT KIT WILL BE A MODIFICATION TO YOUR VALVE BODY. BEFORE YOU START INSTALLING THE TURBO KIT REMOVE VALVE BODY USING DIRECTIONS ENCLOSED. SEND VALVE BODY TO DINAN ENGINEERING. WE WILL INSTALL SHIFT KIT INTO VALVE BODY AND RETURN IT TO YOU FOR REINSTALLATION.

BAG & LABEL SHIFT SPIKE CONTROLLER #D580-0100

- 1 SOLENOID VALVE WITH WIRES AND HOSES CONNECTED
- 1 NO PRESSURE SWITCH WITH WIRES AND HOSES CONNECTED
- 1 SET OF BOOST SPIKE CONTROLLER DIRECTIONS

BAG & LABEL: "PCV hose assembly & HARDWARE" (AUTOMATIC)

- 1 PCV HOSE ASSEMBLY #D620-0140
- 1 #6 THIN HOSE CLAMP

1 SET OF TURBO KIT INSTALLATION INSTRUCTIONS

1988-89 635i Stage 1

SPECIAL INSTALLATION INSTRUCTIONS

Before you so much as loosen a clamp, read the entire instruction manual, look at all the figures and make sure you understand it thoroughly. It is very important that you install the kit in the order of the instructions. Much time has been taken to ensure that nothing will be done twice because another part "should have gone on first". If you do the kit out of sequence you can be assured it will take much longer and your new parts won't look new after coming back off a few times. Another word of caution; DON'T TIE WRAP ANY WIRES OR HOSES UNTIL THE ENTIRE SYSTEM IS INSTALLED. You will just end up cutting them loose and wasting a lot of time and tie wraps.

NOTE: IF YOUR CAR IS EQUIPPED WITH AN AUTOMATIC TRANSMISSION REMOVE VALVE BODY USING SUPPLEMENTARY DIRECTIONS AND SEND IT TO DINAN ENGINEERING FOR SHIFT KIT INSTALLATION.

1. Disconnect negative battery cable.
2. Remove air flow meter/filter box assembly and right headlight access cover.
3. Remove right headlight access cover and flexible breather hose. Remove large windshield washer reservoir and pump. Remove charcoal canister and bracket. Make a note as to which hose goes on which nipple.
4. Remove washer reservoir, charcoal canister and ignition coil.
5. Remove idle control valve bracket and let valve hang. Locate the #12 hose clamp from the kit and install it on the hose that goes from the manifold to the idle control valve(#12 clamp will be found in the bag labeled "idle control valve hose and clamps"). This will prevent the hose from popping off under boost.
6. Unbolt spark plug wire assembly and flop over to left side of engine.
7. Raise car and remove both front swaybar and lower chassis brace tube which is next to swaybar. Remove right front brake cooling duct.

8. Remove oxygen sensor from catalyst. Remove complete exhaust system from car saving all hangers for use later. Remove both the small heatshield that sits atop the right side steering idler arm and the heatshield that connects to the inner pick up point of the right rear lower suspension rod of right front wheel. Remove the large heatshield that covers the right inner fenderwell on cars so equipped.

9. Remove exhaust manifold. Remove the twelve 8mm studs from the head if they are not shouldered type and replace them with the twelve shouldered studs from kit. The threaded holes must be cleaned out with an 8mm x 1.25mm tap to allow new studs to be installed to proper depth which is approximately 1/2 of stud shoulder submerged in head. Install studs using two nuts jammed together on longer portion of stud. Put a drop of red Loctite on threads to prevent studs from backing out. The non-shouldered studs from the factory will often loosen and come out of head causing noisy exhaust leaks, oil leaks and even engine fires.

10. On cars equipped with manual transmission, you will need to replace the factory clutch with the high performance clutch from kit. Install new clutch following normal factory procedure for clutch replacement.

11. Locate the sheetmetal lip that is on top of the right front frame rail that is about 1/2" high and about 11" long that runs between the firewall and right front strut tower support. See Figure 1. Use vise grip type pliers to bend the first 4" starting from the firewall. Bend this lip about 45 degrees away from engine. Finish this bending using a large hammer. Use some touch up paint or spray undercoat if any paint chips off.

12. Remove the large diameter AC hose (split return hose) that connects to the freon regulator then runs down and through right fenderwell. Please send this hose back to Dinan Engineering for return of core charge. **NOTE:** The freon regulator is the small unit in line on the AC return lines that is mounted near the top of the right front strut tower support.

13. Use Figure 8 to find the location of the 2" hole to be drilled in the right front fenderwell for the return line from the "cool box" in the rear of car. Mark this spot and drill a 1/8" pilot hole. Now drill a 2" hole using a 2" hole saw. We prefer to drill the 2" hole from the wheel side of the fenderwell. If you wish to remove the front right side wheel at this point it will help you through some of the next few steps. Clean and deburr this hole using a half-round file and use a little touch up paint on any bare metal.

14. Use Figure 11 to see where the larger diameter metal return pipe from the cool box needs to be bent down and away from frame rail. Remove the nut that holds the two mounting clamps for the metal pipes below and behind the right front brake lines. Remove the clamp from the smaller pipe and pull it just far enough away from the frame rail to let the larger pipe go under then around the hose section of the smaller pipe. Remove and reverse the mounting clamp for the larger pipe. Reinstall the larger pipe on the mounting stud using the original nut but with the pipe bent down and under the mounting stud.

15. Unbolt the freon regulator from the strut tower support. Install the new split return hose on car the same way original hose was but route the hose through the new 2" hole in the fenderwell. Run the S-bend part of this hose under the brake line bracket. Connect the lower fitting to the return pipe. Some bending will be required to line these fittings up. Make sure the AC lines have at least 3/8" clearance from the brake lines. Do not fully tighten any fittings at this point.

16. You will see that the freon regulator needs to be relocated higher up on strut tower support. Use the 25mm long 10mm head sheet metal screw with small washer to reattach regulator. Find one of the small round plastic spacers that were under the fenderwell heatshield on the mounting studs. This will be used to extend the regulator mounting clamp away from the strut tower support. Find the spot where the regulator should be mounted with the return hose centered in the 2" hole and with the plastic spacer under the mounting clamp. The spot for the new screw hole should be about 1/2" to 3/4" from the top surface of the strut tower top. Mark this spot with a scribe, then drill a 5/32" hole. Apply a little grease on the tip of the sheet metal screw and secure the regulator with the spacer under the mounting clamp. Do not fully tighten this screw so regulator can be rotated for later adjustment. Locate the 19-3/4" long AC hose from kit. Connect this hose to the condenser in the front of car where the stock line was removed. Route this hose backward through the large hole behind the right side headlights. Make sure the rubber o-rings are in place before installing all AC hoses. This hose gets connected to the receiver-drier at a later step. You may wish to temporarily wire tie this hose out of the way as far to the left as possible for making intercooler installation easier.

17. Replace the right side headlights, side grill and turn signal assembly.

18. Use Figure 2 to measure and mark for the intercooler cutout. This is on the lower sheetmetal tray below and behind the right headlights. Mark the cutout with a sharp scribe then cut out piece with a fiberglass cutting disc or other suitable tool. Smooth the rough edges with a file and cover any bare metal with touch up paint.

19. The bracket that was used to hold large washer reservoir must be completely removed from front of right fenderwell. Cut with fiberglass cutting disc and use touch up paint.

20. It is very important that intercooler receives as much air flow as possible to attain a high level of efficiency. Any sheet metal or plastic that blocks air flow to intercooler that you wish to remove will result in more horsepower. We usually remove part of the sheet metal that is behind and below right side headlights leaving some of the outlining edge metal for front panel support. Be very careful when cutting this metal since there are wires behind this panel. Use fiberglass cutting disc, file and touch up paint. Find the right headlight assembly that was previously removed. Hold assembly up to its normal position and note that there is a sheet metal lip on bottom portion of headlight bucket that can be removed to increase air flow to intercooler without sacrificing much structural rigidity of bucket.

21. On cars equipped with automatic transmissions the transmission cooling hoses that connect to radiator must be removed from radiator. Next remove the three clamps that hold the metal portion of the cooling lines to the bottom of the car. Now pull the hoses down through the hole in lower sheet metal tray. These cooling hoses are to be routed in front of the vertical piece of sheet metal panel that was previously in front of transmission cooling hoses. Some bending of metal lines is necessary but avoid making sharp bends that can cause kinking or breakage. Reattach cooling hoses and resecure cooling lines to bottom of car.

22. Use Figure 3 to locate hole for oil return. Mark engine with center punch in spot shown on lower right side of engine block near the transmission. Drill a 1/8" pilot hole, then redrill hole with 11/16" drill bit, but before hole is complete coat drill bit tip with grease to catch metal chips. Now tap hole with 1/2" pipe tap coated with grease. Remove and regrease tap a few times during tapping process. Generally tapping is completed when tap is about 3/4" of the way in engine block. Now, using flexible head magnet tool, reach into oil pan through hole to pick up any stray metal chips. Repeat this procedure several times until magnet comes up clean. If you wish to remove the oil pan before drilling this hole you can make absolutely sure that no chips enter engine.

23. Locate 45 degree 5/8" hose to 1/2" pipe fitting and using a little pipe thread sealant install in engine block pointing up and forward about 45 degrees.

24. Remove oil filter canister and filter from oil filter housing. Remove oil filter housing from engine. Be careful not to damage gasket. Using Figure 4 mark and drill 21/64" hole in oil filter housing for turbo oiler line. Tap hole 1/8" pipe thread, wash out housing and install -4 to 1/8" pipe straight fitting with pipe sealant. Reinstall oil filter housing. Install new oil filter and canister. Change engine oil at this time.

25. Prop the hood up with an appropriate hood prop. Disconnect right hood shock from the inner fender and leave disconnected temporarily. It will be connected to a new mount later.

26. Locate the mounting screws that mount the top of the right front fender to the chassis. These screws are located in the long fender channel at the top edge of the fender. Notice the fender screws that is the second one from the front fender. This screw will be above the lower mounting pivot pin for the right side hood shock absorber. Remove this screw.

27. Place the new hood shock mount in the fender channel with 8mm pivot bolt pointing toward engine. Line up the rear hole on hood shock mount with the original fender screw hole and reinstall the fender screw. Lightly tighten the screw for now. Adjust hood shock mount so it is parallel with fender channel. Use a sharp scribe to mark the front mounting hole on top of the fender channel.

28. Remove hood shock mount from fender channel and center punch the spot for the new hole to be drilled. Drill hole using a 7/64" drill bit.

29. Permanently install the hood shock mount using the original screw in the rear hole. Slip one of the 8mm flat washers between the hood shock mount and the fender channel with the washer lined up with the mounting hole. Secure the front of the mount using the 10mm head sheetmetal screw provided. Note put a little grease on the tip of the screw to aid in the tapping process.

30. Remove the small locking clip that holds the lower end of the right hood shock to the mounting pin. Slide two 8mm flat washers onto the pivot bolt of the new hood shock mount. Move the hood shock to its new mounting pin. You may have to undo the left side hood shock temporarily to allow you to move the right shock onto the new pivot. Place one washer on the outside of the shock end and thread the 8mm lock nut on the stud. Do not tighten the nut all the way leave space so the shock head can pivot.

31. Remove the original hood shock mounting pin and bracket from the inner fender. We recommend a fiberglass cutting wheel on a die grinder for this task. Cut as close to the fender as possible. Clean up rough edges using a round die grinder bit. Paint area matching original color.

