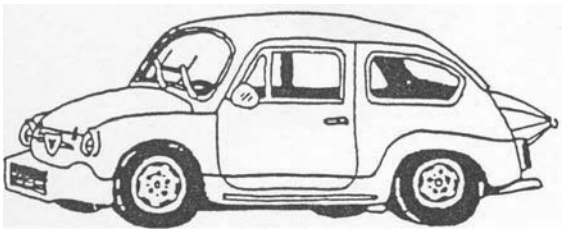
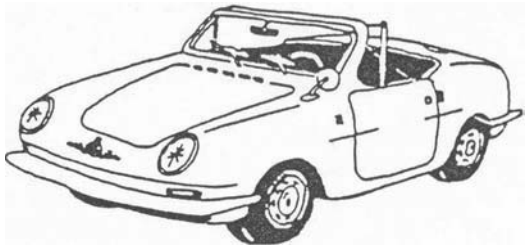
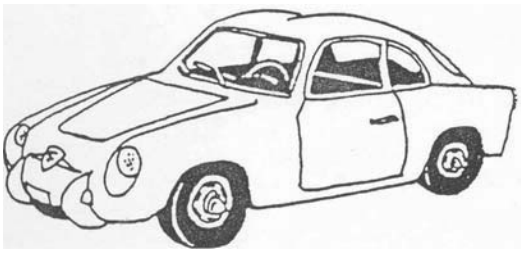
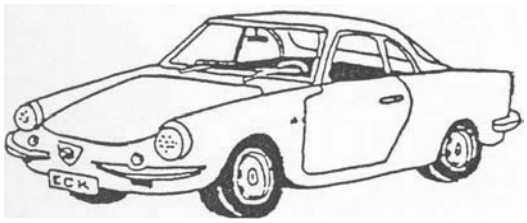


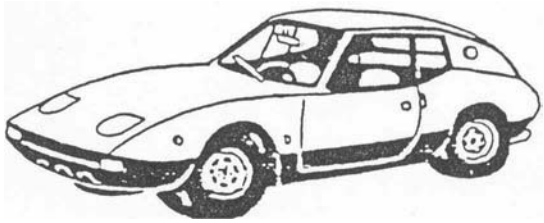


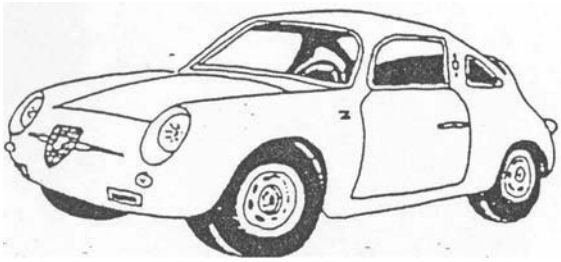


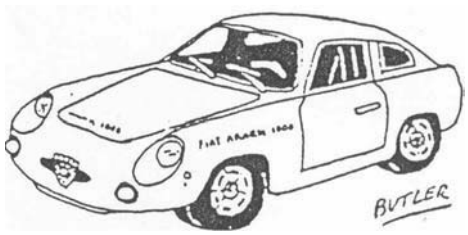
Fiat & ABARTH
tricks

by GREG SCHMIDT



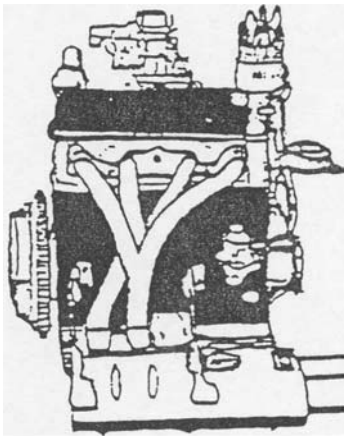






FIAT and ABARTH TRICKS

by Greg Schmidt



Revised 5th

produced by Greg Schmidt with thanks to: Adrienne, Trudi, June, and Roy for production support; to Maurice Dhoore for "investigation"; to Chris Butler for the cover page; and Doc Sekito for "Good vibrations".

Revised second printing October 1984 with updated pages reformated and printed on a daisywheel printer by Kennerley C. Ashley, D.D.S and bis Radio Shack Model Four computer.

Enthusiasts will also want a copy of ABARTH by Pat Braden and Greg .Schmidt, 160 pages, with 220 illustrations, Osprey Publishing Ltd., England 1983. ABARTH is distributed in the USA by Classic Motorbooks (see above & use order #F770A). ABARTH was reviewed in the September 184 issue of Road & Track Magazine on page 28. Note that about 80% of engine rebuilding, conversions & part numbers are contained in ABARTH.

From time to time, new/revised materials are produced for this book. If you would like updated pages forwarded to you, please send a pest card with your name, address, and the number of the book that you have (noted in red on page 1) to: FIAT and ABARTH TRICKS 1512 E. 5th Street #94 Ontario, Calif. 91764 USA
(There is no charge for this service)

FIAT & ABARTH Tricks

I hope the information contained in this book will prove valuable to you. New material, corrections and comments are always welcome. Questions and new materials will be accepted when accompanied by a self-addressed and stamped return envelope. "MORE ABARTH TRICKS" may be forthcoming (see page 82).

With the Sporting intent,

PURPOSE

The purpose of this book is to provide a comprehensible source of technical information for owners and enthusiasts of Fiat-Abarth and other make sport cars which were derived from the Fiat 600 and Fiat 850. Special emphasis is placed on returning more of these vehicles to every day use and maintaining them with reasonable efficiency and a minimum of misspent time or frustration. So it. is hoped that a few owners who have heretofore Dot had the opportunity and pleasure of experiencing their neat little cars in action (or on a regular basis) will be provided with enough "first-hand experienced" information (which with time might otherwise have been lost) and provided the incentive to restore them to original or updated "drivers car" condition. Because, when these cars work right they can be as entertaining as any production sports car yet offered to the driving public. And that full song high-reving engine and cat-like agility (from a vehicle of such humble specifications yet) is usually more than enough to quickly remind the owner that this is "his kind of automotive plaything"..!

The best use of F.I.A.T. and ABARTH

For conveyance and protection, it is recommended that the pages of this booklet be put in a hard cover loose-leaf binder. For heavy workshop use, clear plastic sleeve page covers can be used to protect those pages removed as reference for the job at hand. Both ABARTH (see bottom of facing page) and FIAT and ABARTH TRICKS are designed to complement each other. You should have both so they can be used hand -In -hand. Best results will be obtained by first reading (or rereading) chapters: 3, 6, 7, 11, 12, 13, and skimming the appendix of ABARTH. Then read all of FIAT and ABARTH TRICKS.
Make reference notations in the margins of ABARTH about the loctions of updated, new and related information in FIAT and ABARTH TRICKS. Lastly, I suggest that you Dot loan this book to anyone, as even with the best of intentions, one-of-a-kind publications like this one are frequently Dot returned to the lender. Protect your copy and encourage your friend to purchase his own copy by giving him the ordering information on the facing page. That way I can continue to make FIAT and ABARTH TRICKS and ABARTH available to those who really enjoy these purposeful, efficient, and fulfilling conveyance devices.

ILLUSTRATIONS--starting on page 84

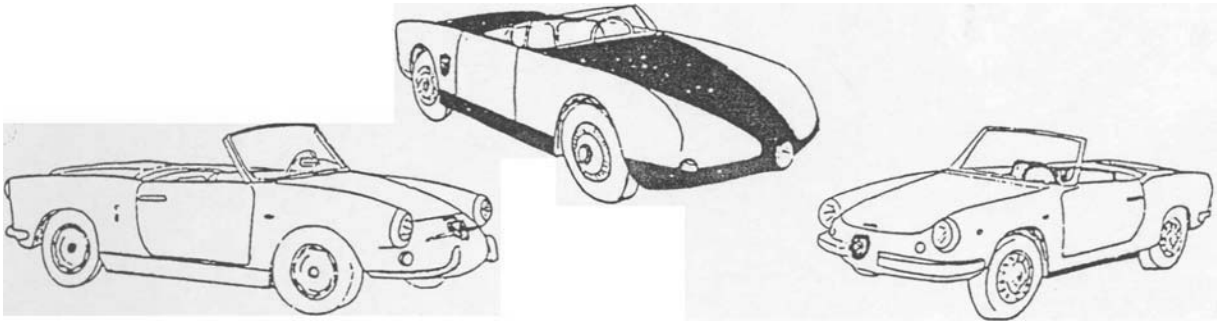
Note: Part numbers net found in these illustrations are located in "Abarth" parts interchange, or drawings in chapters 12 & 13.

Cover page:
Berlina Corsa TC
750 Double Bubble
850 Scorpione
750 Record Monza 1000" Bialbero
OT1000 Spider
1300/124- OT
Scorpione 1300 SS

CONTENTS

CHAPTER 1: OLD BUISINESS FROM "ABARTH"
MISSING PHOTO

We were unable to locate representative photos of: the Spider sinle headlight Fiat-Abarth 210A which was the first special- bodied 600-based Abarth (See page 50 of "ABARTH"), the "ugly ducking" Allanano 750 Spider in street configuration (pages 55-56), and the handsome Allanano 850 Spider "Riviera" which was an Allemano coupe with the roof chopped off (pages 56, 58) . Below are drawings of these models. Photos and information on the or 2000 coupe (850 coupe body and 2000cc Abarth twin cam with modified chassis similar to the or 1600 Sedan) should have appeared on page 84 of "ABARTH" and can be found on page 77 of this booklet.



"The Duck" **210A** **Riviera**

Why Are FIAT-ABARTH Cars Desirable?

What is an everyday road-going "sports car?" Perhaps a vehicle that possesses <u>everything</u> the sporting driver could wish for. Like: responsive performance from the engine, suspension, steering, and brakes plus lightweight, aerodynamic good looks, reasonable driver confort and a certain "aggressive emotional flavor". Along with these forms of efficiency, I am going to add fuel economy, ease of maintenance and repair, and simplicity of design for a given purpose. Brute power (and attendant bulk) may have its place for racing or "weekend fun" but as everyday sporting transportation it leans heavily into the areas of ego gratification and over-use/abuse of resources necessary for the desired result. <u>A true sports car gets the most it can from what it needs.</u> Fiat-Abarths embody all of these qualities. Add to all this the fact that these cars are for the most part quite inexpensive to purchase (as classic sports cars go no,.; days), and there *is* not a lot more an enthusiast could ask for in sporting transportation....

In the case of the Fiat and Abarth sports cars, which this booklet is about, the only real issues that might be considered "flaws in the mold" would be: (1) noise and vibration levels for extended highway use, (2) relatively short-lived and fragile power unit components and accessories, and (3) poor braking efficiency on early 600-based cars. In the first case, other than using a quieter muffler, more sound insulation and higher final drive gearing, there *is* not much that can be done about it. The second is rea1ly net an issue (especially if you are a mechanical hobbyist) in that hardly a car in existence bas an engine or related hardware *easier* to remove and simpler to rework. And on the third point ; it is a small matter to convert to the front disk brakes from a later model Fiat.

"ABARTH" CORRECTIONS (Sure, we made mistakes) Listed by page and location, corrected copy underlined

page ##

26 Right column middle first paragraph: described in detail in Chapter 11.

27 Middle of left column : a modern Fiat 127 cam can be used in the 850 block to change engine rotation for use in 600-00.500 Abarth conversions (see Chapter 13).

27 Second paragraph: complete cylinder head with side draft Weber two barrel carburetor, or 850 style downdraft Weber and special valves and springs for the standard head, olus high-performance camshaft and exhaust Systems.

27 Last paragraph : As to 127 aftermarket engine parts appropriate to Fiat 850 and Abarth OT1000. there is only a set of heavy-duty valve springs (There is a cog-belt camshaft drive conversion kit suitable for 600/850 based motors but it is different from a 127 kit) . The high performance 127 camshafts, while good for *850/903* conversion engines going into a 600-based car, are of no use in an 850-based car unless you have the direct drive camshaft gears to overcome reverse rotation. Likewise, the special 127 combination valve cover and intake manifold with 32/32 Weber barrel carburetor may be unusable as delivered because the float bowl will sit sideways in 600 and 850 based cars (also at a 5 degree angle in the 850-based cars). In addition, the ail filler cap is on the opposite end of the valve cover which makes adding oil difficult.

48 The last paragraph in the left column was insert here by mistake (it also appears in the right column). The following text should have been in its place: The Fiat 600 handling and heating sins proved negligible for the stock car, but critical for the Abarth-modified cars. The tendencies to roll *over* or over-heat were magnified when the available power was increased. They were characteristics of the Fiat 600 which Abarth never completely conquered. In view of the unqualified success of his cars as racers, he obviously solved then well enough to suit his purposes. One other design limitation that nagged Abarth was the marginal brakes of the 600. This was finally dealt with by fitting disk brakes up front on the street cars and disk all around on the racing oriented machinery.

50 Middle of the left column: Outer springs were - available in 34, 43 or 50 kg. strengths(measured at 1.25" compressed. length) or inner springs of 29 kg. could be used with the standard 24 kg. 600/750 outer spring giving a total spring pressure of 53 kg.

53 Photo caption and "Spider. Zagato" paragraph: The Zagato brothers cut off the roof and redesigned the rear body sections of their coupes to create two Fiat-Abarth spiders. The upper photo shows a 56 “topless Double Bubble”, and below it a '58 "topless Record Monza”. Both models used pushrod engines (no rear-engine DOHC spider street cars were made).

58 Photo caption: Perhaps the most pleasantly proportioned, available, 600-based road-going Abarth and certainly the most conformable tourer, the Allemano-bodied Scorpione Coupe came with an 850 cc., or on rare occasions, the one liter pushrod engine.

59 First paragraph: Brakes were improved by increasing the wheel cylinder diameter and replacing the hinged brake shoes with self-centering type.

60 Bottom of the third paragraph: The engine-driven fan (not the rear radiator) was removed on this model, and a short water pump was used

60 Replace the last sentence before "850 Sports Prototype" with: This car has the non-covered headlights and non-removable rear body/motor mount panel and no starter motor access panel. Front disk brakes were fitted, but nearly all other details remained identical to the original Record Monza 750 twin cam model.

63 Middle of the last paragraph: The cars which came before were simply unknown and most which came after were either too mundane (warmed over Fiat look-alikes) or too exotic and expensive.

pp.72 The third and fourth sentences should read: The 817cc U.S. smog exempt version of the 850 engine that Fiat Obtained by decreasing the cy1inder bore by one millemeter (to 64mn) in 1968 to 1971 sedan models was used along with a 32mm one-barrel Weber and special : intake manifold, exhaust system, cam and finned alloy five quart sump by Giannini .

pp. 106 #8 should read: 17mm heads on high-tensile steel cylinder head bolts marked ABARTH & C" (Fiat 600 has 13mm bolt heads & Fiat 850 bas 14 or 17 mm heads on semi-hardened iron bolts which are labeled "Fiat")

pp. 107-110 regarding the current value of the various Fiat-Abarth models : The prices listed are now quite low especially with the recent upsurge in classic car collecting & racing. Also, when "Abarth" was being written (1981-2), my experience had been more with the "low dollar fixer" type of car & this was reflected in my value estimates along with the fact that "being in the business" allowed me to meet many. enthusiasts & hear of the base deals. Keep in mind though chat a nice complete & running car can Cake as much time & money to restore to original as "rough basket-case" because a "nice" car will still require stripping totally to make it 100%. The only Car worth a lot of money is one that's nearly perfect....

Corrections & Supplemental. Materials for "Abarth" Technical Chapters

***pp.* 109 Fiat-Abarth 1300/124 OT item #3. : Reclined to 3/4 upright front radiator ; mounted & shrouded on left side of original spare tire well with Abarth grille & electric fan etc...**
pp. 109 regarding engine number on cylinder block: 1300/12h number is located on right sida of block near fuel pump.
PP. 109 info regarding Fiat-Abarth Scorpione 1300 S/SS : with pop-up head lights and a 1300cc pushrod version of the Fiat 124 engine. Top of pp.
110 : Was modified by Lombardi to fit the Fiat 850 chassis. The true Scorpione SS has special suspension and 4-wheel disc brakes (the Scorpione S and the 1300/124 previously listed has 850-type.....
pp.l07, 113, 120, 122 all these pages mention a non existsant Chapter 14. You probably realized wo meant to say chapter 13 On pp.135 at end of first paragraph we meant to say: refer to chapter 12 (pp *120).*
pp 113 regardin, those "Larger engines for Early Abarths", GOOD *NEWS : Ma*urice Dhoore in Belgium has investigated for me the possibilities of using currently produced readily available fiat 127/Autobianchi A112 engines of tram 903 to 1050cc in early Abarths.
These engines are closely related to the Fiat 850 but rotate in the desired clockwise direction. There are some outer accessories that need to be replaced or modified ("see pp. 59-61 of this booklet), but the engine itself would Ot require disassembly or internal modification as with the conversion outlined in chapter 13 of "Abarth". Of particular interest is the Autobianchi A.112 Abarth 1050cc engine which produces around 70 horsepower (compared to about 42 hp for Abarth 750)
pp. 113 right column 5th line should read : cylinder boring and an oversize head gasket are required for sizes over about 67mm.
pp. 114:special 9.8 to 1 pistons (altered piston pin height with full floating pin design) and rings (thin width)
pp. 114 add to bottom of page : Special Abarth Muffler - with chrome tipped twin large diameter outlet pipes -
p. 116 add to the list of "Updating for Daily Use"

- **« Available battery » conversion**
- **Drive-line movement bar**
- **Clutch cable locator/center support strengthening bracket**
- **850/OT 1000 diaphram clutch conversion**
- ***850/OT1000* stvle cooling system thermostat conversion**

pp. 118 just above "Condition of the Crankshaft", should have appeared the paragraph in the middle of the right column *of* page 133 (Henceforth. When referring ... etc) which is also applicable for this booklet too.
Then the following additional information : Engine rebuilding and assembly procedures are easier to accomplish if you mount front (flywheel end) of cylinder block to an engine stand that allows motor to be rotated to varying positions (especially to flip block over and back during piston insertion and rod-cap installation). Take care when mounting block to leave enough room for front crankshaft seal-housing installation.

Pp 118 and of first paragraph under "condition *of* the Crankshaft" : Note also that oversize Abarth bearings do not come in standard U.S. sizes (.010", .020" etc)" So double check Abarth bearings before crankshaft grinding. Finally as a general rule, most Abarth 850, 1000 and OT1000 engines use special Abarth large main bearings while nearly all pushrod motors use standard Fiat rod bearings.

pp. 119 under "The Cylinder Block" at end of first paragraph : Fiat no-longer supplies late 903 center main bearings with oil delivery hale and grooves. Therefore using Fiat bearings will negate the desirable pressurized center main bearing; so bearings made by other suppliers (like A.E.) should be used in this situation.
Note also that bearings for pressurized center mains can be used on all other 850 engines even though oil holes will ho of no functional value.

While on the subject of 903 cylinder blocks (identified by 4 bolt water pump mounting flange) note that they are about 5mm taller than 843/OT1000 blocks to compensate for increased crankshaft stroke and longer connecting rods (which allow s same pistons to be used in both 843 and 903 motors). In addition 903 cylinder head thickness is different and pushrod and distributor drive shaft lengths are longer than 843 /OT1000 pieces. Note also that 843's can be made into "903's by substituting 903 crank with 843 rods special made pistons. 817's can be bored out 1mm (or larger if desired) to make an 843 as well.

pp. 119 and 120 regarding align-honing block main-bearing 8addles and connecting rod. big-ends : In this process, a very small amount of metal is ground away from mating surface of bearing cap and block or rod saddle resulting in a smaller diameter hole which is then honed or bored-out to original size specifications after cap is torqued in place.

pp. 119 just before lest paragraph in left column : After good "dry" measurements are obtained remove crankshaft and lubricate bearings/thrust washers before refitting and torquing main caps. Now "flip" crank over using only your fingers on the counterweights. If it won't "spin" freely at least one-half turn, something is wrong. Loosen one main cap at a time to locate a "tight" bearing and determine the problem.

pp. 119 regarding crankshaft and end-play at bottom of left column : Proper procedure for measuring is 1. insert large screwdriver tip at one side of center main-cap and lever crankshaft away from center bearing. 2. Measure clearance at one of the end main-bearings (between main-cap end machined edge of crank journal). 3. Move screwdriver to other side of center main and lever crank in opposite direction. Take second measurement at same end main-bearing as before. 4. subtract smaller figure from larger. End-play should be .010" maximum.

***pp.* 119 right column 2nd paragraph 2nd sentence, *(600/750 camshaft* bearings are not pressed into block but held by locator bolts like the rear cam bearings).**

pp. 119 middle of right column : After boring/honing cylinder, do not use solvent to clean them. Use water and detergent and then clean, oiled rags.

pp. 120 under "Pistons and connecting Rods", after first sentence : when rebuilding, .6mm (about .024") "over" your bore-diameter is usually a good safe piston size to order as it leaves room to bore again but is normally sufficient to remove grooves in cylinders caused by broken piston rings. Remember that size stated on piston box and stamped on piston crown is not piston diameter but rather the appropriate finished bore diameter.

***pp.* 120 figure-A should have looked more like figure-1 of this booklet (pp.84)**

pp. 120 bottom of left column end top of right column OT/1000 piston pins are "full floating" and not press fit into connecting-rod as stated.

***pp.120* right. Column starting at 13th line clown should read: Most original pistons have at least a slightly stepped top- except 600, 600D, and OTI000 (sec figure-1 of this booklet) making it obvious which direction pistons must face when taking note of combustion chamber shape in cylinder head.**

Note: piston or rod weights should not vary more than 1 gram.

pp 121 the end of first paragraph : If you find that piston and rod assemblies are quite difficult to install in block because piston ring installation chamber at too of cylinder bore is not exaggerated enough, use a self round-file to accomplish the desired effect your self (rather than returning to machine shop again.) Be sure to stuff rags in cylinder bores to catch motel dust. Light tapping with a hammer handle on piston crown (and some patience) is all that should be required to insert piston in bore. Incidentally, if you should ever hear a definite "snap" when installing a piston, always remove ring compressor and purchase a new ring to replace the one you just broke... As a precaution, crankshaft should be turned so that rod journal for cylinder you ere working on is in the down position. This helps avoid contact between connecting rod and freshly machined crank journal during installation. Use cheap and simple flat-cast-iron piston rings. Exotic design or alloys may break or fail to seat thus spoiling Your engine job. Ring end-gap should be . 0081" to .012".

pp.121 right column, at end of 1 st paragraph : Keep in mind that using a high performance reground cam sometimes necessitates machining off material (maybe .045" or so) from the undersides of rocker arm stands to cancel side-effects (geometry and adjustment problem). Also note that Abarth racing cams with rear roller- bearing can be installed in any block.

pp.124 the end of 1st paragraph: (600 *20mm/..80"and 850* 25"/1" pump gears). 600D/850 style pumps require oil-delivery tube blanking-plate to be fitted over hole in pump cover-lid/pickup when used in a 600/750 motor.

pp.124 under : "Timing Chain and Gears" see additional timing gear installation and alignment details on pp. 41 and figure 2 of this booklet.

pp.128 first paragraph: same style keepers : springs, & locator/retainer CupS

***pp. 1*28 Second paragraph see new info pp. 6 of. this booklet regarding pp.106 #8 of "Abarth" for information about Fiat 600 and Abarth 750/OT1000headbolts. Note that 850/903 bolts are 9mm fine tread, 750/OT1000 are 100mm course thread and 600/600D use smaller 8mm bolts. Also it should be mentioned, that Fiat made special offset "crows foot" wrenches in both 14mm and 17mm sizes, thus negating the need for one oddsize (14mm) bolt head to fitted behind thermostat housing on 903 engines. Finally, when Abarth bolts are fitted with two washers, the thin brass one goes against the cylinder head surface and thick hardened steel type between bolt head and brass washer. Don' t use oil on head-bolt threads or washers as torque values will be effected.**

pp.128 right column, middle of paragraph just before "The distributor should read (especially the left front cover).

Figure 7 will side in identifying and dealing with cooling system parts as described on pp 130, pp.132#11, and pp.155-136 of "ABARTH" as well as its parts interchange (pp.149,) and new materials in this booklet.

pp.131 #8 *1* Note that cylinder head locator dowels are only fitted to 8*50/903/*OT1000 engines.

pp.132 first two paragraphs Note that valve adjustment, distributor installation and timing adjustment procedures are explained in detail on pp:29 #3 and 42 of this booklet. Also note that about two three healthy squirts of motor oil from a lever-operated oil can is sufficient to aid piston ring lubrication with tight new engines.

pp.132 #10 regarding installation and adjustment of carburettor linkage : On 850/OT1000 models and conversion engines, grease linkage pivot pin on top of valve cover and install pivot arm (with cable attaching-sleeve or stud fitted), spacer/retainer washer, and clip or cotter. Fit return spring to arm and valve cover bracket. Grease linkage pivot ball on carburettor and snap on plastic socket with threaded rod and (loose) jam nut fitted. Adjust length of treated rod so that when inserted in arm hole, stop "foot" on valve cover 1/8" from touching pivot arm. Install rod retainer clip. Rock plastic socket back and forth on linkage ball and hold in position at center of travel while tightening jam nut (8mm open-end wrench). Original 600/750 engines have similar but non-adjustable throttle control linkage (see figure F pp. 138 for parts identification).

pp.134 end of #3 should read: Maybe noisy for a street car.
pp.134 middle of right column regarding distributor/oil pump shaft length headaches : Its possible to cure shaft length problems without disassembly of engine if motor has been put together with the wrong shaft length. If shaft is too long for your block, you can fit brass spacer washers between head and distributor housing. If your engine should ever "jump" distributor timing when you bit a pronounced clip or bump in the road, you knew shaft length is too short. Machining the base of distributor housing or making a "splined adapter" from an old distributor shaft-end end drive-shaft-end brazed together) to fit between drive shaft and distributor shaft can help take care of this little inequity,
pp.135 first sentence of "Cooling System" has two comma's missing : three-bolt water pump , fan , and shroud.
pp.136 10th line clown misspelling : or utilize a small filler/ header tank.
pp.136 second paragraph 7th line: will require a 1" section of the 600/750 hose .
pp.136 regarding thermostat housing and fittings for conversion engines:
see figure 7 of this booklet.
pp.137 "Exhaust System" : See figure 8, pp, 108 drawinng, & pp. 46 of this booklet for more details.
pp. 139 after third sentence in 2nd paragraph: see figure 5 of this booklet .
pp.141 right column should be all-one-paragraph.
pp.142 right column end of 1st paragraph : see pp 22. of this booklet for cable-adjustment and adapter-sleeve info .
pp.142 right column 2nd paragraph, end of first sentence add: (note that 850 disk is a slightly larger outside diameter but will usually clear inside of 600/750 pressure plate mounting flange.)
pp 142 1st paragraph of "Clutch" : see pp 66 and figure 9 of this booklet for diaphragm clutch conversion .

"ABARTH" Interchangeable Parts Lists : Corrections & Updates

"ABARTH"

Page	Part Description	Columns	Correction/Update
146	.. Carburetor Base Gasket	600 Notes	for Weber 26 IM
146	.. Engine Gasket Set	Fiat 600	907945 $5.80
148	.. Tappet-std.	Fiat 850	SAME(8req)
*149	.. Thermostat	A750/F600	4045626 $16.30
149	.. Thermostat	OT1000/F850	4154313 $3.30
149	.. Fan & Pu11ey Key	750&600 Notes... delete-NLA	
149	.. Hub for Plastic Fans	600 Notes ... late 600D same as 850	
149	.. Fan Cooling Shroud	750&600 Notes .. delete information	
151	.. Input/Clutch-Pilot Shaft .. 750&600 Notes..late type(early NLA)		
151	.. 3rd Gear	A750/F600	NLA(old# 875487)
151	.. seal for Inner Boot	750&600 Notes..600D seal-40001150	
*152	.. Axle Shaft	A750/F600	early 23mm axle-NLA
*152	.. Axle Shaft	A750/F600 ... 24.34m axle-4009303	
*152	.. Axle Shaft	750&600 Notes.. 600D axle-4061138	
*152	.. Sp1ined Ax1e-Attaehing Sleeve..A.750/F600	for 23mm-878272	
*152	.. Sp1ined Ax1e-Attaehing Sleeve..A750/F600.. for 24.34mm-4095427		
152	.. Snap Ring to Retain Axle .. 750&600 Notes..for 24.34:mn axle only		
152	.. Tie Rod Ends	750&600 Notes..early type(late NLA)	
152	.. King Pin Set	750/600/OT1000/850..1900637	$16.60

***152 .. Leaf Spring (Lower)Bushing..A750/F600..... 4007967 $3.50**
152 .. Leaf Spring (Lower)Bushi_g..0T1000/F850 ..... 4140008 *$6.20*
152 .. Inner Front Bearing Seal ...OT1000/F850..... SAME(2req.)
***153 .. Collapsible Bearing Spacer..A750/F600 ..... 986842 $1.55**
153 .. Wheel Cy1inder- Front .....750&600 Notes..600D-4394465 $18.20
153 .. Wheel Cylinder- Front.0T1000/850 Notes.850 Sedan-4379471 $11.00
155 .. Fuse Box.....F600 ..... SAME
155 .. Wiper Rheostst .....OTIOOo/850 Notes ..67-72 Spyder
156 Revised Spark Plug Recommendation Chart:

Brand Name	Abarth *750* Pushrod	Fiat 600/600D	Abarth OT/OTS 1000,1300/124	Fiat *850* Sport A112Abarth	Fiat 127 A112
Champion	L-5, L-4J	L-7J	N-6Y	N-7Y	N-9Y
NGK	B-7HS	B-6HS	BP -8ES	BP-7ES	BP-6ES
Lodge	2HN	HN	3HLNY	25HUIT	HLNY
Bosch	W225T1	W175T1	W260T30	W200T30	W175T30
Marelli	CW-7N	CW-6N	CW-8LP	CW-78LP	CW-7LP
Abarth	AB200	AB175	AB260LY	AB230LY	AB200LY

158 .. Fiat 600 Front Grille with Emblem .. 889868 $4.55, Upper & Lower Grille Whiskers .. 884321(4req.) $2..90, Center Wiskers .. NLA(2req.) 158 .. Fiat 600D Hubcap. .411722?(4req#) $12.90 159 .. Motorsport Imports .. Note: 600/850 & 127 cog-belt kits differ.

. Denotes a major error :in. "ABARTH" Interchangeable Parts List.

New Listings for "ABARTH" Parts Interchange

Page # Part Description A750/F600 OT1000/F850 Notes
147 .. Connecting Rod... 88822(4req.) $7.25 425683 $13.5 843
427731 $23.5 903
147 .. Conn Rod Bolt..... 884067(8req) $.30 .... 4187674 $1.45
147 .. Rod Bolt Nut..... 12566220(8req) $.55 . . ----------.....
148 .. Replacement Pistons. 66-5765 Borgo-600D.. *66-6210* Borgo-817cc
(62mm ... oversize) ... (64mm + oversize)
148 .. Exhaust Valve ..... 4064702(4req) 54.15-600D(23.5mm) may fit 750
148 .. Valve Spring..... 898327(8req) $1.20..use A12/127 Abarth
to OTI000(16req)
148 .. Valve Spring- Outer.. .....4208869(8req) $2.15
148 .. Valve Spr_- Inner.. .....4183703(8req) $.95
148 .. Rocker Arm ..... 991327(4req) $5.90. .4189130(.4req) $4.30
99I328(4req) $3.65..4189131(4req) $4.30
148 .. Push Rod..... 880904(8req) $2.00..4130697 $7.00 843
4109429 $2.10..903
149 .. Fan Shroud Clamp Ring.....4109842 $1.65 .....
149 .. T .Stat. Housing Lid/Water Outlet ..... 4100580 $9.05 . to mid 68
4187098 $6.55 .. 69-73
150 .. Intake Manifold... _. NLA(use aftermarket) ... 4226436. $28.00
***150* .. Flywheel Ring Gear .. NLA(use 4113558 fly- ..4109024 $15.55**
wheel complete $86.75)
151 .. Speedometer Cable ... see.pp.91. of FAT 4136084 $9.40
155 .. Combination Light/Wiper Switches(3-inch)..4204126 $13.00-coupe
155 .. Heater Fan Switch ... .4294181 $2.75

160 Vandervell, Clevite, AE, Repco, & Glacier are good alternate sources .to try for Fiat engine bearings.
- 160 other Abarth clubs are located in : England, Germany, France, Sweden, Japan.
159-160 ADS & PES are out of the Fiat business and most of the other
listed sources no longer supply much for the early cars. See pp. 81-82 of this booklet for good new sources....

Fiat-Abarth “Bialbero” Engine

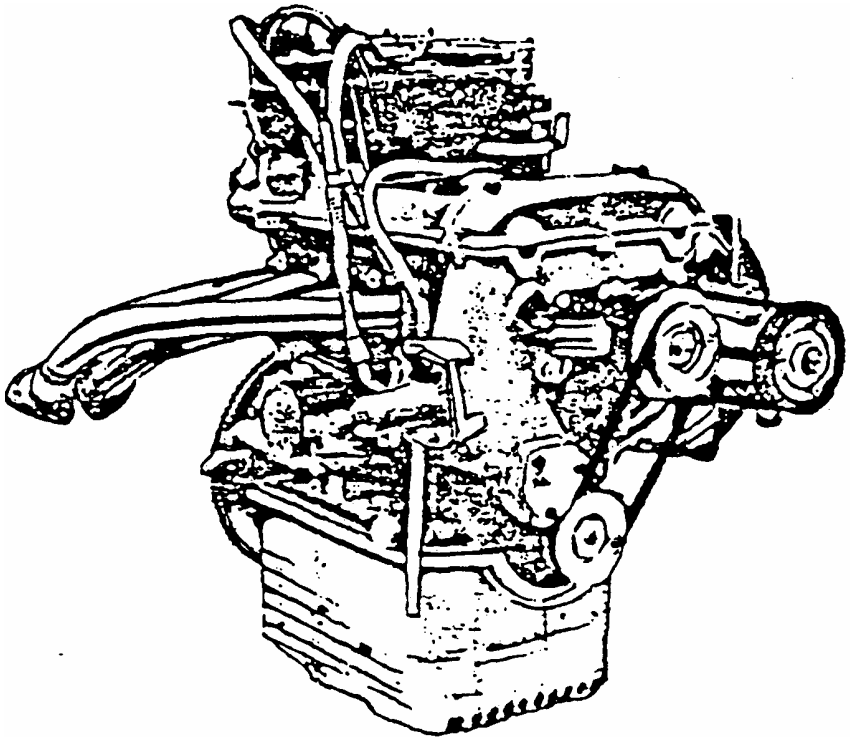
"Bee al bier o" Means 'two shaft'

In the beginning there was a dual over-head-cam Fiat-Abarth engine which utilized the basic Fiat 600 cylinder block and very few other original Fiat pieces (see figure 22 and photograph on page 12 of ABARTH). Bore and stroke specifications were altered to produce either 750 or 850 cc. This engine had dual two-barrel downdraft Weber carburettor cocked half - sideways atop short manifolds between the cams. It used the standard Fiat" long water-pump" and engine-driven fan. Next came the cross-ram manifolds, still feeding between the cams, but using dual twin choke sidedraft racing style Webers (see photographs on pages 56 and 57 of ABARTH). Finally, the side drafts were attached to short manifolds on the right side of the head to achieve a more conventional "cross-flw' style intake/exhaust tract. This engine looks quite similar in layout to an Abarth Simca 1300 (see page 80 of ABARTH). A short Wate-rpump without an engine driven fan was fitted for use with a front mounted radiator and electric fan. Along the way, 700 and 1000 cc displacements were adopted to suit various racing classes. Fiat cast special books for for the twin-cam and push-rod 1000 cc engines which would allow a larger cylinder bore of 65 mm. Early-on, these exotic "mini-rotors" cane in the Zagato bodied Record Monza and later they were fitted to the front radiator equipped Abarth-made Bialberos and a group of small bore "sports racers"*.

Twin earn engine parts are very difficult t to get. I don't think any DOHC pieces have been made for about fifteen years. Some early motors use standard 600 : train and rod bearings, connecting rods, piston pins, timing chain and gears for the jack earn, water-pump and pulley, fan and shroud, generator, oil pump, front crankshaft seal rousing, oil filter canister, rotor mount, and Sate of the nuts, bolts, washers, bushings, gaskets and seals. A 600 cylinder block, flywheel, clutch, fuel pump, and oil pan could probably be made to work on the early twin cams with slight modifications. Late "cammers" use nothing that would qualify as a standard Fiat part except perhaps the oil pan gasket. Unless you can get parts "special made" (see page 82), you nay have to settle for a pushrod engine conversion....

*** 1960 750 Tubolare**
1962 1000 Tubolare
1965 1000SP Barchet ta
1969 1000'Millino

750 rev limit: 7000rpm
1000 rev limit: 7800rpm



750 DOHCMotor

CHAPTER 2

POWER UNIT REMOVAL, INSTALLATION, STARTING, ADJUSTMENTS, AND BREAK-IN PROCEDURES

Power Unit Removal

One of the nicest features of most rear engine Fiat and Abarth models is the ease with which the motor can be removed and handled. The removable rear body/engine mount panel allows the job to be accomplished by one person with the aid of only a small floor jack. In addition, the number one cylinder exhaust header pipe and water pump housing serve as a perfect set of handles to jocky the lightweight engine around making these vehicles ideal "hobby cars." Allemano Coupe and some Record Monza/Bialbero Models though, have a non-removable rear panel thus requiring that the motor be dropped out the bottom like a Volkswagen Bug or 356 Porsche (have you noticed that the Record Monza is almost a 3/4 scale look-alike for the old Porsche coupes) or lifted out the top. The late model Monza also has a one piece non-removable firewall panel which requires removal of bellhousing-to-engine and starter motor colts from under the car.