32. Use Figure 5 to note placement of intercooler mounting brackets.

NOTE: This view is a cutaway to more clearly show mounting. Attach the middle intercooler bracket to the intercooler using one rubber intercooler mount, two 8mm nuts and two 8mm wave washers. Attach the upper intercooler bracket using one rubber intercooler mount, two 8mm nuts and two 8mm wave washers. Slide the intercooler down through the intercooler cutout and let the middle intercooler bracket sit flat on the lower sheet metal tray. Notice where the upper intercooler bracket is going to mount to the vertical sheet metal panel just below the rubber hood seal. Hold the upper bracket against the flat sheet metal piece and try to center the intercooler in the intercooler cutout. Use a sharp scribe to mark the two upper bracket holes. Center punch then drill out the two 9/32" mounting holes. Mount the upper bracket using two 6mm x 16mm bolts, two 6mm nylock nuts and four 6mm flat washers.

33. Raise the car and see where you have to drill a 3/8" hole in the tow hook support for mounting the lower intercooler mount. Now center the intercooler in cutout and use a scribe to mark through the slot on tow hook support. Center punch and drill the 3/8" hole in the spot where the nut will be on the center of the slotted mounting tab. Attach the remaining rubber intercooler mount to the tow hook support using one 8mm nut and 8mm wave washer with two 8mm flat washers between the rubber mount and the hook support. Place two 8mm flat washers on the rubber mount stud. Slide the intercooler slotted tab onto the rubber mount and connect the two using one 8mm flat washer, one 8mm wave washer and one 8mm nut.

34. Now lower the car and mark for the two 9/32" mounting holes through the middle bracket with the intercooler in the correct position. Drill the holes and mount the bracket using two 6mm x 16mm bolts, two 6mm nylock nuts and four 6mm flat washers.

35. Find charcoal canister and bracket that were previously removed from car. This is to be mounted to front of right front fenderwell behind intercooler where washer reservoir was removed. Hold canister against fenderwell keeping it low so that it doesn't get too close to the eventual position of upper intercooler pipe or ignition coil with hose fittings pointing toward engine. Remember that canister bracket clamp can be loosened to position canister to desired position. Mark the four mounting holes with scribe. Drill holes 1/8" and attach bracket to fenderwell using the original mounting screws. Reconnect hoses as before, shortening them if necessary. Use #5 hose clamp from kit to clamp larger hose to canister.

36. Mount wastegate to exhaust manifold using two 10mm copper lock nuts and two knurled lock washers. Wastegate is mounted with pressure release valve pointing down and mating to exhaust manifold face. Exhaust outlet flange points away from engine.

37. Install exhaust manifold to engine using new exhaust gaskets. Mounting is done with twelve 8mm copper lock nuts and twelve 8mm knurled washers. Tighten all these nuts very snug as they are subjected to high temperatures and vibration.

38. Connect and tighten the 44" -4 turbo oiler hose to turbocharger. A small amount of anti-seize compound on fitting threads and mating surface will prevent thread galling and help produce a tight seal.

39. To install turbocharger on manifold, support engine and remove right side aluminum motor mount assembly. Install turbo using the four 10mm knurled washers and copper lock nuts.

40. Locate the oil return fitting and gasket. Also locate the 3" long 5/8" ID oil return hose and two #10 hose clamps. Slide the oil return hose on the oil return fitting tube. Slide the two #10 hose clamps on to the oil return fitting on engine block. Apply some engine gasket sealer to both sides of the oil return gasket. Slip oil return hose and fitting in place and connect the oil return fitting to the turbocharger using two 8mm x 20mm bolts and two 8mm knurled washers. **NOTE:** Some turbochargers require two 3/8" x 3/4" bolts and two 3/8" knurled washers. Slide the oil return hose equally on to both fittings then tighten hose clamps. Replace motor mount assembly.

41. Aim turbo oil line straight up and over valve cover, through space between #4 and #5 intake manifold flanges then directly to fitting on oil filter housing. Apply anti-seize then tighten.

42. Locate exhaust downpipe that mounts to outlet flange of turbo. Before mounting downpipe to turbo hold downpipe in place to outlet flange with center of downpipe outlet 8" from center line of transmission. If there are any places where downpipe is closer than 1/2" to heat insulation, insulation must be moved to produce a minimum gap of 1/2". A large hammer is suggested for this operation. This step is very important to prevent any exhaust vibration noise and to assure long life of exhaust downpipe.

43. Locate the wastegate dumppipe and the 4-7/8" long piece of flexible steel tubing. Slide the flex tubing over the end of the dumppipe about 1".

44. The wastegate dumppipe is mounted to wastegate using two 3/8" x 1-1/4" bolts, two 10mm copper lock nuts and two 10mm knurled washers. Install dumppipe to wastegate with flexpipe routed through space between suspension pick-up point bracket and firewall heat insulation without tightening the bolts all the way so that dumppipe position can be adjusted slightly. If there is insufficient space for dumppipe between suspension pick-up point bracket and heat insulation, the space should be increased using large pry bar and hammer on heat shielding. Minimum clearance at this point should be 3/8".

45. Slide one of the #16 hose clamps on to flex pipe and tighten onto dumppipe. Slide the other #20 hose clamp onto flex pipe for use later.

46. Put exhaust downpipe into position while lining up flex pipe to inlet pipe on downpipe, and with two flat sections of downpipe flange lined up with flat sections on turbo. Install the three 3/8" x 1-1/4" bolts through downpipe flange into turbo flange in the two top holes and the bottom right hole. The 3/8" x 1-1/2" bolt holds the turbo to engine block support bracket as well as the downpipe flange. Connect other end of turbo support bracket to threaded hole in block next to transmission bell housing using one 10mm x 20mm bolt and 10mm wave washer.

47. Now with center of downpipe outlet exactly 8" from center line of transmission, tighten the four 10mm copper lock nuts to the four bolts that hold downpipe to turbo. Tighten the 10mm x 20mm bolt on the turbo support bracket. Tighten the #16 hose clamp on flex pipe at downpipe wastegate inlet pipe.

48. Center wastegate dumppipe between suspension pick-up point bracket and heat insulation. Now tighten dumppipe to wastegate.

9. Cut header down pipe off of catalyst far enough forward so it can cut again to fit 3 hole flange and y pipe see figure 6.

50. Locate 3 bolt flange and hardware. Bolt 3 hole flange up to downpipe. Install exhaust system using original hangers measure and cut catalyzer inlet tubes and fit y pipe so exhaust can fit into stock hangers and meets 3 hole flange precisely. Weld 3 hole flange to y pipe and y pipe to catalyzer weld up as much of exhaust as possible in car. see figure 6 It may be necessary to cut away part of the heat shielding crimped over catalyzer. Do a neat job and do not leave any sharp edges for people to cut themselves

51. Bolt on transmission to exhaust hanger bracket in stock location, and weld to exhaust. Drop entire exhaust system to complete welding. Paint with a good quality high temperature exhaust paint. Reinstall exhaust using gasket provided.

52. Replace stock injectors with turbo injectors (where applicable). A little lubricant applied to rubber o-rings is suggested for ease of assembly and seal protection. Make sure ground wires on rear mounting bolts are reconnected. Install fuel pressure regulator provided, A little lubricant applied to rubber o-rings is suggested for ease of assembly and seal protection.

53. Use the blue 3-M wire connector from kit to connect the two wires that plugged onto the windshield washer reservoir level sensor. Fill the small washer reservoir located in the small space behind the engine compartment with diluted washer fluid.

54. Remove the wires from the windshield washer pump located on the small windshield washer bottle between the firewall and windshield. Locate the two wires that used attach to the large windshield washer bottle pump. cut these wires and extend them and connect the plug to the pump located on the small washer bottle. (The object behind the rewiring is make it so the pump runs when the washer stalk is pulled toward the steering wheel.) This should be tested when car is together and running.

55. Bolt spark plug wire assembly back onto engine. (It is a good idea to change spark plugs and check valve lash at this time utilizing factory specifications.) NOTE: bulletin from BMWNA regarding new plug gap and valve lash settings. LOCATE bag labeled ion shield and hardware. Install ion shield over valve cover using pedestals provided. The shield is designed to cover the distributor cap and plug wire. It should be mounted as far

56. Reinstall front swaybar and lower chassis brace.

57. Locate the 14-1/2" straight chrome pipe with the 1" nipple welded near one end. This pipe goes between the aluminum turbo discharge pipe and the bottom intercooler pipe. The end of the pipe with the 1" nipple goes toward the turbo discharge pipe and the nipple should point up and toward the engine about 45 degrees. Use a 2-1/4" straight bellow hose at intercooler pipe and a 45 degree 2-1/4" elbow hose at the discharge pipe. Use four #32 hose clamps to secure hoses. Adjust the hoses so that the pipe and hoses have about 1/4" clearance from any chassis part.

58. Install the -4 to 1/8" pipe 90 degree fitting into the hole in front side of wastegate using a little anti-seize compound on the threads. Aim the fitting straight down.

59. Locate the 16" long -4 wastegate hose from kit. Install this hose between the wastegate fitting and the -4 fitting on the turbo compressor. Use a little anti-seize compound on the threads and sealing surface of the fittings. Adjust the hose and fittings so that the hose is about 1/2" from all other parts and at least 1" away from any exhaust components.

60. Modify original air filter box as described in FIGURE 9. Air filter should be replaced at this time.

61. Locate the air flow meter to turbo intake pipe this is an aluminum casting that goes from round to oval and back to round. Attach it to turbo using the 2-3/4" orange silicone hose, using 2 #44 clamps.

62. locate upper aluminum casting 90 degree. connect elbow onto first casting with 2 3/4 silicone hose and two # 44 clamps provided. Place elbow onto the end of the intake pipe so it aims forward.

63. Locate air flow meter/filter mounting bracket and hardware bag. Install the air flow meter/air filter bracket using the factory air filter stand on the right fender-well.

64. Install the new air flow meter supplied in kit using 2 3/4 to 3" orange silicone hose and #44 and #48 hose clamp provided. Mount to bracket using 6mm x 15mm bolt, a 6mm flat washer and a 6mm wave washer provided. Reconnect A.F.M. plug.

65. Install modified air filter box to air flow meter using the 2-3/4" to 3" orange silicone hose, a #44 and a #48 hose clamp. Attach to bracket using a 6mm x 20mm bolt and a 6mm large flat washer (on the slotted air filter box bracket)

71. Remount the airbox assembly if it was removed.

72. Connect the PCV hose assembly between the valve cover breather nipple and the 5/8" nipple on the turbo inlet pipe. Use a #10 hose clamp at the valve cover nipple to secure the hose. Connect the small vacuum hose to the small nipple at the plastic coupler. Use figure 7. If the car is equipped with an automatic transmission one of the vacuum ports will be left open. It will be connected when the shift spiking valve is installed later on in the directions.

73. Find the black plastic compressor bypass valve from the kit. Also find the 2" and 8-1/2" long pieces of 1" ID hose and four #16 hose clamps. Slide the 2" piece of hose onto the inlet tube of bypass valve. The inlet tube is the one that is opposite the vacuum nipple for the diaphragm. Slide the 8-1/2" hose over the outlet tube. Clamp both hoses with the #16 hose clamps. Now install this assembly between the 1" nipple on the turbo inlet pipe and the turbo to intercooler pipe nipple. Use the two #16 hose clamps to secure these hoses while adjusting the valve for maximum clearance from other parts. If necessary, loosen the two hose clamps that hold the turbo to intercooler pipe and rotate pipe for proper fitment of bypass valve. Cut the vacuum hose leading to the top of the fuel pressure regulator about 1-1/2" from regulator. Install the vacuum tee from kit and "tee in" the long vacuum hose. Route this hose under the distributor cap then back and down to the compressor bypass valve. Secure this hose with wire ties to keep it away from any moving objects. Cut off the excess hose and connect the hose to the bypass valve.

74. Locate the intercooler to throttle pipe. This is the 90 degree bent chrome pipe with a 3/4" nipple. Use the 2-1/4" to 3" adaptor hose and the 2-1/4" bellow hose to connect the pipe between the throttle body and the intercooler top pipe. Secure this pipe using three #32 hose clamps and one #44 hose clamp but don't fully tighten the clamps on the pipe yet.