For all models I recommend placing the car on a level cement surface to allow the floor jack wheels to move better when the engine is rolled out the back. Also, it is an excellent idea to remove the engine compartment lid (or at least insert a safety prop). Besides providing improved access, you eliminate the change of a poorly supported lid falling on your head. The parking brake (if operational) should also be securely set.

The following sequences are designed to be quicker and more precise than repair manual procedures ; especially if a friend reads the steps as the mechanic works.
For Pushrod Engined Fiat 600-Based Vehicles with Removable Rear Body Panels:

.*Under Front Hood:

1. Remove battery cover thumb screws. t cover (if cover is still in place). Disconnect and isolate negative cable and from battery. Remove fuel line hose (will stop tank from siphoning later) from gas tank outlet pipe and plug (a wooden golf 'T' works well) pipe and hose to avoid contamination.
***At Sides of Car:**

2. Place blocks in front of and behind left front tire. Jack car up from a point beneath right door sill and just in front of right rear tire and support chassis with a safety stand.
***From Beneath Car:**
Remove flywheel and clutch lower dust shield (10mm heads on 3 Bolts) and lower cooling /engine compartment shroud (see Figure-11, or for cars with auxiliary or front radiators, Figure-D. Page 136 of "Abarth" book),
if these tin pieces are not already missing (7mm head sheet metal screws).
Loosen oil drain plug a little (17mm socket and large breaker bar) but do not remove at this time. Disconnect bottom hose at radiator and drain engine coolant into a large pan. If an auxiliary or front radiator is fitted, remove water pump hose from car.

***From Above and Behind Car:**
On Berlina models, remove rear bumper and support brackets and/or deck lid props when fitted. Remove one lower bolt/nut/washer and then two upper attaching nuts and special serrated flat washers from studs on right side rear body/engine mount panel (power unit ground strap should be fitted to top stud as well). Unbolt muffler unit at exhaust header flange(s) and sump support bracket(s). After unscrewing exhaust trim panels (see Figure- 11), muffler is withdrawn from beneath (many muffler shroud panels have been cut away to facilitate installation of a non-standard exhaust system). After stuffing a rag in water pump inlet, removing pan & lowering car may be necessary to momentarily jack up left side of car if muffler could not be jockeyed out with right side raised. Remove sheet metal screws (7mm heads) which attach lower rear portion of muffler shroud panel (if intact) to left side of removable rear body panel. Reach under sump and remove plug to drain engine oil into a pan. Replace plug hand tight.
***In Engine Compartment:**

3. Detach distributor vacuum, crankcase breather hoses, air cleaner support strap(s) and loosen clamp ring before removing cleaner assembly from carburettor intake. Loosen both top water hose clamps and slide hose back off radiator inlet pipe. Remove large rear motor mount nut (17mm socket), washers, and upper rubber doughnut. Support engine from center of oil sump with floor jack. Remove two attaching nuts and washers and one lower bolt/nut/washer from left side of removable rear body panel. Disconnect license plate light wire (except some Berlina). Jack engine up until contact is made with body (at transaxle bellhousing) and maneuver rear body panel out of car. Immediately wrap rear panel with a blanket and store it in a safe place so it's not damaged. Lower engine to normal position, place a small jack beneath rear portion of transaxle and raise it slightly to relieve some weight from floor jack (this is important:
***Continuing in Engine Compartment:**

4. Disconnect fuel supply hose as it enters fuel pump and
allow to drain into small can. Plug hose (wooden golf 'T') to avoid contamination. Detach accelerator and choke control cables, temperature sensor wire, two generator wires, distributor primary wire and high tension cable and tuck them out-of-the-way to avoid entanglement. Disconnect low oil pressure wire at sensor (600) or oil pressure gauge supply hose fitting (Abarth) at steel tubing.
Some Berlina Corsa competition models have a half dozen or so oil lines relating to remote oil filter/ cooler/pressure regulator and crankcase breathers to disconnect and plug.
***Within Passenger Compartment:**

5. Tilt rear seat forward (Berlina) or remove rear cargo area trim panels (Coupe and Spider) and then remove floor mats, carpet, and insulation padding from behind. Remove five sheet metal screws (7mm heads) securing transaxle/starter cover and carefully pry off cover (frequently stuck to body). Remove two starter attaching nuts and pull starter forward (wiring. and operating cable can remain attached if starter requires no attention) and wrap a rag around it before locating it in a secure position atop transaxle case. Remove four large (19mm heads) engine-to-bellhousing attaching
bolts with lock washers.
***4-At Rear Again:**

6. Using gloves or rags to protect your hands, grasp exhaust header with left hand (palm up) and underside of water pump housing with right. Lift slightly and pull toward rear while rolling engine backwards on floor jack. Balance engine on jack before lowering and removing from jack. Run a piece of mechanics wire through an upper bellhousing-to-engine mounting hole and an available hole in firewall to hold up rear
of transaxle before removing small support jack (letting transaxle hang unsupported will ruin shift linkage coupler and transmission mounts).

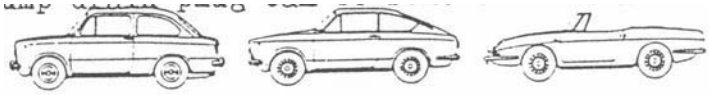
For Fiat 850 Spider and Coupé Based Vehicles with 850-Based

Engines (Sedan models and 'radiale' engined cars differ slightly) :

***Under Front Hood :**

1. Remove battery cover plate (two plastic thumb nuts) and disconnect and isolate negative cable from battery. If optional large capacity Abarth fuel tank is mounted in front, fuel outlet pipe/hose should be disconnected and plugged.
***At Sides of Car:**

2. Place blocks in front of and behind left front tire.
Place floor jack in front of right rear tire (under suspension mounting bracket), lift car until tire is almost ready to loose contact with ground, and support , chassis with safety stand.
***From Beneath Car:**
Use 10mm socket with long extension to remove flywheel and clutch lower dust shield bolts (3 bolts, if intact. Note that right bolt also attaches power unit ground strap).
Remove lower cooling/engine compartment shroud (7mm head sheet metal screws) if intact. Loosen oil drain plug (17mm) a little but do not remove at this time.
Drain coolant into a pan by disconnecting bottom hose at radiator. Radiator cap should be removed after most of the coolant has drained out. Leave the drain pan in' place for now. Water pump drain plug can removed to evacuate trapped fluid.



***At Sides of Car:**
On pre-1972 Spider based models, remove bumper tip securing bolt located inside right rear wheel well (13mm socket). Remove safety stand, lower car, switch blocks to right front tire, jack up left side of car in front of rear tire and support with safety stand. Remove left bumper tip bolt.
***From Beneath:**
Remove muffler heat shield bolts (7mm head sheet metal screws) if intact. Some jockeying around may be necessary to remove heat shield from car as muffler and body interfere. Lower car.

***From Rear (or sides) of Car:**
On 72-73 Spider based models access to bumper tip bolts is provided within engine compartment by removing coolant recovery tank on right and access plate/windshield washer bag-holder bracket on left. With a Coupe simply loosen bumper tip retainer bolts a couple of turns with 13mm open- end wrench from within bumper tip bracket itself.

3. Detach small direct-crankcase-vent hose and larger valve cover vent tube from underside of air cleaner. Remove air cleaner lid, 3 (10mm socket) lock nuts with retainer plate, and then air cleaner housing from carburetor intake (Sedan differs). Loosen top hose end slide *it* back off of radiator inlet tube. Carefully remove fragile heater hose from thermostat housing tube (two very large well-placed screwdrivers will help to lever it off a-little-at-a-time). Remove fan shroud clamp ring (10mm socket & 10mm wrench) & peel back rubber bellows. Use white adhesive tape (especially on 70-73 Spiders and all Racers) to label wires for: stop, tail, turn, license, and backup (early 68-on) lights before detaching. Remove bumper mounting strap bolts (straps

project forward through rear body panel and are attached to sides of rear engine compartment by two special serrated locking type bolts on each side). A Coupe or Sedan bumper may now be removed by merely sliding it rearward. On Spiders, remove large nut, bolt, washers and upper rubber doughnut from rear motor mount (lower bolt head must be held with a vice grip pliers or 17mm box-end wrench to facilitate removal of top nut with. half-inch drive 17mm socket /extension/ ratchet. With a Coupe or Sedan* first detach engine mount torque strut (see Figure-12) from left side of rear body panel and then remove 17mm lower spring mount retainer nut (do not remove top spring mount nut unless you plan to replace inner rubber doughnuts, spring or center stand parts). Now with all cars, support engine lightly from center of oil sump with floor jack. Remove six rear body panel attaching nuts, and special serrated flat washers (on Spiders a special ratcheting 13mm box-end wrench works well on the top nut on either side, while others can be removed with thin-wall 3/8" drive deep socket and ratchet). Jack engine up just enough for motor mount to clear rear body panel mount perch. On Spiders, wrap rags around bumper tips at sides of both rear fenders to keep from scratching paint.

*** Sedans have a removable upper-rear-access-panel to unbolt first (10mm socket for 2 nuts & 2 bolts).**

Now pull body panel rearward with your hands (tap with rubber mallet if necessary) and remove from car. Cover it with a blanket and store in a safe location.
***From Within Engine Compartment:**

4.Disconnect fuel pump inlet hose and insert a wooden golf 'T' in hose to stop leakage. 1970 and later models with closed fuel vapor system should have gas cap removed momentarily to relieve pressure before removing fuel line. Also, fuel line usually needs to be tied or wired to left side of inner body to preclude interference on engine removal. Disconnect accelerator and choke control cables and tuck them out of the way. Drain motor oil into a pan & replace plug hand tight.

Detach two generator wires (cars equipped with alternators have 3 connections). Remove two nuts (17mm socket) and four large flat washers and pull generator or alternator rearward while slipping belts from crankshaft and water pump pulleys. Now
use a 3/8" ratchet, deep 13mm socket and long extension to detach one heavy black cable and one or two heavy brown or grey wires from starter solenoid post. Use same setup (about 24" of extensions J, to remove three starter mounting nuts (a flashlight may be helpful to locate nuts). Unplug push on connector to remove red wire from s tarter solenoid. Three lock washers will fall on ground as you pull starter out of car. Detach tempeature sensor and oil sensor(s) (Spider = 2, Coupe/Sedan = 1) wires, distributor primary wire and high tension cable (at the coil). Pull generator and temperature sensor (coil wire from ignition switch also Before 90) wiring harness forward and to the right to locate it behind radiator filler neck so that it's out-of-the-way.

5.Lower engine as far as. floor jack will allow. Use 19mm box end wrench with suitable length of pipe slid onto end to increase leverage while removing two upper engine-to-bellhousing mounting bolts. Jack engine back up near its normal installed position. stuff a rag into water pump inlet & remove coolant drain pan.
***From Beneath Car:**
Use 1/2" drive ratchet and leverage pipe, 19mm socket, and short extension to remove remaining two (lower) engine mounting bolts. On right side you will need just the right length extension and proper leverage to remove bolt as radiator cowling is in your way. Now support transaxle at rear with small jack and lift slightly to remove some of weight from floor jack (important).

***At rear:**

6.Using gloves or rags to protect your hands, grasp number one cylinder header Pipe with left hand (palm up) and underside of water pump housing with your right. Lift slightly and pull rearward as you roll the power unit backwards out of the engine compartment. Balance engine on jack before lowering and removing motor. Tie a piece of mechanics wire through upper left bellhousing bolt hole and fuel sensor access hole to support transaxle before removing support jack.

Next time try it for speed. About 30 minutes is an excellent time. . .

Power Unit Installation

These procedures are suitable for a fully assembled and "prepared" rebuilt (original or conversion) engine (see Chapter 12 or 13 or "Abarth" book). The preceding engine removal sequence should be consulted if uncertainty regarding installation steps is encountered.

***When* the motor is being installed there is a natural excitement about getting the car running for the first test drive. For this reason and as a matter of convenience, I recommend checking several items before starting the installation. In this way, you will not become rushed near the end and overlook details which might spoil or delay your job.....**

Check brake fluid level, and if low, the presence of fluid leakage at master or wheel cylinders. Pump brake pedal a few times to make sure the system is holding pressure. Check battery condition (water level, charge, clean battery posts and cable connections. See pp. 56). Especially on 600-based models, use a flashlight to check inside of gas tank for rust, excessive sediment, or water. You might want to remove fuel gauge sensor, float and fuel pickup pipe/screen assembly which is sometimes clogged with rust and debris. Be very careful with fragile sensor attaching studs which are easy to snap off (use penetrating oil on them before removing nuts). If rust is apparent, it will be necessary to remove tank and have it filled .with an acid bath solution to remove scale that might later clog fuel lines and carburetor jets. (Note: Some radiator repair shops have facilities to clean fuel tanks). Sometimes a rust clogged fuel pickup screen will need to be replaced or discarded and an inline fuel filter installed to take its place. 850 based cars do not suffer these maladies as often, but it's still a good idea to check because gas tank access on these models requires that power unit and transaxle be removed first. Also make sure that you have at least 3 or 4 gallons of fresh premium fuel in the tank for initial starting and test drives (you might want to drain tank first if car has been setting a long time and fuel has "gone bad"). Radiators should nearly always have their tanks. removed and cores rodded out* at a radiator shop. Check throw-out-bearing condition by applying forward pressure while rotating bearing. Dry, rough, or sloppy bearings will require replacement. As a matter of fact, it is a good policy to always replace this inexpensive piece as a noisy bearing will require engine removal later. Grease should be applied to the surface that bearing collar slides on when in use. Check to see that operating fork-to-collar retainer clip is in good condition and properly fitted & greased. This is good time to add or change transaxle gearlube (gearbox must be level). Axles, sleeves, couplings, and axle boots should also be checked and if necessary replaced now. (See pp. 49 for axle checking and replacement procedures). Check that two transaxle-to-engine locator dowels are in place in lower engine block mounting bolt holes and use duct tape to hold upper flywheel dust shield (see Figure M, pp. 143 of "Abarth") to rear of block during engine installation.

*** Note. Some radiators came from the factory with excessive amounts of solder present within their cores which restricts flow & later hastens premature clogging. "Boiling out" doesn't disolve it!**

Also: External fins are often packed With grease which blocks air flow.

If you haven't already, now is the time to fill the engine with motor oil (see pp. 37 for recommendations and procedure), Unscrew carburetor lid and lift it high enough to allow float bowl to be 1/2 filled with fuel (unnecessary if electric fuel pump is being used). Replace lid, tighten screws and wipe away any spillage. Slide new top water hose and clamps onto cylinder head outlet pipe (or thermostat housing lid) but do not tighten.
Remember that car should be on a level cement surface.

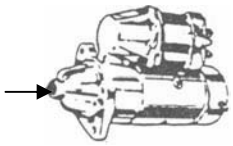
Installation Procedures for 600 Based Cars with Pushrod Engines and Removable Rear Body Panels:

1.Block front wheels and set handbrake.

***At rear:**
Support transaxle in level position with a small jack and remove your bellhousing support wire. Place engine on floor jack and balance it with middle of its sump resting on jack. Roll engine into back of car jacking it up as necessary for clearance and finally reaching a height and level position that will allow transaxle input shaft, to enter greased crankshaft pilot bushing. Using gloves or rags for your hands, lift motor slightly by exhaust header and water pump while pushing forward and rocking engine side to side as input shaft and then locator dowels enter their final positions. (Hopefully, if taped-on, flywheel dust shield will not falloff a few times while trying to accomplish this). Frequently, input shaft splines will' not be in alignment (especially course-spline Models) with clutch disc splines which causes engine to stop moving forward before locator dowels are engaged. Either moving input shaft just slightly or rocking engine from side to side while pushing forward (with transmission in gear) should solve this little problem. Care should be taken not to "hang" or rest engine heavily on pilot shaft and throw-out-bearing contact-ring (held onto clutch pressure-plate) during installation. Contact ring attachment is somewhat delicate.

***From Inside Car:**

2. Install and tighten four large bellhousing-to-engine attachment bolts (19mm) with lock washers (2 longer bolts go in bottom holes). Replace starter motor dust shield plate and then starter itself (2 nuts and lock washers). If starter was removed completely you will need to attach two electrical cables (large black battery cable and heavy brown wire: also rubber protector boot) to threaded brass post near starter control lever arm. Also control cable must be attached to the arm. Select adjustment hole in cable bracket that allows starter lever a small amount of play before starter engagement. On those cars that have been converted to a 600D starter, a conventional solenoid has replaced mechanical lever arm and an electrical wire with plug-in "bullet" connector replaces control cable and is run from a late model combination ignition, and starter switch. Lever on floor is then relegated to the role of "a trim item."



600D starter

Also from inside car, check visible condition of clutch cable (broken inner cable strands or damaged outer cable housing) and watch for smoothness of operation and flexing of center support/locator plate (see Figure-10) as someone operates clutch pedal for you (initial cable adjustment may be necessary for checking purposes).

I nearly always replace old clutch cable with latest 600D improved type and beef up center support/locator plate (see Figure.10 and pp.66). Check that clutch return spring is properly fitted and in good condition. You cannot get along without this .spring because it also helps to hold special cable-attachment-pin and retainer bracket (see Figure-10).
Install transaxle/starter motor access-cover-panel(five-7mm head sheet metal screws and special serrated flat washers. Larger screws necessary If Clips are stripped out). Perfect contact of cover panel rubber-sealing-gasket is essential if engine heat, fumes, and noise are kept from entering the passenger compartment. Replace all insulation padding, floor mats, and rear cargo area trim panels *(4* Pivot rear seat-back into normal position on a Berlina).

*** From Beneath:**
Remove jack from beneath transaxle, leaving floor jack under engine.

***In Engine Compartment:**

3. Although on 600-based cars, generator and drive belts could have been fitted before engine installation, now is also a convenient time to do this job. When you are seated on a suitable stool, motor if located in perfect position while rear panel is not yet in place. Fit water pump belt into forward-most generator pulley groove and crankshaft pulley belt in rear-most generator pulley groove. With belts "hanging" in pulley grooves, slide assembled generator and mount bracket in position to rest upon water pump housing. Tilt pulley end of generator down to allow belts to be slipped over crankshaft and water pump pulleys. Now slide generator forward and onto bracket mounting studs. If you already have correct belts for your setup this is an easy job. See pp. 35 for proper belt adjustment procedures. Attach two generator wires (posts end connectors ere different sizes to assure correct connection.) with protector boots, distributor primary wire (from D, CB, or negative post on' ignition coil to distributor plastic terminal with threaded stud), and coolant temperature sensor _ire with protector boot. Install new fuel pump supply hose between delivery pipe (exiting firewall) and engine. Allow enough slack in hose to accomre0date engine movement. Plug-in coil high-tension wire and use tie-wraps or plastic wire loom clips to neatly route and retain spark plug wires in a manner that will avoid fouling or chafing against other components. With 600's, attach low oil pressure sensor 'wire with protector boot. On original Abarth, connect a new oil pressure gauge supply hose, and on conversion engines (see pp. 141 and Figure I of "Abarth") attach appropriate wires or high pressure hoses as necessary.

4. Jack engine up until bellhousing contacts body at firewall. Slide engine mount stand and large lower rubber doughnut onto rear body panel stud (see figure K, PP.141 and 143 or ,"Abarth") and manoeuvre panel and mount into installed position.
Fit four special serrated flat washers onto panel mounting studs, taking care not to forget ground strap attachment between top right stud and upper fan shroud mounting bolt on water pump, and pull up and tighten nuts a little at a time. How install two lower bolts/nuts/washers attaching panel and body at each bottom corner. Lower engine and remove floor jack. Install upper rubber doughnut, large flat washer, lock-washer, end tighten nut with 17mm socket. You may Want to touch up any scratches that occurred on bottom of a tin oil pan with some black spray paint.

***Note: never allow generator wires (#67 & #51) to reversed. Immediate damage will occur....**

Make sure 850-based carburetor linkage rod length is properly adjusted (bottom pp.9 for procedure). Remembering that, depending on valve cover style, some conversion engines will require shortening of throttle cable steel tube as it exits the firewall and a longer inner cable wire (see pp. 138-139 of "Abarth"). Check, straighten, or replace and lubricate accelerator cable wire (for 850-based cars see procedure.-PP.47). With rubber dust boot fitted to cable wire, slide outer cable housing-end into retainer bracket register on valve cover while threading inner wire through hole in pivot stud or sleeve (see. pp. 139 of "Abarth"). Secure outer housing-end by metal screw and plate clip (750/600) or snap ring clip (850-based and conversion). Force rubber dust boot over end of outer cable housing. When tightening pinch bolt, see that there is at least 1/8" of slack in wire between pivot stud or sleeve and pinch bolt (wire must be pulled to rear and then released to remove excess slack in cable and associated linkage). This is necessary to allow for engine movement during acceleration and shifting. As an added touch, I like to remove about 3/4" of insulation from a piece of 16 gauge electrical wire and slide it over bare cable wire end (saves you from being stabbed when working in engine compartment. Check, straighten, or replace and lubricate choke control wire keeping in mind that cable will be too short on conversion engines (see pp. 139 and Figure G of "Abartht"). Also, lubricate all carburetor mounted linkages, and inside the car; choke and throttle control pedal/pivot housings. Now slide outer choke cable into register or bracket attached to carburetor assembly while threading inner wire through cloke pivot arm pinch bolt hole. After tightening outer cable retainer bolt, provide "pre-load" by lifting driver operated handle about 1/4" off of its stop. Now while holding carburetor-mounted choke pivot-arm in fully open position, tighten choke wire pinch bolt (pliers and 7mm wrench). In this way you can be sure that when you want the choke off it is off. Test the operation to see that it works fully and smoothly (see pp. 130 of "Abarth" for linkage & spring details).

Attach license plate light wire (except some Berlina models). Then slide top hose onto radiator inlet pipe (for conversion engines see pp. 136 of "Abarth" regarding top hose to radiator inlet reducer sleeve) and tighten clamps. On motors with vacuum distributor advance, install a new hose between carburetor and distributor fittings.

5.Jack car up from in front of right rear tire and support with a safety stand.

*** From Beneath:**
Check condition of rubber shift linkage coupler (see Figure.14 and pp. 48) and transaxle mounts (Figure-11), Watch coupler and mounts along with clutch cable center support/ locator(fig.10)as someone operates shift lever and clutch pedal from inside car. Oil soaked, softened, cracking, or split rubber parts, damaged mount brackets/crossmember, or excessive movement of drive-line(pp.68&Fig13) or cable support(pp.66)should be attended to now. Also, it's a good time to adjust handbrake (see pp. 54 and Figure-16) *if* driver operated control lever moves more than 5 or 6 clicks before locking rear wheels, adjustment is not optimum.
Install new lower and front or auxiliary radiator (if fitted) hoses and while you're at it check condition of water pipe hangers (if fitted). Fit lower flywheel/clutch dust shield (3 bolts with 10mm heads - frequently necessary to retap stripped threads and install 1/4"x20 American bolts). Install sheet metal screws that hold muffler heat shroud panel (if intact) to rear body panel.

***In and Beneath Engine Compartment:**

Using new exhaust flange gasket(s) and bolts with brass nuts and lock washers, attach muffler to exhaust header (may be necessary to raise left side of car to position muffler properly). ,Fit muffler support strap to rear bracket on original tin oil pan(or on conversions with cast sumps, attach to special made bracket - see pp. 137 and Figure E of "Abarth") and then to attachment ear at right rear corner of muffler. Install exhaust trim panels with sheet metal screws where exhaust pipes poke through the muffler shroud panel (see Figure- 11). I'd think twice about using the asbestos trim plate gaskets, as asbestos could conceivably flake off and be transmitted by original 600 style heater ducts into passenger compartment. Remove support stand and lower car (except for cars with front radiator). Make sure water pump and radiator drain taps are closed before filling cooling system with plain water (temporary). If your car has a front radiator it will necessary to either open the bleeder fitting (if provided) at top surface of front radiator or jack rear end of car up high to facilitate partial release of air bubbles from system. Do not fit radiator cap or lower cooling and engine compartment shroud (see Figure- 11) *as* yet.

***In Front:**

6.Connect fuel supply hose to gas tank (if removed). Check to see that all electrical switches are in 'off' position and attach ground cable to "prepared" battery (see pp. 56 and *70* regarding battery preparation and conversion). Now in engine compartment, remove distributor cap and with ignition points closed and ignition switch 'on' flip points open a few times with small screwdriver tip while watching to be sure that you have “fire” to the points.

*** In Front:**
Jack up car from center of front leaf spring and place safety stands under chassis behind each front wheel. Remove suspension splash shield (if intact) and adjust clutch pedal free-play by loosening jam nut and turning adjuster sleeve-nut until about 1 inch (or to suit your driving preference) of free pedal movement before clutch starts to disengage. If you have used a particularly thick clutch disc lining material, it may be necessary to fit a spacer sleeve onto cable-end before installing adjuster sleeve-nut and jam-nut (see Figure-10 for parts identification). Look for brake master cylinder leakage before refitting suspension splash shield and lowering car.

Installation Procedure for Fiat 850 Spider and Coupe Based Cars with 850-Based Pushrod Engines(Radiale engines differ in some details).
First read introductory installation paragraphs on *pages 18-19.* Then check condition of: 3 starter Mounting studs on transaxle bellhousing, clutch cable and return spring, transmission mount brackets (I recommend strengthening modifications - see pp. 67 and Figure-12), and engine mount perch on rear body panel (frequently Spider models will require rear panel/mount perch repair. See pp. 67 and Figure-12). Remove throw-out-bearing pivot arm and grease pivot-ball and arm socket. Late U.S. models ('70-'73) with pollution control equipment can conveniently have all smog hardware removed if a '68 or '69 model engine has been fitted to the car ..... (see details on pp44). Fit all new fuel line (6mm fabric-braided hose) and clamps between gas tank and fuel pump supply pipe as it exits left firewall. These seldom-replaced hoses are frequently rotten and can be difficult to change with engine installed.

Installation Step #1 is same as for 600 based cars (See pp. 19).

***Reaching Forward From Behind and Below Engine:**

2.Install two (long). lower engine-to-bellhousing mounting bolts (19mm socket and extension) with lockwashers. Then remove transaxle support jack.

***From Behind and Above:**
Lower engine as far as floor jack will allow and install upper (short) mounting bolts (19mm box or open-end wrench). This is a very good time to check or replace clutch cable and/or return spring and to pre-loosen cable jam nut for later adjusting (10mm open-end wrenches) as poor access will make these jobs more difficult later. Also, cable-end threads can be sprayed with WD-40 to aid in adjustment sleeve movement. Raise engine back to level position. Install starter being sure to fit lockwashers. 13mm deep socket and very long extension(s) can be used to insert, start, and tighten the three nuts. Plug in red solenoid wire and then attach large black cable and large brown wire (or 2 grey or brown wires with an alternator) with protector boot to threaded post on solonoid.

3.Follow Step #3 - pp. 20 of procedure for 600-based cars as well as the following supplementary information. For late model cars with alternators there are four wires to attach rather than two (2 thick grey wires fitted to threaded post-also with radio suppression condenser ,wire-and protector boot j yellow w/ plastic covered female connector plugged into plastic male socket; small grey w/ bare female connector pushed onto remaining bare spade connection). Early ('66-'69 cars have ignition coil attached to rear body panel and, therefore, it's wiring must be attached later. Late ('70-'73) models also use an external ignition coil ballast resistor. See #5, pp. 35. if you have any doubts about the more complicated coil wiring on these models. (You may melt points or be unable to start car if wiring is wrong). Long coolant temperature sensor wire with protector boot is green in color and plugs into top of water pump by-pass banjo fitting retainer bolt on cylinder head. On late cars, coil high tension and primary wires should be routed through retainer/insulator gromet fitted to bracket atop fan shroud housing (these relocated ignition coils require long wires). Spiders have two oil pressure sensors (see Figure I, pp. 140 of "Abarth") and Coupes one.
To test if you have Spider sensor wires fitted correctly, turn on ignition key and if oil pressure gauge immediately pegs itself to right, you have wires switched. (Usually the wire that is slightly shorter and has a large rubber protector boot fitted to it, is the one that goes to low-pressure warning light sensor) .

4.With Spider-based models, jack up engine until transaxle bell housing makes contact with firewall. With rags wrapped around bumper tips and plastic mounting gaskets in place and located by rear body panel attaching studs, start to insert body panel/ motor mount perch into position (sometimes jack must be lowered just slightly for panel to clear muffler tail pipes».
As panel is moved into place, insert mount stand sleeve and large lower rubber doughnut between panel mount perch and engine mounting bracket. (see Figure K, pp. 141 of "Abartht”). Take care not to pinch any electrical wires while pulling up and tightening 6 nuts and special serrated flat washers that attach rear panel to body. Lower engine until contact with mount perch is made and insert large mounting bolt and flat washer from beneath mounting perch. Fit small upper rubber doughnut, large washer and nut. Lower engine and remove jack. Hold bolt head from beneath with a 17mm box-end wrench or vise grip pliers and pull-down and tighten locking nut from top using a 1/2" drive ratchet, 6" extension and l7mm socket. Install bumper mounting strap bolts (special serrated locking type) loosely and jack car up one-side-at-a-time to install bumper tip attaching bolts from within the rear wheel wells ('72 and '73 models access is through inner fender panels). While right side of car is jacked up and supported with a stand, install lower flywheel dust cover with power unit ground strap attached to right side bolt (l0mm socket and long extension for 3 bolts. lf threads are stripped use a 1/4X20 tap and fit u.s. bolts). Then fit a new lower radiator-to-water pump hose and clamps. On '67-'69 models attach stop/ tail/turn wiring by plugging in plastic sockets on either side of the engine compartment. License plate and backup light wires (brown and yellow) should have their individual spade connectors pushed together and rubber insulator sleeves forced over them (it is easiest to slide insulator sleeve over "male" end and pull it back before pushing connectors together. Then lubricate connectors and sleeve with WD-40 to allow sleeve to slide over connector. If you have a '70-'73 Spider) and you marked lighting wires with tape on disassembly you ere in good shape when refitting them. lf not, see pp. 58 for hookup diagram and don't forget to replace six square protector boots while you' re at it.

On Coupe models, mount bracket, spring assembly, and engine torque strut should be fitted to engine in one piece (see Figure- 12). With engine jacked up, slide rear panel (with body gaskets fitted) into body and draw up and tighten nuts with special washers. Lower engine, remove jack, install lower flat and lockwasher and tighten nuts. Attach torque strut to left inner rear body panel using 2 rubber gromets, steel spacer sleeve, through-bolt, lockwasher, and nut (see Figure- 12). Install rear bumper (4 special bolts at sides of engine compartment and 2 pinch-bolts for outer tips) and attach license plate and backup light wires. Jack up right side of the car and fit flywheel dust cover, ground strap, and lower hose as noted for Spiders.

***Within Engine Compartment (and if necessary, Within Passenger Compartment):**
'66-'69 Coupe and Spider Models can have ignition coil/distributor wiring attached now (see #5, pp. 35 for coil wiring detail.
Follow carburetor and choke control cable attachment directions detailed in Step #4 of 600-based installation procedures. *(pp.21),* noting that 850-based throttle pedals often develop a lot of play in them before carburetor actuation is accomplished. The lever arm is staked onto the end of throttle pedal pivot shaft where it pokes through center (shifter) tunnel near driver's right foot. It needs to be removed (see pp. i7) and welded without getting it hot enough to melt the plastic pivot bush/ bracket. Carefully inspect heater hose where it slides onto thermostat housing tube. Often, end of this hose is split
from impatient removal, crystallised from heat, or smashed by original wire-type clamp. Pull hose a little further out of firewall and carefully trim off about the last 5/8" of damaged end. Now slide hose onto thermostat housing tube and fit new American style clamp. Install a new top radiator hose and clamps. Force rubber fan bellows over lip on radiator shroud and install large wire 01amp. Fill cooling system with <u>normal tap water</u> but do not fit lower cooling shroud and muffler heat shield or radiator cap yet. lf *you* are retaining pollution control equipment on '70-'73

model cars, hose attachment details are provided on pp. 4*5* .
5.Jack car up in front of left rear tire and support with safety stand.

***From Beneath :**

Inspect transmission mount brackets for splitting or spot-weld failure (see pp. 67 and Figure -12. for repair and strengthening modifications). Shift linkage rubber coupler should be watched as shift lever is moved slightly forward and back. If coupler moves more than transmission shaft, check for worn pivot sleeve or attachment hole in coupler (see Figure-I5).
Now see that shift lever is in a perfect perpendicular position when car is in neutral. If not, 2 coupler clamp-bolts can be loosened and shifter moved to perpendicular before retightening. Watch for excessive drive train movement as clutch and shifter are operated and check rear body panel/engine mount perch for spot weld failure and torn sheet metal (see pp. 67 and Figure-12 for repair and modification details). Lying on your back in front of rear tire, use 13mm ratcheting box-end wrench to adjust handbrake (long threaded rod at rear of shifter tunnel) so that rear wheels lock at about five clicks of lever movement. Still on your back but now beneath muffler, use two l0mm open-end wrenches to adjust clutch pedal free play. Move threaded adjuster sleeve on cable-end (attached to operating fork in bellhousing) until adjustment is achieved (1 inch pedal free-play or to suit driver). Note also as pedal is operated, if left side of center tunnel (near driver's right foot) moves or groans. This problem can be cured by strengthening the area where cable pivot pin attaches to inner tunnel (see pp. 67).

*** At Front :**
Check that all electrical switches are in 'off'" position and attach ground cable to "prepared" battery (see pp. 56).
Make sure to fit positive cable-end insulator boot and install battery cover plate (2 plastic thumb nuts and rubber washers). Check to see that you have "fire" to ignition points (see #6 - *pp.* 22 of procedure for 600-based models).

Starting, Adjustments, and Break-In Procedures

Quite frequently, with a freshly rebuilt "tight", engine, nothing short of a brand new starter and battery will turn things over fast enough (or at ail) for these motors to start. It's not that the engine is too tight but that this starter is just not a very strong unit even though it may have started a previous "loose" motor just fine. It is normally necessary to tow the vehicle with another car or hand push it down a moderately steep incline. If your car has external oil lines and remote filter end/or oil cooler, it is highly recommended to crank or tow the car with spark plugs removed until oil pressure shows on the gauge. On engines without external lines, it's up to the individual whether to develop oil pressure before attempting to start. If you have a 600/750 motor with paper element oil filter, be sure to fill the canister with oil before fitting the lid (see Figure 3) for filter parts-breakdown). Pump brake pedal again a few times to make sure everything is still in order. An operational handbrake is a big plus during pull/push starts. A horn and stop lights might come in handy too.

"Starting Drill" for All 600 and 850 Based Cars

1.If you are going to pull it, tie a fairly long rope around front leaf spring-to-chassis attaching brackets. Don't even think about "pushing it with another car" and with an aluminium bodied model, caution your helpers to be very careful where they apply pressure if hand-pushing.

2.With a screwdriver, scratch a reference mark across joining point of cylinder head and distributor housing (if not done earlier). Adjust idle mixture needle screw out 1 1/2 turns off its seat. Adjust carburetor idle stop screw in about 2 1/2 turns after it starts to make contact. Place screwdriver (for idle and mixture adjustments), open/box wrench (to move distributor for timing adjustment), a glove or small rag for your left hand (to rotate distributor by its cap), and a jug of water next to you on passenger seat. Full choke fully out and make sure it is opening and closing properly. Turn on ignition switch and see that generator and oil lights (if fitted) are on. Place car in third gear and push clutch in.

3. After slack in rope is taken up, have driver of tow car pull away slowly and wait until he has reached about 10 miles per hour. Let clutch out and give a small pump or two to accelerator pedal.

4.If everything is right the fact that you have "primed" carburetor float bowl beforehand should allow car to fire immediately.
As soon as it does catch and start to run, shove in clutch while operating throttle. At same time, honk horn or stick your left arm out of open window to signal driver ahead that car is running and start to brake in relation to how quickly the tow car is stopping. If you are having trouble keeping it running with throttle pedal, a handbrake stop will make things a little easier (you won't have to move your foot from throttle to brake pedal). If you didn't use handbrake to stop, apply it not and shift gearbox into neutral. Engine should be idling very fast and no doubt misfiring considerably. Look at oil pressure gauge or tight to be sure you have pressure (cold starts should show at least 50 lbs. with a new engine).
If no oil pressure is indicated, shut off engine immediately and investigate. Don't be alarmed about all the smoke coming from rear of car. It is only the oil you squirted into cylinders being burned and paint/oil residue smoke off of exhaust headers. If someone is available, have them operate throttle linkage in engine compartment (if necessary to keep engine running) .

5.Grab your screwdriver, wrench, and glove/rag and run to back of car. Adjust idle speed down a little as engine allows and if possible try to open choke linkage a-little-at-a-time conditions permitting. If you are able to open choke fully and lower idle speed to around 1500 RPM within a minute or so, you are in position to make some preliminary adjustments by turning idle mixture needle screw in and out and loosening and rotating distributor back and forth (use glove when moving distributor by grasping cap) a little to eliminate misfiring. Keep adjusting idle so that it stays around 1500 RPM.

Optional

If you cannot open choke without engine immediately wanting to stall or can barely even keep it running with choke fully on, try slowly loosening idle-jet retainer brass screw (see Figure 5 for 30 DIC 2-barrel carb models) off its seated position anywhere from 1/32 to 1/3 of a turn. If idle speed goes up immediately at any particular position, idle jet is,. either plugged, a larger jet is required, or you have a vacuum leak (see pp. 129-130 of "Abarth" and pp. 43 of this booklet for details).

6.Look under car for signs of oil, fuel, or water leaks (stop engine to investigate if leaks are noted remembering that any water pump seal leakage may cure itself in a day or two). Be especially careful that cars with front or auxiliary radiator have run long enough to open their thermostat (if fitted) and/or purge themself of air bubbles. If motor seems to be running well enough, try driving car around the block (don't get too far from home yet) 4 or 5 times while keeping an eye on water temperature and oil pressure gauges. Don't let water temperature get above 200°F or do any hard acceleration. Whiile driving, note any irregularities regarding driver controls (shifter, clutch, throttle, brakes, steering, etc.) that should be attended to when you return (see Chapter Three). Back car up to your work area, recheck water level, check condition of radiator cap before fitting, adjust idle down to around 1200 RPM (if possible) and play with fine idle mixture needle screw, stopping just before idle speed shows any sign of faltering or slowing down while turning screw in. Remember to keep a close eye on water temperature (200°Fmaximum) while completing final tuning adjustments.

Final Adjustments

1. With the possible exception of primary-side idle jet on 2-barrel Weber 30 DIC carburetors, standard jetting should be just right as fitted for any stock Fiat or Abarth engine/carburetor setup. If you have modified the engine (cam, compression, head work, or alternate carburetion) see *Race* Preparation, Chapter 6 (pp. 19) for rejetting guidelines. If you have a good distributor, I have found that the best way to set final ignition timing is "by ear." With glove on your left hand, grasp top of distributor cap as you start to loosen distributor housing clamp nut.

As you slowly rotate distributor counter-clockwise (more advance), engine speed will increase until a very definite misfiring occurs. Now slowly rotate distributor clockwise (retard) until engine almost stalls. Final timing point will be found when distributor *is* rotated from retard (stall) position 1/4 of the way back (counter-clockwise) towards where misfiring is pronounced. Sit on a stool and play with timing for a few minutes *until* you are satisfied that you have found the spot to lock distributor housing in place. You will realise that the point at which engine runs best and idles fastest is not the proper place to set timing as engine will b_ slowed down considerably from fastest idle when properly positioned. Look at reference mark you scratched on cylinder head/distributor housing base and don't be, surprised if these "static timing" marks are now 1/8" or less from each other if you used the recommended setup procedure (see pp.42).

Now drive car around the block another half dozen times. As a quick double check of timing, try going around, end accelerating lightly out of a fairly slow (900) corner in third gear. If engine "pings" badly (fresh premium fuel is a must for this test), it is a sign that you have too much advance. Although excessive retard may spoil best acceleration, idle, and starting performance, too much advance can really be detrih1ental to engine life (especially if you lug the car up hills without enough momentum (see pp. 118 of "Abarth").

***2. When* you return to work area, place a large piece of cardboard on ground under engine (extending from crankshaft pulley to beyond flywheell. Try some additional adjustment of fine idle mixture and idle speed screws. A good idle speed is 1050 to 1150 RPM (never mind that the Fiat manual says). Below 1000 RPM, idle may be irregular and prone to stalling whi19 over 1200 RPM you frequently encounter detonation or "running-on" after ignition is shut off. Not gauge readings for oil and water and turn off ignition key. Remove cardboard and inspect for signs of oil leakage. A fine spray of droplets on pulley end is normally from timing cover oil seal or centrifuge (if fitted), and on flywheel end it denotes front seal problems. Now is the time to find and stop leaks, as later-on after more driving, oil will be blown around making location of the source more difficult (see pp. 37 for common oil leaks).**

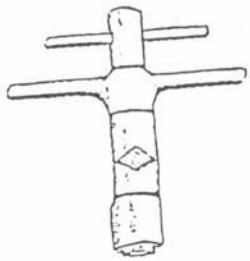
3. If your starter and battery are decent, you should now be able to restart car and put 15 or 20 miles on it (no dusty conditions without air cleaner though). A good break-in procedure is to drive car at about 35 miles per hour and then accelerate relatively hard (not full throttle though) to 55 miles per hour before backing off to-allow deceleration to 35 miles per hour again. Do this about 10 times during Jour drive. Remember to monitor temperature and oil gauges carefully (see pp. 126, last paragraph of "Abarth" for acceptable oil pressure readings). Park car for the rest of the day. Cover carburetor air intake and set engine lid (if removed) in place.

Cylinder Head Retorquing and Valve Adjustment

I have found that, despite the extra work, retorquing the head after the first time the engine has been brought up to operating temperature is a really good idea.

1. With engine cold, check oil and water levels before draining cooling system (drain top or plug fitted to bottom or front of lower radiator tank or detach lower hose at radiator).
Unclip cap from distributor and set it off to right side of cylinder head. Disconnect fuel and emission line(s) at carburetor and plug hose(s) with a golf 'T'. Detach throttle cable linkage rod at carburetor. Be very careful on 850-based cars while using a screwdriver to lever delicate plastic ball-socket off (keep screwdriver tip as close to socket as possible to avoid breakage). Then remove linkage pivot arm cotter pin (600-based) or retainer clip (850-based) and upper spacer washer. Pull off outer cable housing dust boot (if fitted) and remove retainer plate (600) or clip (850). Lift pivot arm off valve cover pivot pin while detaching throttle return spring and pushing outer cable forward and out of holder bracket on valve cover. (When done in suggested manner, cable adjustment will not be lost). Tuck cable with attached linkage out-of-the-way. On some cars, _ou will need to detach choke cable before removing carburetor and drip tray (if fitted). On other models} carburetor can be unbolted (600-based= 2 studs, 850-based=4 studs) without cable detachment and moved to an out-of-the-way position thus avoiding readjustment of choke control cable as well. 600 or 750 cylinder head water outlet and hose may be left intact, but 850 and OT1000 style thermostat housing (2 or 3 hoses connected) will need to be removed (unless you have the special "crow's-foot" off-set wrench formerly sold by Fiat in 14mm and 17mm sizes) to gain access to headbolt behind it. Use speed wrench to remove valve cover hold-down nuts and then carefully lift cover(large screwdriver tip sometimes helpful to lever it off when stuck to gasket) just enough to facilitate removal of washers from 4 studs (magnet probe may help; 600/750=4 lock washers, late 600D/850/0T10000=4 lock and 4 hold down plate washers). Use socket to remove 4 rocker stand hold down nuts and washers a-few-turns-at-a -time and pull off rocker assembly.

2. Starting in center of head and progressing outward in a spiral pattern, torque ten head bolts (one is inside intake manifold port) to 38 to 40 ft. lbs. (600/600D engines only=22 ft. lbs.). Then torque a second time, as center bolts frequently loosen up when outer ones are tightened. Replace rocker assembly, flat washers, and lock nuts, pulling down nuts a few turns at a time while making sure that all adjuster studs stay properly located in push-rod sockets. Torque locking nuts (600/750/ early 850 sedan with 8mm studs using 14mm socket=15 ft. lbs. 850/0T1000 with 10mm studs using 17mm socket=25 ft. lbs.)



3. Valves must now be readjusted (see specifications on pp. 132 of "Abarth"). I like to loosen all jam/locking nuts with a socket wrench before beginning valve adjustments. It saves time, and also when job is finished, if you have any doubt that all valves have been adjusted, simply attempt to rotate each jam nut with your fingers as a final check. To obtain proper adjustment, loosen jam nut 1/2 turn, unscrew adjusting stud 1/4 turn, insert feeler gauge, turn adjusting stud back until nearly as tight as your fingers can accomplish, spin jam nut down with fingers and tighten with open end wrench. Frequently, adjusting studs will not even need to be held with tools to stop them from moving as jam nut *is* tightened. A small- adjustable (crescent) wrench or pliers can be used to hold>-studs if your fingers are not enough though (special Fiat adjusting tool was formerly available). If gauge is too 10088 or tight now, try again. I find it easier to provide a relatively heavy drag on gauge when finished. Each adjustment should naturally have about the same amount of drag on gauge as the others.

Adjustment Sequence:
With transmission in neutral, use a ratchet and socket on generator pulley nut to turn engine over in direction of ,engine rotation (some people will find this job easier if spark plugs are removed). You will need to apply finger pressure to belt on right side and beneath generator pulley to stop belt slippage on clockwise motors (600-based cars) or from left side of pulley and on top of belt for counter-clockwise units (850-based). Turn pulley until #4 cylinder valves are rocking (exhaust just finishing closing and intake, just beginning to open) and adjust both valves of cylinder 1. Continue in sequence with: #2 rocking, adjust #3; #1 rocking, adjust #4; #3 rocking, adjust #2.

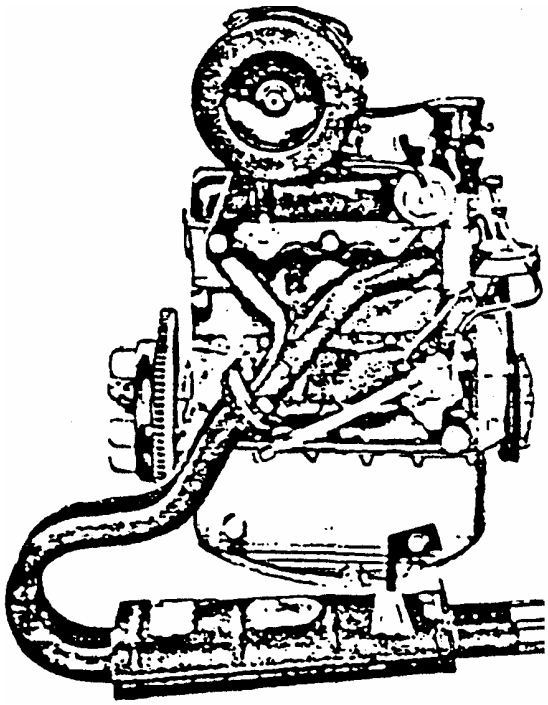
4. Replace thermostat housing and hoses (if removed), valve cover, carburetor drip tray (if fitted) and gaskets, carburetor, distributor vacuum hose (if fitted), throttle cable with linkage and spring, choke cable (if removed), fuel line(s), distributor cap. Test for proper choke operation.

5. To install 850/0T1000 Coupe or Spider air cleaner, first slide a piece of new fuel line hose onto intake manifold fitting for direct crankcase breather valve leaving the other end uncut to length for now. Slip valve cover breather hose (with internal flame-trap screen fitted) onto large tube fitting on underside of air cleaner assembly. Drop 3 spacer sleeves onto carburetor lid studs (retap stripped stud threads and use 1/4X20' U.S. studs or bolts) before lowering air cleaner body with rubber gasket fitted, onto studs as breather hose is pushed over tube on valve cover filler neck. Fit large retainer plate (sometimes necessary to straighten plate with hammer on a flat surface) and then install three locking nuts (10mm socket) being careful to not over-tighten and strip threads. Bend three retainer tabs on air cleaner lid inward, hold new filter element in place, and bend tabs back to hold filter in place. Place lid on air cleaner assembly and attach3 hold down clips. Carefully route direct-crankcase-breather valve hose around throttle linkage and cut to length before fitting to remaining (small) tube on underside of air cleaner assembly. Snap carburetor fuel line into clip on right underside of cleaner assembly (see Figure 6 for parts identification).
600/750 & 850-Sedan air cleaners slide over a round rubber seal that sits on top of carburetor intake/air horn. 600-based types have a clamp-bolt to be tightened and attachments for two small crankcase breather hoses (one from valve cover, one from cylinder block). 600, 600D, and 750 all use different filter elements. 850 Sedans use same style valve cover breather tube (with flame-trap screen inside), direct-crankcase-breather hose, and filter element as 850 Coupe and Spider (see paragraph above). All types attach support strap(s) to (longer) exhaust header mounting stud(s) and 850 Sedan has an additional mounting bracket that attaches to a stud "ear" cast onto side of carburetor assembly. (Again, see Figure 6).

6. Check belt tensions and readjust if necessary. Close radiator drain top or refit bottom hose, and if there are no water leaks, fill cooling system with a mixture of 50% permanent type coolant and the rest distilled water. Start engine (If engine doesn't turn over fast enough to start now, you probably have a bad starter motor and/or battery.) noting any obvious/excessive valve noise and add coolant as necessary to compensate for air bubble evacuation during warm-up (take special care for cars with front or auxiliary radiators) before replacing radiator pressure cap. On 850/0T1000 models (not OTS or OTR) fill plastic coolant recovery tank about 1/2 full of coolant. While on the subject, you can clean inside of plastic tank by tossing a handful of nuts add some solvent into tank and shaking vigorously while covering filler/outlet holes with your palms. Step Two is to replace solvent with soap and water..

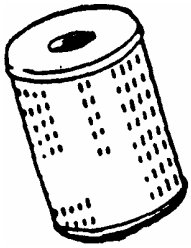
7. Finally, if no fluid leaks are apparent) install engine compartment and cooling system shroud (see Figure 11" and Figure D pp. 136 of "Abarth") on right side and with 850-based models, also muffler heat shield on left using 7mm-head sheet metal screw with special serrated flat washers.

You can drive car normally now, but do not maintain *any* given speed on the highway for more than 4 or 5 miles at a time and refrain from drag-race starts or full throttle acceleration for about five hundred miles ; at which time you should change the motor oil (with engine hot). Some people like to retorque cylinder head and adjust valves at this time also, but those who recommend this, have normally not done these jobs just after the first time car was driven. If you don't mind the extra work though (and it will help you sleep better), go ahead and da it a second time.. As motor continues to loosen up during break-in period. idle speed should be adjusted back down to around 1100 RPM.



Fiat-Abarth 850 TC Power Unit

CHAPTER 3



MAINTENANCE. ADJUSTMENT, AND REPAIR PROCEDURES

Fiat and Abarth Routine Maintenance Checklist

Suitable after engine break-in is completed (at 500 miles, vehicle is in good condition, and being used as regular transportation. If maintenance history *is* unknown and restoration not planned, do complete checklist when you obtain the car.

Daily:
Check operation of dashboard warnings lights and gauges (especially oil pressure, coolant temperature and charging system).
Weekly

Check coolant and oil levels with engine cold and watch for signs of fluid leakage beneath car. Coolant recovery tanks on 850-based cars should remain about half full. If the tank is near empty just a few days after refilling several times, look for blown head gasket or defective or incorrect radiator cap.

Monthly :

Check battery water (especially in hot weather) and brake fluid (if low check for signs of master or wheel cylinder leakage) levels, tire inflation pressures (see PP.55) and wear characteristics (uneven wear could mean wheel alignment is out of adjustment), condition of wiper blades (you sure wouldn't want to scratch that expensive windshield because of defective wipers), generator and water pump belt tension (see pp. 35), and windshield washer fluid level (always keep reservoir filled on late cars with rear mounted washer bags as empty plastic bags are easily melted due to close proximity of exhaust headers). If heater (850-based cars) has not been used this month, drive carfor a few minutes with heater water-valve open. Change DOHC engine oil filter every 1500mi.
***When E*vident:**
Adjust (or repair) brakes (600/750 front and rear, 850/0T1000 to mid-1968 rear only) when too much pedal movement or poor braking efficiency are noted. Adjust handbrake (5 clicks optimum). clutch:" throttle, choke, or shifter controls when effectiveness is reduced. Investigate steering and suspension noise, play or stiffness of operation and brake noise or spongy pedal on application. Keep engine clean by utilising coin-operated car wash to spray hot soapy water throughout engine compartment from above and below. Plastic bags should be tied over distributor and air filter intake. After rinsing, drive car home and wipe everything with clean, dry cloth. This keeps things nice, aids in repair work, and allows source of an oil leak to be spotted immediately.
Every 2500 to 3000 Miles:
Change engine oil and filter element (if fitted) (centrifugal filter should be cleaned about every two years or 25,000 miles). Grease two front suspension king pins, 6 steering tie-rod-ends (600-based only). Adjust greaser cap on distributor in 2 or 3 turns (600 based). Check air filter element if conditions are dusty and replace when necessary.
Every *5000* or 6000 Miles or as Required: .
Do a tune-up (see pp.33). (Poor performance, starting, idling and fuel economy are signs that it's time to check things out). Retorque cylinder head and adjust valves (see pp. 29&30).

*** see pp.22 for 600/750 & pp. 25 for 850/0T1000 clutch adjustment.**

Every 10 000 to 12,000 Miles or Yearly: Retorque head and adjust valves with engine cold: Replace in-line fuel filter (if fitted), check fuel and emission lines and if necessary replace with new 6 or 8mm fabric-braided neoprene hose and new clamps. Check freeze. plugs/water hoses and drain coolant. If radiator interior shows debris lodged in ends of tubes (seen through filler hole) remove radiator and have it rodded out. If exterior fins are plugged with dirt and grease pull radiator to carefully scrape/brush solvent/steam clean away blockage noting that disintegrating fins are cause to replace radiator core itself. Allow engine to run with drain plugs removed, and heater valve (if fitted) on, and a water hose inserted in filler neck to replenish fluid loss until drain water is totally clear before shutting off engine and water hose. When system *is* empty, replace plugs and fill radiator with 50/50 coolant and distilled water. Rotate radial tires front to back on the same side of car noting irregular wear (alignment problems, etc.) and check air in spare tire. Check generator/alternator brushes and replace if necessary. 600/750 generators should have their external oiler fitting (on commutator-end) filled with 50 wt. oil. Change transaxle gearlube(90 wt.) and check steering box adjustment & lube level. Check for excessive play in axles, sleeves, and couplings (see pp.49) and condition of axle boots, shock absorbers, and engine/transmission mounts including excessive drive line movement (see pp. be.). Check floor, under-body, and spare tire well for formation of rust and lubricate door/hood/engine lid hinges and locks plus seat slider rails & adjusters.

Every 25,000 Miles or 2 Years:

Clean oil centrifuge (see pp. 36 if fitted) .

Remove and clean fuel pump and carburetor filter screens. On older 600-based cars that are not driven regularly, remove and clean fuel tank pick-up screen and check for rust inside tank. Disassemble and inspect brakes for lining wear or fluid seepage. Check rubber brake hoses for cracks or deterioration. Bleed brakes until replacement of all fluid is accomplished. Disassemble generator to repack bearing(s) (switch to sealed bearings when replacing) and on 600/750 models check commutatorend bushing play. Repack front and rear (crush spacer required) wheel bearings. Change steering gearlube (90 wt -1/2pt).

Tune-Ups

1. First check for excessive oil buildup within air cleaner housing. Normally there is almost no sign of oil when your engine is "tight". A lot of oil film probably means broken piston rings and excessive compression blow-by from crankcase breather tube.

2. Compression Test: Four readings that are close to each other is much more important than high readings in some cylinders. Warm motors throttle held open and all spark plugs removed a strong engine might register say 180 lbs. per sq. inch after about four to six engine rotations. All the way down to about 120 lbs. per sq. inch is good as long as all readings are within about 10% of each other. To determine if a low reading is caused by a ring or valve problem, use a lever operated oil can to deliver about 3 or 4 squirts of engine oil into a low cylinder and try the test again. If your reading shoots up from 60 lbs. to say 190 lbs. you would know that rings are the problem (oil temporarily "sealed" rings). If there was little or no change from 60 lb. reading you might be able to cure the problem with just a valve job. A cylinder with excessive blow-by also frequently fouls its spark plug with oil.

3. While spark plugs are out, check plug color and gap. Color of center insulator should be light brown or grey and gap .022"-.025". W*hen* center electrode tip is significantly rounded off or plugs are fouled, replace spark plugs. *As* a temporary emergency fix, an "oiling" cylinder can have one
hot plug (ie : F.850=N13Y ,BP4ES...) installed to burn away oil fouling. Don't take a chance trying this with irreplaceable Abarth motors.

4. Pull off distributor cap and use a socket wrench to rotate generator pulley (apply finger pressure to crankshaft belt to stop belt slippage) until ignition points are fully open. (Rock advance mechanism forward and back to be sure of full point gap). Point gap should be about .018" with no pronounced tit on one point and a depression in the other. Mildly burned points without tits showing can be saved by filing with an abrasive stick as long 8S care is taken to clean away all signs of grit when finished. While points are open, grab hold of rotor and try to wobble distributor shaft side to side. If more than about .002" of change in point gap is seen, distributor should be replaced as there are no service parts available for this condition (worn cam/advance bushing). A small amount of grease should be applied to rubbing cams where they contact point rubbing block and a drop or two of engine oil given to the felt wick within cam spindle and under rotor (except for early Marelli 850/OT1000 distributors with large round rotor and advance on top). Now grasp rotor again and rotate the advance clockwise to check free movement. When you release rotor, advance should snap back immediately. If it doesn't, worn advance mechanisms and/or loose springs are probably the cause. Springs are still available but some advance mechanism parts are not. If your advance works good, lightly oil moving parts, if not obtain a new distributor. Check all distributors to see that primary wire plastic insulator block is in good condition so as not to allow electrical shorts. Tip of rotor can be very lightly filed and distributor cap electrodes scraped with a pocket knife to improve contact surfaces. Be sure rotor is not a sloppy fit on distributor shaft. Early large round Marelli 850/OT1000 rotors come in two different styles. One is notched on bottom to allow advance weight movement and other one is not. When replacing, use notched type which fjts both distributors. Plug wire sockets, carbon brush, & terminals should be checked carefully for arcing/erosion*/damage. 600/750 vacuum advance units should be checked with a special tester/pump tool and external grease cap fitting filled with grease. Side-entry distributor caps are a little more expensive but fit all models whereas top-entry plug wire type will only fit 850/0TIOOO Coupes and Sedans. Side-entry style also offers a more compact plug-wiring arrangement regardless of car model. .Check high tension wires for cut, chafed, hard or oil softened insulation and damaged boots and replace when indicated. Cars without radios can use solid copper-core wires with silicone covering.

*** especially with Ducielier (black) caps fitted to 70-71 Spiders**

With a radio, supression wire should be used. Shop around for high quality plug wires and use retainer guides and wire holders to route and support them. Late 850 (903 engine with right side of engine compartment coil mounting) has long coil-wire supported by rubber gromet held in bracket atop fan-shroud housing. NOTE : late long wire' Marelli points also fit early distributors.
5. Check ignition coil polarity noting that all models have a negative ground electrical system. Before 1970, coils with internal ballast resistor were used. To check polarity, remove wire from SW, BAT, B, or positive terminal of coil, turn ignition switch on, and momentarily brush wire connector across any bare metal ground. You should see a small spark. On CB, D, or negative coil terminal there should be a wire going directly to distributor-terminal stud.. .Other wire for tachometer (usually brown) is also attached to negative coil terminal.
1970 and on Spiders and Coupes have external ballast resistors (white or brown ceramic block with two terminals and attached to coil mounting bracket). The problem here occurs when coil is replaced. Many auto parts store catalogs are confusing or in error on this subject. So If you are given a coil with internal resistor for a late car, you now have two resistors and maybe not enough juice to start the car. On the other hand, if you are given a coil without an internal resistor for an early car, you will have no resistor at all and stand a good chance of melting point rubbing-block or eventually"
frying the points themselves. The same thing will happen if you get the wiring wrong and by-pass the resistor on a late car.
Use same procedure as described with early coil to determine which is hot wire from ignition switch (usually blue and white wire). Attach it to SW, BAT, B or positive side of coil.
The other coil terminal should have a stiff red wire attached between it and ballast resistor. Remaining D, CB or negative terminal on ballast resistor should have one wire going directly to distributor terminal stud (routed through holder gromet on fan shroud along with high tension wire) and tachometer wire (usually brown) attached to it. It is a good idea to have your coil tested at an auto electric repair shop to ensure that it is not weak. For replacement purposes, I recommend using earlier (internal resistor) coil on all models and tossing external resistor away.

6. Check ignition timing (see pp. 28), carburetor adjustments (mixture, idle speed - *1100 R*PM, throttle. and choke operation and full movement pp.21) and lubricate all carburetor linkages. Check or replace air filter. If necessary clean carburetor

7. Check belt condition and adjustment (see pp.35). Check exhaust system (holes, broken welds, mountings, flanges, pipes, muffler) and quick check cooling, fuel, and emission hoses.

8 . Clean and test battery (see pp.56).

9. Check operation of all electrical equipment including: lights (stop, tail, turn, headlight-aiming., instrument, interior, backup, side markers, engine compartment, etc.) horn, wipers, electric washer (if fitted), and fuse connections.

Belt Condition and Adjustment
Belts should not be cracking, fraying, or oil-soaked. About ¾" of back-and-forth belt deflection should be noted when pressure is applied. Spare belts should always be carried in the car.

Belt adjustment can be a time consuming "guess and try" affair on these cars (particularly if you don't have exactly the right belts). With belts fitted use a large screwdriver or pry bar as a lever between generator/alternator and water pump housings, to hold belts in tension while tightening lower bracket retainer nut (17mm socket or open-end wrench). Normally one belt will be tight (3/4" deflection) and the other loose. If crankshaft belt is tight, unbolt outer water pump pulley-half (10mm socket for 3 lock nuts except very late alternator equipped cars which have 6 nuts) and remove one or more varied thickness adjusting-shim washers from between pulley-halves to reduce pulley width and in-effect increase pulley diameter. Replace pulley-halves with extra shims now divided on outsides of assembled pulley. Each locking nut should be tightened when pulley is rotated so that chosen stud and nut faces towards generator and therefore away from portion of pulley which belt is riding in. Keep at this on a trial and error basis until water pump belt is properly tensioned (equal to crankshaft belt). If water pump is the, one that is tight, you will need to add shims to center of water pump pulley end then retension both belts by loosening generator bracket, levering generator up further and retightening. Just for reference purposes, if you had exactly the proper belts for your car, there might be about two thin shim washers remaining on outside of water pump pulley when finished adjusting. If you cannot gain correct adjustment with all or none of shims fitted (or anything in between) you need different belt(s). Be sure to fit at least one shim washer under lock nuts on water pump pulley and check that two large diameter flat washers are installed on both generator mounting bracket studs before final tightening of the adjustment nuts (17mm.).Note also that *some* late alternator equipped cars have elongated top mounting bracket hole as well, allowing for more selective (and even trickier) adjustment. You may learn something about patience before this job is completed See figure 7b on page 88 for pulley parts.

Oil Filter

600/750 engines have a paper filter element that drops into a canister assembly located in-front-of and below generator. Remove lid and use suction pump to withdraw as much oil as possible before removing element. Then evacuate remaining dirty oil from can. Be sure you have all. *of* the parts (2 filter element seals, 2 seal washers, spring, lid gasket, lid washer) and replace them along with new filter element in proper sequence before filling can about 2/3 full of oil and replacing lid (see Figure 3).

600D/850/0T1000 motors have centrifugal filters (see Figure C, pp. 123 of "Abarth") which are cleaned by removing aluminium crankshaft pulley cover (6 bolts with 10mm heads, pry-off with medium screwdriver-tip under lip provided on cover) and scraping soft materials from pulley and cover compartments. On most cars, engine compartment lower shroud must be removed and pulley rotated (use socket on generator pulley) to gain access to cover attaching bolts from rear and below. With some engine/body combinations, however, you might want to remove rear body panel for improved access. Clean centrifuge about every 25,000 miles or two years and remember that centrifuge effectiveness is decreased well before it is "packed solid" with debris.

A new '0' ring must be fitted to cover on replacement and it will be noted that cover can only be fitted in one position or attaching bolts holes will not line up.

Oil Changes and Recommendations

1 should be drained with engine warm and car parked level or facing slightly down-hill in front. Wipe lower sump surface clean and remove dip stick and oil filler cap. Loosen drain plug slightly before placing clean drain pan under sump and removing plug. Allow oil to drain completely. Wipe drain plug clean and apply Teflon tape to pipe threads (or fit new gasket and wipe sump where gasket seats with 903 type 12mm internal hex plug) before reinstalling (see pp. 126 of "Abarth" for magnetic drain plug information). . Removed drain pan and check for debris in bottom when pan is emptied. Older engines may have small semi-hard black chunks in their drain oil as rubber timing chain tensioner becomes crystallised and is thrown from crankshaft gear. Unless timing chain is quite noisy though, I wouldn't worry too much about this until rebuild time. What you don't want to see is small chunks of iron, aluminium, or bearing material in drain oil.

To avoid spillage when refilling or adding oil, all engines require a funnel with a tip small enough to extend through lower hole in valve cover filler neck. I recommend premium quality 30 wt. detergent oil in war climates, 20-50 under' , cooler conditions and 10-40 in really cold weather. Non-detergent break-in oil can be used with new engines, but is really not essential. 600D and 850 motors with tin oil pans hold 3 quarts of oil; 600/750 engines with tin pans and including oil filter *, 3.7 quarts; 903's with Fiat cast-sumps, 4.5 quarts; and OT1000's with Abarth cast-sumps hold about 5 to 5 1/2 U.S. quarts. (Note that oil level sticks very in length for the various sump designs). After filling, replace cap and dipstick.

Start car and run at fast idle (2000 RPM using hand throttle) for about 5 minutes. Oil presure light and/or gauge should show pressure within two or 3 seconds after " starting. Then watch under engine to see if any oil leaks develop. After stopping engine check dipstick to see that final oil level is correct. When driving remember that the 903 sump design will allow oil pressure loss during cornering or tracking when only one quart low on oil. So, if you notice oil light flickering on cornering or braking check oil level right away.

Oil Leaks

By about 60,000 miles (if you reach it) these engines are usually a mass of oil leaks. There is an added problem with the cars using rear radiators and fans because oil and dirt are mixed and blown forward clogging radiator fins; with overheating and blown head gaskets the end-results.

The first step in curing leaks (other than an engine rebuild) is to clean engine compartment and undercarriage (steam clean, solvent, Gunk, etc.). Then run motor at a fast idle for 15 minutes while watching for telltale oil droplets or "trails" from leaking components.

*** 600/750 oil filter canister should be filled before replacing lid.**

Tired engines commonly leak in the following locations:

***Crankshaft oil seals become "baked" at high mileage because of poor engine compartment air flow. Front seal involves removal of engine (see *pp.13-25),* clutch, flywheel, oil sump, and seal retainer housing. Front seal leakage can be seen as droplets emerging from flywheel lower dust shield vent hole or as a trail down front-end of sump. It's nearly always a good idea to remove radiator and have it cleaned inside and out. Rear (timing cover) seal is replaced by draining oil, removing rear body panel/engine mount perch (support engine sump with floor jack), crankshaft pulley, and levering seal out of timing cover by inserting small screwdriver tip between metal seal-flange and cover. Leaks are seen as drip from engine compartment shroud beneath crankshaft pulley or trail on sump-end. It's a good time to replace timing chain/gears/ tensioner ring, if necessary, as you are "halfway there" right now (see pp. 41). Check if your new seals are rotational before fitting (see pp. 134-135 of "Abarth"). See appropriate information - pp. 125 and 126 .and Figures C and D of "Abarth" to refit parts. Always replace' front seal whenever engine is out of car.**

***Oil sum gaskets sometimes "squeeze out" and tear away at attaching bolt holes. Sump may be removed with engine in car by first jacking up and supporting each side of vehicle just in front of rear wheels. Then, with tin oil pans, use a 10mm socket and speed wrench while lying underneath to remove attaching bolts. 600 motors will require removal of two exhaust mounting brackets and 750 types have one rear bracket to detach from sump. 903 and OT1000 cast sumps will normally require a 1/4" ratchet, long extensions and universal joint to snake around the bulged sides of these sumps. On some of these models it may even be necessary or advantageous to remove exhaust system) as a heat deflector shield attached just above muffler can interfere with removal of left side bolts. Read and follow carefully sump refitting procedure on *pp.* 125 and 126 along with Figure D of "Abarth. It One exception is that you may want to glue sump gaskets to sump after trimming, as cylinder block will not be overturned as during an engine rebuild.**
Be sure that glue has dried before fitting sump so no slippage occurs.

*** Drain plug loos e or in need of Teflon tape (or 903 gasket) .**

*** Oil pressure sensors often crack. For all cars except Abarth 750 use 21mm deep socket to remove and replace. Be sure to fit one copper washer for each sensor (Spider=2, Coupe and Sedan=1) and note that Spider gauge sensor points up end to rear at 45° angle. 750 steel braided flexible oil gauge hose to engine block should be replaced as soon as you get the car.**

***Valve cover gasket particularly at left front corner. Bend lip of cover down slightly at left front, use two gaskets, and don't use too much force when tightening progressively. Also check crankcase breather hose to air cleaner.**

***Oil filler cap seal or filler neck attachment on valve cover. Use new parts.**

***850 or OT10000 dipstick seal becomes hard and looses sealing ribs. See pp. 126 of "Abarth" for replacement.**

*** Fuel Pump - cracked plastic insulator block, defective gaskets and loose bolts.**

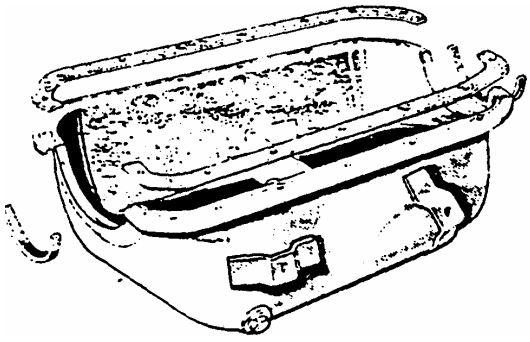
***Oil Pressure Relief Valve - loose, or missing copper washers.**

****600/750* Oil Filter Canister - see Figure 3 for parts breakdown.**

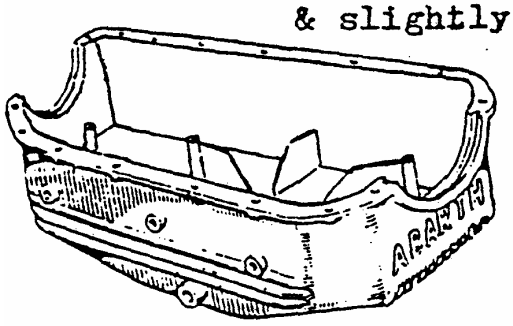
***600D/850/OT1000 Centrifuge - Fit new '0' ring and check for cracked cover or damaged pulley (especially at crankshaft woodruff-key slot).**

***Distributor Housing Base - 850 Marelli plastic or Ducillier aluminium oil-slinger cup attached to distributor shaft "goes away" or becomes worn. See distributor removal and installation on pp 42 & 43.**

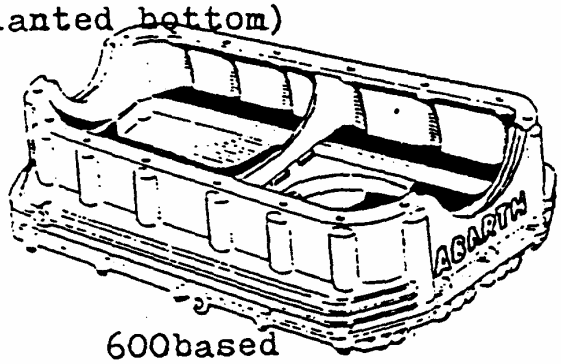
***Front camshaft bearing plug rarely leaks unless disturbed. Requires engine clutch and flywheel removal. Looks like front oil seal leak but comes from behind upper flywheel.**



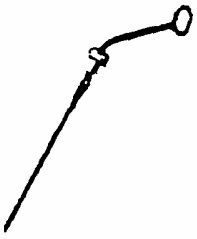
600/600D/750 Stamped Steel Pan-3qt.
(Fiat 850 Same Except No Muffler Mount Tabs
& slightly slanted bottom)



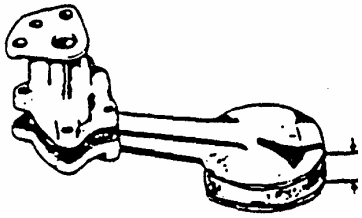
750 DOCH & Optional for 600-Based
Pushrod, Finned Alloy-4 ½ qt



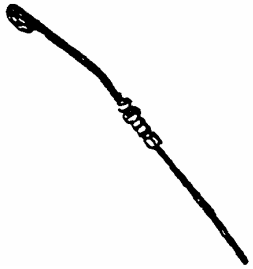
600based
Racing Alloy Split Sump-7qt.



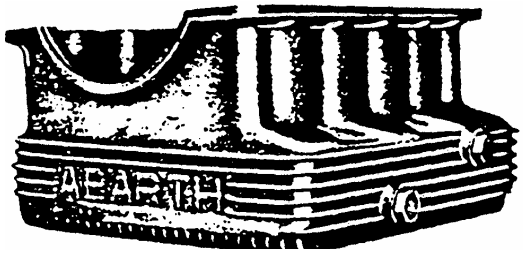
600-Based Dip Stick



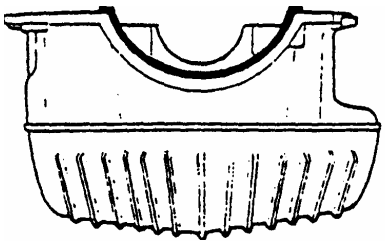
Extended Oil Pump Pick-Up For
Deep Sumps like OT1OOO & Racing



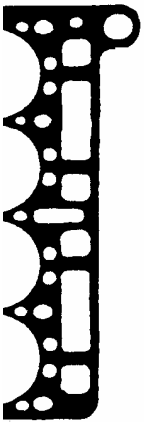
850-Base Dip Stick



OT1000 Finned Alloy Sump 5qt.