75. Find the black rubber snubber with the 6mm stud on one end. This is to be installed on the top of the right fenderwell to prevent the intercooler to throttle pipe from hitting the top of the fenderwell. Mark the spot that is directly under the bend of this pipe and drill a 9/32" hole. Use a 6mm nut and 6mm wave washer to secure snubber. Reinstall pipe with pipe resting lightly on snubber, tighten clamps.

76. Locate the 1-5/8" long 3/4" to 1" hose from kit. Use one #10 and one #12 hose clamp to connect this hose between the idle control valve and the 3/4" nipple.

77. Locate the four 4" long wires that are gray, brown, violet and yellow. These wires are for lengthening the airflow meter plug wires. Slide the rubber boot back about 6" from the plug. Now cut the four wires about 1-1/2" from the plug. Strip the insulation from the ends of the wires. Slide two pieces of the 7/8" long shrink tubing over each new wire then solder in the wires according to color. Make absolutely sure that these wires do not get mismatched. This would prevent the engine from running and could cause computer damage! Slide the shrink tubing pieces over the solder joints then shrink them using a heat gun or cigarette lighter. Now wrap the wires with friction tape from the factory wire harness then up to the plug. Spray a little silicone spray lube on taped section and then slide the boot up to end on the plug. Connect the plug to the airflow meter and wire tie the wires to the bottom side of the intercooler to throttle pipe.

78. Find white plastic line centered on the underside of the intake manifold. find the green and black check valve from kit. Cut the white plastic line about in the center and splice in the check valve. The green half goes toward the manifold.

79. Change engine oil (filter should have been changed previously).

80. Install oxygen sensor into turbo exhaust manifold and wire in turbotronics 6 using the following instructions. Note: if sensor has more than 30 k miles on it replace with new one.

81. Install turbotronics 5 (map sensor) ,turbotronics 4 (detonation control system) and turbotronics 6 using FIGURES 13, 14, 15, 16, 17 & the accompanying instructions. The 3 systems must be installed together because of their close proximity and shared wiring. Note do not mount the knock sensor to any other control units it puts out a very large electromagnetic field which may interfere with other control unit operations. We recommend that the control unit be mounted on the floor of the glove box.

Read all of the following instructions before beginning installation.

**INSTALLATION INSTRUCTION
FOR THE
DINAN ENGINEERING DETONATION CONTROL SYSTEM
TURBOTRONICS 4 (DEDCS)
MAP SENSOR (TURBOTRONICS 5)
AND TURBOTRONICS 6
88-89 635csi**

On the 635, the detonation control box gets mounted in the left hand corner of the glove box door(see FIGURE 13). Hold box in position and mark the three accessible holes. From inside the the glove box, drill the three marks to 1/8" only through the plastic, NOT all the way through the leather. Attach plug to DEDCS and secure to glove box using the three small black screws and the plastic washers.

Use FIGURE 15 to find location for the detonation sensor. Screw the special mounting stud into the engine block as far as possible, IMPORTANT: USE LOCTITE TO SECURE STUD (IF STUD COMES LOOSE, DETONATION SENSOR WILL NOT FUNCTION PROPERLY AND ENGINE DAMAGE WILL RESULT). Then slide on one 8mm flat washer, the sensor, another 8mm flat washer and then the 8mm locknut. The plug for the sensor should point straight down. Tighten the 8mm nut to 9 ft. lbs. maximum.

Wire Connections: NOTE: ALL WIRE WIRE CONNECTIONS MUST BE TESTED BY HOLDING CRIMP CONNECTOR AND PULLING ON WIRE, HEAT SHRINK TUBING MUST BE PLACED OVER EACH CONNECTION AND SHRUNK USING A HEAT GUN UNTIL HEAT SHRINK IS TIGHTLY SECURED. THESE STEPS ARE VERY IMPORTANT. THE ENGINE'S LIFE IS DEPENDENT UPON THIS DEVICE. See wiring diagram FIGURE 14. Ground wires for control unit (Black and Yellow): notice that there are two separate ground wires for control unit. Attach these wires to existing grounded screws in the area above the glove box. It is important that they be located as far apart as possible to prevent feedback to each other.

Positive power wire (red): This wire goes to the large red wire with blue stripe that powers the fuel injection E.C.U. Disconnect the harness from the E.C.U., remove a 3" section of the tape and dig through the harness until you find it. On some years there will be two red wires with blue stripes, in this case, use the largest one. The map sensor will get its power from this wire also. Using a blue butt connector, tee into this wire as shown at the bottom of FIGURE 13. Shrink tube this connection. Retape harness and tie wrap wires to harness.

● **Black, Yellow, and Brown (ground):** peel back the carpet at the top of the right kick panel. Drill two 3/16" holes, 3" apart, making sure there is nothing behind where you are drilling. Scrape the paint away from around the holes for good metal to metal contact. Attach the brown and yellow wires from the Turbotronics 4 (DEDCS) to one hole and the black wires from the turbotronics 5 (map sensor) turbotronics 4 (DEDCS) and turbotronics 6 to the other. Use the two 10mm hex head screws to fasten wires to kickpanel. (See FIGURES 14 & 16.)

Detonation sensor wire (Black sleeve with white and black wires): This wire must be run through the firewall using the rubber grommet that the A/C line go through. Use a flat blade screwdriver to make a small hole in grommet below the A/C line. Now poke the sensor wire through the small hole and run wire forward along the right inner fender-well attaching the wire to existing lines of wires, then over to engine. Make sure this wire stays away from the exhaust manifold or any moving parts.

● **Locate the sensor plug from the kit and connect the rubber boot to sensor plug.** Strip away the outer sleeve of the sensor wires about 4" from the end. Cut about 2-1/2" off length of black and white wires. Connect plug to sensor. Strip about 3/16" of the insulation off the ends of the small white and black wire.. Slip the two 1/2" long pieces of shrink tubing over the wires then solder the sensor wires to the plug. Shrink the tubing over the solder joint using a heat gun or cigarette lighter.

Twist together the bare shield wire and double over the last 1/4" of it to make it thicker. Crimp on the wire lug with the larger hole. Mount this wire lug to the air conditioning bracket mounting bolt as shown in FIGURE 15. Connect plug to sensor.

Primary ignition wires (Green and White): Route the green and white wires through the main fuel injection wiring grommet to the ignition coil. Note: It is important to route the green and white wires through a different grommet than the sensor wires. The detonation sensor circuit is extremely sensitive to electromagnetic pulses and these wires must be routed at least 6" apart from each other.

● **Run the wires forward to the coil.** Cut the factory coil wire about 1-1/2" from the wire lug, then connect the wires as shown in FIGURE 14 using the blue butt connectors.

Using FIGURES 7 & 13 run the plastic boost line into the glove box area. Connect to the pressure switch, turbotronics 5 (map sensor) and turbotronics 6 as shown in FIGURES 14 & 16 and 17.

In the 6 series car, Turbotronics 5 the map sensor, turbotronics 6 and the pressure switch fit into the space just above and to the left of the glove box light. You can tie wrap them to existing harnesses. Run the brown and yellow wires from the map sensor up through the hole in the fire wall (see FIGURE 13) and along valve cover to coolant temperature sensor. Splice into brown wire as shown in FIGURE 16. Shrink wrap all connections.

Route the green and orange wire for Turbotronics 6 to the oxygen sensor harness through the same hole that the brown and yellow wires on the map sensor were routed. Connect in series with the oxygen sensor black wire using figure 17.

82. Install computer chip according to instructions provided with chip.

83. Tie wrap and arrange all wiring and hoses in engine compartment and glove box area.

84. If the car is equipped with an manual transmission install pressure plate provided. NOTE: If the rest of the clutch components need service or if they have more than 60k miles on them we highly recommend you replace them at this time.

85. If the car is equipped with an automatic transmission reinstall valve body previously remove using automatic shift kit directions.

86. If the car is equipped with an automatic install shift spiking controller as follows. Locate the auto-shift, boost spike controller kit #D580-0100.

Mount solenoid valve on the ignition coil mounting stud along with coil.

Using figure 18 connect the black ground wire to a good chassis ground.

Connect spare lug on pressure switch to the positive side of the coil.

(NOTE: TAKE EXTRA CARE WHEN MAKING THESE CONNECTIONS, THE ENGINES LIFE DEPENDS ON IT.) Test the boost spiking valve before connecting

vacuum hoses. Blow through the hose that is marked "fuel pressure

regulator" it should come out the hose marked "compressor bypass valve"

and not the one marked pcv. Connect a boost gauge to the hose marked

"compressor bypass".

Take your boost pumping device and pump up the gauge to 10 psi pressure should hold. pinch or plug off hose and disconnect pump. turn on ignition key. Connect boost pump to the vacuum hose that goes to the pressure switch. Pump up switch to 12.0 psi the switch should make, opening the gauge pressure to the hose marked pcv. The gauge should immediatly go to 0 psi. If this happens the system is working properly. Neatly route the vacuum hose, marked "FUEL PRESSURE REGULATOR" and tee it into the vacuum hose that connects to the fuel pressure regulator. Neatly route the vacuum hose marked " COMPRESSOR BYPASS VALVE" down to the compressor bypass valve, located on the turbo discharge pipe. Cut off any extra hose and connect to bypass valve. NOTE: BE VERY CAREFUL NOT TO PINCH THE HOSE OR GET IT NEAR HOT EXHAUST WHICH MANY CAUSE DAMAGE TO IT". Route the hose marked "PCV" and connect it to the vacuum port on the T located in the pcv hose nearest the turbo inlet. The hose should be wire tied very carefully to ensure that they will no get pinched.

87. reconnect battery cable

88. Start engine, listen for any strange noises and check for leaks.

89. Evacuate and recharge air conditioning system.

90. With engine completely warmed up no adjustment of the idle co is necessary.

91. Place a high quality infrared onto tailpipe. Using a hand held pump, ie: coolant system pressure tester with brass fitting instead of hose, pump up the line going to the map sensor and turbotronics 6 to 10 P.S.I. (With the car running) the mixture should get much richer, the R.P.M. should change. If this occurs the system is functioning properly.

92. Test the DEDCS (turbotronics 4) according to the instructions provided.

Testing the system: Plug the light bar display tester into the small jack on the control unit. Peel back the duct tape on the pressure switch and disconnect either one of the brown wires. Start engine. Using a long 1/2" extension, tap on exhaust manifold. The first few lights on the display bar should flicker and the R.P.M. should drop momentarily. This indicates that the system is functioning properly. If nothing happens, recheck all wiring and connections or call Dinan Engineering for further assistance.

Reconnect the brown wire to the DEDCS pressure switch and cover with the duct tape. Start engine. Tap the engine manifold in the same location with the same amount of force required to make the display lights flicker on the first test. The display lights should remain off during this test. This indicates that the system is functioning properly. If any lights come on, recheck all connections or call Dinan Engineering for further assistance if necessary. Proceed if system is operating normally.

93. After you have tested both the map sensor, turbotronics 6 and the DEDCS, you're now ready to set the boost level. Start out with wastegate adjusting screw in about half way. Set boost level according to transmission type using instructions provided. The detonation light display bar must be connected and observed during this test.

BOOST SETTING WITH 5 SPEED

Testing must be done on a flat and level road with a long straight away. With the car in fourth gear at 2000 R.P.M. hold your foot on the floor until 5000 R.P.M. is achieved or until conditions warrant otherwise. Boost will rise gradually and decrease. Peak boost should be 11.5 P.S.I. maximum and should occur between 3200 and 3500 R.P.M. Boost must not exceed 12 P.S.I. or damage to engine will result

BOOST SETTING WITH AUTOMATIC

There are two types of transmissions, electronic and non-electronic. On cars with electronic transmissions select MANUEL mode. On cars with non-electronic transmissions disconnect transmission controlled throttle cable at throttle pipe and select third gear.