Fiat 903 Finned. Alloy-4tqt.



Head Gasket Problems and Cooling System Notes

Coolant temperature should ideally range between 170° - 190°F. I consider 210° and above "overheating" and 1500 or less too cold (Proper thermostat should be used. See last paragraph, pp. 136 of "Abarth"). Overheating and blown head gaskets are common with these cars when : 1) Cooling system is poorly maintained (leaks, radiator clogged internally ** or packed with oil/dirt/debris externally ** : bypass fittings or hoses plugged, coolant recovery. tank empty or hose plugged, rubber fan bellows damaged, metal damage from hard water being used instead of permanent type coolant); 2) Proper precautions are not taken when performing engine repairs or rebuilds (cylinder head has been surfaced too much, high compression replacement pistons have been fitted proper retorquing procedures were not followed, head or block surface is not flat or contains etching or corrosion damage, high temperature thermostat is fitted in warm climates, non Fiat-made radiator cap (especially with 850-based cars), standard equipment heavy duty or auxiliary radiator has been replaced or removed, cooling system/ engine compartment lower shrouds have been removed; 3) Detonation is occurring (driver consistently "lugs" car on hills, poor quality and low octane gas is used, ignition timing is off; 4) Engine is "tired" (time for rebuild).

Head Removal, Servicing, and Replacement Notes:
When removing distributor, rotate engine to #1 cylinder firing position (points just ready to open) and on 850-based engines scratch a reference mark through distributor housing and cylinder head joining point. Next on all types, scratch a mark on edge of upper distributor body to show direction rotor is pointing before removing distributor (remove distributor, tachometer drive and intermediate housing as one assembly on Abarth 750).
This procedure will aid in correct distributor replacement. Carefully scrape block surface and look for irregularities and corrosion damage. See second paragraph, pp. 120 of "Abarth" for head locator dowel removal procedure on 850-based motors.

After head disassembly and cleaning (bead blasting works well) check pp. 127 and 128 of "Abarth" for important cylinder head information. Before refitting head, check items one through four above. Then see pp. 66 of this booklet and pp. 135-136 of "Abarth" to determine if cooling system is adequate for your engine and finally, check last. paragraphs of "Water pump and, Associated Parts" pp. 130 of "Abarth" and Figure #7. Be sure to follow prescribed retorquing and valve adjustment procedures on pp.25-30. Special heavy-duty head gaskets are very desirable....

The Water pump inlet tube where lower radiator hose attaches, cylinder head outlet where top hose attaches, and heater and bypass hose tubes and fittings often become heavily eaten away from use of hard water in cooling system. To eliminate coolant seepage at these points, remove parts and use a wire wheel or scrape with a knife at affected areas. Sometimes it will be necessary to trim off perhaps 1/2" of material with a hack saw to get rid of heavily pitted areas at the ends of these tubes before reinstalling and fitting new hoses and clamps. Again, it's usually not a good idea to attempt rebuilding of these water pumps. Normally bearing housings will be broken during disassembly or seal leakage will occur after reinstallation. Note that all 850-based pumps use special fine-thread bolts to attach fan shroud mounting strap,

*** shine a flashlight into #1 spark plug hole with piston at TDC to cheek for high compression deflector top replacement pistons (Fig 1)**

** see note at bottom of pp. 18 & 1st paragraph of Oil Leaks on pp. 37
but in addition, 903 straps also use rubber grommets and washers to "isolate" the strap from pump body (and engine vibration).
Also, I've heard that by turning water pump pulley hub around backwards, pulley will be in position to fit one long belt for both generator and water pump instead of original two belt setup.
On 850-based cars, operate heater valve (red lever on right side of heater box) about twice a month for 3 or 4 minutes (even in summer) while" driving car to guard against valve corrosion/leakage/ siezure. 600-based cars can have. a coolant recovery tank system fitted

Valve Adjustment and Cylinder Heed Retorque

See pp. 28 to 30 for procedure and pp. 132 of "Abarth" for clearance and torque specs. Cooling system will not require draining on original 600-based engines. Engines with thermostat fitted to cylinder head water outlet will require draining and removal of thermostat housing if you do not have special "crow's foot" wrench to allow access to right front head-bolt.

Timing Chain:

At idle speed if you hear an obvious rattling coming from area of timing cover (put your ear .to the handle of a very long screw driver with its tip resting on top surface of cover) it's nearly always a loose chain, worn gears, and destroyed rubber tensioner ring. Unless chain is grinding itself against inside of cover though, you can frequently get away with ignoring "chain slop" for awhile .(until rebuild time).

Replacement Procedure for Chain & Gears:

If you're feeling really lucky and sump end-seals and gaskets do not appear to have become too hard from heat, you might try re moving timing cover without replacing pan gasket and end-seals.
You may be able to use gasket sealer to avoid sump leakage afterwards. Be sure to pull-up two sump-to-timing cover bolts first when tightening so as to compress old end-seals and gaskets before tightening cover-to-block bolts. You need only to support sump with a jack and remove rear body panel for this procedure. Most likely though, you'll have to support rear most portion of transaxle before removing rear panel so that sump can be removed and all gaskets and seals replaced. See pages 124-126 and Figures C (600D/850/0T1000 motors only) and D of "Abarth" and Figure #2 of this booklet for chain/gears/tensioner, pulley/timing cover, and sump information. Note that engine should be set at number four cylinder firing position to align marks on timing gears (line on crank gear an dot on earn gear_ See Figure #2 before removing chain and gears. With new chain* and tensioner ring fitted to new gear_ line up timing gear marks by slipping gears "along chain until tentative alignment is accomplished. Slide chain and gears assembly onto crankshaft snout until it is only about ¼" from its final installed location. It may be necessary to utilize a hammer and suitably large piece of tubing to tap this "small" gear into position. If, for some reason, camshaft dowel and gear hole do not line up perfectly, camshaft can now be rotated slightly to obtain exact alignment by using a small screwdriver wedged between locator dowel and camshaft snout hub and used as a lever arm (spark plugs should be removed). See pp. 124 of "Abarth" if you're having trouble stretching a tight new chain. When gear is properly fitted, check alignment of timing marks, by laying a straight edge between center of hole in crankshaft snout and center of cam gear retainer bolt. Marks should line up perfectly (see Figure #2). To keep engine from turning when tightening cam bolt and crankshaft nut, you can use a vise grip pliers on flywheel (remove lower dust shield).

* see chain stretcher "feet" information pp. 124 of “Abarth" & Figure 2 of this booklet.

Clutch Replacement:

See engine removal and replacement procedures in Chapter 2 of this booklet, pp. 131 and 142 of "Abarth" (or what to use and look for, Figure #9, and if a diaphram clutch conversion for 600-based cars is desired see pp. 66 of this booklet as well. Clutch discs typically last about 50,000 miles or about the same as / engine life expectancy and the beginning of major oil leaks. So if motor is not ready for a rebuild, at least make sure that crankshaft oil seals, pan gasket, and timing chain are in good shape while engine is out. Always replace throw-out-bearing and check : flywheel ring gear teeth; disc* rubbing .surface scoring; tightness of & oil leakage around flywheel attaching bolts(bolt holes extend through crankshaft flange and will leak if Teflon sealing tape is not used on threads). Inspect pressure plate very carefully (see pp. 131 of "Abarth") before deciding to reuse or replace it. It is difficult to install disc backwards but just in case; longer side of splined center faces away from flywheel....

General Distributor Notes:

See "Head Removal, Servicing and replacemnt pp. *40* for distributor removal procedure. Note that any 600 distributor will fit all 600/600D/750 motors and likewise any 850 mechanical advance style distributor will fit all 850/903/OT1000 engines. Frequently the metal or plastic oil slinger or shield at upper portion of distributor/intermediate shaft is in poor condition or missing. This sometimes allows oil to seep out at base of distributor housing. 600-style are no longer available and 850-type slingers can be difficult to install, so it's easier and just as effective to use non-hardening gasket sealer on distributor base and head before refitting. If for some reason you ever need to fit distributor without engine already in proper position to accept it, here is the set-up procedure for all engines: Turn engine in direction of rotation (use generator or crank nut or hand-push car in 3rd gear) with oil cap removed while watching #1 exhaust valve movement through oil filler neck hole. After valve opens and then closes, turn engine one more complete rotation of crank shaft pulley stopping about 5/8" before top-dead-center line on timing cover (if valve cover is removed, merely turn motor until #4 valves are "rocking" and stop 5/8" before the mark).

For 850-Based Distributors:

While standing at the rear of engine, hold distributor above cylinder head installation hole and rotate distributor housing until primary wire attaching stud on housing faces to left (perpendicular to the crankshaft center line). Now rotate distributor rotor so that it points in the direction #1 spark plug wire electrode (and just as point rubbing block hits cam) if cap were installed (all distributors spin clockwise regardless of engine rotation) and "drop" distributor into engine. Fit distributor retainer clamp loosely end rotate distributor housing a small amount in clockwise direction. Now, slowly twist housing counter-clockwise until ignition points just start to open (you can try this several times to get it where you want it) and then tighten retainer clamp. With a screwdriver tip scratch a line through lower distributor housing and cylinder head joining point. Later you will probably find that this "initial" ignition timing is very close to where final adjustment turns out to be.

*** 600/D/750 disc lining diameter : outside -155mm(6 1/8"), inside -114mm(4 ½")**

For *600/750* Engines and Distributors:
Procedure is similar to 850-based but there are some extra parts to deal with; i.e., bottom to top: intermediate shaft with oil shield and loc screw, tachometer drive gearbox (750 Abarth only), distributor support housing with vacuum advance and linkage plus distributor housing clamp device, and the distributor itself with peg-drive shaft coupling (see Figure #4). For distributor service, see "Tune-Up" section and pp. 126 of "Abarth."

Starter Generator Alternator :
80% of the time, weak starters should be replaced with a new unit. Replacing brushes and bushings and "turning" commutator or replacing armature is often a futile effort. Apparently field coils go bad and end-housings warp which means -almost every part needs replacing. Do yourself a favor. and buy a new one. Also stay away from "Femsa" brand starters / generators / distributors unless the price is really "right" as some parts are not interchangeable with Marelli and no Femsa parts are available in the U.S. Generators and alternators can usually be successfully rebuilt. Always replace original ball bearings with sealed type. Alternator brushes can be easily replaced by just removing metal-screw ;'retaining plastic brush-holder on outside of alternator case (disconnect battery first). Some generator brushes are soldered to end-housing and field coils and, therefore, require generator removal and disassembly. Voltage regulators for generators should be tested in car by a competent auto electric shop upon installation (new ones are often adjusted wrong). If your battery always seems to be "using" water perhaps regulator is allowing too high a charging rate and boiling away water. For generator/ alternator and starter removal and replacement, see power unit removal and replacement sections. For 600D starter conversion see pp.19.

Carburation, Desmog and Fuel System Notes :
Most of the important information regarding two-barrel Weber 30 DIC/A is contained on pp. 129-130 of "Abarth" Parts breakdown and part numbers are shown in Figure #5 and jetting charts are provided on pp. *103* of this booklet to aid correct parts replacement after cleaning. For cleaning, all parts except throttle shafts/butterflies and linkages should be removed and everything except "soft" parts soaked in professional strength carburetor cleaner. Then wash thoroughly with water and blast all passage-ways with compressed air before spraying with WD-*40* to evacuate any remaining water. If primary idle jet becomes clogged and you do not have a compressed air nozzle available to you, use a single bristle of a wire brush to carefully dislodge blockage. Typewriter or dental tools are helpful when attempting to install delicate choke pull-off spring. When brass fuel inlet or closed-system fuel-return (smog cars only) tubes leak or pullout of float bowl lid, they can be "expanded" and refit by striking tube length-wise around its circumference with a chisel and hammer and then driving it back into its press-fit bore (hardening-type sealer optional).

If you suspect a vacuum leak, because even installation of a 50 idle-jet will not allow engine to idle at around 1100 RPM, check for: a stuck direct-crankcase-vent valve (if fitted) in intake manifold, condition of pollution device vacuum diaphrams and hoses (it fitted), as well as carburetor and manifold flatness, base mounting gaskets, and attaching studs (may need to be retapped oversize). Carb-base leaks can be located with engine running by pulling on carburetor in different directions and/or spraying solvent around carb / manifold / head joining surfaces (keep spray away from throttle shaft linkage though) while noting obvious engine speed changes when leak is momentarily sealed by solvent.

Check condition of all fuel lines carefully (remember that fuel lines run close to exhaust system and constitute a fire hazard if leakage occurs). Use 6mm fabric-braided fuel line and new clamps. See pp. 127 of "Abarth for fuel pump info. If an electric fuel pump is desired, try the new / small light weight transistorised type. For carburetor tuning on stock engines, see initial and final adjustments sections of "Power Unirt Installation" .pp26-28 and pp. 129-130 of "Abarth." Standard fuel capacities are': 600-7.1; 750-7.0; 600D-8.2; 850-7.9 gal. Tank removal and cleaning details are contained in "Power Unit Installation" checks on pp. 18 .

1968 and 1969 850's enjoy a rather unique distinction among cars imported to the U.S. . in that they are exempt from smog device laws which went into effect in 1968. In '68, Fiat decided to take advantage of the 50 cid (820 cc) engine capacity "loophole" ; and decrease bore size of the 843 engine one millimeter to obtain 817 cc. In California, if you have a 1968 or 1969 car or even e later vehicle with a '68/'69 engine, you are not even required to have it checked at a pollution station. Just ask to sign a "statement of facts" form on which you confirm that original or replacement engine is under 50 cubic inches. (Department of motor Vehicle employees frequently have to be informed about this. Don't let them talk you out of it, though. justice is on your side... Insist that they look it up in their procedure manuel ! *)*

Anyway, is it any wonder that "many" 850'5 seem-to-have 1968-69 engines in them and are totally lacking in smog-control devices ? The real truth is that 1970-73 903-engined cars are almost totally unaffected performance-wise by the various devices, but it can be a real "Pandora's Box" trying to locate leaking vaccum hoses and smog diaphragms (smog diaphragms are not available individually and must be purchased as expensive complete units). In addition, you have a lot of useless junk hanging all-over engine compartment, complicating maintenance and power unit removal -- not to mention the extra weight your "poor little motor has to drag around.

The reason I tell you this whole story is to explain why I remove pollution devices (legally, of course). Now, how to do it. It is easiest while engine is out of car. On left side of carb, deceleration fast-idle diaphragm is fitted (a vacuum hose is attached too) in conjunction with choke cable holder bracket. Remove operating rod and unscrew housing. Using a hacksaw, cut awa)' diaphragm housing, leaving choke holder and its mounting flange. Make a new gasket that covers entire "'Well" within carburetor body mounting flange and re-install gasket and choke cable holder. Snip off edges of the operating "foot" connected to front side of secondary throttle shaft so that it can't get stuck with linkage movement.

Choke pull-off diaphragm is on right side. On customer cars I sometimes leave this intact to keep unaware drivers from choking motor to death. For myself, I remove it and be sure to back choke off a little about two second after engine starts. With diaphragm removed install a suitable sheet metal screw or other plug into vacuum supply hole. On very late cars, if you leave this diaphragm housing intact you must plug small vacuum tube that was formerly connected to fast-idle diaphragm (which you removed a moment ago).

903 carburetors (30 DICA models) have two fuel lines connected to brass tubes in carburetor lid. Tube on left has a metered hole in it and acts as a fuel return to gas tank. This tube can be removed and plugged, or have a short piece of plugged fuel hose fitted, but my favorite solution is to exchange complete lid for an early (1967-69 30 DIC) model piece. On a 1970-73 850, fuel return hose should be cut and plugged close to gas tank. It's a nice touch to fit an early model black plastic fuel level-sensor access / cover plate, which has no hole in it for hose.

There are two vacuum fittings on intake manifold which must be plugged if you decide not to obtain an early non-smog manifold. Now you can remove smog device hardware and hoses from engine compartment (canister and vacuum/electric switch from right side and test switch from left. Tape the ends of test switch electrical wires). The semi-clear hose connected between fuel tank-ventilation plastic air filter and evaporative canister should be cut off and left to hang free next to right side of radiator. The other semi-clear hoses fitted along top of the" engine compartment firewall should be left intact to provide a fuel tank vent, as gas cap is a non-vented type. Except in cold climates, late air cleaner with exhaust heating duct can be replaced by pre-1970 type cleaner assembly, and ducting hardware attached atop exhaust header can also be removed. If retained, a climatic adjuster knob can be set for pre-heating of intake air. If you decide to retain smog hardware add are unsure which hoses go there, here is the correct setup : 1)Large fabric-braided hot air hose from charcoal canister gees to tube attached to exhaust header. 2) Small (8mm) hose from top of canister to intake manifold fitting with small metered hole facing towards rear of canister to intake manifold fitting with small metered hole facing towards rear of car. 3) Small semi-clear hose from bottom of canister to small white plastic 3-way valve/filter mounted to upper right front corner of engine compartment and then continuing along top of firewall before passing through holes in firewall and attaching to gas tank vapor separators 4)8mm fuel hose from rear of Electro-valve switch mounted on lower right side inner fender to fitting (with large hole in it) projecting from right side of intake manifold. 5) 8mm hose from front side of same switch running along side of radiator and then along top *of* rear firewall to adjustable idle-kick-down diaphragm tube at left front corner of carburetor. 6)6mm hose from brass tube with Metered hole at left front of float bowl lid to fitting attached to fuel level gauge sensor on gas tank (accessible through black plastic cover plate on left firewall). To check operation and adjustment (1600RPM)of idle-kick-down mechanism on left side of carb, a test switch is provided at left rear corner of engine compartment. You may need to replace the charcoal canister which is probably saturated with fuel by now. Note: idle CO reading=1 ½ - 2 ½ % @ 900 RPM.

Under miscellaneous, I recommended locking bas caps for 850-cased cars and particularly Spyders, as they have filler neck locations that promote tampering or theft. Coupe/Sedan/Racer models could utilize an engine-lid lock for this purpose, as their filler is within engine compartment. Also, if you happen to use *a* large 124 style carburetor with vacuum operated secondary, only the secondary-opener arm from the 850 2-barrel is required (after vacuum hardware is cut away and holes plugged) for mechanical secondary actuation. (see Figure #5). Note: BAP/GEON is US. Weber agent.

Exhaust System :

Listen for leaks or loose internal baffles (rattling then engine is revved-up), note loose manifold, flange, and mounting bracket bolts, and look for rotting muffler (stab at bottom of mufflerr with a screwdriver tip) or cracked welds at muffler inlet pipe(s). See pp. 130 and 137 of "Abarth" for more information.

To fit an 850 style exhaust system)first install two mounting brackets onto studs on top of muffler (each bracket also utilizes two rubber grommets and a spacer tube as well as a retaining nut, large flat washer and lock washer--see Figure #8), but do not fully tighten nuts. Fit exhaust gasket to cylinder head studs and slide exhaust system into place. Start five header flange nuts

(with flat and lock washers) and four bracket-to block attaching bolts (flat washers and lock washers with one spacer sleeve fitted to long upper rear bolt - see Figure #8).
First tighten cylinder head stud nuts, then bracket-to-cylinder block bolts, and lastly muffler stud nuts. Sometimes if header flange is warped or sloppily manufactured you will be required to do a little "grinding / shaping" and/or fit two gaskets to obtain proper sealing. For 600/750 systems, bolt header to head, then attach muffler flange(s) with gasket(s) , & lastly, install muffler to-sump attaching bracket(s) (750=one rear bracket, 600=two brackets).

Control Cables:
600/750 clutch cable removal is accomplished by first dropping front suspension splash shield (if fitted), jacking up and supporting front end, and removing jam nut and adjusting sleeve from threaded cable-end. Next remove starter access plate behind rear seat / luggage area, detach spring and retainer clip from throw-out-bearing accuation-fork arm and slide out the special cable-attachment-pin (don't loss this very small pin). From beneath car pull outer cable-end forward and out of locator hole on transmission case. Now pull cable rearward to withdraw from center tunnel. You can see from this description why I always fit a new cable before engine installation (half of the work is already done for you). Replacement of cable is reverse of removal with pedal free travel adjustment (about 1'-1 ½" or to your preference) required before fitting of suspension splash shield.
See pp. 66 and Figure 10 for cable support strengthening.

Access to 850/OT1000 clutch cable is gained by first pulling up floor mat covering front portion of center control tunnel (some cars have center consoles to remove also) and then unbolting tin cover plate (one or two bolts - 10mm socket). Now try to remove special cable retainer clip without damaging it. Tie a long piece of heavy string to front end of cable. Next, jack *up* and support left rear side of car and while lying beneath muffler, reach up and remove cotter, washer, and clevis pin at cable-end bracket/operating-arm connection. Pull cable-end forward to remove it from locator strap/bracket. Now carefully withdraw cable and string from tunnel and locator hole. Remove string from front end of old cable and tie it to new one. With someone inside car to pull gently on guide-string, feed inner cable into locator/support hole. The rest of installation procedure is same as for removal with addition of pedal free play adjustment (about 1 1/2" or to your preference). Be sure that special front retainer clip is in good condition and situated so that it cannot pop-off of the grooved shaft. It is a lot easier to fit washer and new cotter to rear clevis pin if clevis *is* inserted from back side of throw-out-bearing arm so that hole for cotter will be facing you. Once again, it will be seen that cable replacement is much easier with engine out of car.

On 850-based cars, when squeaking and groaning are noted as clutch pedal is operated, it may be possible to "drip" some heavy oil into plastic-bushed clutch pedal pivot shaft, but it is often necessary to remove, disassemble, and grease (or rebush/rebuild) pedal assembly to permanently cure this annoyance. While you're at it, remove and grease pivot arm and operating rod located within center tunnel at front cable-end attachment point. Watch for definite flexing at left side of tunnel as pedal is operated & see pp.67,107-8. for tunnel .strengthening details if necessary.

Access to 850/0T1000 accelerator pedal and control wire is obtained in same manner as clutch cable. The accelerator pedal lever arm that extends into center tunnel is peened onto its shaft and frequently becomes loose allowing considerable play before cable is operated (see drawing pp.108). Remove cotter and retainer washer and slip control-wire-end off of pedal ann. Loosen hand throttle pinch bolt and slide it off hand throttle wire. Remove two bolts (10mm 1/4" drive socket) holding combination plastic bushing and pedal assembly mounting-block to center tunnel and "maneuver" pedal assembly around until it can be withdrawn through installation hole (sometimes lever arm must be bent slightly to accomplish this). It's possible :hat a punch or chisel could be used to "restake" lever arm. to shaft, but it's rare shat it will hold for very long. I recommend heli-arc welding and then immediately quenching so as not to melt the plastic mounting/pivot block. Even a new pedal assembly is a good candidate for welding. I-fake sure shaft-to-bushing play is Got excessive (before welding), and drip a small amount of heavy *oil* into it. Before refitting, be sure that pedal installation area and adjacent floor boards are clean. Use a new cotter with cable-end retainer washer and allow at least 1/4" of play in hand throttle wire before tightening pinch bolt. To replace accelerator cable wire, remove pinch bolt and cable-end dust boot (if fitted) from wire situated atop engine valve cover and straighten end of wire. Gain access to center tunnel and remove cable-end from pedal arm. Pull wire out, uncoil new cable wire and carefully straighten out any bends (use a bench-mounted vise and pliers). Wipe off with a rag and apply grease to wire as it is inserted into front end of tube. The wire will stop when it is less than halfway inserted. Reach under car at center control tunnel exit panel and unplug flexible outer cable sheath from its locator in panel. From inside car push cable wire in another six inches. From beneath again, insert cable wire into outer sheath and feed it through until it comes to the end, being careful not to force things when a stoppage occurs due to wire becoming caught on objects inside passenger compartment (someone to guide wire from inside is a big help). From inside, pull cable forward enough to attach the end to pedal stud with retainer washer and a new cotter. At rear, install rubber dust boot, slide cable wire through pivot-arm plastic-sleeve (it may be helpful to momentarily remove outer-cable-end or pivot arm from valve cover to keep from bending wire on installation). Pull slack out of cable and linkages and then let-go of wire and install pinch bolt with at least 1/8" of slack showing beyond plastic sleeve. Snip off any excess wire (about 1 1/4" is a good ar.10unt to leave). See Figure F, pp. 138 of "Abarth."

600/750 accelerator cable setup and procedures are similar except that access in front is gained by removing front suspension splash shield (if fitted), and in rear, outer cable is quite short and plugs into steel tube exiting engine firewall (rather than extending through firewall and plugging into rear of center tunnel as for 850-based vehicles).

600/750 pedal assembly is of a better design than 850/0T1000 units and rarely requires attention other than dripping a small quantity of heavy oil into aluminum pivot-bushing/mounting-housing. The long pedal-mounting bolts are fragile and may snap off or strip their threads during removal. If this happens, retap captive mounting nuts and install oversize U.S. bolts.

As a temporary fix, a cable wire that has broken off near the end, can be bent in a 180° loop as it extends from outer flexible cable, and another loop can be bent in a short piece of new (steel) wire that is inserted in pivot-arm sleeve. Hook the two loops together and adjust cable in a normal manner.

As all models must have their complete choke cables pulled forward through center tunnel, it is advisable to tie a heavy string or wire to rear end of old cable wire (make a loop and crimp it tightly over string knot) before withdrawal front tunnel. On 850/0T1000 models, handbrake lever holder-plate must be unbolted end lifted up after removing handbrake cable end (clevis, cotter, and retainer washer) from one of the backing-plate-mounted operating-arms on rear brakes (one side or the other is sufficient). This is necessary to gain access to choke cable retainer nut or clip located under handbrake plate. On 600/750 models, unbolt choke and starter lever aluminium-housing from tunnel for cable access. See engine : installation procedures for proper choke adjustment (pp. 21).

Adjustment for 850/OT1000 handbrake is covered in engine installation procedure for those models. 600/750 models with handbrake fitted to front end of transaxle are adjusted by loosening jam nuts and moving them along threaded outer cable-end (at transaxle cable-holder bracket). Shoe to drum clearance should be .010" (0.25mm) or about five clicks of driver operated handle should be heard before brake is locked solid.

<u>Shift Control:</u>
When 600-based cars have Shifting difficulties, first check for a split, cracking, or oil softened rubber shift coupler (watch from beneath as someone operates shifter). To replace coupler, remove two set-screws (10mm socket and extension), slide coupler forward and off transmission shift rod (it may be necessary to use penetrating oil *and r*otate coupler while carefully holding shift rod with vise grip pliers). Support front end of transaxle with a jack and remove crossmember-to-chassis attaching bolts taking care not to misplace spacer washers as you lower transaxle (see Figures 11 and 14) to provide enough clearance for pulling coupling to rear and off of shift lever shaft. When fitting new coupling, make sure that locator holes are perfectly aligned (use flashlight) before installing set-screws (someone to operate shift lever is helpful at various times during removal/replacement process). If you should ever lose a coupler set screw, a normal 6mm x 1.0 bolt can be modified to fit. First spin a nut onto the threads and then grind or file a point on tip of bolt. Removal of nut will clear threads and assure quick starting on installation. As a temporary fix, holes can be drilled through coupler flanges and rubber center portion and then machine screws and locking or double jam nuts used to hold a broken coupler assembly clamped together.

If shift lever is not in a perfect vertical position when gearbox is in neutral, shift mechanism mounting bolts can be loosened and holder bracket moved for adjustment (mark original position before moving just in case shifter operation becomes worse). Shift lever rattle at speed is a common (and very irritating) fault of 600/750 models. As there are few parts still available for shift mechanism, about the only option left is to make your own pieces or cannibalise two or three used assemblies to "build" *one* good one (see Fig- 14/15a*). with 850/0T1000 shifting problems always check for damaged transmission mount brackets and rear engine mount perch first (see pp. 67) & then next remove rubber shift coupler at transaxle end (10mm socket and open end wrench) and check to see that attachment hole in coupler has not become oval in shape (it should be round) allowing sloppy fit of special stepped pivot-bolt (see Figure #15). Even though the rubber portion almost never separates (like 600/750 types), you still must replace coupler when attachment hold becomes elongated. Now with rear pivot/attachment bolt, spring washer, retainer washer, and locking nut refitted, check to see that shift lever is perfectly perpendicular when transmission is in neutral. If not, loosen two front coupler-attaching-bolts (13mm socket and extension) and retighten them with shift lever perpendicular. As a last resort, small spacer washers can be installed between shift lever assembly and its mounting surface on center tunnel. The three attaching bolts (10mm socket) are in a triangular pattern which allows shifter assembly to be tilted by selective fitting of spacer washers. Try washers about 3/16" thick with left rear bolt (a slightly longer bolt may be necessary) about 1/16" to 1/8" thick with right rear bolt, and none under front bolt, as a good starting point....

Axles Couplings Sleeves Boots Checking :

Place car in neutral with hand rake off and block rear wheels front and back. Apply a vise-grip pliers to one axle and twist one direction and then the other and attempt to rotate axle. Watch rubber-filled alloy coupling attached by a splined sleeve to outer end of axle. It should not remove at all. If it does, it's shot. If couplings are good, turn your attention to play between axle and splined sleeve (4 bolts attach them to coupling).
***A* little play is normal even with new parts but excessive slop usually requires replacement of axle and sleeve (if axle splines sheer-off while driving, you will be left with a car that runs fine but will not move. If this ever happens, set handbrake, place car in any gear and let clutch out. Go around to rear of car and look underneath to see if one of the axles is spinning.**
If neither axle is in motion, your-crutch disc or maybe even the transaxle has just "bitten the dust"). Note, condition of inner axle boots (cracking, leakage, etc.) on all models, and with 600D/850/OT1000 vehicles check outer axle/splined-sleeve boots (torn or missing outer boots allow grit to contaminate grease and prematurely wear axle end sleeve splines until they sheer-off.

*** Note also that a reverse lock-out spring is fitted to shift rod &attached inside of tunnel behind shift lever on all cars.**

Axle Coupling, Sleeve or Boot Replacement :

A though procedure *is* the same, axle removal is obviously much less ,difficult if engine and radiator should happen to be out of car. Using an impact wrench en four 8 or 10mmt sleeve-attaching bolts (600/750=14mm socket, 850/OT10000=17mm socket) and large coupling-nut would make things a lot easier too. Most people do not have this type of facilities though, and in addition many vehicles will not have a handbrake capable of holding with the tire jacked up off of the ground. So, I'm going to outline "the hard way" to do this job. On 850-based models, rear shock absorbers must be detached at their lower ends. (Hold lower portion of shock' tube with channel-lock pliers but do not squeeze herd enough to dent tube and use a 17mm socket to remove lower mounting-stud nut with flat and lock washers and two rubbers). . Push shock tube up to allow improved access to axle sleeve and coupling. On all models, roll car forward slightly to place axle sleeve attaching bolts in e position where two bolts can be removed without further movement. Block front wheels front and back and set handbrake. Use a 1/2" drive extension and socket with a piece of pipe slid onto large ratchet handle to increase leverage when removing bolts. Move car forward to gain access to the other bolts. Work space is definitely tight with car on the ground, so if your handbrake works really well, you might try jacking-up and supporting the side you are working on or using elevated ramps. Next place a small pan beneath inner axle boot to catch minor leakage while detaching boot. 600/750 transaxles require only removing large inner clamp and pulling boot off of its holder sleeve. 600D/850/0T1000 gearboxes require removing boot retainer plate nuts (600D=5 nuts, 850/OT1000=2 bolts and 2 nuts). Now pull back splined axle sleeve, lift outer end of axle upward, and pull inner end of axle out of gearbox. On outer end, about a 1" long spring may be found inserted into a recess in tip of axle and or inner *side* two axle "stones" are attached to a machined pin that is pressed into a hole *in this* end of axle (see Figures 14 and 15). Remove axle-coupling-nut cotter and using a 1/2" drive ratchet with a long piece of pipe slid over the end for increased leverage (or an impact wrench), remove special large castleated nut. On 850/0T1000 models, lower shock absorber mounting bracket support will sometimes not allow splined coupling to slide off of stub axle. If this is the case, I either tend the support slightly with a vise-grip pliers or momentarily jack tire off of ground allowing stub axle to be tapped outward just enough to provide room for coupling withdrawal (handbrake must be released).

Slide on new coupling and tighten nut as tight as possible (100ft.lb.) w/ long lever bar and ratchet. Raise car or push vehicle forward to rotate wheel and find cotter hole that is closest-to perfect alignment (through castelated nut and stub-axle holes). It is usually necessary to loosen nut slighty to gain perfect alignment. New cotter should slide right in without difficulty when alignment is correct. Do not pack rubber-filled coupling with grease before fitting axle as it will melt rubber.

Now install new 600D/850/OT1000 inner axle boot seal in its retainer sleeve (plastic or metal types) and then force sleeve into inner recess of axle boot (some new boots come with sleeve and seal already installed). Grease seal and slide boot assembly onto its axle. When replacing boots on 600-based models where boot is clamped to axle shaft, axle must" be installed and large inner clamp fitted on transaxle sleeve before small outer clamp is positioned (with axle parallel to ground) and tightened. If necessary, large American style hose clamps can be used to replace awkward original Fiat retainer bands. On 600D/850/OT1000 models, install outer axle boot. Then with all models, grease axle and axle sleeve splines before sliding sleeve onto axle and installing retainer snap ring (stand axle on end and apply thumb pressure to pop snap ring into its groove). Slide inner boot retainer plate (600D/850/OT1000) onto axle shaft. Now apply heavy grease to machined shaft pressed into end of axle and clean the two drive "stones" before slipping them onto either side of their shaft.

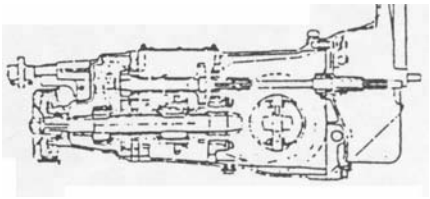
Jack side of car up and support it with a stand beneath suspension arm before removing rear wheel. Sit facing brake drum and insert axle (with stones in place) into transaxle sleeve. Use your index and middle fingers to keep stones from cocking out of alignment as they enter slots within gearbox. With splined sleeve slid inward end a new spring inserted in hole at outer tip of axle, lower axle into place while compressing spring.
Spring should rest on tip of outer stub-axle when properly positioned. Now slide splined sleeve outward and install all four attached colts. Refit wheel add tire and lower car. Push car forward or back until two attaching belts are accessible from behind and under car and use handbrake or block tires to allow bolts to be securely tightened with a large 1/2" ratchet.
Roll car further to tighten the other two bolts. Check to see that small outer boot (600D/850/0T1000 models) is properly located in its retainer groove on splined sleeve. With 600/750 models, simply slide large inner axle boot in place over lip on transaxle holder-sleeve and clamp it in place. Now clamp boot to axle shaft. On 600D/850/OT1000 models, attach boot to transaxle by bolting retainer plate to side of gearbox housing a little at a time (600D=5 studs, nuts and lock-washers using socket and extension, 850/OT1000=2 studs, nuts and lock-washers and 2 bolts and lock-washers). All vehicles must have axle parallel to ground before attaching axle boots. Misallignement, boot damage, and leakage will occur if inner boots are attached while rear suspension is in a "droop" position. Lastly on 850/OT1000 models, reattach lower shock absorber stud (with washers and rubbers) to suspension arm. In case you ever need to replace 600 stub-axles, note that 600D fine spline stub-aaxles and couplings are stronger than the 600/750 coarse spline type.

The Transaxle

Both 600/750 and 850OT10000 transaxles are trickey to successfully rebuild. Special fixtures and dial indicators are necessary to obtain proper "setup" and adjustment * My experience is that a Fiat transaxle that has been apart is far more likely to give trouble than a good used unit. If you decide to rebuild this gear-box yourself, follow instructions in the Shop Manual. Few mechanics are qualified to rebuild one of these transaxles -- so beware of anyone (including Fiat dealers) who says that "transaxles are all alike and anybody can handle the job." Decent 850 units have been so easy to locate in California junk yards, that I only open up an 850 gearbox when changing ring and pinion ratio (desirable with 124 engine conversions). Likewise, I have been able to locate enough 600-based (600D and Abarth) gearboxes through "friends of friends" to make rebuilding of these units unnecessary also. See specifications, pp.102 for list of popular final drive ratios and 850/OT1OOO pinion bearing shims with part numbers.

On 600/750 units pay particular attention to condition of all first and reverse gears (cluster, driven gear, slider, idler see Figure #14) and second gear synchroniser. Note that there are two different sizes of input/pilot shafts, cluster gear and shaft, and handbrake drum and seal. With 850/0T1000 types, check first and second gear synchronisers and related slider gears carefully.

Transaxle removal is quite simple once engine (see pp. 13) and axles (see pp. 50) have been removed and gearlube drained. It is also possible to merely support bellhousing (use wire) and detach axles at their outer ends (4 sleeve-to-coupling bolts) and use an elastic bungie-cord to hold inner portion of axle shafts in gearbox so that removal of axles is unnecessary.
Detach: 1) (600/750) starter cable and wires; 2) clutch cable end and outer cable holder; 3) shift linkage coupler; 4) (600/ 750) handbrake cable; 5) speedometer cable (for removal of 850/0T1000 style cable, see pp. 57); 6) (Some 850) backup & smog switch wires. Now support transaxle beneath differential with a floor jack and remove two crossmember (600/750 - see Figure #11) or mount bracket (850/0T1000 - see Figure #12) bolts. Lower and roll transaxle to rear slowly noting possible interference (especially 850 sway bar and handbrake cable, plus axles if still fitted).



600/750 Transaxle Cross Section

See pp. 68 for details on conversion to Fiat 600D transaxle and related hardware.
*** 600/750 case preload: .004", *R&P* backlash: .003-.005"**

Gearlube

Do not neglect gearlube changing as previous owners probably have. Gearlube should be hot before draining. Use magnetic drain plug as found on 850 gearboxes for all models. Thoroughly clean metal chips from magnet and wrap a couple of turns of Teflon tape around threads before replacement of plug. 90-weight gearlube should be used. On 850-based gearboxes, the small diameter/tall plastic quart container with a pointed tip that some companies sell gearlube in can be used by inserting it into filler hole at an angle from shove left axle while lying on your back beneath left rear edge of body. 600-based models will require a hand pump with its flexible tube inserted adjacent to left lower corner of radiator. Gearlube will run out of filler hole when full if car is on a level surface; out it's easiest, for all models, to just use 2 U.S. quarts and then replace plug.

Brake Rebuilding Notes (Specifications: pp 108)

Because of the nature of Fiat wheel cylinder design (seal at end of piston rather than fitted to piston groove), I replace (rather than rework) these cylinders whenever possible. All wheel and master cylinders (except for late 850 dual master cylinder) are inexpensive and worth the replacement cost (see figure #18).

Late 850 self-adjusting rear brakes in particular cannot have their drums turned very much at all without. affecting braking efficiency and even causing cylinder leakage. Don't allow cars with these brakes to go too long without inspecting rear shoes. If worn shoes are allowed to extensively groove the drum, you will be forced to replace these really expensive brake drums. Note also that Fiat 128 drums will fit as 850 replacement units and most 850 rear brake drums fit tightly over rear stub-axle hub and often become rusted onto hub. This requires beating on inside lip of drum from beneath car with a stout chisel and heavy hammer. You must deliver about two strong blows and then rotate drum about 1200. Sometimes this process takes as long as 20 minutes to get a drum off. (Be sure that you have removed the two drum/wheel locator bolts/pins before hammering away). Once drum is off be sure to polish drum and hub contact surfaces with abrasive paper and grease them before reassembly (so this won't happen again). Remember that cars with handbrakes operating on rear wheels may require handbrake adjustment (and on non-automatic adjuster cars perhaps the shoe adjusters too) to be released somewhat before drum will fit over new thicker brake shoes.

Late (mid-'68 to '73) 850 rear brakes have friction type self adjuster mechanisms fitted on each shoe (see Figure #17). These units work well but are frequently assembled wrong causing all manner of difficulties. Use a vise-grip pliers and a pair of channel-lock adjustable pliers in the installation procedure.

On back side of shoe, fit sleeve,. spring, and one sintered bronze friction washer. On front side, place second friction washer and steel retainer washer. Now with vise-grip pliers adjusted just right (to lock near the end of spring compression), use one pair of the pliers on each side of steel retainer washer to compress spring evenly before locking vise-grip pliers. Vise-grips. Will hold assembly compressed in place while a new snap ring is fitted. Vise-grips cannot be clamped too close to center sleeve. or there will be no room to install snap ring. Make sure that new snap ring is fully installed in its groove. You can imagine-the damage snap ring and washers would do if they were free to roam around inside brake drum It is "possible" to reuse snap rings if you and "the fellow before you" were careful to properly compress the assembly before trying to remove snap ring. If you don't do this right through, snap rings will be bent and rendered incapable of retaining adjuster assembly.

The nice thing about the late model (mid-1968 and later) Fiat 850 front disc brakes is the ease with which you can replace the pads. It is not necessary to unbolt caliper holder from hub carrier. Merely pull out four little retainer clips and uses a screwdriver and, hammer to drive-out two caliper "sliding plates." Now pry, caliper free from its holder with large screwdriver. Remove lid from master cylinder reservoir and stuff some rags around it to control spillage should reservoir overflow when you use a couple of large screwdrivers in conjunction with your foot (to support caliper) to pry caliper piston back into its bore. This is necessary to make room for thicker new brake pads. Check to see that pad anit-rattle spring-clips are in good condition and insert pads into caliper holder. Now leyer caliper into the proper position in holder and use a large screwdriver from below to pry caliper up against tension of upper caliper retaining spring and drive greased lower "sliding plate" into place. Then pry down on caliper from above & drive-in greased upper "sliding plate." Lastly, replace four little retainer clips.

When both sides are finished, pump brake pedal 3 or 4 times and check fluid level before replacing reservoir cap. Note: Never "turn" damaged brake rotors as they become too thin *. Use only the highest quality disc brake fluid & don't neglect flushing every 2 years. Notes: On cars with dual master cylinders, the resivour for the front brakes circuit is located nearest the left

side of car. When .060" or less of lining material remains, its time to replace the brake shoes.

Brake Adjustment

The nice thing about late850 front disc and self adjusting rear) drum (or 4-wheel-disc brakes) is that after you have them in good working order, you can forget them completely until it is time for regular inspection. So unless you are using the original 12" wheels on a 750, I would install these brakes on all models and forget about the following information on adjustments as well as the habitual poor brake performance of Fiat all-drum brakes. On 600/750 models, holes are provided in brake drums to check adjustment and thickness of remaining lining material.
First insert a .010" (0.25mm) feeler gauge between lining and drum at a point where each lining is closest to upper eccentric (snail type adjuster) pin. Turn nut on back side of backing plate to affect adjustment. Now insert a .004" (0.10mm) feeler gauge at lower edge of shoe lining (closest to lower fulcrum/hinge pin). To adjust each shoe, a nut on back side of backing plate must be loosened sufficiently to allow offset hinge pin (fig.17)to be tapped outward enough to clear its locking notches behind adjusting screw-head. Use a large screwdriver inserted through drum hole to move adjusting screw/pin one notch at a time before rechecking with feeler gauge. When you get the best possible lower adjustment, readjust top setting again. Afterwards, test drive car on, a deserted stretch of road by momentarily removing your hands from steering wheel as you apply brakes. Car should not make an immediate sudden turn when brakes are applied. If your linings and drums are in good condition (not worn, scored, or out of round) you "should" be able to play with the adjustment until semi-adequate braking is obtained. Note that whichever way car turns during braking probably has one or more of its brakes adjusted tighter than the other side. Good luck Some late 600, all 600D, and early 850/0T100 drum brakes are self-aligning and require only a single adjustment for each shoe. 600D types can be adjusted the same as the top portion of 600/750 types (.010"). Early 850/0T1000 rear brakes must be adjusted to "feel" by locking drum with one shoe at a time and then backing adjusters off slightly so that shoe drag is very light. As before, give car "hands off" test when finished .Pedal free play should be near ½“.

Handbrake:
600/750 handbrake is adjusted by moving jam nuts along threaded outer cable-end at bracket attached to transaxle end-housing.
About 5 clicks of driver operated lever before lockup is a good adjustment. Be sure to drain gearlube before removing brake drum from end of transaxle to replace shoes. Remaining shoe lining can be seen through holes in drum without removal (see Figure #16). Late 600 and 600D handbrakes are adjusted at each outer cable-end. 850 style requires only moving jam nuts along a threaded rod at rear of center tunnel, and just ahead of transaxle.

* New 1968-on Fiat brake rotors measure .397" thick.

Tires and Wheels:

With original) 1/2"x12" Abarth steel wheels on a 750, about your only tire size choice would be 145sR12. Prelli, Michelin, Semperit, and Kleber to name a few} are good choices if you want to stick with European brands} and good Japanese brands are Riken, Yokohama, Bridgestone. It's "possible" that 165/70x12" radials on 4 1/2" (widened) Abarth wheels will fit under the front fenders of some cars without hitting on sharp turns. .There is no problem in the rear. The handling improvement with wider tires can be dramatic.... Recommendations for early cars with disc brakes and/or 1)" wheels conversion are contained on pp. 116 of "Abarth." Keep in mind, though, that 1)" wheels and wider tires can be taller as well and make your car sit-up higher (suspension towering may be required). An exception, if you can get them" under the fenders, would be the ver low profile 185/60x13 (Riken makes a low cost"Pirelli replica") . Standard 850 OT1000 tires are 155SR13 and alternate wider tires are listed on pp. 117 of "Abarth." Again, the above 185/60-series would be even better especially with 5½"or 6" wheels.All cars use course thread lug bolts all around except for 1965 "to early 68 Coupe & Splder front wheels. These early disc brake cars use the 124 style fine thread. When fitting Italian Chromodora (Fig.25) or Campagnolo (Fig.20b) alloy wheels, use Mazda RX-7/626 mag wheel lug bolts (course thread only) with 850 Sport front wheel spacer plates (2 locator bolts each) on all 4 wheels. Lug bolts should be torqued to 45 lb. maximum. Rotation of radial tires should be accomplished by switching them front-to-back on the same side (not X-ing). Try about 25 lbs. of air in front and about 30 lbs. in rear as a starting point *.* With the first sign of unusual or uneven tire wear or featheringr have wheel alignment checked (see suspension section for recommended settings).

Rear Suspension

When rear shock absorbers are weak on 600/750 models "bump steer" becomes pronounced. A good set of new heavy duty rear shock absorbers * is money-wall-spent on these cars. Replacement rear suspension arm rubber bushings are no longer available tor 600-based cars. When changing rear wheel bearings_ a new collapsible spacer(see Fig.14&15)must be used, & the stub axle-to-coupling nut torqued to around 100ft.lbs. Check pp. 69 for rear suspension improvements/alignment.

Front Suspension & Steering

All models must have their king-pins lubricated frequently with a grease gun. If you hear a definite clunk in front when encountering pot holes and major bumps, or groaning "and/or high steering effort is required as wheels are turned, it is probably a sign that the previous owners neglected greasing king-pins (one fitting on top of each upper suspension arm). 600 and 850 based models both use same king-pin set and rubber suspension arm bushings.
When bronze king-pin bushings are driven in, they collapse which necessitates reaming by a machine shop. This, along with the fact that wheel alignment is required when job is completed is a good enough reason to consider letting a front-end shop do the complete Job. If you do the job yourself, follow directions in Fiat, shop manual. Check to see that front leaf spring is not sagging from old age.

*** see pp.56 at bottom**
**** *30/33* for competition events**

If it is, you may need to have it reached by a spring shop. Naturally, good heavy duty shocks * are plus in front too. For front wheel bearing replace/adj. : tighten spindle nut to 15 ft.lbs. while rocking hub up-&-down and side-to-side. Next, loosen nut and retighten to 5 lbs. Lastly, back-off nut 30 degrees and insert cotter pin (600-based) or 'stake' special locking nuts (850-based). New cotters or loc nuts should be used as they are damaged on removal. See up. 70 for front suspension improvements and revised wheel alignment. recommendations(Fiat says 1½° pos. camber, 8°pos.castor,1/166"toe-in).

600-based cars have *six* grease nipples provided for lubrication of steering tie-rod ends. Check condition of dust boots and grease these steering "ball joints" when lubricating king-pins. 850-based cars have sealed tie-rod ends that are permanently lubricated as long as boots are intact. A plug is provided to check or fill steering box with gearlube. Use 90-weight gear oil in steering box. All rear engine Fiats have exceptionally quick steering with little or no play in steering wheel before direction of vehicle travel is altered. If tie-rod ends, idler bracket rubber bushings, and steering box mounting (850 Coupes in particular can sometimes have their mounting panel tear away from the body requiring support/gusset plates to be welded in place) are all tight, steering box lash adjustment should take up extra play. To adjust lash : loosen nut in center of steering- box cover plate, tighten adjuster screw until play is taken up (with wheels straight) while steering effort/feel remains free and easy when operated. When you are satisfied that play has been removed without added stiffness, retighten the jam nut while holding the adjusting screw in place. If excessive lash remains or gearlube leakage is noted, it's time to remove & rework the steering gearbox (3 seals, 2 bearings, 1 bushing, worm & sector, shim, thrust washer, adj. ring, adj. plate, gasket –see Figure 20a). Note: 600/850 steering ratio is 13-1 with 3 ½ turns-to-lock.

Battery Preparation

Test specific gravity of each cell (charging or battery replacement may be necessary) before adding distilled. water to low cells & replacing caps. Remove negative cable first and then positive cable (screwdriver tip may be used to spread cable-end). Use baking soda, water, and a small brush to neutralise acid residue and clean battery top, sides, posts and cable ends. Use a wire brush and file to finish cleaning cable-ends. Special tools should be utilised to ream or brush battery posts and inside of cable-ends for a precision and clean connection. To limit acid residue build up, grease should be applied to all surfaces of battery post and cable-end. Some people even like to use "White Karo Syrup" on battery top to control acid. Frequently, small 6mm Fiat cable bolts and nuts are eaten away or "shrunk" from acid action and require replacement. A common 6mm bolt and nut can be used, but a little filing may be necessary for hex bolt head to clear notch at hole in cable clamp. Grease bolt and fit a small flat washer between cable clamp and the new nut. Make sure battery hold-down clamp is in good condition, clean and securely attached and always fit a positive terminal insulator boot and (if possible) the battery cover plate. See pp. 70 for conversion to currently available (taller) battery.

*** If heavy-duty shocks are unavailable, original units can some times be disassembled and suitable heavy fluid used to stiffen action. Or perhaps you'll want to take the original shocks to Can auto supply to match-up their method of attachment, length, travel, and relative stiffness to that of a shock meant for some other car. Shocks Test: bounce each fender up & down briskly &**

note if movement continues more than ½ "cycle" after you stop bouncing. Koni sbocks can sometimes be-rebuilt by the distributer (Kensington Corp).

750 Electrical System * and Gauges

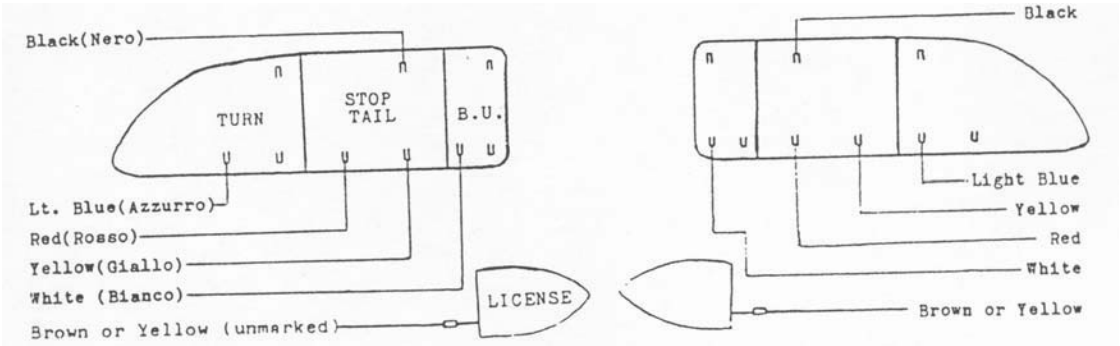
850 Spyder electrical switches are as good as the 600-type were bad. Outwardly, they look alike except that 600-style had chrome toggle levers and 850's black plastic. 850 inner mechanisms are much better (600 switches fail a lot) and they use "push-on" spade connectors rather than the early "push-in" bullet style. I would change an early Abarth over to 850 switches. They fit perfectly but require that new crimp-on connectors be installed on wiring harness (A simple Job when you remove one Wire at a time and then immediately plug it into new switch. Don't forget to disconnect battery...). You will no longer have a special "arm-parking" circuit for the wipers, but this is an unreliable feature anyway. While you're at it, you might want to convert to a "push-on" style turn signal flasher also. The steering column mounted turn signal and headlight-dip switches on a 750 can be obtained from a junkyard 600. If an improved windshield washer is desired, use all hardware (switch, pump, water bag, hoses, jets) from a Fiat 124 electric washer system. Check to see that all vulnerable electrical connections have rubber protector boots (generator, starter, oil/water/fuel sensors, coil, distributor, license and tail light connectors). Abarth/Jaeger speedometer . and tachometer cables can be made-up special by local speedometer shops. Remember to have your speedometer recalibrated if you change final drive (ring and pinion) ratio or tire diameter. Replace steel-braided hose that connects oil gauge pipe to engine block (interior of car may fill with smoke if this hose fails while driving). Early windshield wiper bushings and linkage are often badly worn by now. You can try dripping heavy oil into the bushings but eventually you will have to rebush where drive shafts attach to wiper arms. To save wear and tear on wiper motor and linkage, I sometimes mount only the driver's side arm and blade. Passenger side will require a spacer or spring to replace missing arm. Brake light switch is fit to master cylinder and has "push-in" electrical connectors. Universal-fit pipe-thread switch with "push-on" type connectors is available at most auto parts stores (replacement requires brake system bleeding). To adjust 750 headlights, loosen large stud/nut on back side of headlamp bucket (inside luggage compartment), aim beam against a wall as desired and retighten nut. Make sure power unit ground-strap is connected between cooling-fan-shroud mounting bracket on water pump and upper right stud on rear body panel.

850/0T1000 Electrical and Gauges

The Veglia Borletti gauges and switches fitted to these cars are excellent. Their oil pressure sensors are not known for reliability, but the gauges themselves almost never fail. Some oil gauges may momentarily stick on zero when engine is first started but a thump from your index finger will solve this little inequity. Speedometer cables can sometimes be a little tricky to detach from gearbox socket. A special notched bolt holds cable-end in a plastic sleeve on transmission end-housing. To remove, unscrew locking nut (10mm wrench) on left side until bolt tip no longer extends through nut and tap bolt back to right about 3/8". Now grasp outer cable with a pliers and carefully pull cable end out of gearbox socket. You may have to tap notched bolt back and forth a little to find correct spot for cable removal. Brake light switch is attached to pedal assembly bracket, and

*** see Gary Mortensen's *nice* article about 600/600D/750 electrical switches in Abarth Register - Newsletter #32 (June 84)pp.28**

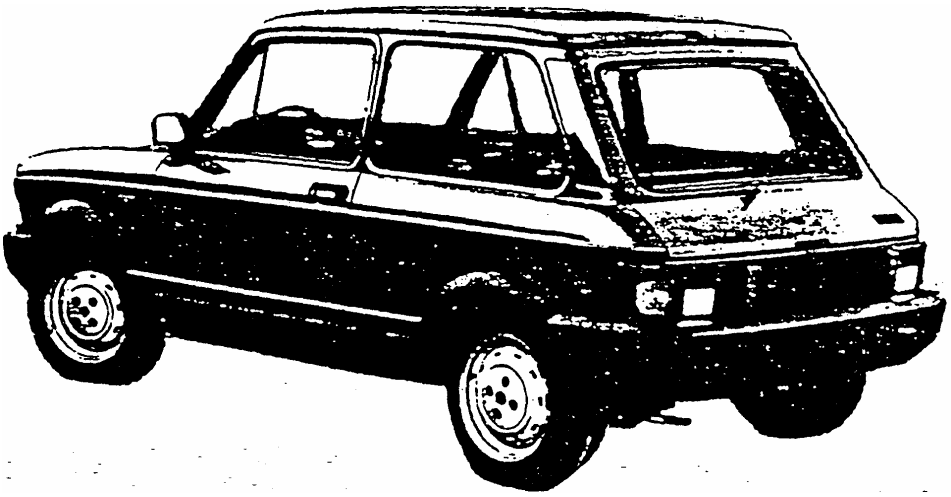
therefore does not require disturbance of the hydraulic system. Three conventional adjusting screws or nuts are provided for headlight aiming. Power-unit ground strap is attached between left lower radiator mounting bolt and right side lower flywheel dust shield attaching bolt (frequently stripped but can be retapped to 1/4"x20). Late ('70-'73) Spider stop/tail/turn/backup/license light wiring is sometimes difficult to hook-up properly after rear body panel has been removed. Wire coloring is actually labelled in Italian on light-assembly-casting near connector terminals but is difficult to see and figure out (there are nine terminals and only five wires) so Figure below should help. When finished remember to fit rubber protector boots and license plate light protector sleeves. Note also "that the clear back-up light lens *is* very fragile where the attaching screws are located. If you happen to over tighten a screw and pull out its cast-in spacer sleeve, you can use a small flat-washer under the screw head to retain the lens.



fiat 850 Sport Spider (903) 1970-72 Rear-Panel Light Wiring as been from rear(72-73 similar)

Bulb Application	SAE #	Fiat #
Stop/Tail,F. Turn/Park	1034	14146190
Rear Turn & Back-up	1073	14146090
License Plate	67	14145990
Side Marker, Indicator, Panel	158	14145890 14144190
Courtesy, Spider engine Compt.	----	10863090
Headlight Sealed Beam	6012	6012

Fuse Box contains seven 8amp fuses & one 16 amp (for Courtesy, Horn, Lighter, Hazard fissh)
For Alternator Equipped (903) Models:
Attached to upper right radiator mounting stud is 8 amp in-line Alternator/Regulator fuse under dashboard is 3amp in-line Seat Belt & Remove-Key Buzzer fuse.



A112

ABARTH

"An Italian Mini Cooper"

Chapter 4

A DRIVER'S CAR FOR THE EIGHTIES
Late Model "European" Engine Conversion

The Fiat 127 and 127-based Autobianchi A112 engines can be installed in a Fiat 600-based Abarth with no internal modification (Fiat changed engine rotation back to clockwise again). Sale external accessories and hardware will need to be replaced or modified but advantages include : current availability new or used, up to 300cc more displacement and 30 more horsepower, improved drivability and improved parts availability. With a change in engine rotation, these engines can also be used in the 850-based cars (note that reverse impeller or complete 850 water pump is required)

Available European Engine Specifications
(information courtesy of Maurice Dhoore)

Make	Model	Engine #	Cc	BxS	HP@RPM	Carb
Fiat	127	100GL000	903	65x68	47@6200	Weber 3 2IBA2 a
Auto-Bianchi	A112	A112A00	903	65x68	44,45 47@5600	Solex C30DI40 or Weber 32IBA10,20,22
"	"	A112A5000	"	"	42@5400	Weber 3 0 IBA2 3
"	"	A112A054/6 (Sweden)	"	"		Weber 32DTMR36/100 2 -barrel
Auto-Bianchi	A112		965	67.2x68	48@5600	
Auto-Bianchi	A112 Abarth	A112A1000 1971-1975	982	65x74	58@6600, 58200	Weber 32DTMR3, 33 2 – barrel
Auto-Bianchi .	A112 Abarth	A112A2000 1976-on	1050	67.2 x74	70@6600	Weber 32DTMR3, 2 -barrel

Note that the 1049cc (76x57.8) Fiat 127 engine is of the Fiat 128/ Strada/Ritmo/X1-9 familly of SOHC engines and therefore is not suitable for this conversion. As you can see from the chart, the late 1050cc A112 Abarth motor is the "hot set-up". The 982cc Abarth would be a good choice too. I am currently importing some of these engines ; so contact me if you would like to get one of these late model unit (see pp.81). Compare *the* following information to the 850/903 conversion details in chapter 13 of "Abarth" for added clarity.

Cooling System : Problems arise when trying to use 600 water pump & fan. Use standard 127 type "short" water pump with bypass pipe and hoses, single drive belt, & a thermostatically controlled electric fan (from any later Fiat model). An auxiliary or front mounted radiator is a must (see page 135-136 and Figure D of "Abarth" and page 66 of this booklet). A pre-1969 Fiat 850 water cutlet can be used along with a 750Jaeger temperature sensor (see page 136 of "Abarth"). Alternate lower water pump to radiator hose (s) will also be necessary.

Exhaust System :

A 750 exhaust system will work if modified as for 850 conversions (see page 137 of "Abarth", first paragraph in particular). If you use a 600/750 tin or 600-based cast sump,' you can mount the muffler bracket to it.

Other oil pans will require that either tabs be welded to the tin ones or triangulated support brackets be fabricated *for* cast ones (perhaps utilising the front exhaust bracket holes on the block, if available, and sump or timing cover bolts). Only one rear bracket mounting hole remains on this block which renders the 850--type rear bracket (see Figure 8) unusable.

Carburetion and Linkage

The 127-based engines have their carburettor float bowl turned sideways (to match the engine mounting) . As a result, fuel level in the float bowl may be adversely affected during cornering (I haven't had opportunity to experiment with this yet). If necessary, an 850 Sport 2 barrel carburetor (30DIC/A) could probably be made to fit the A112 Abarth intake manifold although larger 8mn mounting studs are used on these late manifolds. Sate A112 Abarth models use an Abarth-labelled combination finned alloy valve cover and manifold cast together in one assembly which will need to be removed if an 850 manifold and carburetor or special manifold (see Figure 6) and larger Weber downdraft unit (see page 113 of "Abarth" and page 83 of this booklet) are to be fitted. Naturally if you change carburetion, jetting may need to be altered (see page 79). You nay be interested in milling the 850 – type manifold-to-carburetor mounting surface parallel to its base to gain a level carburetor (see page 137 of "Abarth"). Unless there are unavoidable clearance problems, I would use the standard air cleaner (see page 139 of "Abarth" second paragraph and Figure 6 of this booklet). You nay need to use one of the valve cover and linkage setups recommended on page 139 of "Abarth" because a 127-based covers have no provision for carbaretor linkage. The fuel pump is now mounted on the upper left side of the timing chain cover (driven by a cup/earn bolted to the camshaft gear) and requires only fuel rose rerouting. Or , if you use an electric fuel pump, make up a large diameter oil filler/breather tube (like Berlina Corsa race cars)to replace the mechanical fuel pump; as the A112 Abarth alloy valve cover has its filler cap placed on the opposite end making access poor.

Electrical Equipment :

Some 127-based models use a generator. If yours is so fitted, it will merely be necessary to use the voltage regulator from the car your engine came from. Or, you could use the original 750 generator with large diameter Abarth pulley (one groove will remain unused) and regulator. The 850 or 127 alternator/regulator/relays could also be used wt would require extensive re-wiring (see page 140 of "Abarth"). Naturally, anything wt the original 127/A112 generator or alternator will require a different length drive belt 1/8" spacer washers may be needed between a 600/750 generator bracket and the engine block to line-up the generator pulley with the others. Except for sore late A112 Abarths with electronic ignition, all models use a standard 850 style distributor. The only hitch is the lack of a mechanical tachometer drive (see page 140 of "Abarth").

Oil System:

A modern spin-on filter (Fram #PH-16) now occupies space are the lower left corner of the cylinder block where the fuel pump and oil, relief valve once resided. * Some A112 Abarth models use an adapter housing between the cylinder block and the filter to provide fittings for small flexible hoses which route oil to, a British style oil coolling radiator similar to a MGB or Mini Cooper (See Figure 21). A new crankshaft pulley and plugged crank snout does away with the centrifuge type oil filter and those miserable oil-delivery sealing rings (see Figure C, page 123 of "Abarth"). The 127-based engines also have the desirable pressurised center main bearing (see #1 page 80) The oil pressure relief valve is now located inside the, oil pump housing as a replacement for the now unnecessary oil delivery pipe. It appears that 127-style sumps have suitable pan baffling for use in early cars. Note that oil pump pick-up length and sump depth as well as dipstick length will need to be checked when trying to utilise an, alternate (non-127/A112) oil pan. You may be required to use an 850 oil pump modified as per #8 on pp.80 if the 127-style pick-up is too deep, or an OT1000 type extended pick-up as on PP.39 if it's not the sump floor. Don't forget that 850/OT1000 sumps will angle when fitted to a 600-based car. Oil gauge sensors adapted as in the 850 conversion (Figure I & pp. 141 of "ABARTH")

*** muffler shroud panel may need to be trimmed - or a remote filter housing fitted to allow oil filter clearance.**

Clutch:

You might be able to drill out 9031965cc crankshafts with a handheld 17mm drill (if you can keep it real straight), but hardened (nitrited) Abarth cranks require engine disassembly & use of a lathe & carbide cutter before a 600/850 pilot bush can be pushed-in.

You could use a 600/750 disc, throw-out-bearing, modified flywheel and pressure plate with heavy duty springs fitted (see Figure J and page 142 of "Abarth"). It I s really a shame to have such an antiquated and inefficient setup with your up-to-date and more powerful engine, though. There are three other possibilities. Number one will work for sure, but numbers two and three need to be investigated further:

(1) Fit an 850 flywheel with a 600/750 starter ring-gear pressed onto it. Use the correct Renault R-8 pressure plate or reverse the 850 pressure plate attaching straps and throw-out-bearing contact ring straps. Grind away a lot of material from the aluminium 600/750 starter end-housing so that the new pressure plate does. not contact the housing. Make up a throw-out-bearing holder-sleeve adapter that allows proper positioning and movement of the bearing against the pressure plate contact ring. If you have a coarse spline transaxle input 'shaft, you will need to use a 600/750 disc, or better yet, have an 850 disc (larger diameter) with a coarse spline center hub made up. If you have the stronger fine spline (600-D style) gearbox and axles, try using a stock 127 or 850 clutch disc.

(2) The 127/A112 pressure plate uses no throw-cut-bearing contact ring. This requires that a different style bearing with a rounded contact face be used. A Toyota Corolla1200 bearing, as used on the 124 engine conversion (see page 64, #3), can probably be used along with a special made adapter sleeve ring fitted between the bearing and its holder. The only other consideration is to check to see that the throw-out-bearing has ample travel to allow pressure plate operation.

(3) The 127 style throw-out-bearing and pivot fork are quite a bit different looking than the 600-based type (see Figure 9). If you can make a 127 pressure plate ,bearing and pivot fork work properly within the 600/750 bellhousing, a 127/A112 flywheel with a 600/750 starter ring gear pressed-on can be used. If not, a Renault *or* reversed 850 clutch and 600 bearing holder (probably with modified reach) must be used.

All diaphragm pressure plates will require starter housing grinding. Whatever clutch you end-up with, the clutch cable center support will require strengthening (see page 66). Note also that the stronger 600-D fine-spline stub-axles and coulplings can be used with or without the 600-D transaxle and axles (see page 142 of "Abarth" and page 68 of this booklet).

Mounting:

An engine movement "torque barn attaching bracket is cast into the front end of early cylinder heads & must be cut off for firewall clearance with a hack-saw. Otherwise, details s1nIld be similar to an 850 conversion (pages 142-143 and Figures K, L, and M of "Abarth")

Engine Details & Notes:

The A112 Abarth engines use the OT 1000 "style" short pistons with thin piston rings, full floating piston pins, and larger (2.123") main bearings. The 1050 engine has had its cylinders "spread" slightly by offset boring. An 850/OT1000 cylinder head can be used if one water passage near the end of the head is modified slightly to match the 1050 block and gasket pattern (info from Mahlon Craft). Besides the head gasket, about half of the other gaskets are different from 850/OT1000. All parts are currently available from Fiat in Europe (see:pp.81).

Optional equipment includes the Abarth after-market cog-belt camshaft drive setup (see figure 25 & note that the kits for 600/850 based &-I27/AI12 based motors are different) that replaces the original short-lived/sloppy/noisy timing chain & gears, and an Abarth electronic ignition to replace the standard distributer & coil.

Preparations for High Fuel Economy

Here are my recommendations for a super fuel economy engine (if you can tolerate a little less performance). For all 600-based cars, use a Fiat 6000 engine (1961 to 69,767 cc, 62x63.5 mm, 7.5: 1 compression) The earlier Fiat 600 motots (1955-60, 633cc, 60x56mm, 7.5:1 compression) have so little power that I don't consider them to be a realistic choice. For 850-based cars, use a Fiat 850 Sedan engine (1964-67, 843cc, 6Sx63.5mm, 9.3:1 compression . These early engines have a small-valve cylinder head with 8rrm rocker stand studs. 1968-71 Sedan engines are 817cc, 64x63.5mm, 9.5:1 compression and have the larger 850 coupe/spider size valves and 10mm rocker stand studs. The more powerful 903cc engine (65x68mn) would work also if a sedan camshaft, single barrel carburetor and intake manifold were fitted. Any of the above engines can remain totally stock, but precision machine work (engine blueprinting) and rebuilding procedures will help engine efficiency (see chapter 12 of "Abarth"). Ordinarily, I would say to increase the compression ratio on an economy engine to gain efficiency, but that would require more expensive premium fuel plus octane-boosting additives. Getting better mileage doesn't help if you have to pay more for the fuel. Therefore, stay with the 7.5 : 1 of the 600D and reduce compression of the 850 motors to about 8.5:1 (shave the top of the pistons and use a thicker head gasket). Be sure that your cylinder head has plenty of "meat" left below the spark plug hole. This is an indicator of how much it has been "milled" (see pages 127 and 128 and figure F of "Abarth").

When considering fuel economy alterations, it is usually a question of whether a particular modification will help enough to justify the cost and time spent on it and if you can tolerate any operational losses produced. Here is a list of items that might give reasonably profitable results: 1. Md a fuel flow meter or vacuum gauge to help train the driver to use the "egg under the foot" style of accelerator operation. 2. Inflate special low-rolling resistance radial tires to about five pounds *over* the recommended .pressure. 3. After the engine is broken in, change to light weight synthetic - motor oil and transaxle lubricant. 4. Use an efficient exhaust header and glass-pack muffler. 5. Remove the engine-driven cooling fan and use an auxiliary or front radiator with a thermostatically controlled electric fan and rot (180-190 degree) thermostat (see page 66). 6. Use pulleys that slow accessory speeds (larger generator, water pump ; smaller crank) 7. Lower front suspension and add an air- dam to limit air flow under the car. 8. Use a higher ring and pinion (see page 102) transaxle and light7"weight 13 inch wheels. 9. Md. a high-quality electronic, capacitive discharge , or hot-coil ignition & solid-core silicone-insulated plug wires. Use a wide spark-plug gap. The coil should be located so that the high tension wire to the distributor is as short as possible. Advance the ignition timing 3 to 5 degrees extra unless it causes pinging or hard starting. 10. Use an inline fuel filter, an adjustable fuel pressure regulator set as low as engine operation will allow and lower the carburetor float level 1/16 inch. Use slightly leaner jetting but be careful (see page 79). Use a smaller size accelerator pump jet, and adjust the linkage for a shorter stroke. Set the idle adjustment as slow as practical; about 700-800 RPM. Make sure the choke pull off and accelerator linkages work smoothly with no sticking and use a return spring that is not too easy or too stiff. Try one heat range hotter spark plugs. 11. Connect the air intake of the air cleaner to a ram-scoop on the outside of the body. 12. Add a water-alcohol vapor injection system. 13. Add a cruise-control system. 14. Use magnetic drain plug and "Moly" or Teflon oil additives. 15. Use new wheel bearings with Moly-base grease and adjust them slightly loose. Adjust the brakes for no drag. 16. Adapt the charging system from a 1984 Honda Civic 1300 which charges only on deceleration.

PBS 124 Engine Conversion Kit for the Fiat 850

PBS in Garden Grove, California used-to market a conversion kit , that when combined with a few items that they did not supply, would allow you to install a 124 engine in an 850 chassis. There are enough of these kits still floating among enthusiasts that I'll detail what you need, what to do, and what you might end up with....
It's no two-weekend diversion putting one of these conversions together. If you don't have "the good pieces", patience, a little insight and the money to do it right, you may give up half-way-through and sell what you have gathered; or if you do finish, it may turn out to be a "weekend hotrod" (an expensive, fragile, rattly toy that is very disappointing to drive).

Fiat-Abarth 1300/124 & Scorpione	PBS kit comparison
1. A classic sports car that will appreciate in value.	1. Great fun for the enthuiast but with little resale value.
2. Early 850 coupe and Scorpione coupe body styles only	2. All 850 sedan, coupe, Spider, Racer & Giannini/OTAS. Simca 1000 sedan, & Bertone coupe(w/minor changes).
3. 1197cc Fiat 124 pushrod engine bored out to 128Ccc with 10.5 to 1 compression pistons delivers 88 hp @ 6000 rpm.	3. choice of Fiat 1197 and 1438 pushrod or 1438, 1592, 1608, 1756 twin cam engines. 1592, 1608, 1756 will require a bulge in Spyder or racer deck lid to clear cam-drive belt and gears.
4. Fitted with 3.*70* or 3.90 gears for relaxed highway cruising and 105 m.p.h. top speed.	4. 4.38 final drive from Simca 1000 can be fitted to your 850 gearbox. The ideal Abarth 3.*70* or 3.90 gears are NLA. standard 4.88 850 Sport or 4.6 OT 1000 and early 850 Sedan gears are too low for pleasant highway use and give poor fuel economy.
5. Special Marelli starter that parts ere no longer available for (note that PBS bellhousing, VW/Bosch starter and special exhaust system could be used as replacement).	5. Special hand-made exhaust system frequently crack from vibration because of poor mounting support attachment locations.

Basic PBS kit

(compare to 1300/124 details on pp 114 of "Abarth")

1. Special transexle-to-engine bellhousing (one style for pushrod engines and another for twincams. Swapping. flywheels is all that is required to use other style kit with opposite engine).
2. Special transmission input/pilot shaft (124 clutch spline and pilot bearing size on one end, 850 transaxle input spline on the other end).
3. Special motor mount crossmember (rectangular tubing "engine sling" fitted between sides of engine compartment. There are'not rear battery mounting brackets attached as with Abarth installation).
4. Special front radiator (crossflow upright mounting w/bleeder valve).
5. Special fiberglass front radiator shroud.
6. Special filler tank to replace rear radiator (optional. Rear radiator can be retained).
7. Special camshaft-drive gears (to reverse rotation of pushrod engines) or Ford six-cylinder distributor/oil pump drive gears fitted to jack-cam and distributor shaft as well as modified distributer end-thrust, refazing of camshafts, and revised ignition firing order (to reverse rotation of 124 twin-cam engines).
8. Special throw-out- bearing adapter sleeve (for use with 200 or 215mm clutches only).