With transmission set as described above you may begin testing. Testing must be done on a flat and level road with a long straight away. With car at 2000 R.P.M., hold your foot on the floor until 5000 R.P.M. is achieved, or until conditions warrant otherwise. Boost will rise gradually and decrease. Peak boost should occur between 3200 and 3500 R.P.M. Peak boost should be at 11 P.S.I. maximum, any higher could severely damage your engine due to the boost spiking up between shifts. The boost spike control system must be tested at this time. On cars equipped with an electronic transmission select economy mode cars equipped with cable operated downshift mechanism make sure cable is reconnected. Have some one ride along to monitor the boost pressure on a gauge Accelerate from a dead stop when the transmission changes gears boost will spike approximately 1 psi if the system is working and 3-5psi if it is not working. If at any time during this test you hear pinging or it more than two lights show up on the display bar, LIFT UP ON THE THROTTLE IMMEDIATELY Engine meltdown only takes a few seconds

Be very careful when executing this test since you will be accelerating rapidly and reaching relatively high speeds. Dinan Engineering does not condone or suggest that any person or persons should exceed the posted speed limits on public roads.

Feel free to call Dinan Engineering at (415)962-9417 if you need further assistance getting your engine in the safe range.

SPECIAL INSTRUCTIONS

As with all turbocharged engines, when shutting off the engine after any hard running (freeway driving or "on boost" performance, etc) let the motor idle for one to three minutes before turning it off. This allows everything to cool down before the oil flow, which lubricates and cools the turbo, is shut off. Failure to do so will shorten the turbo life dramatically. Also do not boost engine until it is warm or you will dramatically shorten engine life. This is true of any engine but especially with turbo cars.

Street turbos are designed to run in boost for only short bursts. If you are at a race track or on a very long section of road that enables you run boost almost continuously, lift off occasionally for several miles allowing the engine to dissipate heat. If you are planning to run the car in this manner frequently, we recommend the following additional modifications to ensure long life: oil cooler and larger capacity radiator.

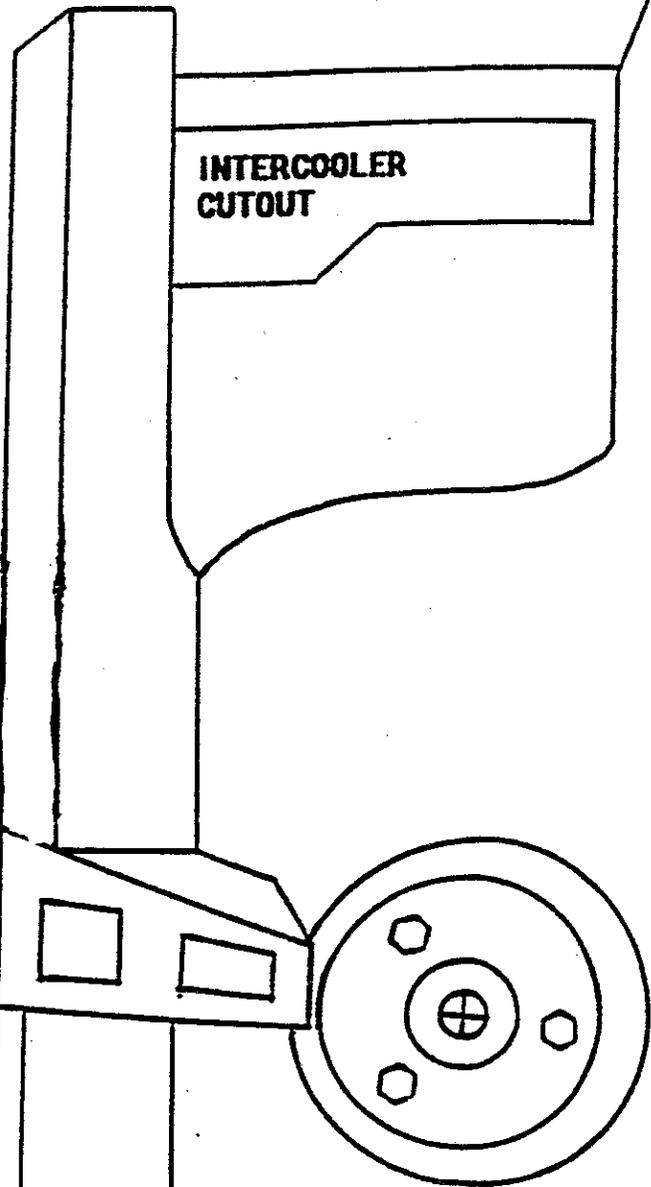
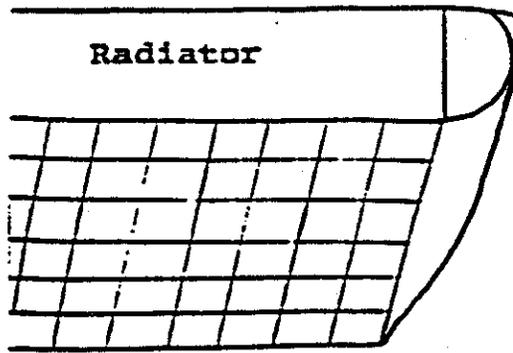
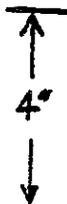


FIGURE 1
SHEETMETAL BOX SECTION
CUTOUT
1983-→ 5351-6351
STAGE II



BEND THIS LIP OVER 45°

RIGHT FRAME RAIL

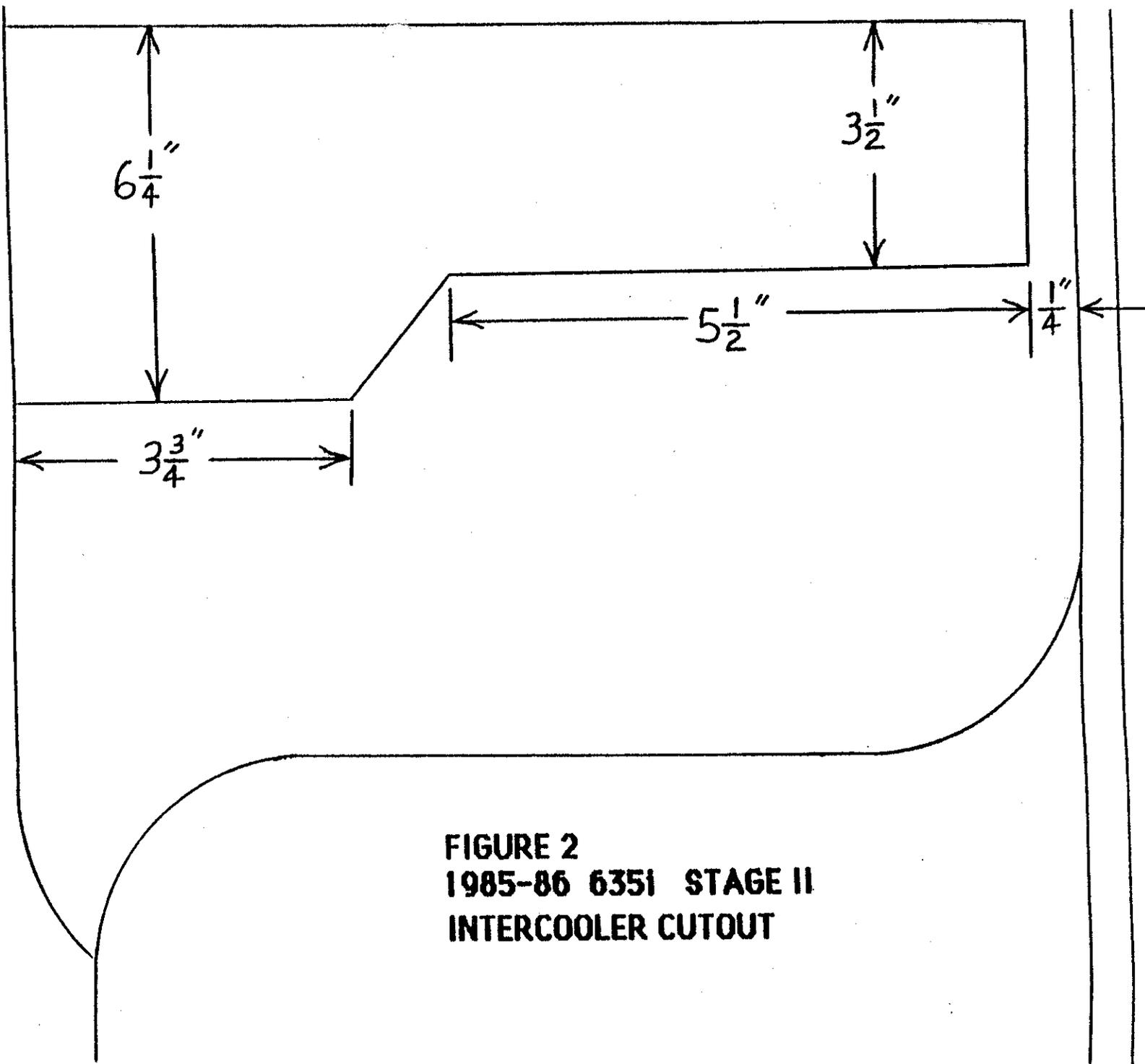
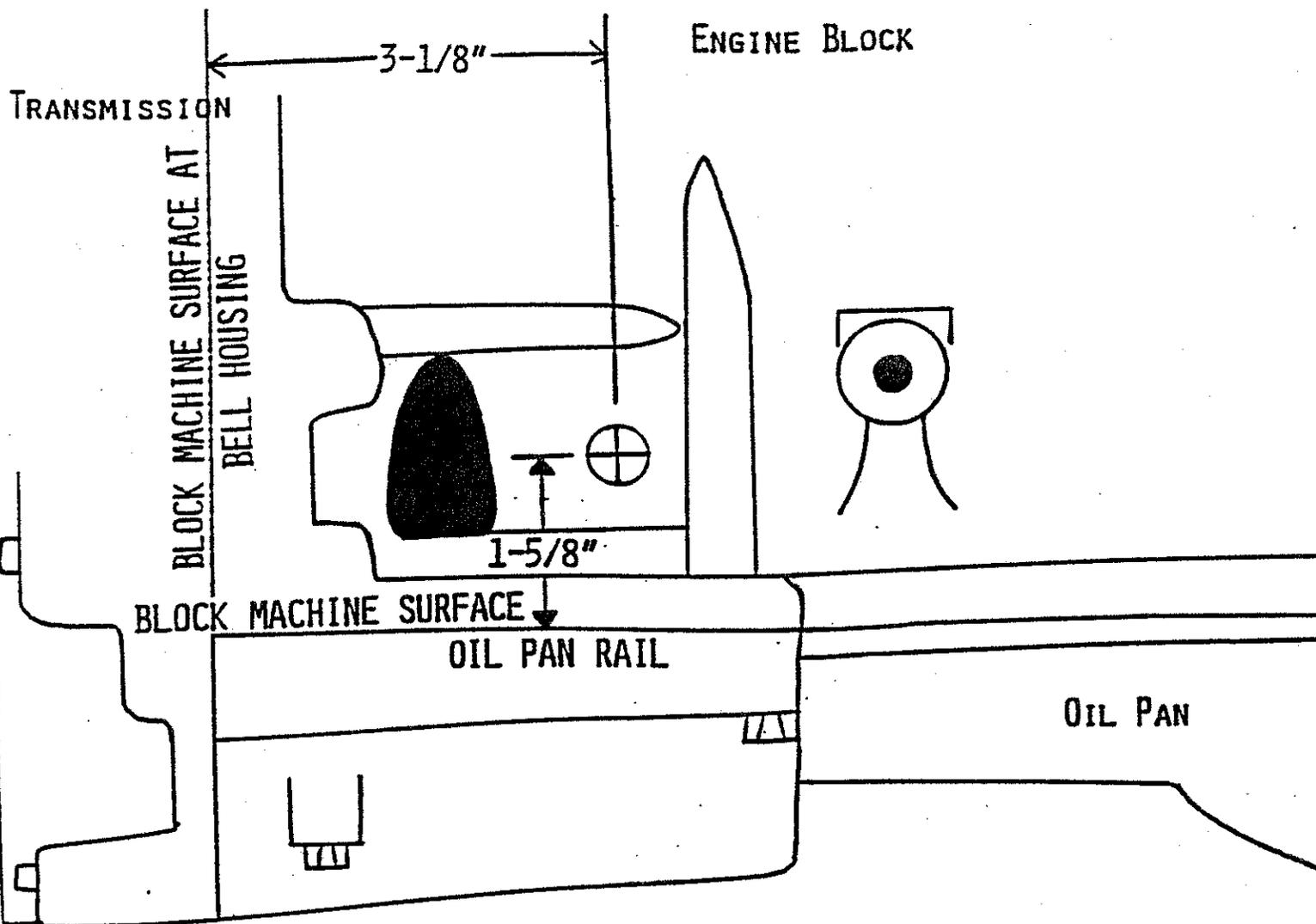