124/850 Conversion (continued)

Things to got hold of or do on your own:

1. VW/Bosch starter- 12 volt recomended. 6 volt will work also and give extra cranking power but cannot be operated very long without letting it cool down.....
2. Handmade exhaust system (headers, pipes, muffler, support brackets, etc).
3.Reverse pressure plate attachment straps, and on 180mm (1197 pushrod), clutches reverse throw-out-bearing contact- plate straps. Also if 200 or 215mm clutch is fitted, a Toyota Corolla 1200 throw-cut-bearing must be used with long with the special PBS adapter sleeve (easy to machine one on a lathe if you don't have one. Use standard clutch disc and flywheel to match your pressure plate- (Note : flywheel ring gear has different number of teeth for pushrod and twin cam engines. Use proper flywheel to suit the bellhousing with your kit.)
4. Cut hole in front of car for radiator intake and in spare tire well for air exit A lip must be. Dent down under nose to stop reverse air flow into en t. Trim. mount perch and some inner sheet metal from rear body panel for longer engine. Trim left firewall to allow space *for* new exhaust system.
5. Water pipes end holder brackets under floor with hoses to attach engine to front radiator (pp.66). A thermostatic cooling fan is optional.
6. Two early Fiat 124 generator brackets and a large stud and nut of your choice to be welded to 850 generator for mounting. If you are using a 124 alternator this will be unnecessary (recommended for 70-71 Coupe and *70-73* Spider which already have alternator systems. Earlier cars would need extensive rewiring for new regulator and two rel_ys. Note th_t 124 elternator is usable because it's "non-directional"). Generator, starter, coil, and gauge-sensor wiring lengths must be altered to suit new locations on 124 engines.
7. On anything but a coupe, an after-market low-profile air cleaner must be fitted. Throttle and choke controls will require minor modification also.
8. Lets not forget the 124 engine complete with carburetor, distributor, water pump, fuel pump, flywheel and clutch, oil and water sensors, rubber engine mounts (solid rubber type are better than hollow/spring-center style) and count brackets. You'll normally want to rebuild anything but a very low-milage used engine

What else is necessary to make things right?

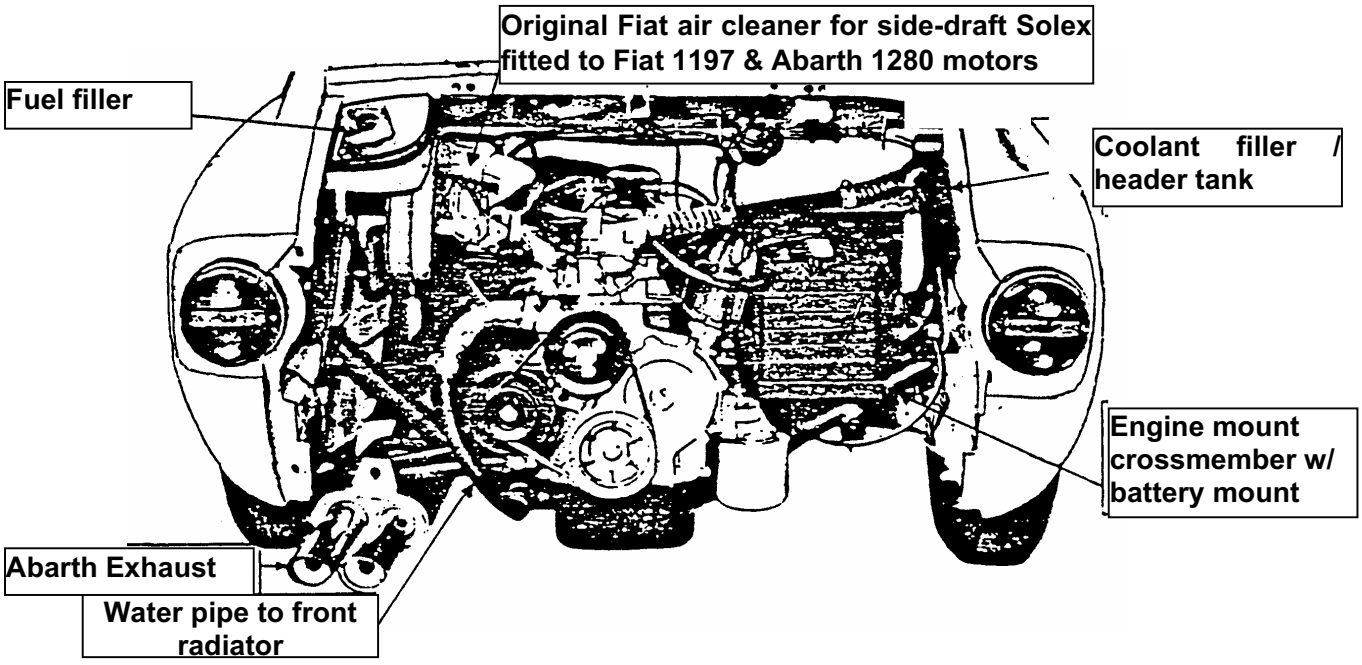
1. Carburetor cold-sir-box with filter and ducted-intake should be fabricated to lessen effects of poor engine compartment air flow/excess ive heat.
2. All new original Fiat 850 axles, rubber filled couplings (Pirelli), and splined sleeves (even so, consistent full drag-race starts can damage these items).
3. Heavy duty shock absorbers (like Koni).
4. Wider high performance tires (like 165 X 70 front and 185 x 70 rear or 185 x 60 all around- see PP.55).
5. Simca 1000 ring & pinion (4.38) or Abarth(4.11, 3.9, 3.7-see pp 102).
6. Modified and strengthened transmission mounts (see pp 67).
7. Switch clutch cable-end and return spring attachments (upper hole must be drilled out slightly larger) on throw-out-bearing arm for increased leverage and less pedal effort (adj. cable-holder location to align).

8. On Spiders with 1433 twin cam motors. the cam belt cover will not clear the underside of the engine compartment lid & can't be used.

Optional Items :

1. 5-speed overdrive gearbox conversion would be great (I've heard that. Webster Gears in Texas used-to make a 5-speed racing gearbox conversion. (It may have been non-syncro and with noisy straight- cut gears though..) Or maybe you can find en Abarth Simca Six-speed and adapt it.
2. Some will want more carburetion. I've tried dual Weber 40mm side-drafts and single 28/36 or 34/34 down-draft converted to mechanical secondary linkage and found the side drafts more suited to "ego gratification" and visual appeal for street use. *If* you really need the extra cost & tuning plus poor milage, go for the dual 2-barrels. A single 36/36 or 40/40 is better...
3. You really need more fuel carrying capacity (even more-so with big carburetors). A racing style fuel cell mounted in luggage compartment with two electric pumps (one for standard rear gas tank), and dash mounted three-way electrical switch makes for a nice setup' one-way check valves needed).
4. Even wider wheels and tires (fender flaring maybe required).
5. Engine compartment air vents in rear body panel.

In conclusion , the PBS conversion can be expensive if a really professional job with all the best pieces is desired. The end-result though, is a car that looks completely stock (except for wide tires and wheels and perhaps exhaust pipe tip(s)) but "takes-off like a dirty shirt", handles like a monorail (extra power and engine weight improves 850 handling and wide tired really help too), and gets about 18-22 miles per gallon overall. You can surprise alot of expensive and exotic cars on twisty roads and even at the "stop-light Grand Prix" but there is really no class that the car would be competitive in at a serious Championship Slalom unless radical engine and suspension modifications were carried out (On the West coast anyway, you would have to run with under 3-litre modifieds which means Mazda-powered Lotus Super-Sevens). Keep in mind also, that a car with thie conversion will have little resale value in proportion to your effort end expanse. If you decide to do it, I recommend using an early Spider (pre1968 covered headlight model) with a 1438cc pushrod or twin cam engine or early (pre-68 single headligilts) coupe (made to look like an Abarth OT 2000, see pp. 78) or Sedan (to look like OT 1600 , see pp.78) with a 1756cc twin cam motor.



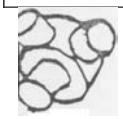
1300/124 Engine Bay

Front Radiators

With Fiat 600 or 850, I don't mind cutting a hole in the nose for a front radiator air-inlet, but I'd look for an alternative method of providing improved cooling for an Abarth, because its nice to have the option to restore these cars to "original" some later date. My favourite setup is to mount a lo_b and two/to _our inch tall (depend_ng on available cleerance) crossflow auxiliary radiator (with 1 1/8" inlet and outlet pipes) just below the bumper/bumperette line in front and then build an air dam/spoiler from aluminium sheet around and attached-to the radiator with air intake hole and a flexible rubber lower section to avoid damage when negotiating driveways (rubber baseboard strips from houses work well). In this way if you decide to remove the auxiliary radiator and air d_, you have only 2 radiator mounting holes end a couple of pop rivet. holes (attaching ends to edge of fender) to fill _d even those are located in little-noticed locations. For plumbing, rectangular section tubing (say about 3/41 x 21) gives more ground clearance and is easier to mount than 1 1/8" round conduit. At the front and rear, form a short piece of round tubing on one end to slide over _ be welded-to rectangular tubing and then accept suit able hoses. I've experimented with thermostatic temperature control and found that a "two thermostat system" works very well. Use normal 160 degree thermostat fitted to the housing at cylinder head outlet and a second 124 style in-line 3-way thermostat between lower radiator outlet, water pump inlet, and return pipe from front auxiliary radiator. When hooked UD in this way, coolant first is drawn from rear radiator lower outlet through water-pump and is stopped from circulating by closed thermostat at cylinder head outlet to radiator. When this thermostat- opens, coolant flows in the normal 850 manner through engine and rear radiator. When coolant gets hot enough to star_ opening higher temperature 124 3-way thermostat, flow is divided between front and rear radiators. When fully open, 2nd thermostat shut-off flow from rear radiator to water-pump and forces all coolant from rear radiator to go to front auxiliary unit before returning to water pump and engine. This is "a real progressive setup*' that cures eratic warter pump when dual radiators are mounted at opposite ends of the car. Lastly, en electric fan must be mounted (to help under traffic conditions) behind the rear radiator when engine-driven fan is removed to help. increase available power. A thermostatic switch(434087859.65) to activate the fan should be installed in a fitting brased on to the supply pipe to the front radiator. An air scoop must be fabricated and attached below and in-front-of the lower tank of the rear radiator to enable efficient air pick-up (as opposed to the exhaust duct/reverse scoop that is used in Fiats"forward flow" setup.

early

in-line thermostats



late

Diaphragm Clutches for 600-Based Cars

I've never been satisfied with the operation of 600/750 spring-type pressure plates for high-performance use. See page 61 for conversion information and Figure 9 for parts breakdowns.

Clutch Cable Locator Support strengthening for 600/750

The clutch cable locator support plate at the rear of the shifter & control- cable tunnel and just ahead of the transaxle is weak to begin with, and Abarth or other heavy-duty pressure plate springs Cause flexing of the plate and cable routing tube. A piece of 2-inch angle-iron Can be cut to length, drilled for access by the various control cables, and bolted to the floor pan and against the cable support / locator plate (it may be necessary to bend or trim-away a seam -lip where the plate meets the floor pan in order to allow flush fitting of your new bracket) in order to provide unyielding cable end location when the clutch pedal is depressed(see Figure 10). The cable insertion hole in your bracket must allow the cable-end to be plugged into it (rather than extending through it),so that the

original plate is no longer required to take the thrust of the cable-end during clutch operation. In addition, you may want to provides extra tube support on pedal-end as cable exits tube near front suspension. You'll see just how bad your car is in both respects when lying underneath watching for movement/flexing as someone operates clutch pedal after suitable heavy duty pressure plate has been installed. Use latest 600 D cable. If outer cable does not have enough of a bow (slack) in it when installed (it should never be stretched straight), you may be required to fit spacer washers to locator sleeve on cable-end for this purpose. A-drive train movement bar" will also help the situation by improving a variety of operational flaws relating to the clutch, shifter, and mounts(see Figure 13 & *pp.* 68). Note also that jumpy first gear clutch engagement can also be caused by defective rubber filled axle couplings (see pp. 49).

850/OT 1000 Clutch Linkage pivot pin Support

Remove the front tunnel access cover and observe flexing (and sometimes groaning) of the pivot and tunnel left-side sheet metal as the clutch pedal is operated. To curethis, make a spacer three quarters of an inch in diameter and one inch long with an 8 mm X 1. 25 mm threaded hole through the center. Use this to replace the nut on the pivot pin. While they are loose turn the pivot bearing b.1shings 180 degrees to an unworn spot. Thread a two and a half inch long stud into the spacer through the access hole in the, right side of the tunnel. Place a two inch diameter washer over this stud, reposition the pivot and fasten the washer to the tunnel with sheet metal screws taking care to avoid the heater tubes inside the tunnel. Put a small washer on the stud and draw up a nut and lock nut to preload the left. side of the tunnel against flexing and support the right end of the pivot pin. The improvement in clutch action and shifting is dramatic(detailed info pp.107).

850/OT1000 Power-Unit Mounts Strengthening

On 850 Spider-cased models the engine mount perch frequently starts to pull away from rear body pull causing clutch and shifter problems. This whole area should be strengthened by holding separated inner panels clamped together with a vice-grip pliers while installing pop rivets at' locations where spot welds have broken or gusset plates and rivets where panels *are* torn(fig.1.2).. The "spring-mounted" coupe/sedan doesn't do this much. 850 style transmission mounting brackets are of poor design and even poorer construction. The stamped steel bracket frequently tears around lower mounting-stud hole or at 90 degree bends between its sides spot welds also fail a lot. Left side bracket gives trouble more often than right one. Symptoms of failure may included 1. muffler and tail pipe no longer parallel to rear body panel. 2. distributor tilted off to one side (not perpendicular). 5. shifting & clutch engagement difficulty. 4. possible accelerator and handbrake controls interference. 5. radiator fan shroud rubber boot damage. 6. on early cars (to mid-68) top radiator inlet pipe may crack at its attachment to upper radiator tank. . professionally welded in place on lower mounting surface before using original mounting-stud hole as a guide to drill through "double-plate." Spot welded "cars" should then be profesionnaly welded around their edges to insure strength (see figure 12).
Rubber counts and spacer sleeves should also be shortened about 3/16" to allow the transaxle to be "pulled-up" tighter. Remember to use spacer washers about the same thickness as the material you removed between top of rubber mount and chassis. This keeps transaxle case from connecting body as shortened mounts would allow a higher relative positioning of gearbox. (see figure 12). Check to see that mount rubbers are in good condition with small rubber tits intact before refitting in the sequence illustrated and use heavy large-diameter flat washers to attach brackets to transaxle case.

Drive-Train Movement Bar

All models suffer from excessive engine/drive-line movement during clutch and shifter operation which eventually damages power unit mountings ; the final consequences of which Can sometimes be far reaching (ie: see pp.67 item numbers 3,4,5,& 6 for 850-based cars). To improve the situation, I often install a rubber-bushed limiting bar (like a Fiat 128 engine torque bar) mounted front-to-back between the transaxle Case and chassis floor pan. After fabricating special mounting brackets for each end of the bar, attach the complete three-piece assembly to the transmission end-housing and place a small jack between the chassis and gearbox for the purpose of forcing the entire drive-train back about a half inch or so before drilling mounting holes for the floor pan bracket. When the bolts are installed and jack removed, you will have provided enough "pre-load" on the rubber bushings to counteract" any excessive foreand-aft drive-train movement. Figure 13 should give you a good idea of what we are talking about. If an auxiliary radiator is fitted ahead of the rear suspension though, you'll need to find another location to mount your bar and brackets (or see pp.69 and Figure 20b for details on a camber compensator/mount strengthener device).

Shift Controls

I recommend shortening a 750 shift lever about 3" on most cars to keep from grinding skin off the back of your hand as you shift. The underside of Abarth dash panel is too close when attempting to engage 1st or 3rd gears. After cutting lever off with a sharp hack saw, you may have to grind down the diameter of the tip a little to allow a thread die to "start" on shaft. Some people like to fit a VW after-market style "bent lever- to 850/OT1000 cars. To accomplish this, original lever must be cut off to a total length of only a couple of inches and new lever clamped-on using the attachment coupling and locator bolts (see fig. 15). This conversion will not work on a 750 or *600* due to the fact that their levers are free to rotate.

600D fine-Spline Transaxle /Drive-Axles/Stub-Axles Conversion for 600-based cars

The "D" transaxle has a stronger fine-spline input shaft which allows use of the 850 clutch disc. drive axles, boots and seals are of the "850-style" (compare fig. 15 to fig. 14). 600D sedan final drive of 8*39(4.88) is suitable for "all around use" being a compromise between low-end acceleration and top-end cruising speeds for cars with 750/850cc pushrod engines. No handbrake mechanism is fited to "D" gearboxes though which requires conversion to 600 D/850 rear drum brakes or 124 rear disc brakes if an operational handbrake is to be retained. Speedometer unit calibration will be necessary for accurate readings (Italian speedometers are very optimistic anyway). 600D transaxle, boots, axles, & splined attachment sleeves must be used together in the conversion. Note that "D" axles and boots will not work with a *600/750* transaxle. Fine-spline outer stub-axles and rubber-filled cuuplings on the other hand, can be fitted to all 600/750 and 600D-based models with either gearbox fitted. All related pieces merely "bolt-up" without modification. Note: with 80 + hp. motor you will want to "open-up" trailing arm for 850 coupling & sleeve.

Brake System Improvements

600/750 models have small diameter drum brakes all around. Braking performance is not up to the sporting character of Abarth 750. If you want better brakes, but still wish to retain the original 12" wheels, you have about 4- logical choices: 1. fit Berlina Corsa or late Record Monza disc brakes,2. use Rinaldi aftermarket "segmented rotor & pads" type: disc brakes, 3.- "convert to 600 or 600D Multipla large diameter.

drum brakes *. Complete Multipla brake assemblies (backing plates , wheel cylinders, shoes, drums, etc.) must be changed as well as fitting the large-bore Multipla master cylinder. 4. Fit 600D large cylinder drum brakes. Most 600/750 and 600 Multiplas have aluminium brake shoes which are hinged from a lower eccentric pivot-pin and have no provision for a hand brake. The 600D sedans and 600D Multiplas have steel shoes of the self-centering type incorporating a hand brake on the rear wheels.

If you have decided to make your 750 a "drivers car", at least the late model (mid-1968 and later) 850 Sport front disc brakes are a must. The conversion is a virtual bolt-on exchange of caliper, rotor, spindle, hub, king-pin housing, A-arm and steering tie-red end. 850 spacer plates & long lug bolts plus 13-inch wheels must be used. These brakes work very well and their pads are easy to change. Be sure to see the 600/750 brake improvement note at the bottom, of page 70. Your options for rear brakes, depending on what you consider "adequate brakes" and on which transaxle you are using (with or without hand brake) are: 1. *Retain* the standard 600/750 drum brakes. 2. Fit Multipla large diameter drum brakes. 3.Fit 600D/ 850 (mid-68 & later are self-adjusting) rear brakes which have provision for a hand brake. 4. Convert to Fiat 124 rear disc brakes which have a hand brake. Use front Fiat 124 calipers if no hand brake is needed. A special caliper holder plate is required. PBS used-to make them and may still be able to supply a drawing. Wheels must be 13 - inch.

On 850-based models, the standard front disc and late self-adjusting rear drum brakes will probably be adequate unless you have a 124 engine conversion and drive the car aggressively ...

Suspension Improvements

Heavy duty rear shock absorbers in good condition are vital on all models. A combination rear camber compensator and transaxle mount strengthener was available for the 850/OT1000 models (see Figure 20b). It bolted to the transmission mount brackets and rear sway bar perches via support struts extending forward from the center of a dual transverse leaf spring. The rear sway bar was discarded or used to replace the smaller diameter front bar when added front stifness was desired. The usual sway bar alter links attached to the spring-eye ends at the suspension arms . If you can fabricate one of these , you will be in great shape. An alternative for all cars is a drive train movement limiting bar . (see page 68). This works well with a standard or add-on rear sway bar . Another possibility is to make up leather suspension-travel-limiting-straps. Attach than between the chassis and the rear suspension just inboard of the brake backing plates.

The rear suspension can be lowered and de-cambered slightly by having the coil springs heated and compressed to the desired highth and retemped at a spring shop. Too much shortening causes coil binding and suspension bottoming. It is easier to cut a coil off the spring, but this stiffens the spring rate and may be detrimental to handling (rear engine swing axle design law states that you can compensate for the handling effects of the front to rear weight ratio by giving the light end of the car more roll resistance). In addition, the Fiat 600 springs would require considerable grinding to re-flatten the end and the 850 styles need to have exactly completee coils removed to allow proper seating ; as a spring with one-half or three-quarters of a coil cut off will not seat in its socket correctly. This makes coil cutting somewhat less than "the hot set-up".

*** Multipla brake swept area is 666 sq.cm & sedan is 432 sq.cm (a 35% - increase)**

Remember that the rubber bumpstop pads may need to be trimmed with lowered suspensions. For rear wheel alignment, as high as two degrees of negative camber and zero to 1/8" toe-in can be used. Anytime the suspension is lowered or wheel spacers are addes to widen the track, be sure to reset the alignment.

In the front of all Berlinas, except the early 750s, Abarth used a transverse-mounted leaf spring stiffener bar (see Figure 20b). It looks similar to a drive train movement bar except for the sideways mounting. It attached above the leaf spring assembly via two small pivot / mounting brackets 'on the right side under-body, and at the leaf spring center bolt. If is' is felt that the front of a 600-based car needs stiffening, you could make your own brackets for use with an engine torque bar of suitable length from Safe front-wheel-drive car such as a Fiat 128, Honda Civic or Mini Cooper.

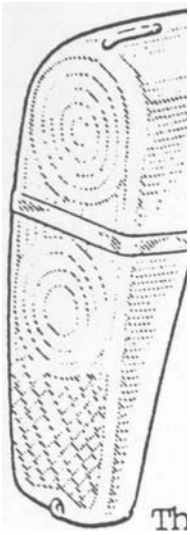
Lowering can be carried out by disassembling the front leaf spring and flipping over the main spring leaf so that the eyes' on the ends that attach to the suspension face upward (see figure 20b). This leaf must be reverse-arched by a spring shop to function properly when re-assembled upside down. The other spring leaves should remain as originally fitted. Note that while old sagging springs obviously lower the car as well, it is at the cost of poor suspension operation. Supporting spring leaves should be re-arched to regain proper function during the process of flipping and reverse-arching the main leaf. Some 850-based models may have a very heavy, solid iron, leaf spring assembly holder-channel which can be lightened by drilling alot of large holes in it. The front-end can also be lowered by welding spring attachment "extending ears" to the bottom of the king pin support houssing. Whatever method is used, the robber bump stops may need to trimmed to provide adequate spring travel. If the car ends up being" too low", you can add large spacer washers between spring holder channel and the body to compensate. Wheel alignment * must be carried out <u>after</u> lowering or <u>adding</u> wheel spacers. For street cars, modified settings of about one-half degree of <u>negative</u> camber (upper attaching stud spacer-sleeves may need removal to shorten them), six degrees of positive castor and one-eighth inch of toe-in will provide improved handling <u>especially</u> if wide tires and/or smaller diameter steering wheel are fitted. If a replacement steering wheel is to be used, make sure it is no more than one inch smaller in diameter then the original. Too small a wheel increases the steering effort substantially and often decreases control. Naturally, good quality front shocks are a plus too.

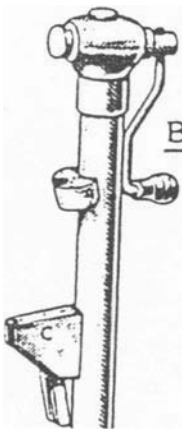
<u>Battery Conversions for Fiat 600-based Models</u>

The original 600/750 batteries were unusual by U.S. standards in that they were not very tall and had smaller diameter terminal posts. A replacement battery of the sane width and length (22 N) is now readily available but is two inches taller with standard size posts (see page 104 for replacement battery dimensions). To make the original cover plate fit over this new battery, fabricate a spacer to go around the battery and use threaded "extender" sleeves on the hold-down studs to accommodate the added height. Whether the cover is used or not, a standard <u>850</u> rubber insulating boot should be installed to protect the positive battery terminal. To make the small cable-ends fit a standard post, I have successfully removed the clamp bolt, spread the ends, and then used a cable-end reamer to achieve the desired size increase. I then run a drill through the clamp holes while the cable end is fitted to the battery to notch the post and align the holes. The clamp bolt must then be inserted <u>after</u> the terminal is on the post. Use new, longer, 6mmm x 1.0 or 1/4" x 20 bolts and nuts. Universal fit, clamp-on, replacement cable ends are another possible solution. An 850 positive cable can be installed, rot it runs the whole length of the car and is inconvenient to change.

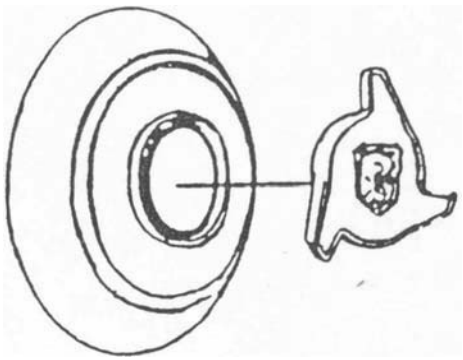
Note:

Upper suspension arm attaching-point support is weak & allows chassis flexing & warpage. This condition should be checked during alignment & corrected/strengthened by luggage compartment transverse or cross-bracing (a must for race cars). 600/750 brake effectiveness, is also improved with this added support.





CHAPTER FIVE
TRIM, AND REPLICA CARS



Abarth 750 Body, Trim ,and Accessories

The big question is: "Who do I let work on the aluminium body ?" Most body shops will just cover any problem areas with bondo well as ignoring the electrolysis action that takes place where the alloy door sills meet the steel floor pan. What you really need is a "panel beater" to fabricate replacement aluminium body parts for heavily damaged coach-work. I would guess that there are very few of these "body artists" outside of Italy. Call around to classic car restoration and race car preparation shops and attempt to locate a good aluminium man.

Rust is common in the floor pan and battery well. These areas should be wire brushed, bead-blasted or soaked in an acid bath before cutting away areas too badly damaged and welding new sheet metal in place. Afterwards , use epoxy paint and/or undercoating to protect things in the future.

Glass is another trouble spot as with any low volume coach-built sports car. Side and rear glass can be replaced with plexiglass without too much difficulty; especially if you still have an old damaged window to serve as a beginning mold. I have heard of several companies that make a business of producing safety glass front windshields for exotic cars (if you have a Double-Bubble model, see the Parts Sources section of "Abarth"). The price is usually over five hundred dollars. A more realistic alternative for a "seldom-used hobby car", if you are not concerned with " legality" or windshield wiper use, would be to have an inexpensive plexiglass windshield made. A very good half-way compromise that will allow wiper use as long as the surface is kept clean, is a medium-priced high-quality aircraft "hard , plexiglass" unit. It's considered good enough for jet aircraft, why not cars? A three sixteenth inch thick polycarbonate material like Tuffak CM-2 by Rohm and Hass (or lexan) would be a good choice according to Gary Mortensen (See his excellent article in the August 1982 "Abarth Register, USA Newsletter" Number 24, page seven). Call around and see if anyone can form this kind of material in your area. See page 108 for I glass repair.

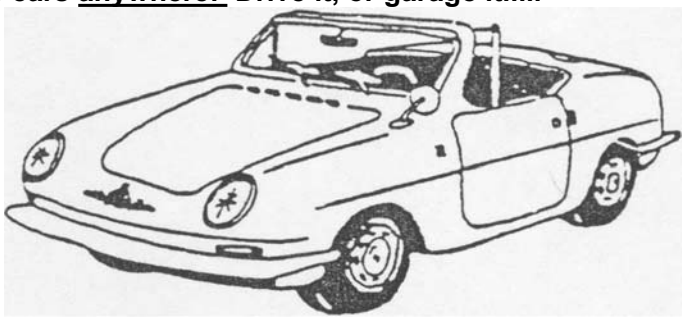
Dashboard rattle on these cars can be really annoying. A piece of heavy support strap attached between the lower center section of the backside of the dashboard and the front firewall usually cures the problem.

The heater design, at first glance, seems like a "good idea". It uses the available rot air from the engine cooling system with a rear flapper control mounted at the right rear of the center tunnel (behind the passenger side seat-back) and adjustable front directing doors connected by the center shifter tunnel to provide passenger compartment heat without the added complication, light or cost of a separate heater radiator, plumbing, water valve and electric fan. In practice though, few cars (and only some oxcarts) have poorer heating and defrosting than a 600-based

automobile. At best you have an eratic "toe-warmer" (as long as the shifter boot is intact) with the one good feature of providing a nice "hand warmer effect" from air escaping around *the* emergency brake handle assembly . If you don't drive *the* car in cold weather, then *the* engine compartment fumes, low-volume air flow (almost none at idle) and windshield fogging caused by heater operation under damp conditions will not be a hindrance to you. If a good heater is desired though, I would use an 850 heater box with control valve and electric fan and provide water hook-ups by utilising an 850 thermostat housing (which has a heater hose outlet) and soldering a return tube onto *the* lower radiator tank. Then mount small diameter water pipes under *the.* floor pan with short connecting hoses at the ends. As an alternative, you could install the after-market cold-country gasoline heater listed for VWs and Porsches.

If your seats need to be redone, consider having a pair of "Record Monza" replica racing seats made up, as most other 600-based Abarth models have really "minimal "seats (See page 52 of "Abarth"). If you use carpet on the floor and inner fenders, sewing a beading on around the outside edge makes a much nicer finished product. The original Abarth steering wheel can be taken to a leather or upholstery shop to be professionally covered if you don't like the black plastic rim. Cheap do-it-yourself "fits all" covers usually look terrible. M:>st Abarth door-pulls and window and door handles are also found on other coach-built Italian-bodied cars (i.e. early Alfa and Lancia). See page 111 of "Abarth" for lighting lenses and other trim. Emblems are shown on page 99 of this took.

Lastly, never park these cars anywhere! Drive it, or garage it.....



1000

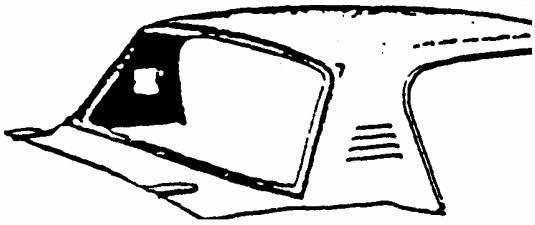
850/OT1000 Spider Body, Trim! Accessories

The front luggage compartiment lid cares from the factory equipped with a rubber plug installed in the water drain hole at the very front and center of its underside support channel. This was a big mistake. Pull this plug out to assist in drainage and "rust prevention" (probably too late by now). Check to see that the drain tubes connected between the hood drain-sill (in front of the spare tire) and the wheel-well cutlet roles are properly fitted and that the tire well has a couple of holes drilled in it at it's lowest points to allow water to drain cut. It is too late for this when the Cross-member beneath the spare tire has rotted away ... Be sure that you occasionally check under the floor mats for rust-causing moisture, as it only takes one slight drizzle with the top down to start rust on its way. Just behind the front and rear wheel wells on the sides of the body are also common locations for rust to start.

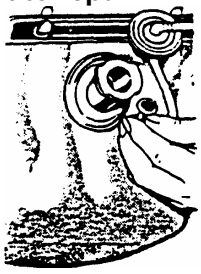
Two engine-lid rubbers should be fitted to the rear body panel and two rubbers attached to each side of the engine compartment water drain lip to control rattling of the lid. The fixed vent windows at the front of each door should also have a rubber cap to *cover* the sharp tip of the chrome support post. without these little devices you stand a good chance of scarring your forehead when entering and exiting the car (see page 157 of " Abarth ") .

The left door window-regulator cable often breaks on these cars. The regulators are cheap rot require patience to install. Remove the trim panel from the right door also so that yen have an example of how to string the cable. Do not remove the cable retainer-clips from the new regulator until the cable has been strung.

A very nice accessory for this car is *the* Bertone steel factory hardtop which is constructed as a one-piece assembly incorporated with the convertible top cover panel. With the convertible top removed from its stowage area you have a "children back seat" or small luggage space. This hardtop does not suffer from wind buffeting noise like some fiberglass after-market types do but has the disadvantage of being -not-so-easy to remove and replace. It is the kind of top that you leave installed all winter and then use your convertible top all summrer. Another useful modification is to drill out the hinge pins in the convertible top cover panel and replace them with aircraft style ball-lock push-pins. In this way you will have a "convertible rear seat." Never let anyone sit on the convertible top cover. It dents easily and is very difficult to repair.



BERTONE



The center consoles from later Spider and Racer models will fit the early cars. AMCO makes a nice "arm rest center console", that once you have, you won It want to be without. AMCO also makes toneau covers (high or low-back seat types) for interior protection when the top is down. Roll bars are still available for these cars but most commercially made bars will use up about two inches of your seat travel and, depending on *your* point of view, spoil the car's looks with the top down. Threshold plates with the Bertone script that cane on the Racer models (70-71) will also fit the Spyder. I prefer the Racer "women basket" style gauge and radio mounting panels in the dash. The original plastic "fake wood" panels seem to be to be the only . "cheap looking" trim items 'on the whole car. If your dash covering is damaged, you can fit a 1972 dash with aluminium panels complete. I like to paint these panels with black "wrinkle paint" like the Ferrari dashboards . The fragile plastic Bertone emblems that are attached to the front fenders just ahead of the doors, can be replaced by the enemaled brass "Cloisonne" type that care on early AlfaRomeo Sprint Coupes, the NSU Sport Prinz and other Bertone-built bodies.

850s came equipped with a nice tool kit in a grey plastic box. It would be good for a 600-based car also. Included are: 8/10 mm and 13/17 mn open end wrenches, spark plug socket and handle, lug wrench (19nm), a regular and Phillips reversible screwdriver blade with a wooden handle, and a 10mm socket wrench (for the carburetor main jets). These kits came in nearly all Fiat models and are commonly available in junk yards. The screw driver is usually missing, but Fiat now sells a plastic handled one for less than a dollar (see page 158 of "Abarth")'.

Care must be taken when operating the Fiat jack. First, the vehicle must be on a flat surface and the handbrake in good working order (block the tires too). Next, make sure to shorten-up the jack enough so that the lifting timing can be fully inserted into the bracket hole provided at each

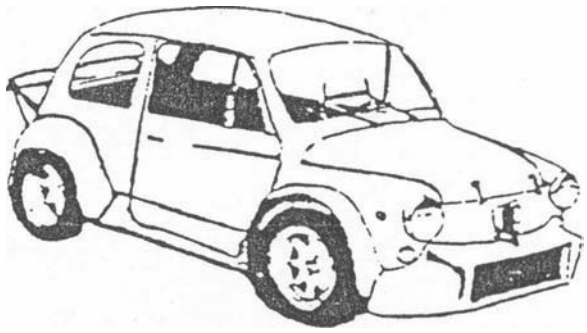
side of the car, beneath the floor and just ahead of the rear wheels. Finally, do not rest the jack foot-pad flat on the ground prior to jacking. The jack must be tilted on an inward angle at the bottom with only the outside edge of the foot resting on the ground so that the top inside portion of the jack mechanism does not contact and damage the fender as the car is near its highest jacked position. If done properly, the foot-pad should sit level in the up-position. As a general rule the front and rear jacking points under the nose and beneath the rear body . engine mount panel should not be trusted to support the weight of the car without causing body damage.

It is important to momentarily open the right side (red handle) heater valve a couple of times a month while driving the car, even in the summer, to protect against seizure or leaking of the valve due to disuse. It is no fun to change an 850 heater valve and rubber gasket. To operate the heater, pull the aforementioned (red) hot water handle back and then do the same with the left side (blue handle) fresh *air* door. Then select the proper adjustment of the three black plastic flapper doors attached to the bottom of the heater box for heating or defrosting modes. If you are not getting enough warm air flow to suit you, turn on the two-speed electricc fan controlled by the grey plastic rocker switch in the center of the heater box. The fresh air door is located beneath the black plastic screen at the rear of the luggage compartment lid and should re cleared of debris and lubricated periodically to avoid sticking and breakage.

A door-lock oiler hole is found above the lock mechanism on the door jam after a plastic dust plug is removed The Spyder luggage compartment lid-lock pivot-linkage located beneath the windshield wiper rotor frequently becomes stiff from moisture and lack of lubrication and breaks loose from its spot welds on the body. After rewelding or pop riveting it back in place, be sure all pivot points are well greased. Note that on sate year models, the operating handle located within the lockable glove box tray is released by pushing forward, while others work by pulling back the plastic 'T' handle. The windshield washer pick-up tube screen inside the fluid bag must be cleaned periodically (see page13). A single bristle from a wire brush can be used to clear the windshield washer jets if they get plugged with wax when polishing the paint.

The most sought-after body style would be an original Abarth or 1000 Spyder or a 1965 to very early 1968 Fiat 850 Spider with recessed covered headlights and law-back bucket seats . Changing the U.S.A. "hung under the bumper" front turn signal assemblies to the European "mounted in the body" type (similar to Porsche 911 in looks-See page 70 of "Abarth") and substituting amber rear turn signal portion tail light lenses as well as removal of the bumper over-riders will help to "Abarthatize" the U.S.A. model Fiat Spyders.

The Berlina Corsa Race Cars



The Corsa TC was Abarth' s entry in under one-liter sedan racing. They were fitted. with 850 or 1000 cc pushrod racing engines depending on which class they were to be entered in. It is unclear why the twin earn engine was never used in the Berlina. Perhaps it had something to do with the rules governing

sedan racing classes at that time. The final 1000 TCR version (see figure 23) had the " radiale" cylinder head and twin Weber sidedraft 2 barrel carburetors. This engine should not be confused with the one used in the Fiat 850-bodied OTR1000 Coupe which was a street car. Its engine was based on the 850 block, ran counter-clockwise with side-draft Solex's and was in a much milder state of tune than the TCR.

Along the way there were a thousand detail changes during Abarth's fifteen year development of the Fiat 600-bodied Corsa. Most of the racing Corsas had a number of obvious visual similarities though. There were large front-mounted combination water and oil radiators contained within an aerodynamic shroud (see figure 23) which replaced the front bumper (some early cars used only a small auxiliary radiator mounted below the front bumper). Above the shroud was placed the standard Abarth "grille" (sometimes with grille whiskers) with enamaled Scorpione badge. Sore cars had chrome "Fiat Abarth 1000" (or 850) lettering on the rear deck lid or the same information painted on the front or rear fenders. The engine lid was held in a three-quarter horizontal position by two three-leg support props (an original Abarth idea to aid aerodynamics, and to a lesser extent, engine compartment ventilation) and both front and rear lids were retained by rubber security straps (also an Abarth first). A connecting-bar linkage attached the wiper arms together and when not in use the blades were parked upright in the middle of the windshield.

Depending on the class rules and fender clearance, suitable twelve inch vented steel wheels (figure 20a) or thirteen inch Campagnolo magnesium alloy wheels (figure 20b) and racing tires were fitted. The dashboard held a high performance gauge cluster with mechanical tachometer, speedometer, oil pressure, temperature and fuel gauges (see figure 23). The interior frequently contained a special seat (or two) and a leather covered spooked alloy steering wheel. Some models had rollover bars fitted.

On the "serious racing models", the engine compartment contained an impressive array of oil lines, filter and pressure-regulator assembly, and crankcase breather tubes as well as a single cog-belt engine accessory drive for the generator and a special "shorty" water pump. A tachometer gear box was driven off of the timing cover (distributor-base tachometer drive on sore early models). Naturally, a finned cast-alloy split sump of seven quart capacity (see Figure 23) or a one-piece five quart alloy sump and the famous "Abarth exhaust" system were fitted. The non-Radiale engined models used a Weber 36 DCD two barrel carburetor with screen covered velocity stacks set atop a special manifold which required a significant enlargement of the cylinder head intake port- see Figure 6 and photo page 83 (One barrel 34 Weber or solex, or 32 Weber were also used on milder engines).

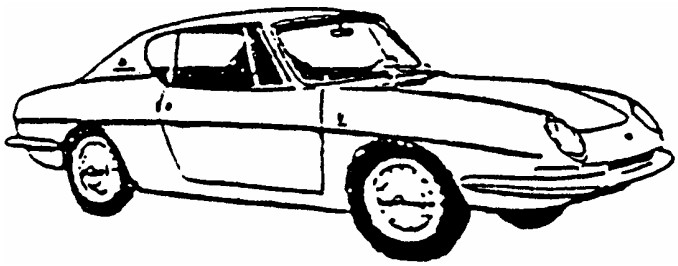
Although none of the obvious visible hardware was there for show, the real secrets to the car's success were beneath the surface. At the top of the list was the heavily breathed-upon "giant tiler" Abarth rotor, five speed close-ratio gear box (page 62 of "Abarth") and four wheel disc brakes (early cars had front discs only). In the beginning the suspension, although considerably stiffened (especially in front), remained almost identical to the original Fiat 600 design; the only additional items in front being a leaf-spring stiffener bar and disc brakes. With the appearance of rear disc brakes, Abarth vent to universal joints on the outboard end of the rear axle shafts. Near the end though, Abarth scrapped 95% of the Fiat suspension pieces in favor of an alloy cross-member with double wishbones and coil-over shocks in front (Fiat used a transverse leaf spring and upper wishbone see Figure 20a) and semi-trailing-arms with double constant-velocity-jointed axles and coil-over shocks in the rear (originally swing axles with pi voting stones, sliding splines and rubber filled. flex couplings - See figures 14 and 20a). All of the above special suspension, axles and hardware can be seen in Figure 20b. Late cars also be fitted with fiberglass "bugler" rear fenders while front fenders were extensively trimmed and flared straight out to allow clearance for the wider wheels and tires used with the special Abarth

suspension.

Unless you can find a wrecked Corsa, you will probably have to be content with scrounging-up and/or fabricating enough of the "visual items" to suit your sense of originality. Really, you would be better-off being a real one (if reasonable) because your replica will never be a genuine Abarth!

Putting Together a Corsa Replica

1. PBS once made a replica front water radiator and fiberglass shroud and there are a number of these & other reproductions still around.
2. Grills are still to be found among enthusiasts and are being reproduced (see Parts Sources on page 81). Chrome rear deck lid lettering can be hard to locate but stick on letters could be used on the front fenders.
3. You can make engine-lid support props (remember three legs).
4. Rubber lid-retainer straps are available never with the "Abarth" logo.
5. Making a wiper arm connecting-bar that pivots at the attaching points is easy . The blade parking device within the wiper switch can no longer be used if you want vertical blade parking.
6. Campagnolo wheels are hard to find and are quite expensive. substitute similar Fiat/Chromodora wheels.
7. The dashboard cluster will be hard to duplicate (also tach drive).
8. You could use a from remote oil filter bracket with external oil lines (see page 80 for revised lubrication system). If you are really serious about utilising the original Carello style remote filter assembly, try using a Lancia Flavia (1800 or 2000cc flat-four engine) unit with a custom made aluminium sandwich plate and fittings bolted. to the back side of the Lancia filter/pressure - regulator/thermostat assembly housing. When mounted in the engine compartement, it should look nearly identical to the Berlina Corsa TC/TCR or OTR 1000 Coupe unit (information by Randy Bent).
9. I saw a cobelt accessory drive setup for the 850/OT1000 in the Bayless catalog a coople years ago.
10. Special intake manifolds are still available or can be fabricated. A number of carburetors can be used (see middle of page 83 and figure 6, plus page 113 of "Abarth"). The 36 DCD Weber can be found on early Alfa Romeo non-Veloce models.
11. Sumps are still around but remember that the ones meant for the 850-based cars will hang at an angle.
12. A used Abarth exhaust is nice or an after-market unit can be used.
13. I would use a European Autobianchi A112 1050cc Abarth engine with the above mentionned exhaust, sump, manifold and big carburetor plus an after-market chrome air cleaner and forget about the remote oil filter; as these engines have a spin-on oil filter and remote oil cooler fitted as standard equipment (see page 59-61 and figure 21).
14. "Good luck" finding a five-speed gearbox.....
15. 850 disc brakes will fit in front and 124 units can be adapted in the rear with the aid of a specially made bracket. Thirteen inch wheels must be used" with Fiat disc brakes.
16. A wrecked late Corsa (1969 to 1970) is about your only source for the special suspension and axles (very doubt-full that you will locate one).
17. Front fender modification is not difficult but rear fiberglass type fenders will not be easy to locate or make.



Berlinetta Bertone Replica

Only a couple of prototype Berlinettas (see page 70 of " Abarth") were made, Cut you can assemble your own from commonly available parts. Start with an early 850 or OT10000 "covered headlight" spyder. Then locate a 1970 or 1971 Fiat 850 Racer (Spyder model with non-removable black vinyl-covered fastback steel hardtop). Remove the vinyl top covering and prepare the hardtop for paint (acid bath, beed blast etc). Racer tops unbolt from underneath after the luggage area trim panels are removed (dont try to "pry" it off).* Switch either the door-window-glass or complete doors from the Racer to the Spyder. Remove the soft top and unbolt the top cover panel from the spider (four nuts on the underside). Remove and reinstall the gas tank (engine and transaxle must be removed), filler and vent hoses/hardware and drip tray, and the top gas-tank-cover body panel (Spyder panel had a filler hole in it) from the Racer onto the Spider. Use the engine lid hinges from the Racer. Fit the Racer luggage area trim panels to the Spider. At the nose, cut a rectangular role just above and below the bumper for the radiator *air* intake and fabricate a replica grille (see page 70 of "Abarth").

For trim, aluminium Bertone door threshold plates, women-mat dash-board panels and the center console from the Racer can be used as well as the brass and enemal emblems (see figure 24) from other Bertone – bodied cars (Alfa Sprint, NSU Sport Prinz, etc.). Also, European turn and tail lights and deletion of the bumper overiders are desirable changes. An Abarth Scorpione mediallion on the nose, "champione Del Mondo" and "Fiat-Abarth It from the nose of an OT1000 Spyder but without the whiskers (see figure 24) relocated to the sides of the hardtop behind the quarter windows, plus OT1000 hub caps would make things really authentic. Naturally you would want a leather covered Abarth steering wheel (see Figure 25).

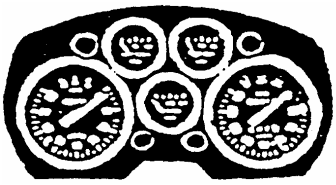
Choices abound regarding engine selection. The 843cc unit from the Spyder or the 903cc motor from the Racer would both work fine and even benefit a little from the improved cooling and lack of an engine driven fan (the Berlinetta uses a front mounted radiator with an optional thermostatically controlled electric fan). Alternative engine possibilities would be a 1050 cc reverse rotation (use 850 cam and distributor/oil pump gear) Autobianchi A112 Abarth engine or perhaps a 1438cc Fiat 124 pushrod, or twin cam conversion (see page 63 of this booklet). Of course, if you could locate a wrecked or rusted out OTR1000 Abarth Coupe (see text and engine photo on page 69 of " Abarth ") you would have just about everything you need (Radiale engine, high geared transaxle, upgraded suspension, front radiator and plumbing, wheels and hubcaps, steering wheel, etc.) to make a really authentic Berlinetta Bertone (only the front grille and a couple of emblems would be missing) .

OT 1600 Sedan and or 2000 Coupe Replicars

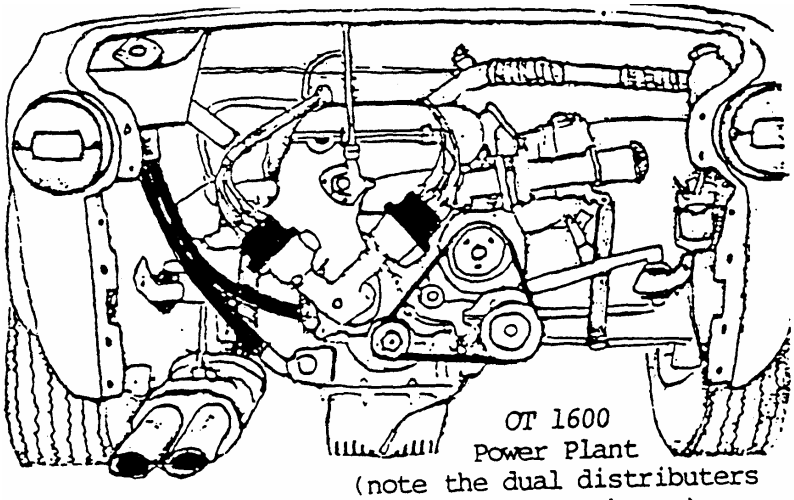
An Abarth OT 1600 replica (see page 83 and 84 of "Abarth") could be put together utilising an 850 Sedan body with a front radiator and an OTS/OTR 1000 coupe grille, large auxiliary gas tank mounted in the luggage

*** Note: Attachment brackets must be welded to top of Spyder windshield frame for front hardtop mounting bolts.**

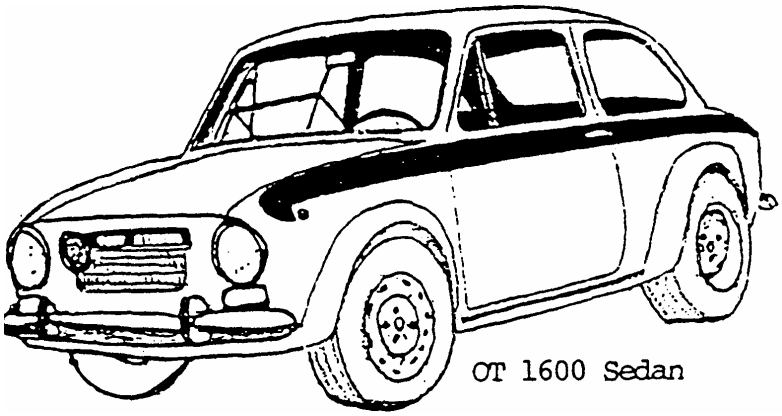
compartment or rear seat area, flared fenders, nag wheels (six by 13" front & 7 by thirteen inches in the rear), fat tires, heavy duty shocks, lowered and decambered suspension, wheel spacers (especially in the rear), 850 front disc brakes, with 124 rear discs optional, Abarth style twin chrome outlet muffler, leather covered steering wheel and special bucket seats, Corsa type windshield wiper connecting linkage, toped off with a 1608cc or 1756cc Fiat 124 twin earn engine conversion (see page 63) with higher transaxle ring and pinion ratio. Recreating the "gauge cluster" would be a difficult but rewarding project (see below) along with the Abarth-optional rear deck lid/spoiler/engine- ventilation panel. For an OT *2000* "look-alike", start with a pre-1968 850 coupe (single head lights and tail lights and non-duck tail engine lid panel) and equip it like the above noted OT 1600 replica. In addition you will want tomount the spare tire horizontally poping- out between modified (quarter) bumpers in front with a leather retainer strap (this setup also makes a pretty good "safety bumper") and provide two triangular (with rounded corners) radiator air cutlets in the luggage compartment lid (see below). Don't forget the Scorpione Motif and grille, and FIAT ABARTH lettering on the rear fenders .....



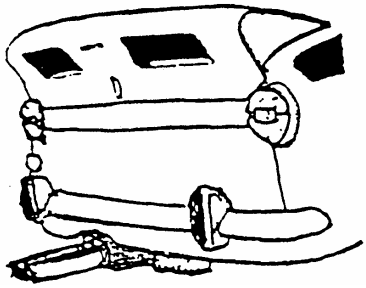
Gauge Cluster



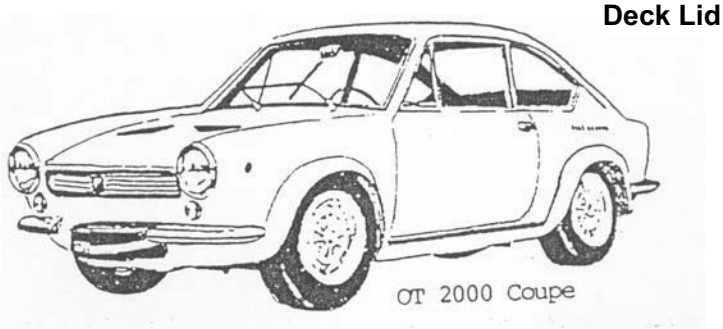
OT 1600
Power Plant
(note the dual distributers
and dry sump hoses)



OT 1600 Sedan



**Optional OT 1600
Deck Lid Spoiler**



OT 2000 Coupe

CHAPTER 6

COMPETITION EVENTS AND PREPARATION

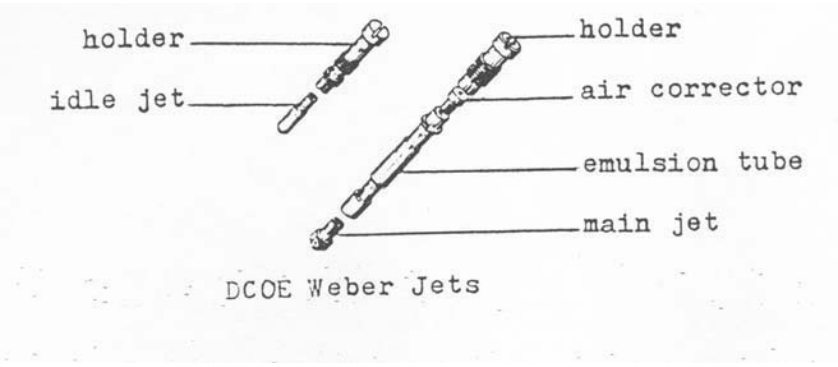
Individualised Specifics :

There are still lots of things that I won't be able to cover in this booklet and competition events/vehicle preparation didn't make it this time..... Part of the reason is that there are such a variety of events, classes, and cars that a really complete job would require a-volume again-as-large as this one. Also, racing modifications would only appeal to a limited number of owners. But, if you are considering a certain type of event and already have a Fiat or Abarth, or will purchase a car "after deciding on the particular class to compete in, send me a self-addressed stamped envelope along with a rules book for the events you want to enter plus $5.00 and I'll devise a complete list of recommendations "specifically tailored" to your purpose and car. If you have no particular class and / or car in mind yet, but just know you want to do some kind of automotive competition in a Fiat based car, I'll recommend something suitable at no charge (see pp. 100 to 102 of "Abarth" as a "racing primer").

A Few "Race-Oiented Tid Bits"

Carburetor Jetting for Modified Engines and Alternate Induction Systems

There is a lot to know (or guess-at and test) regarding carb jetting. Here are a few quick notes to get you started: (1) The one most important factor is not getting the main jetting too lean (which burns valves and pistons) or too rich (which washes oil off cylinder bore and rings). If the car runs reasonably well from the beginning (without noticeable misfire when driving), try driving on the freeway at 55 miles per hour for about 15 miles with new spark plugs fitted. Select a good off-ramp with a safe place to park at the road shoulder and then without slowing down, shove in clutch and shift to neutral while shutting off ignition switch (be careful if your car has a steering lock). Coast off onto the exit ramp and pull number one and two spark plugs. Center insulator of plug should be startinng to become a chocolate, tan, or light grey color. If insulator is white, you need larger primary side main jet(s) or smaller primary. side air corrector(s), and if insulator is very dark brown or black you need smaller mains or larger airs. (2) Idle jetting is pretty much a factor of what gives smoothest idle. (3) Improper accelerator pump jet size will be evident if car stumbles whenever throttle pedal is operated. (4) And keep in mind that if the carburetor that you have selected is a radical departure from the engine size, type, and setup you have, you will need to obtain suitable size venturi(s) before proceeding with anything else. Sometimes it's not all this easy so I'll try to cover it in detail in the future.....



DCOE Weber Jets

Note for Weber DCOE carb tips see Abarth Register Newsletter #35(Dec. 84) pp.41-45

High Performance Engine Lubrication System

I've made several references to a modified "reverse-flow" oiling system that eliminates the 600D/850/OT1000 centrifuge & oil delivery sealing rings. On a street car, I probably wouldn't make these changes unless new' sealing rings & retainer housings (see pp 123 of I' Abarth") are unavailable as in the case of Abarth OT&OTS1000 engines. Note that a remote, spin-on, full flow oil filter is included with this new setup, and while' you are at it, 'you can provide for the desirable "presurised center main bearing" too (72 & later 903 motors already have this feature).

1). For pressurised center main, drill a 3/16" diameter hole in block center-main bearing webb (use a bearing provided with) center-main holes in it as a guide to center punch. proper location for block drilling) on an angle through to the bottom of (left side) main-cap bolt hole.

2). Remove &: discard center oil gallery plug from outside of block & use a long 3/16" drill (be careful not to drill off-center) to provide oil supply to bottom of main-cap bolt hole.

3). Enlarge outer hole & tap threads in block at above mentioned gallery to accept fitting for high pressure, hose from remote oil filter.

4). Enlarge oil pump delivery hole in block (& hole in gasket) its full depth to 3/8" diameter.

5). Braze or plug-up oil-pressure-relief-valve drain hole in block.

6). Remove oil delivery pipe & fabricate a rear main-cap blanking plate (steel, for added cap support).

7). Retain excess oil return pipe (if fitted) along with 6-bolt front seal housing & full circle gasket. 4-bolt types use ½ moon gasket & no pipe.

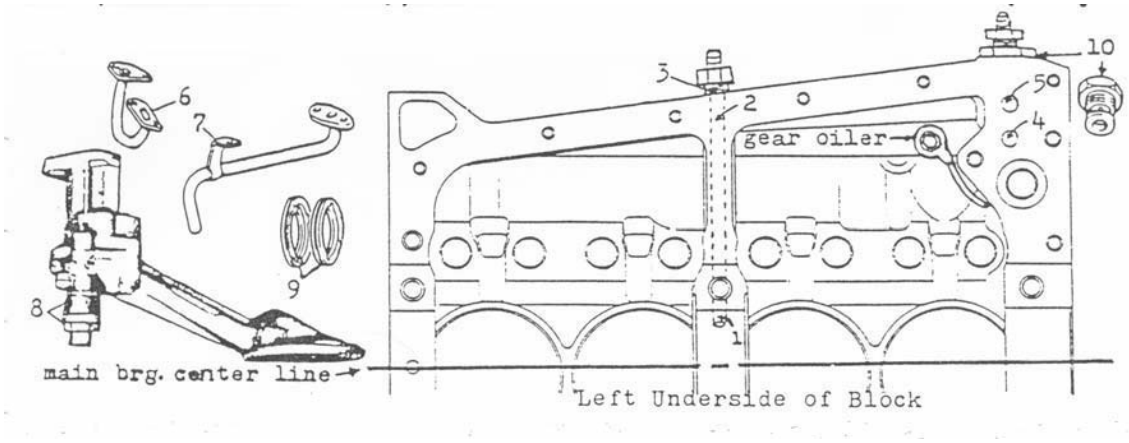
8). Braze a heavy duty oil-pressure-relief-valve (see pp 126 of "Abarth") onto oil pump flange that has been cut off of oil delivery pipe; or perhaps a complete Fiat 127-style oil pump with relief valve incorporated could be used (see Figure 21) along with a deeper sump.

9). Plug & braze-up hole in end of crankshaft snout & discard oil delivery sealing rings. Sealing ring retainer housings & washer (see pp 123 of "Abarth") must be kept intact to act as spacers for timing gear & pulley. Retain centrifuge cover to stop possible leakage.

10). Remove spring / valve / cap from an extra oil-presure-relief assembly & drill-out hole at interior end to allow increased flow volume. Either replace the cap with suitable fitting for remote filter hose or drill a hole in cap & braze a fitting to it (see Fig. E up.126 of "Abarth" for parts). Hoses & fittings should be about 3/8-inch or 10mm inside diameter.

Oil now flows tram pump w/relief valve (8) ; to delivery hole (4) ; to former relief-valve fitting (10) ; to hoses (aeroquip etc.) & remote filter (From makes 0) ; to re-enter block at center gallery fitting(3) ; be to new galleries (2&1) for distribution first to center main bearing & then other main/rod/cam brgs.

Optional Items: oil cooler between filter outlet & block inlet, Abarth one-piece steel distributer/oil pump drive gear & shaft (Fig.B pp.134 of "Abarth"), Abarth gear oilier assembly (below & Fig.22) , smaller crankshaft pulley (*600/750* steel, PBS or Abarth alloy, Abarth cog-belt drive system), Abarth heavy duty oil pump, increased capacity finned-alloy sump(see pp.39).



CHAPTER 7

PARTS, SERVICES, EXTRA FAT

All kinds of people tried to follow Abarth's "world's largest speed shop" lead, but nobody else was able to elicit the emotional response that genuine Abarth pieces generated among enthusiasts. You wanted Abarth "hot rod" hardware even more for its looks and heritage than for what it was meant to accomplish. The beautiful coach-built sports cars were obtainable to some)but anybody who owned a car) could save up for his own handmade, wrinkle painted, dual chrome tipped, finned alloy, leather covered, enamel Scorpion crested legacy of those world-beater cars that streaked around race tracks everywhere.

Parts Availability & Special Services

Recently, new replacement parts have become harder to obtain. In particular, items that are "Abarth only" (not interchangeable with Fiat pieces) such as pistons, main bearings and thrust washers for large journal crankshafts, transaxle ring & pinions etc. Also, Fiat's pull-out from the *as* market has made even common fiat items scarce. With this in mind, along with the special sources I had developed in the past for my former Fiat repair business, I've decided to get back into it by opening a "full coverage one-stop-shopping parts & accessories supply" for Fiat 850 & related Fiat-Abarth vehicles. Included in the list of cars" covered are:

1. **Fiat 850 Spider/Coupe/Racer/Sedan**
2. **850-based Fiat-Abarths (OT 1000) & other similar makes (OTAS, Giannani, Moretti, Siata, Nardi, Lombardi, Cisitalia etc)**
3. **850-based Fiat-Abarths with modified Fiat 124 engines (1300/124 OT, Scorpione)**

Special engines & conversion parts for 850 & 600 based models in stock:

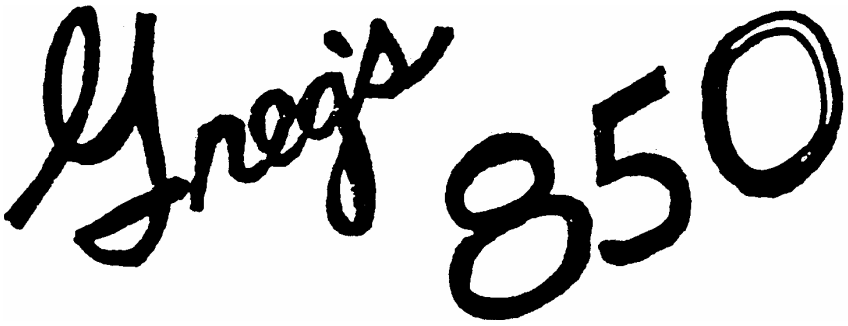
1. **Autobianchi All2 Abarth 1000 & 1050(see pp. 59-61)**
2. **Fiat 124 pushrod 1197 & 1438 (see pp. 63-65)**

other Services offered:

1. **Repair & mechanical restoration of 850-based cars**
2. **Bail-ding *of* "Abarth Replicas" (OT1600/2000,Bertone-PP.77)**
3. **Buy,. or trade your unwanted cars,. parts, literature**

To receive my "850 & Abarth Parts" booklet along with a subscription for regular update mailers, please send $4.00 cash or check(made payable to Greg Schmidt) at: Greg's 8505691 Mt. Acara Dr. San Diego CA 92111 USA or call for a phone quote : (619) 279-0460 Anytime

THE BEST SERVICE AND THE CHEAPEST PRICES ....
(you'll be pleasantly surprised)



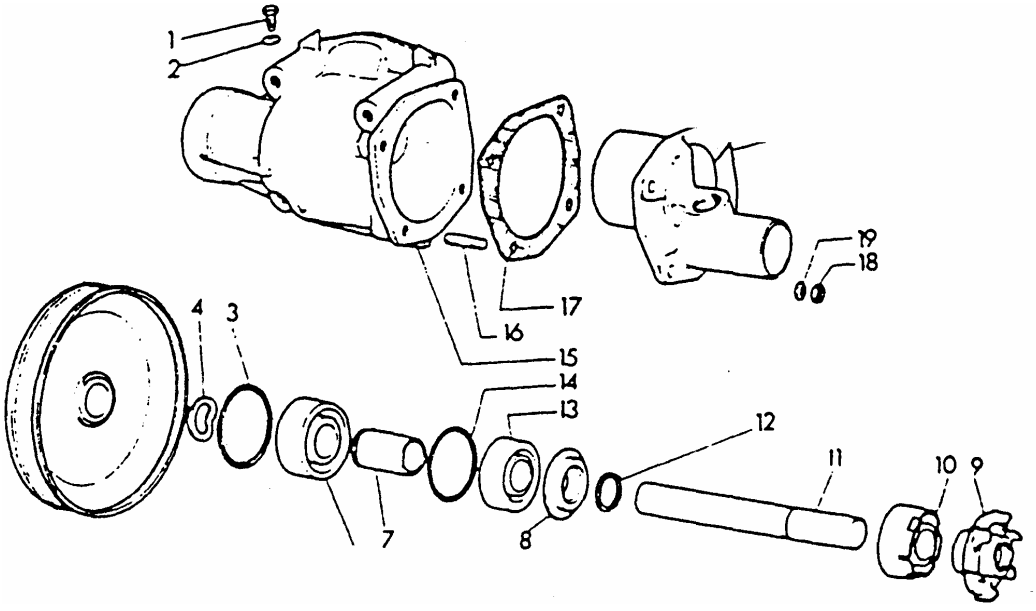
Special Machine Work & Parts Production

Abarth twin-cam engine parts have been almost non-existant for the last fifteen years. I recommend Sergi Bartolini at Motor Works Inc 1531 India st, San Diego, CA 92101 ; (619) 233-8875 ; Telex 619 00, as a good place to have unobtainable parts made. If you can't find bearings, Motor works makes a habit of turning-down/building-up cranks and/or align-boring blocks so that bearings from currently popular engines can be used (anyone for an Abarth-Mitsubushi motor). These guys also make valve gear (valves, guides, retainers, seats, etc.), repair and recondition exotic heads, and even convert early twin cam heads to "shim type" valve adjustment. They can get twin earn pistons, crankshafts, or gears made for you locally too if you can': come up with serviceable used pieces.

Proposed Subjects for M.A.T. (More Abarth Tricks):

1. Competition Events & Race Car Preparation
2. Fiat, Fiat-Abarth, & Abarth-Simca Production & Specification Chart
3. More Fiat-Abarth Bialbero & Radiale Engines
4. More 1300/124 & Scorpione
5. Abarth-Simca & OT 1300/1450/1600/2000 Technical
6. Fiat-Abarth "step Children" (other 600 & 850 based makes) .
7. Fiat-Abarth Descendants ; Front Wheel Drive Models Built from 1971 to the present (Autobianchi A112, Fiat 127/panda/Uno, Seat 133).

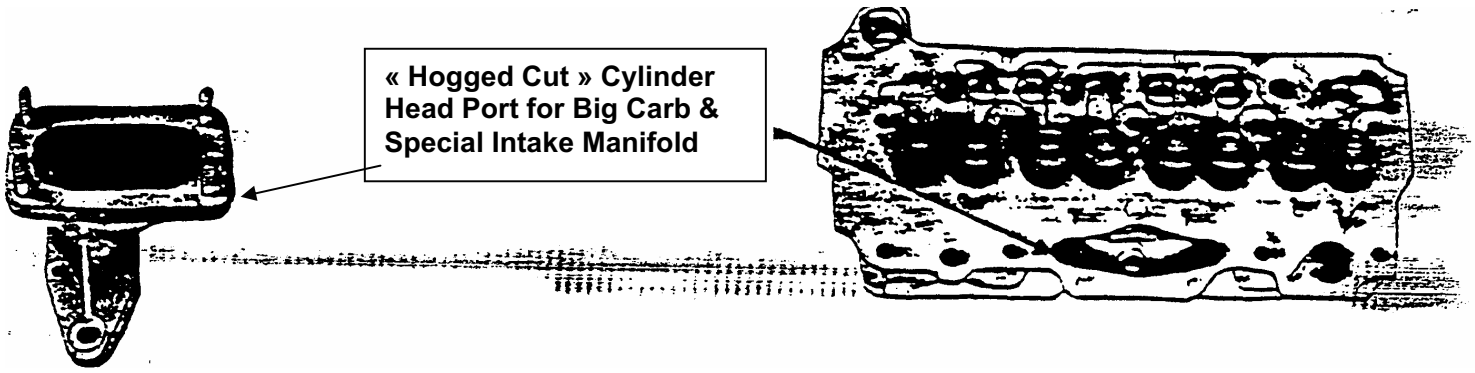
127/Al12 Water Pump Parts Breakdown (w/clockwise impeller)



1. Locating screw
2. *Washer*
3. *Sealing ring*
4. *Wave washer*
5. *Pulley*
6. Bearing
7. *Spacer tub*
8. *Seating ring*
9. *Impeller*
10. *Gland bush*
11. *Water pump shaft*
12. *Snap ring*
13. *Bearing*
14. *Sealing ring*
15. *Water pump body*
16. *Stud*
17. *Gasket*
18. *Nut*
19. *Washer*
20 *Water pump cover*

“Getting Ahead” From Fiat Friends

So .... you want your Fiat or Abarth to be a little bit “hotter” than the next guy ? 'Nell, quite a few people decided they could make better cylinder heads for Fiat engines than Fiat themselves. Surprisingly, quite a few of these devices are still to be found gathering dust in enthusiasts or 'former racers' garages. I'll mention some of the more popular ones: (1) Super Sprint (made by Sprint Filter Company in Italy). With' this one you get two round intake ports in the top of the head with valve cover and intake manifold cast together as one piece and mounting a Weber DCOE side-draft, across the top of the valve cover (intake facing left side of car). These may still be available new ... (2) Aztec (formerly made by Dale Tholen in California). An 8-port, head with four long runners connected together above and to right *of* head and again mounting one DCO Weber (this time facing to the right). This is a Very good head but there may not be clearance under the rear deck-lid on some models for the rather tall. intake manifold. (3) PBS 8-port (formerly made *by* Paul and Bob Swensen in California). Similar to the Aztec head but reportedly doesn't work quite as well. (4) Any number of people have punched larger or different hole (s) in the standard Fiat head to mount multiple carburetors. Rich Motors (in Glendale, California) welded up the Fiat single intake port and punched two new holes to mount dual one-barrel downdraft Weber/Solex, and I've seen, the same thing done to mount the British Skinners Union (S.U.) carburetors. There were (and still are) a variety of adapter manifolds made, that after enlargement of the standard intake port, would allow innumerable carburetors to be fitted. The large Weber, downdraft (28/36, 34134, 32/36, 36/36) manifold was probably the most popular (below & Fig.6) followed by the DCOE side-draft conversion manifold (wich required an inefficient 90° bend before entering the cylinder head runners). A company by the name of Alquati in Italy still makes special 600 and 850 manifolds which are available through Bayless in the U.S. (5) The ultimate (other than. an Abarth twin cam) would be one of the PBS overhead cam heads with dual DCOE side-drafts which came in either single or double cam styles. One of these setups also requires all the related cam-drive hardware and, therefore, is better purchased as a complete engine.



You say you don’t like your “long pump” and you’d like to have a “short one ?”

PBS, and - of course Abarth, made “shorty” 3 -bolt water pump to fit 600 and *850* ,'blocks for use with front radiators when engine driven cooling fan was removed (reportedly as much as five *horsepower could be gained at high* RPM with fan removed).On clockwise 850-based 903 conversion motors you might adapt a Fiat 127 short pump (see pp.82 & 96). Although it has only a 3-bolt mounting, holes appear to be spaced to match the 903 pattern (one hole in block not used). Make your own-gasket and/or Water outlet flange-shape, block adapter and “sleeve-down” mounting-bolt holes in block from 10 to 8mm. I purchased a 127 pump a couple of years ago from the J.C. Whitney Catalogue. No doubt bought them by mistake, as no 127's are in the US ...