FIGURE 2
1985-86 6351 STAGE II
INTERCOOLER CUTOUT

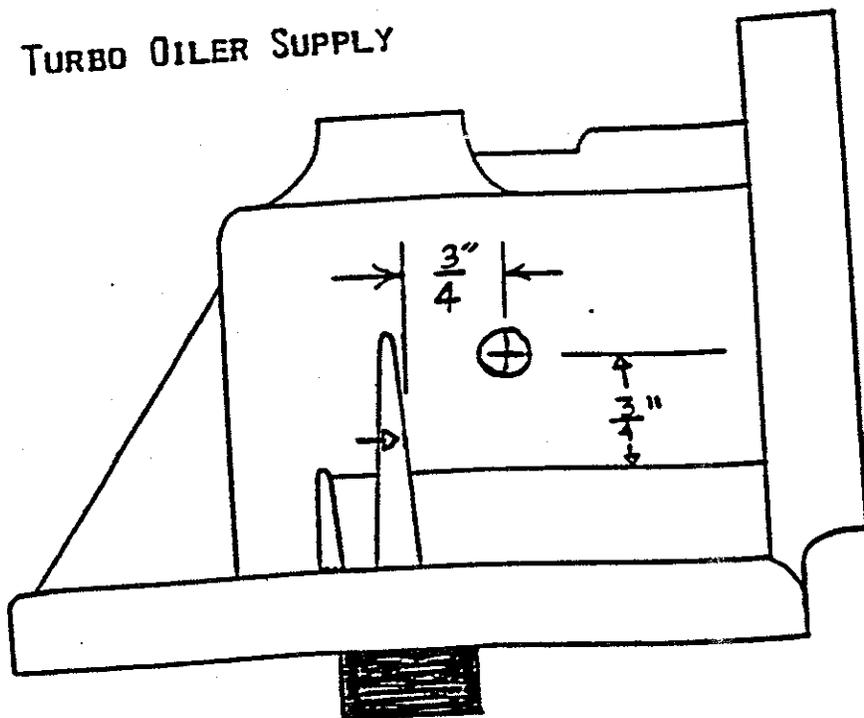
FIGURE 3

1985-> 535i, 635i, 735i
OIL RETURN HOLE IN ENGINE BLOCK



HOLD RULER PARALLEL WITH BLOCK WHEN MEASURING
DRILL $\frac{11}{16}$ " HOLE, THEN TAP $\frac{1}{2}$ " PIPE THREAD

IRE 4 TURBO OILER SUPPLY



OIL FILTER HOUSING REMOVE FROM ENGINE BLOCK.

DRILL $\frac{21}{64}$ " HOLE IN LOCATION SHOWN ABOVE, THEN TAP $\frac{1}{8}$ " PIPE.

$\frac{21}{64}$ " Drill Bit
 $\frac{1}{8}$ " Pipe Tap

$\frac{1}{8}$ p to -4 fitting

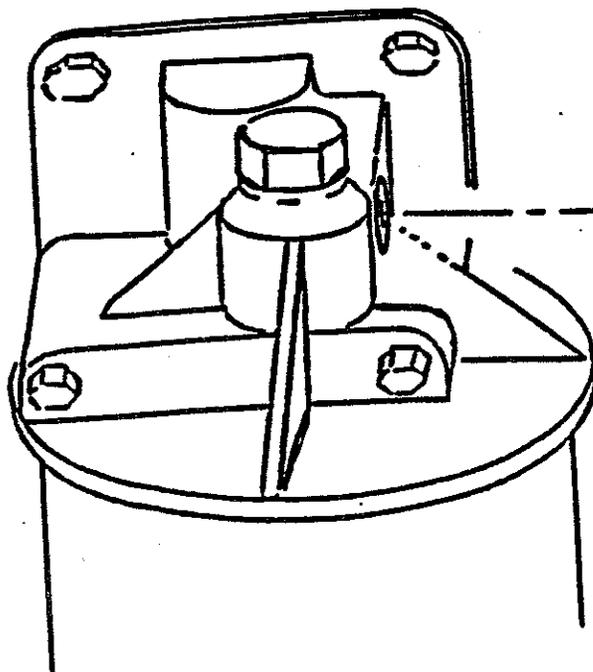
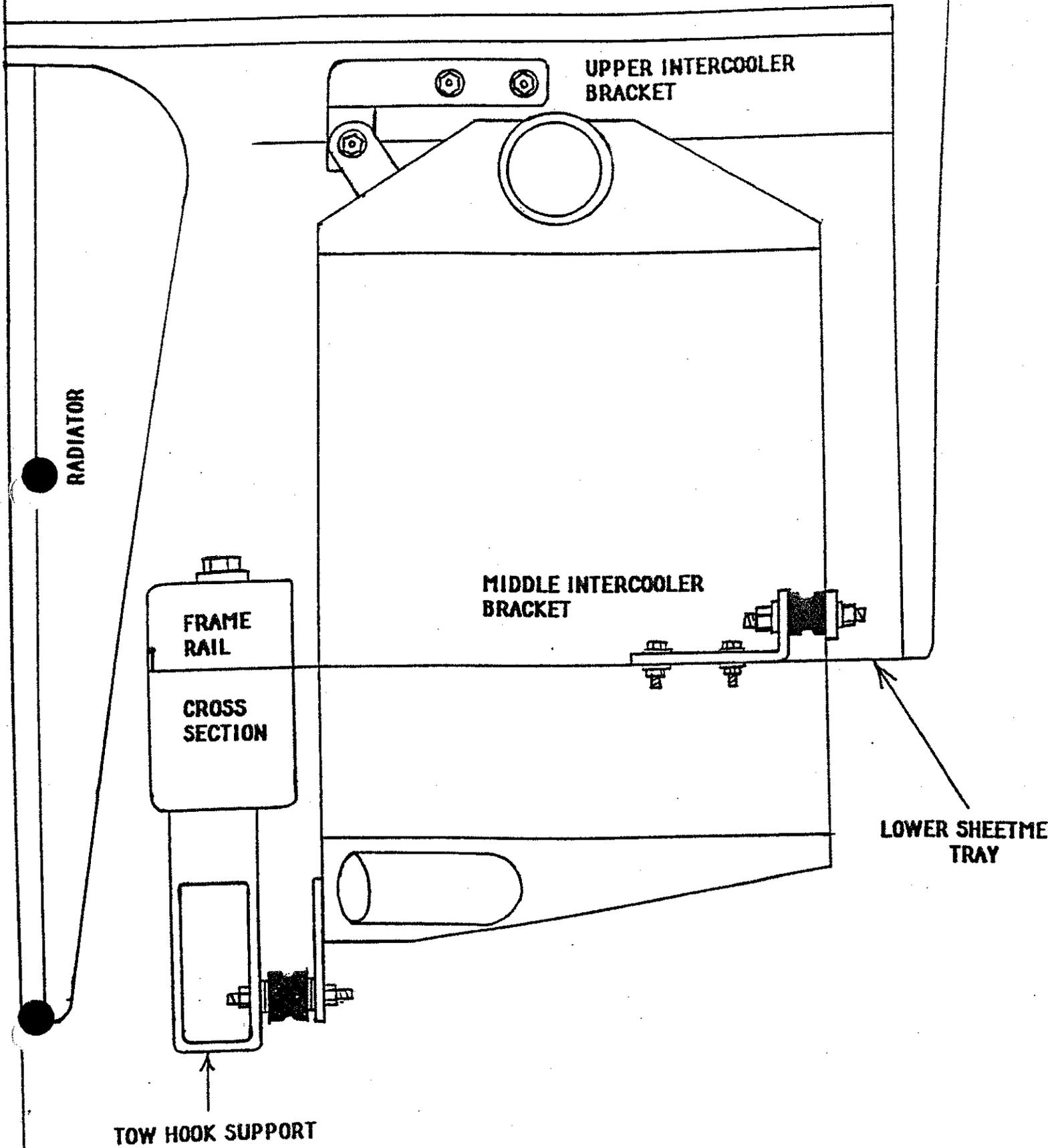
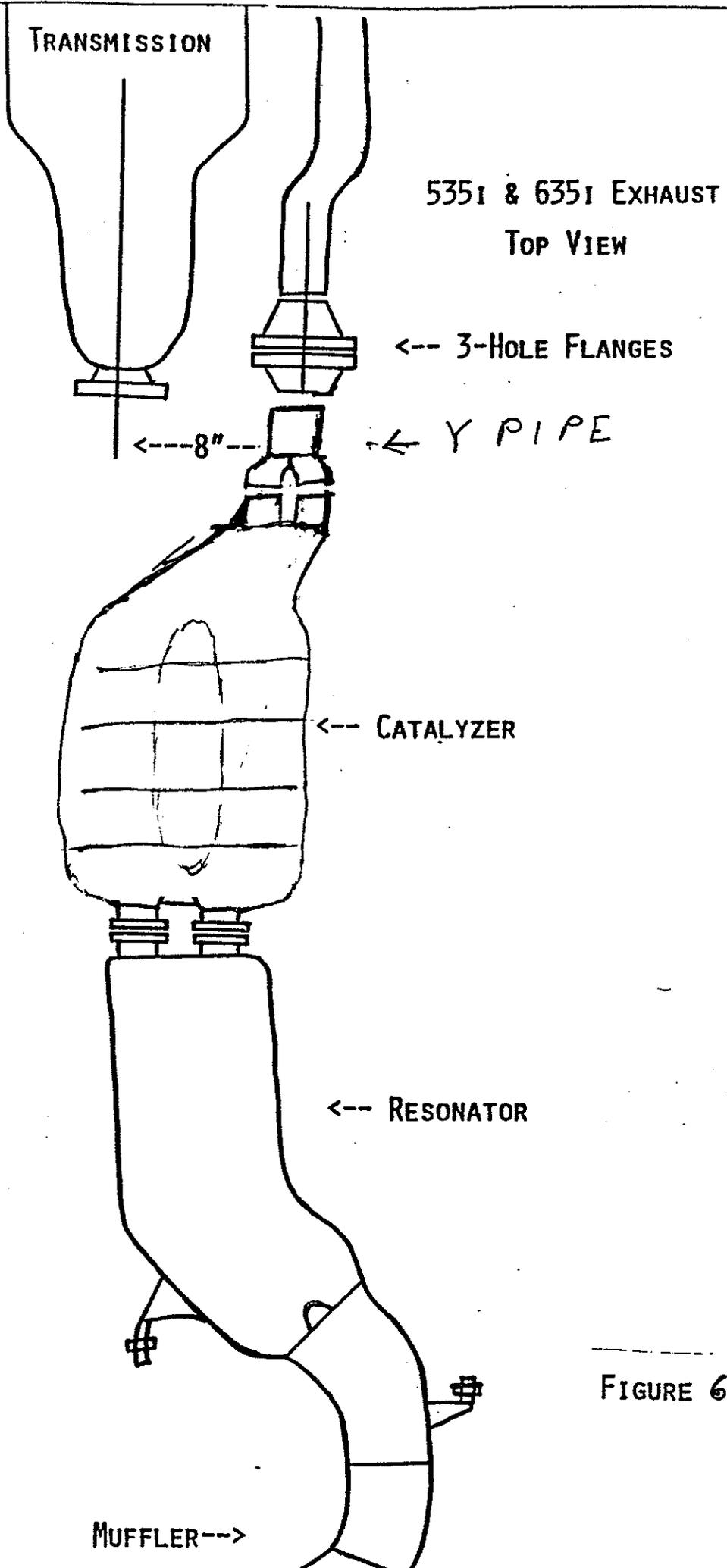


FIGURE 5

**INTERCOOLER MOUNTING
1985→ 635I STAGE II**





TRANSMISSION

535i & 635i EXHAUST
TOP VIEW

←-- 3-HOLE FLANGES

←-- 8" --

← Y PIPE

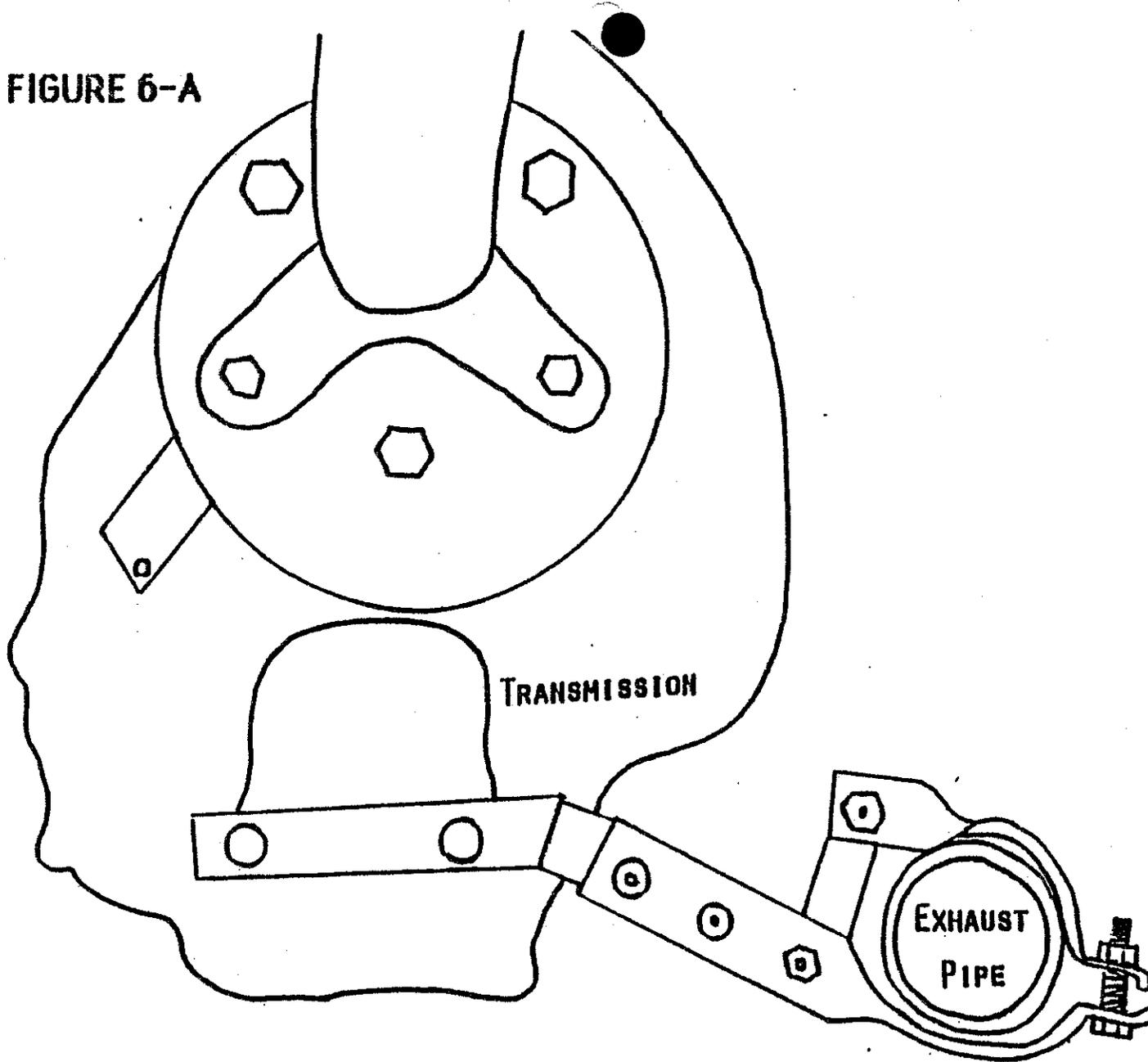
←-- CATALYZER

←-- RESONATOR

MUFFLER-->

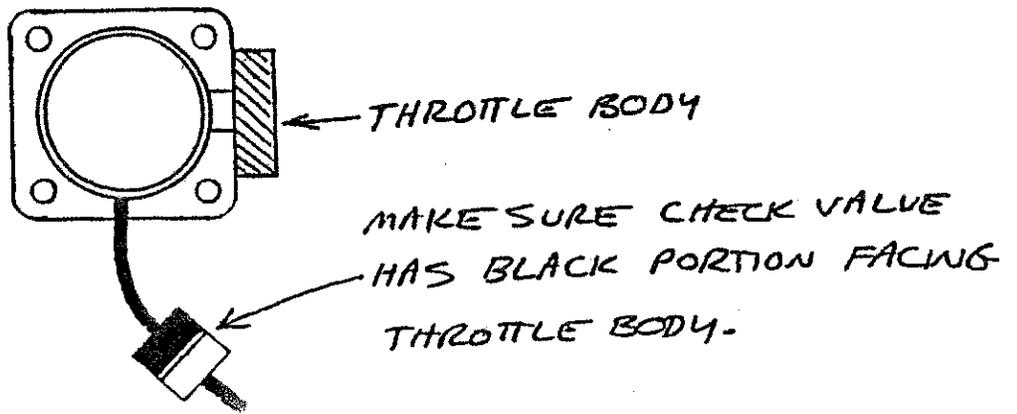
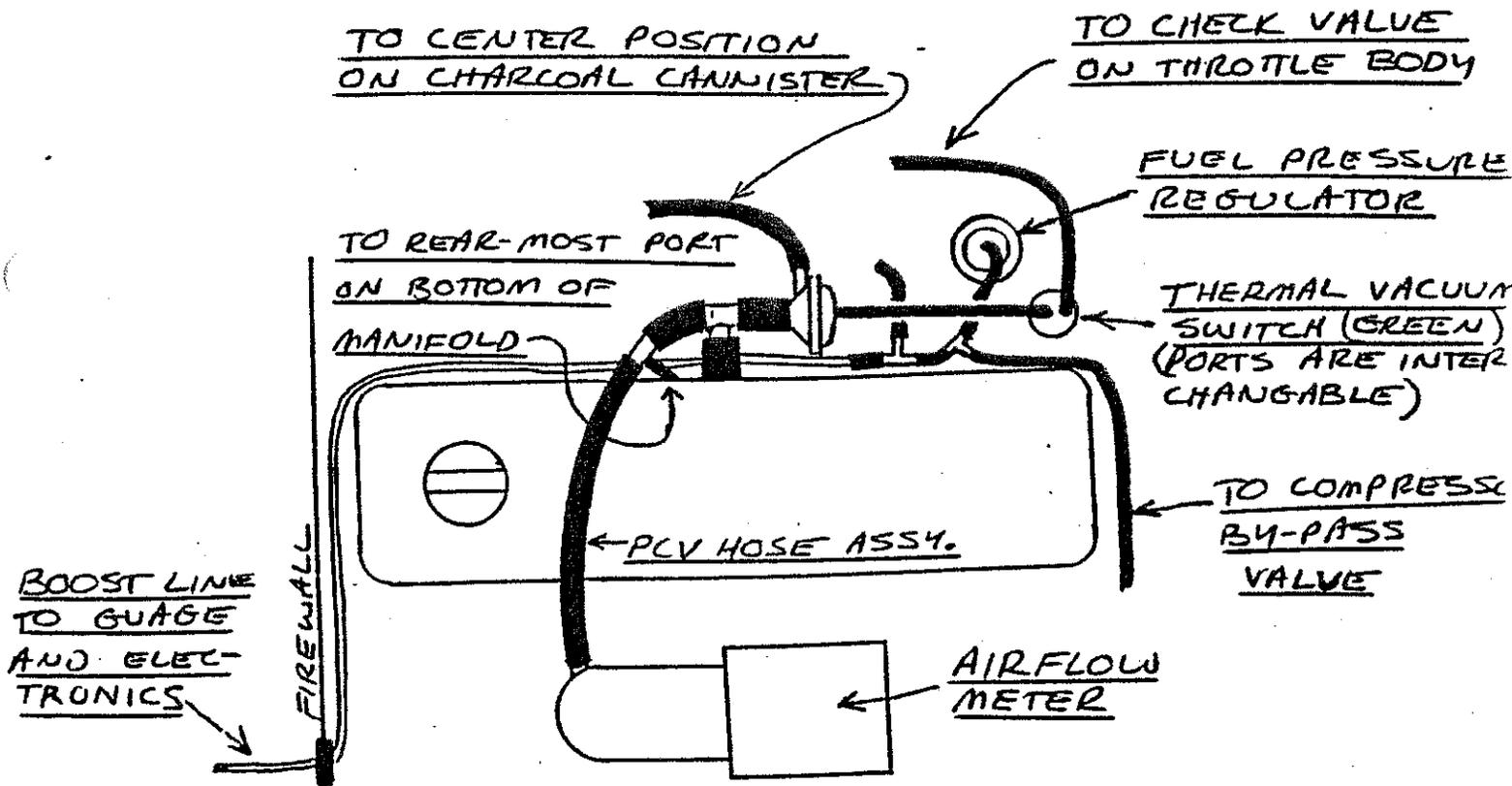
FIGURE 6

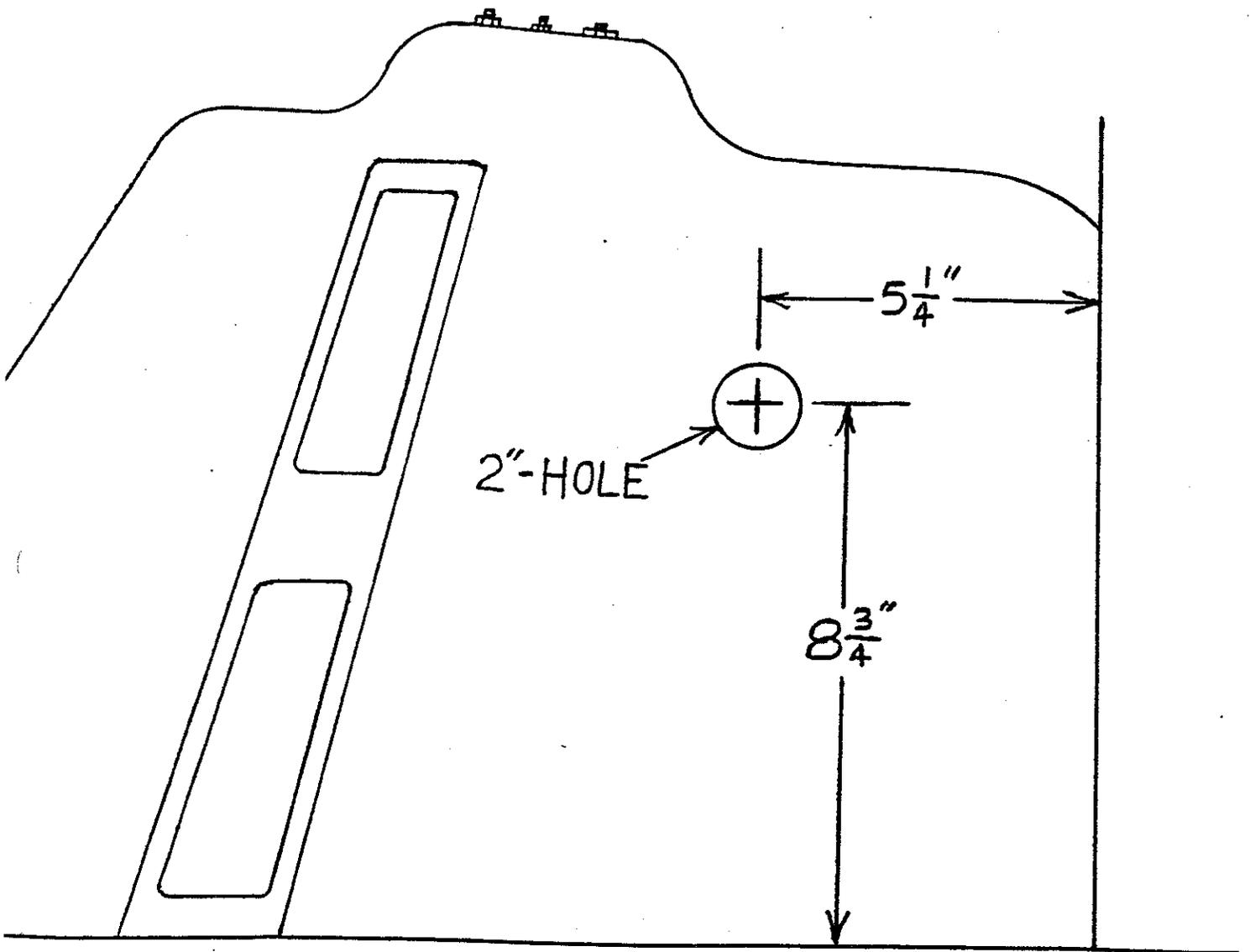
FIGURE 6-A



TRANSMISSION TO EXHAUST BRACKET FOR OFF ROAD EXHAUST

1985 5351-6351 STAGE II
ALL AUTOMATICS 1985-89





RIGHT FRAME RAIL

FIGURE 8

1987-89 6351 RIGHT INNER FENDERWELL

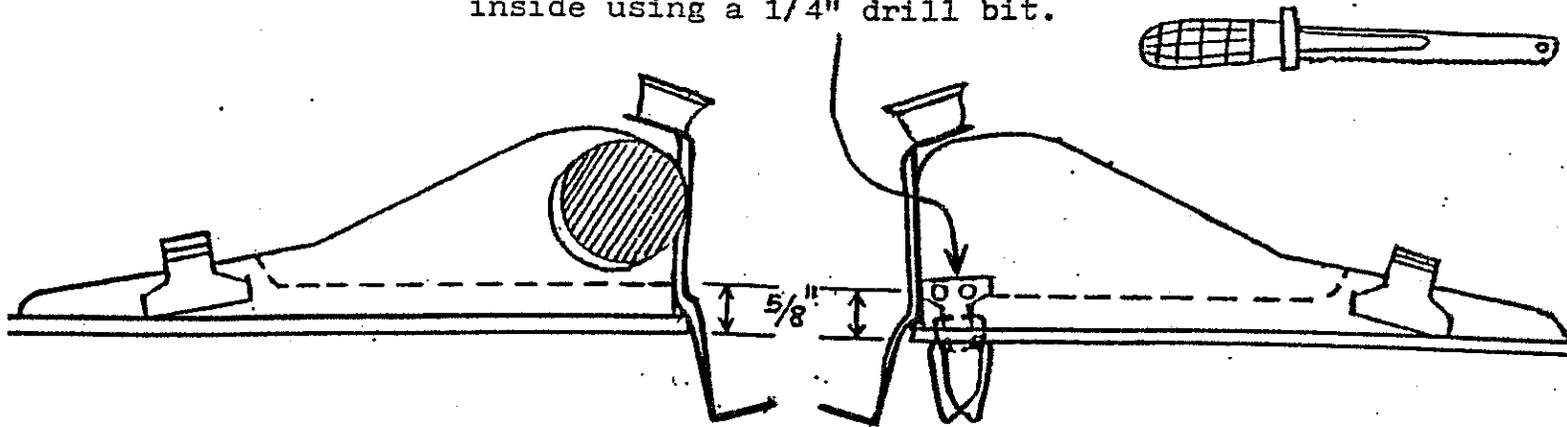
AIR FILTER BOX MODIFICATIONS

FIG 9

85-87 735i

*Cut airfilter box along dotted lines as shown below.
Wire clamp and bracket must be carefully removed for re-use.

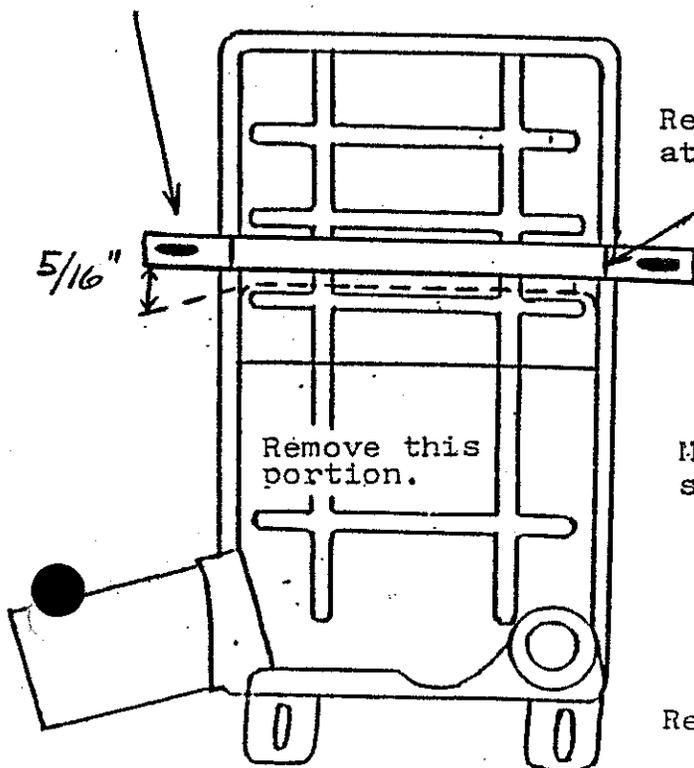
Remove bracket by drilling out spot-welds from the inside using a 1/4" drill bit.



*Use a 3" fiberglass cutting wheel mounted in a die grinder or a hand held hacksaw. (shown above)

DO NOT REMOVE
THIS BRACKET!!!

Clamp air-box back together;
upside-down from stock, to
look like drawing below.

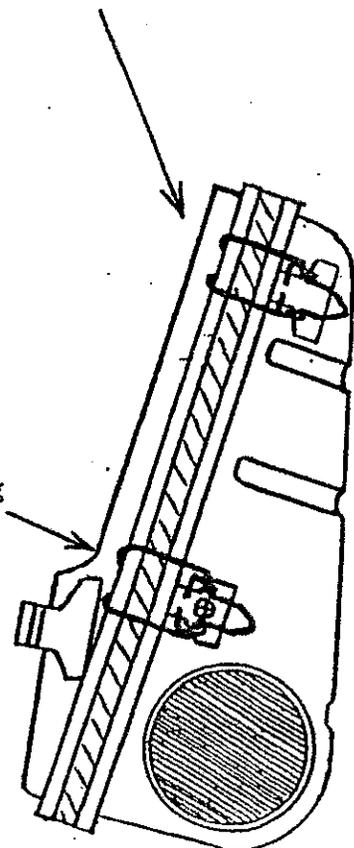


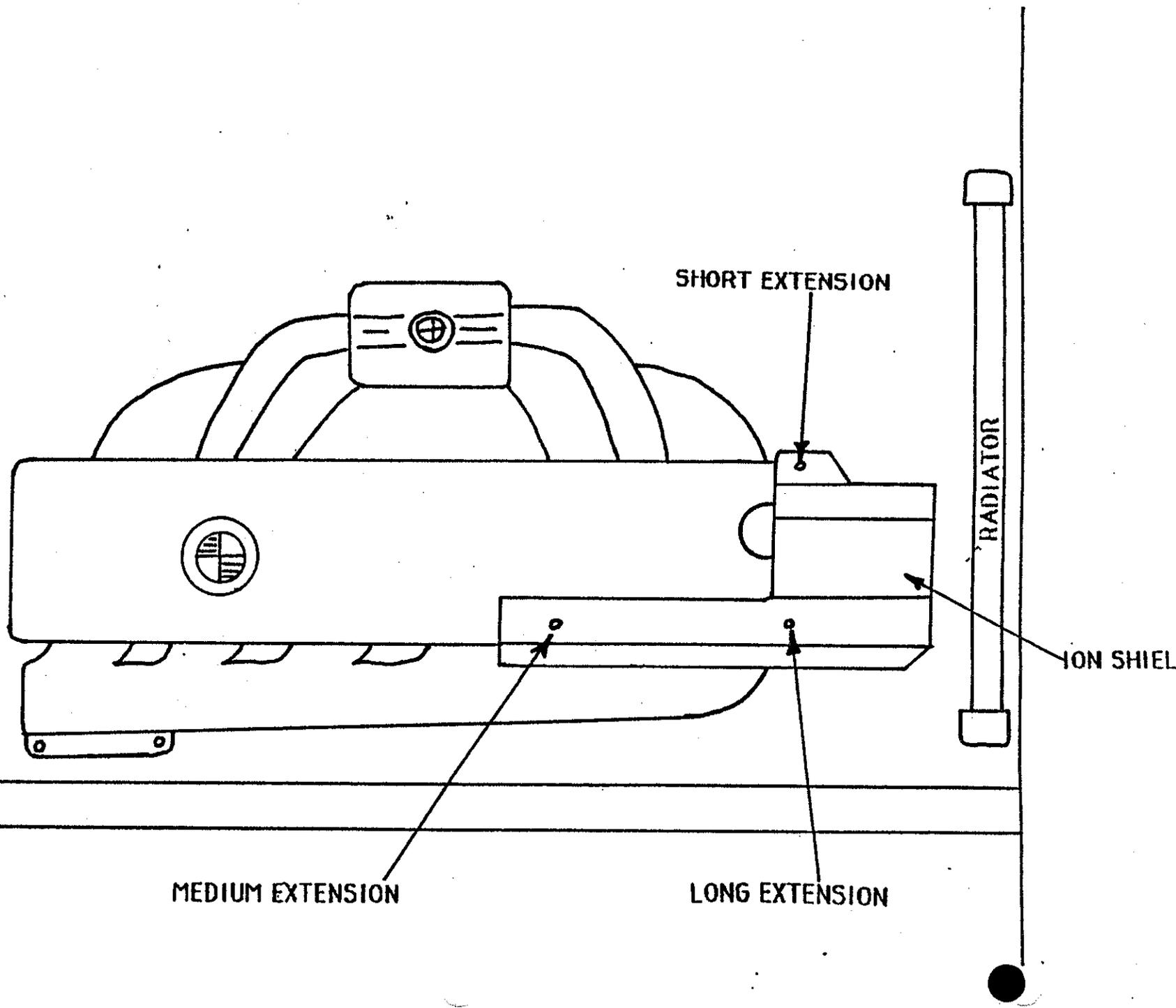
Remove bracket
at this line.

Remove this
portion.

Mount wire clamp here using
sheet-metal screw provided.

Re-paint if desired.





SHORT EXTENSION

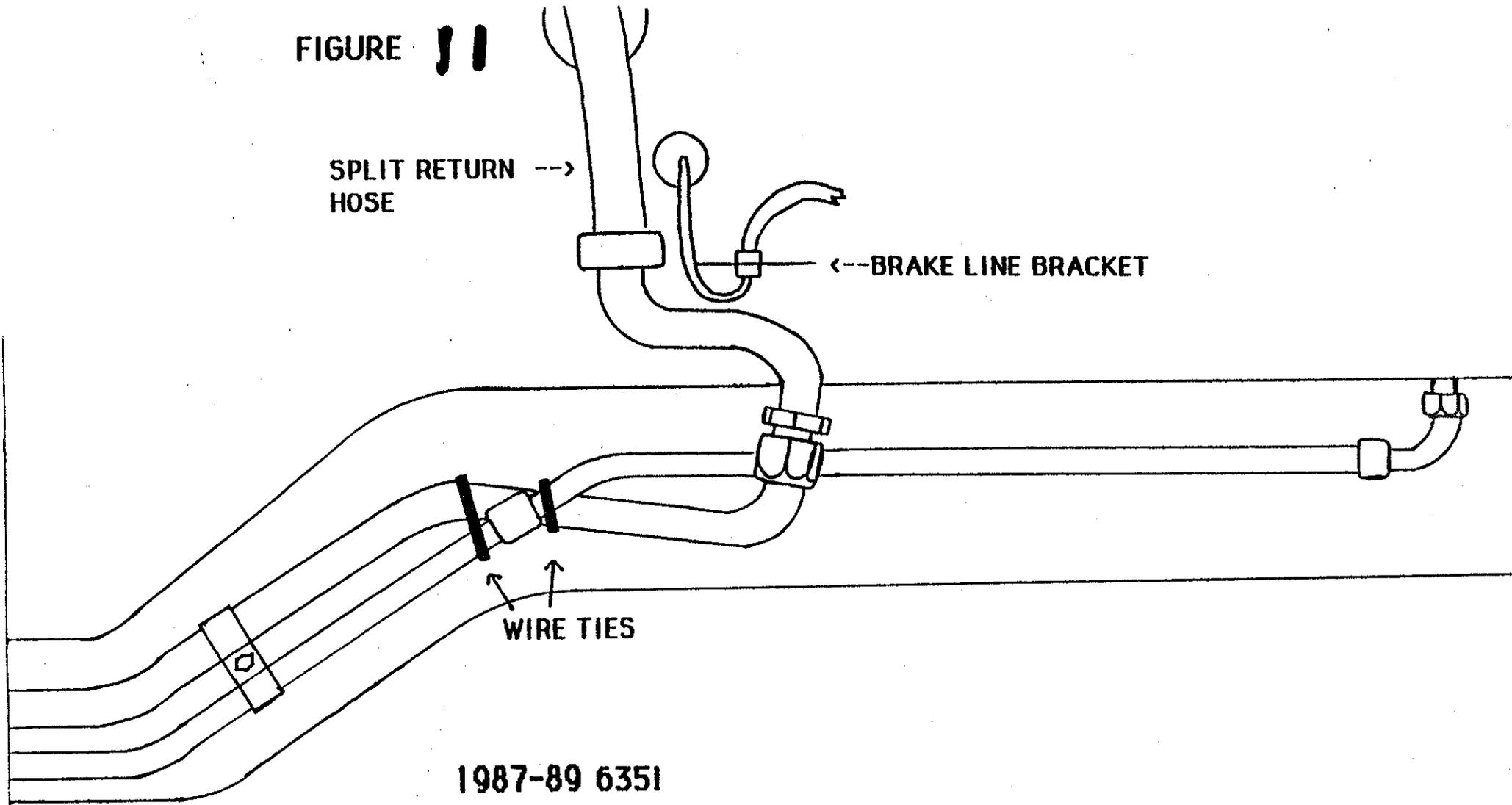
RADIATOR

ION SHIELD

MEDIUM EXTENSION

LONG EXTENSION

FIGURE 11



SPLIT RETURN HOSE -->

<--BRAKE LINE BRACKET

↑
↑
WIRE TIES

1987-89 6351

AC LINES BEHIND RIGHT FRONT WHEEL

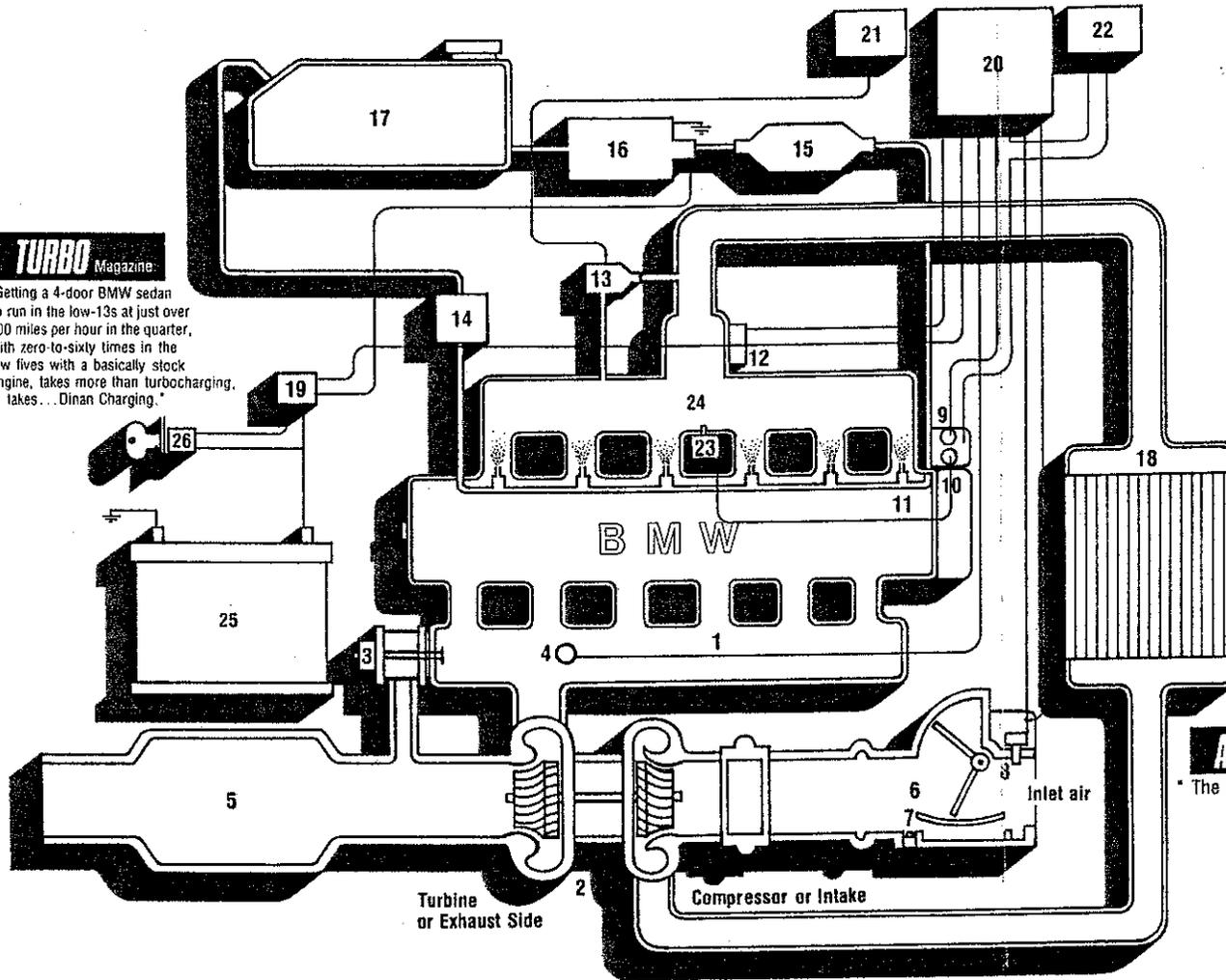
(VIEW WITH SUSPENSION REMOVED)

APPENDIX B

Diagram of Dinan Turbo System

TURBO Magazine

"Getting a 4-door BMW sedan to run in the low-13s at just over 100 miles per hour in the quarter, with zero-to-sixty times in the low fives with a basically stock engine, takes more than turbocharging. It takes... Dinan Charging."



ABOUT INTERCOOLERS

As a turbo compresses the air going into the engine, it also raises the temperature. This increase in temperature can cause that dreaded detonation. In order for our system to run 11 pounds of boost, we must cool the charge air with an intercooler. Not only does cooler air reduce the possibility of detonation, it also dramatically increases power by providing a much higher density charge. We use an air to air intercooler because they have proven to be more thermally efficient than air to water. To corroborate this statement, we offer two examples. When Renault first introduced turbocharging to F1 and when Porsche first introduced the 935 GT car, they both utilized an air to water intercooler. Both companies dropped this in favor of an air to air intercooler resulting in large power gains. Because of this all of today's fastest turbo racing cars use air to air intercoolers. Another reason air to air intercoolers are so popular is their superior dependability.

THE BOTTOM LINE

Combined with the finest, most efficient design are the highest quality construction and workmanship; clean, well organized packaging and a 12 month/12,000 mile warranty on the entire turbo system. Here is what the BMWCCA had to say about the quality of our system... "The painstaking attention to detail was everywhere you looked." AUTOWEEK says, "The fit and finish is superb... The cars are constructed so well that a driver has to be reminded this is an aftermarket product."

Now you can see why buying the best is worth the cost. DINAN ENGINEERING has successfully addressed every aspect of turbo technology to produce a truly superior product. Call today for consultation or a test drive.

AUTOWEEK

"The best of the best."

Dinan Turbo

(415) 962-9417.

THE SOLUTION

The answer to the fuel management problem is to redesign the car's original port injection system to give accurate fuel flow under all conditions. Sure this is more expensive than add-on devices but the results are well worth it. Having a sophisticated fuel management system is why turbocharged F1 racing engines are pumping 1000hp out of a 1500cc power plant.

This is the solution which Dinan Engineering employs. Our redesign includes high flow injectors, and/or fuel pressure regulator, a recurved air flow sensor to give you the additional fuel flow only when it is needed and an electronic control unit that ties into the existing fuel injection brain. See Item 20 & 22. This ECU measures boost pressure and rpm to change the brain's existing fuel flow curve to one precisely matching the turbocharger's needs

Unlike other turbo system manufacturers, we address all three elements to ensure accurate fuel delivery; air flow, rpm and boost pressure. This gives our system precise control throughout the entire rpm and boost range. This system works so well it prompted TURBO magazine to say "The intercooled 3.5 is able to pull a solid 11 pounds of boost on 91 octane fuel without lowering the compression, resorting to water injection or other outside means of controlling detonation. This transmits into some serious performance gains."

We call our advanced fuel management system TURBO-TRONICS II. It is the right solution... period!

DINAN CHARGING

- | | |
|---------------------------|-----------------------------|
| 1. Turbo Exhaust Manifold | 14. Fuel Pressure Regulator |
| 2. Turbo | 15. Fuel Filter |
| 3. Waste Gate | 16. Fuel Pump |
| 4. Oxygen Sensor | 17. Fuel Tank |
| 5. Catalyzer | 18. Inter Cooler |
| 6. Air Flow Sensor | 19. Combo relay |
| 7. Idle CO Adjuster | 20. Ign/Fl ECU |
| 8. Ambient Air Tempensor | 21. Idle ECU |
| 9. Tempensor | 22. Turboelectronics ECU |
| 10. Thermo Time Switch | 23. Cold Start Injector |
| 11. Injector | 24. Intake Plenum |
| 12. Throttle Pos Switch | 25. Battery |
| 13. Idle Control Valve | 26. Ignition Switch |