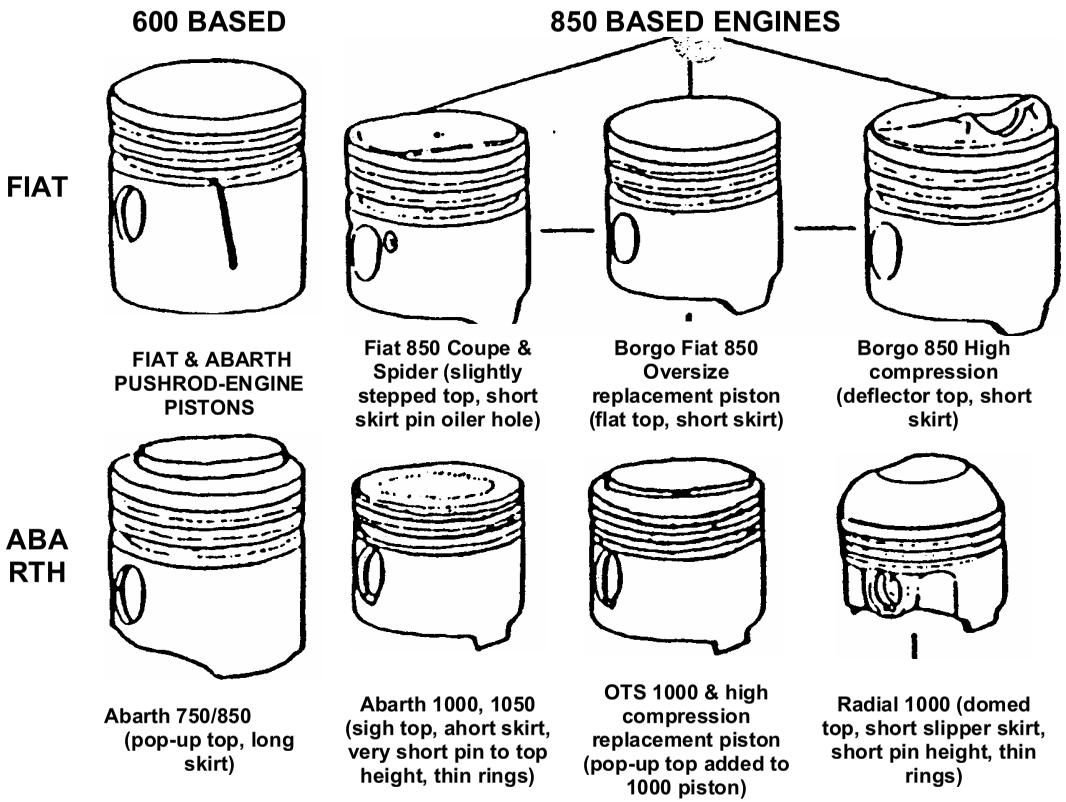


Figure 1 : FIAT & ABARTH PUSHROD-ENGINE PISTONS

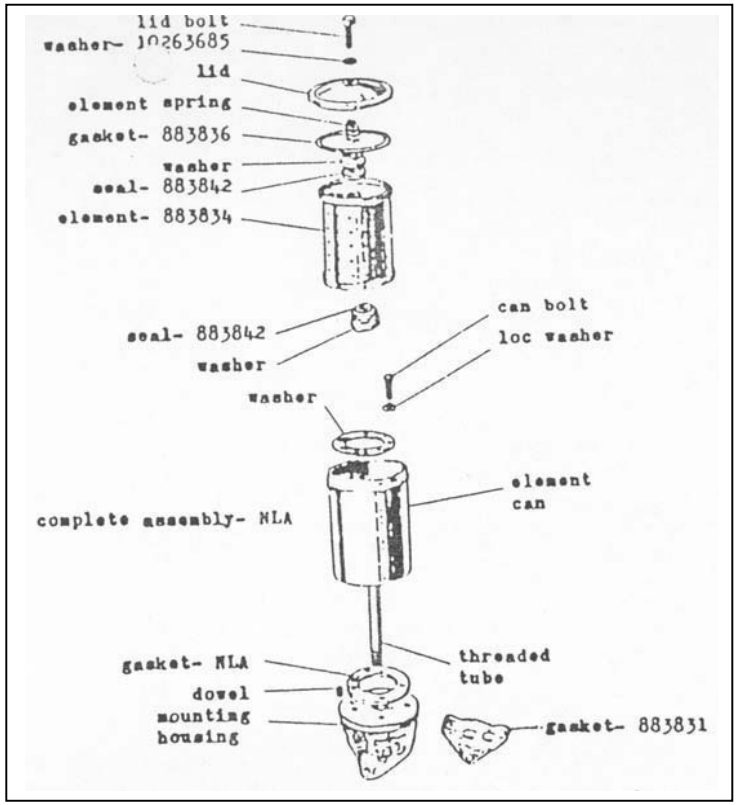


Figure 3 : 600/750 oil filter assembly and parts

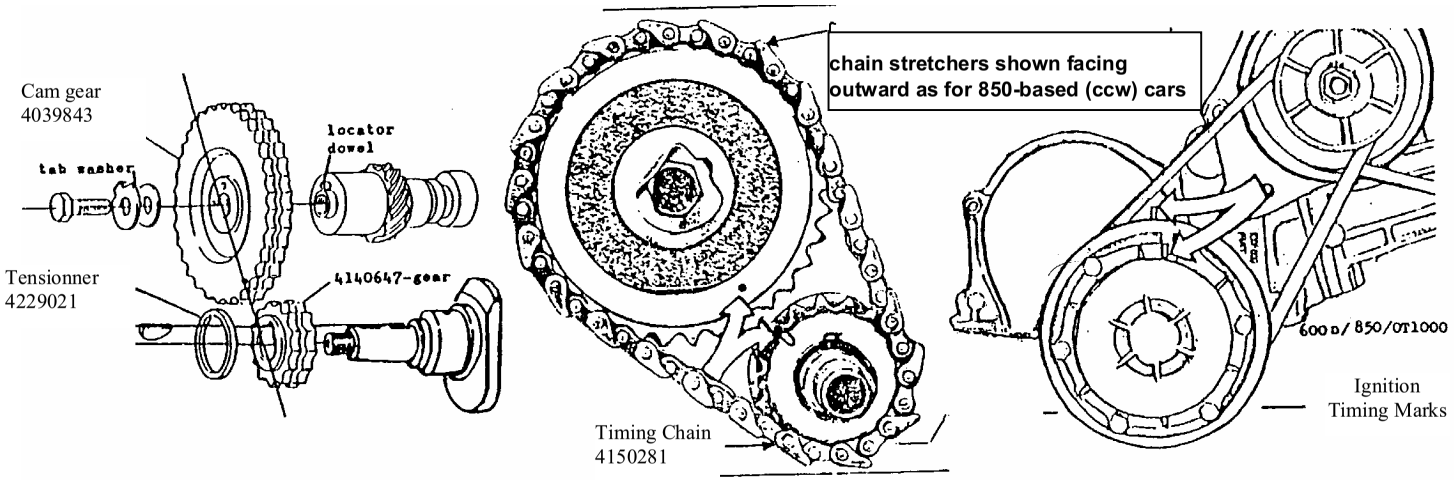


Fig. 4

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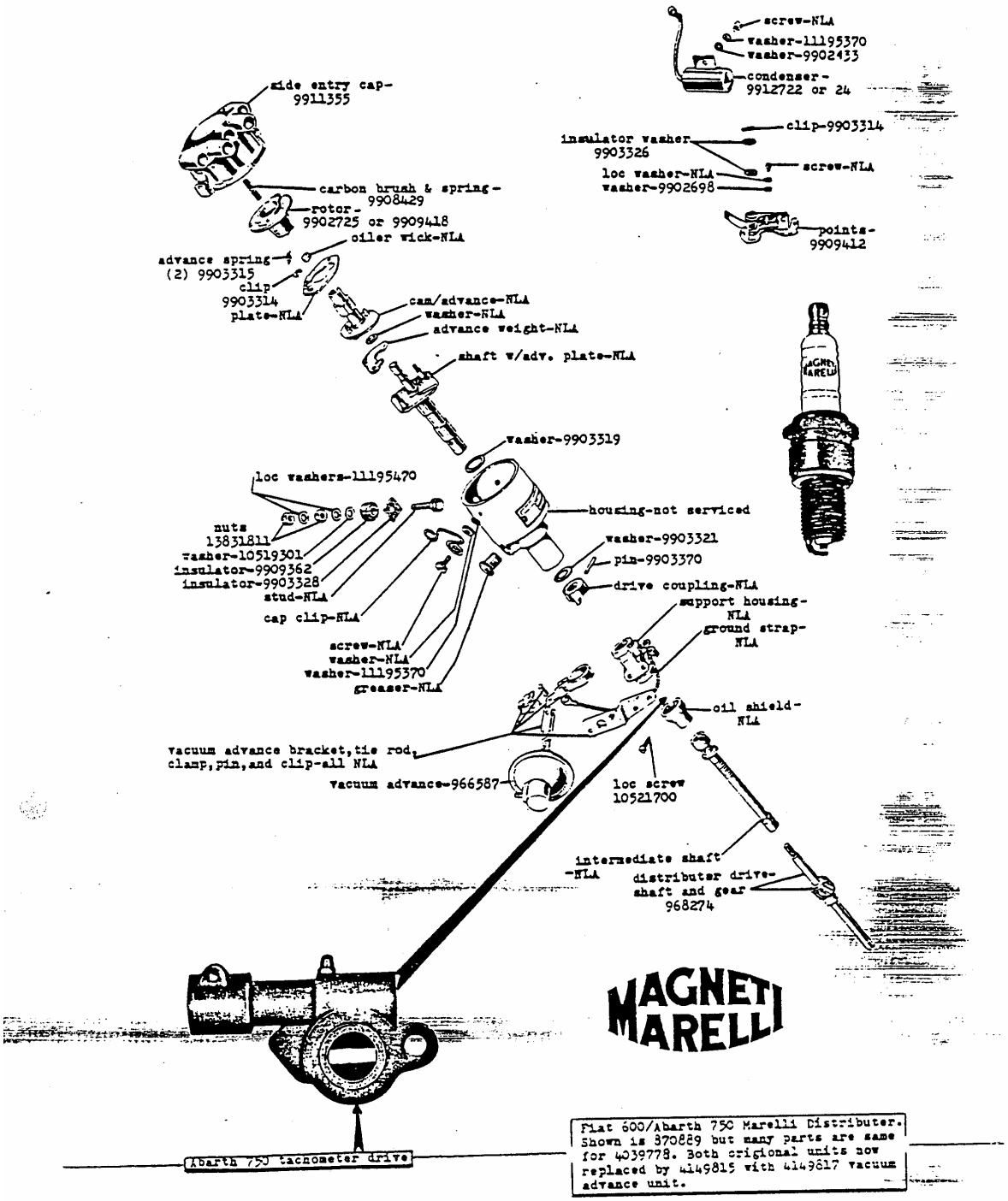


Figure 4:

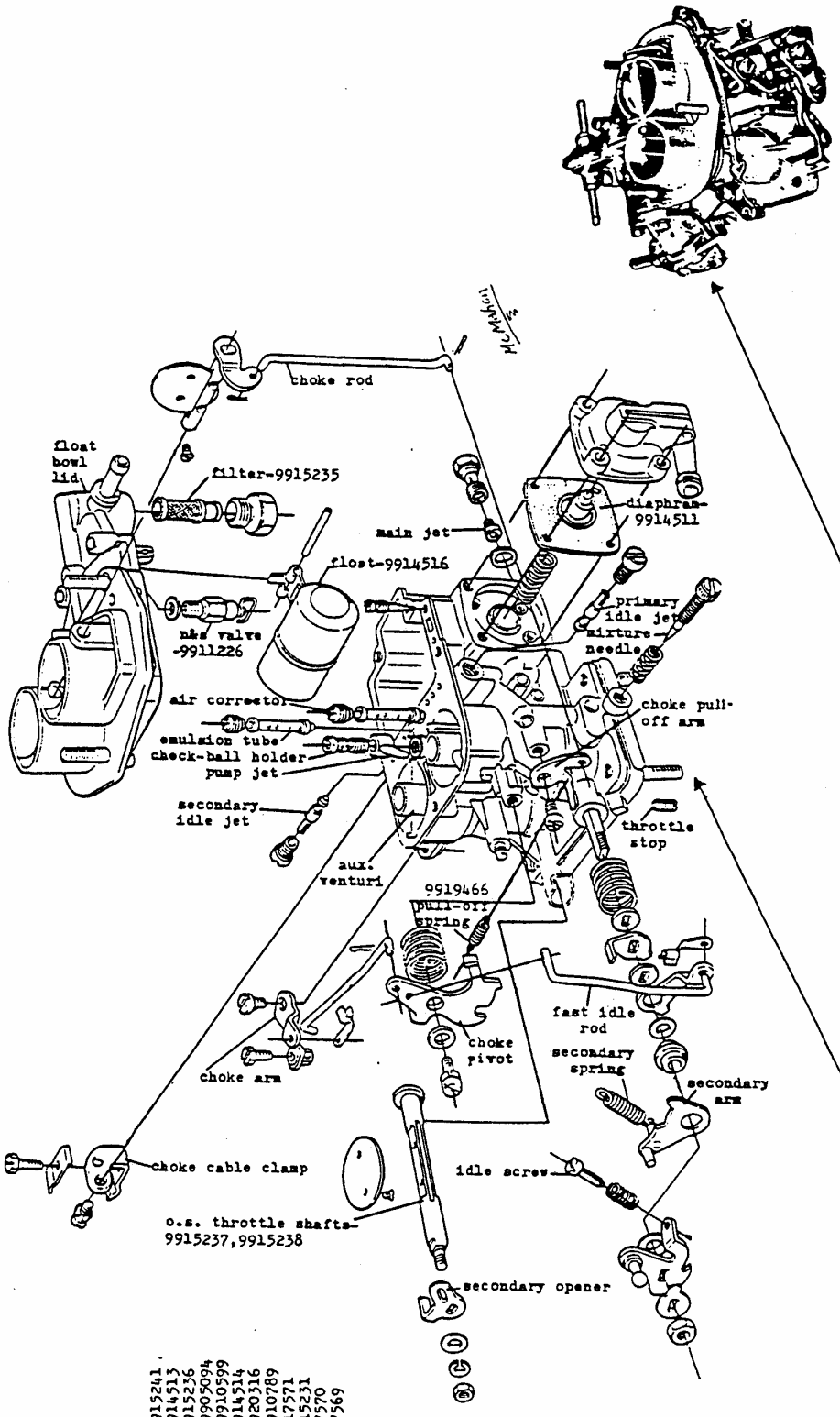


Figure 5:
—850/CT1000 Weber 30 DIC 2-barrel Carburetor= 4227564 (23/21 main venturi,no emog equip.). 1970-73 30 DICA#4255444(USA,23/23,emog)

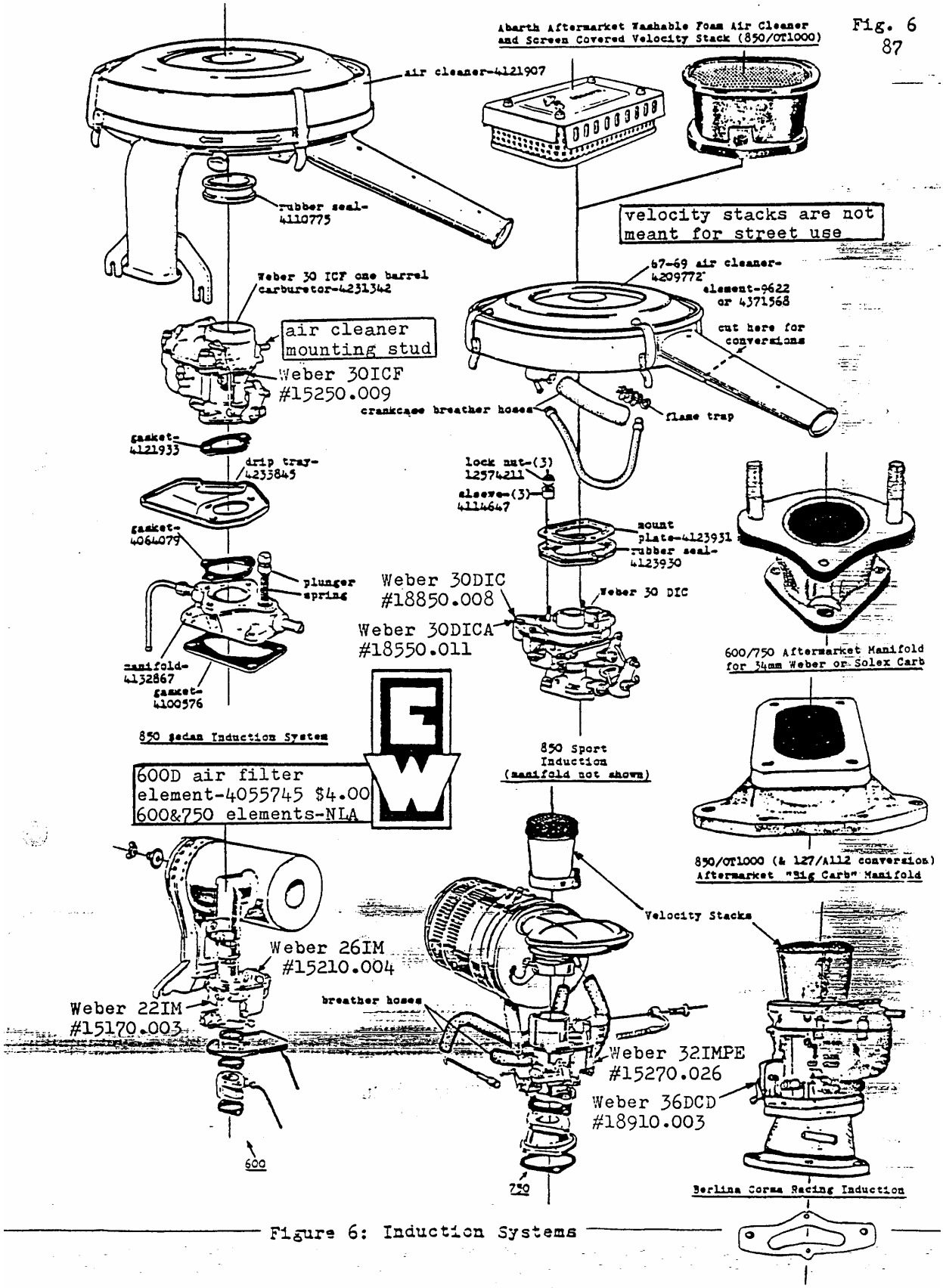
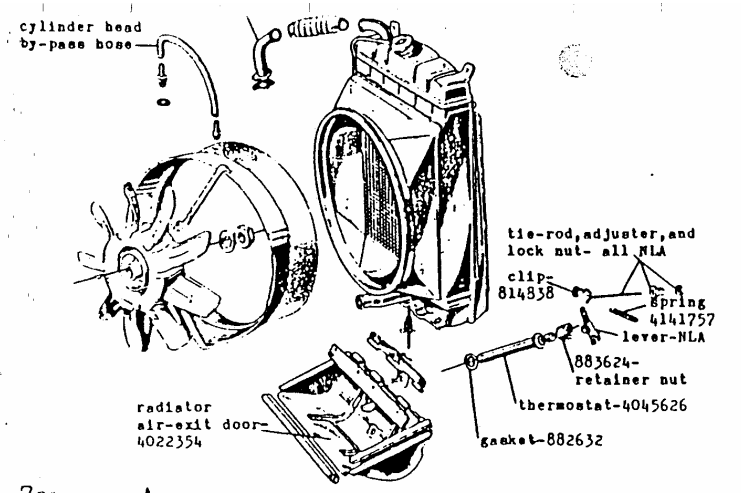


Figure 6: Induction Systems



7a:

600/750 cooling system parts. A temperature sensor is fitted to the water outlet on Abarth models.

7b: 850/OT1000 cooling system parts.

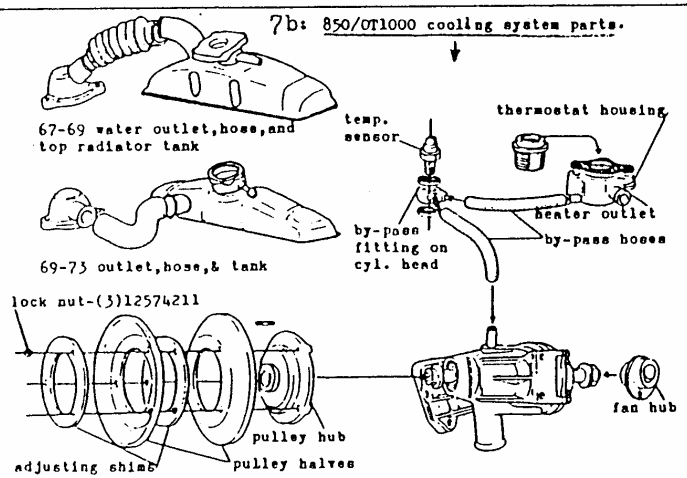
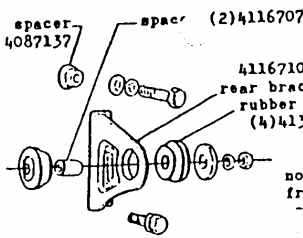
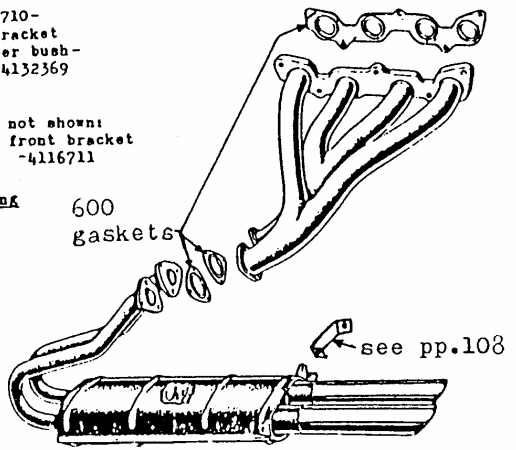


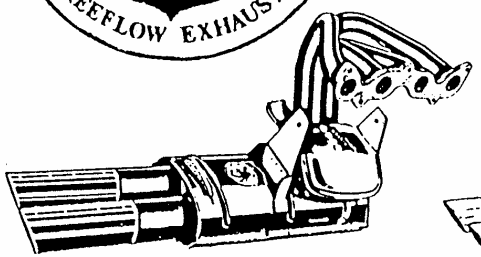
Figure 7:



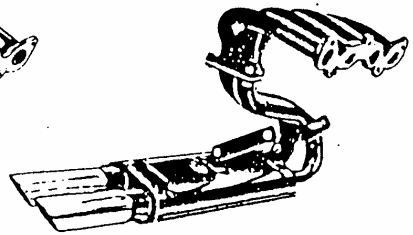
850 Exhaust System Mounting



Abarth 750
(Berlina 850 TC uses larger muffler)

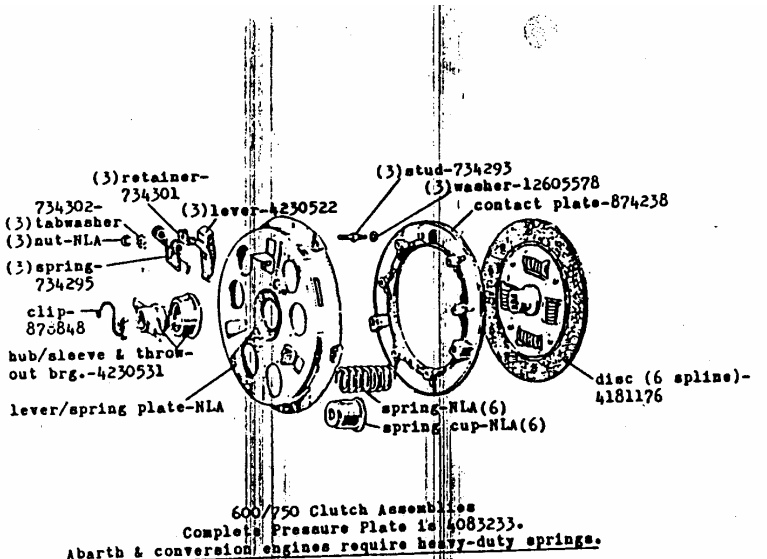


Abarth OT1000 Original
Fiat 850 Replacement



Aftermarket Replica Systems
(popular makers included: Ansa, Monza, Stebro, Daytona, Exostech, SuperSprint, Prima Flow, Toaf)

Figure 8:



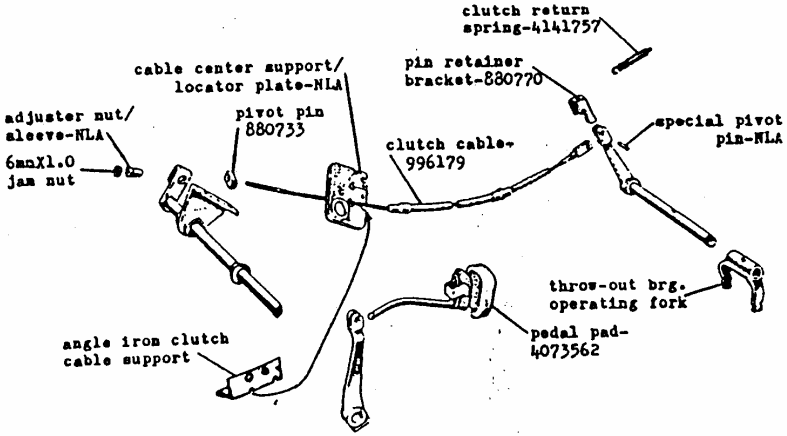
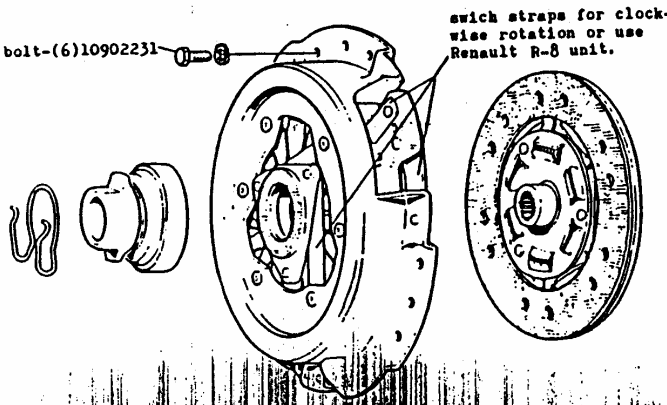
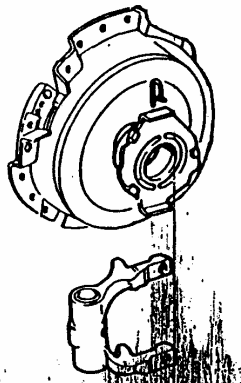


Figure 10: 600/750 Clutch Actuation





Standard 850/OT1000 Diaphram Clutch (6 spline disc & CCW rotation)

127/A112 Diaphram Clutch

Figure 9: Clutches.

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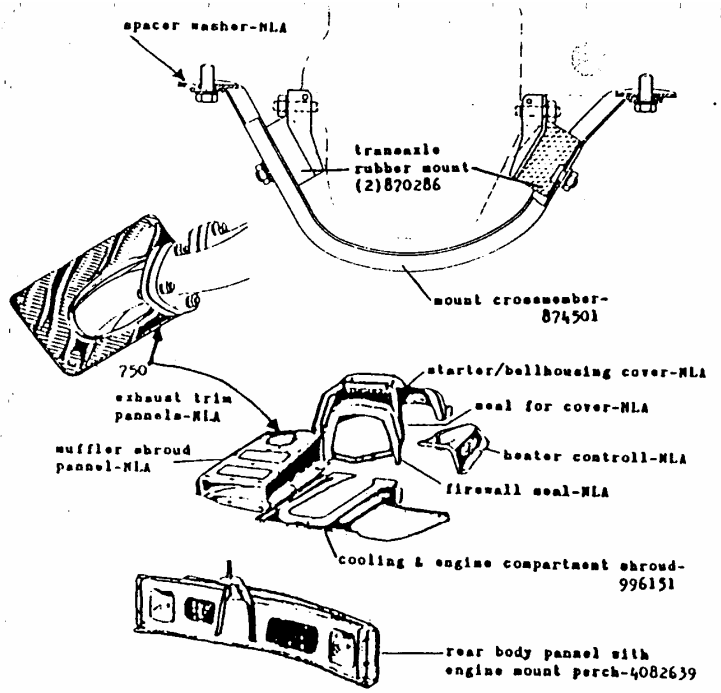


Figure 11: Engine Compartment

600/750 Mounts, Body Pannels, Shrouds, Rubber Seals, & Trim

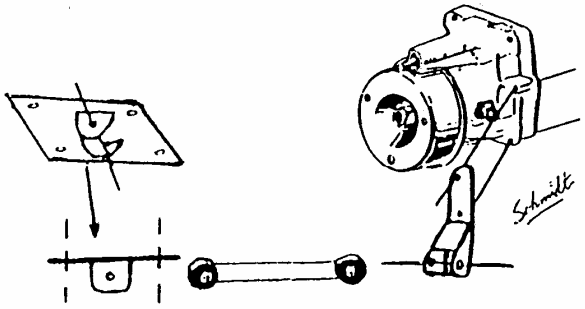
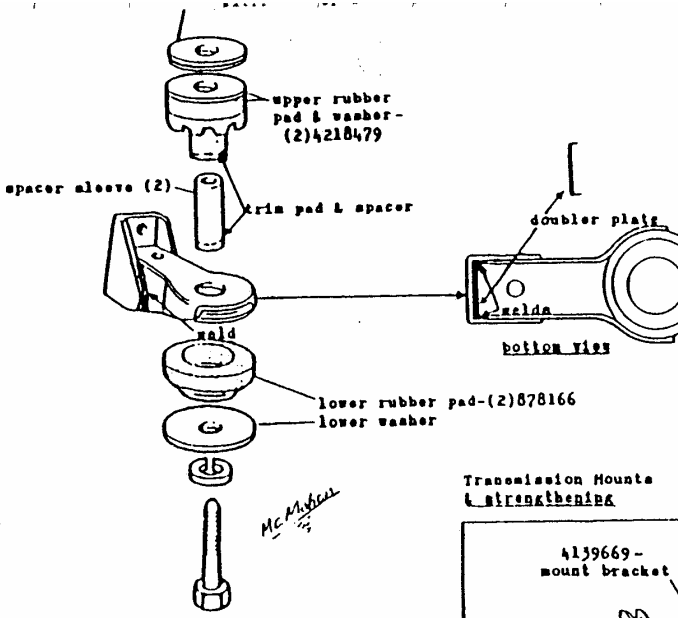
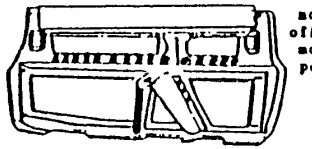


Figure 13:

Drive Train Movement Bar



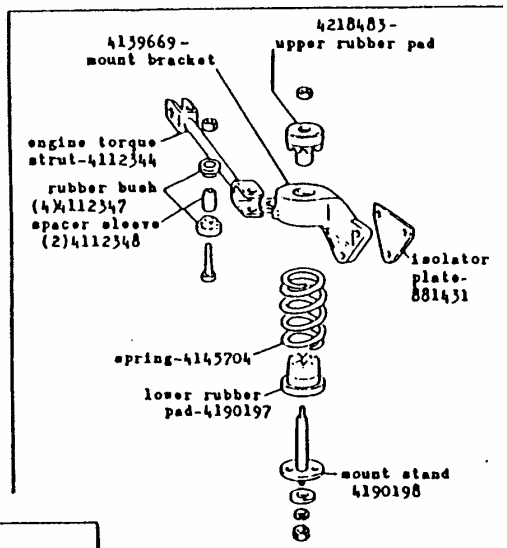


Spider rear pannel/mount perch showing placement of strengthening rivets

Figure 12:

Fiat 850 & Abarth OT1000 mount parts & modifications

Transmission Mounts & strengthening



Coupe/Sedan Engine Mounting

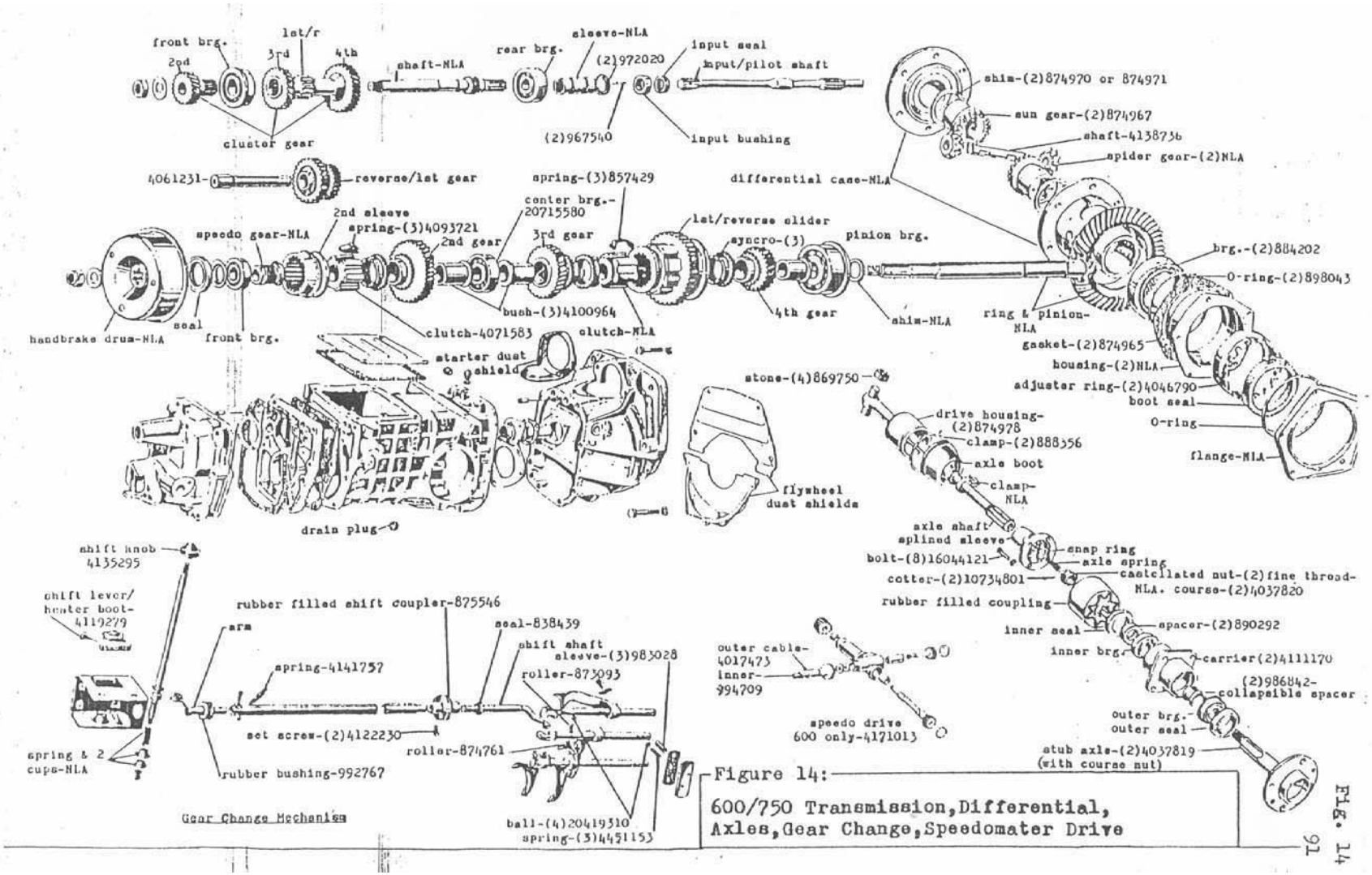


Figure 14:

600/750 Transmission, Differential, Axles, Gear Change, Speedometer Drive

Fig. 14

Fig. 15,16

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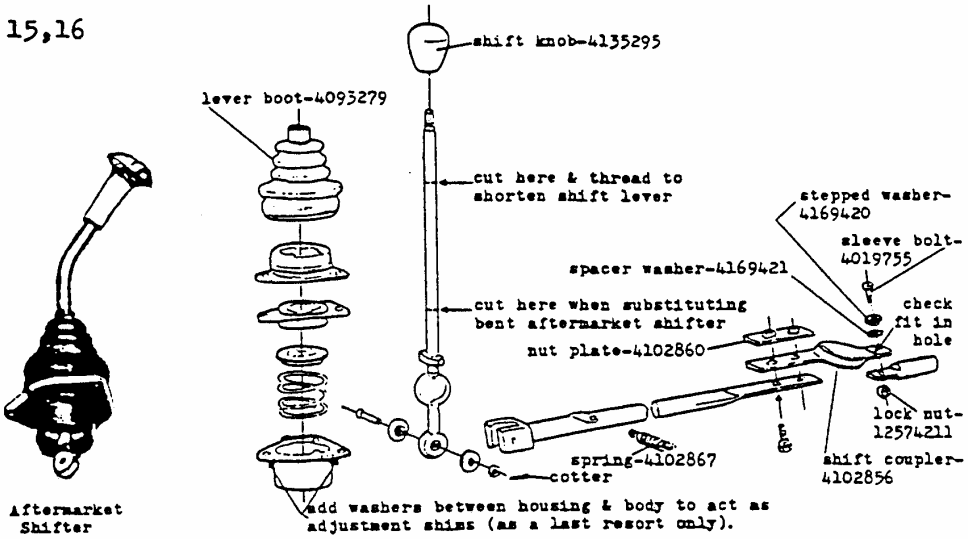
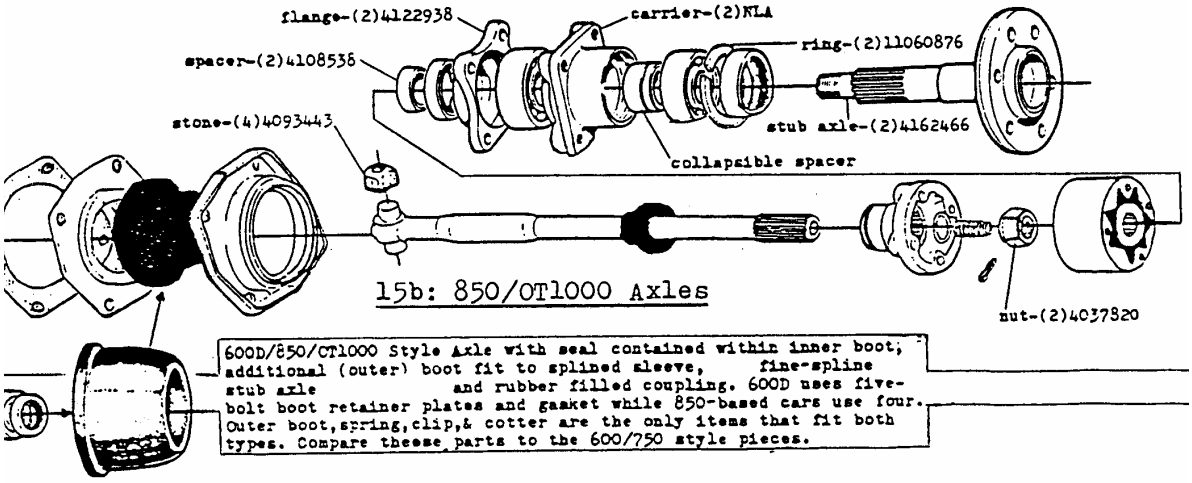


15a: 850/OT1000 Gearchange Mechanism Parts & Modifications



15b: 850/OT1000 Axles

Figure 15:

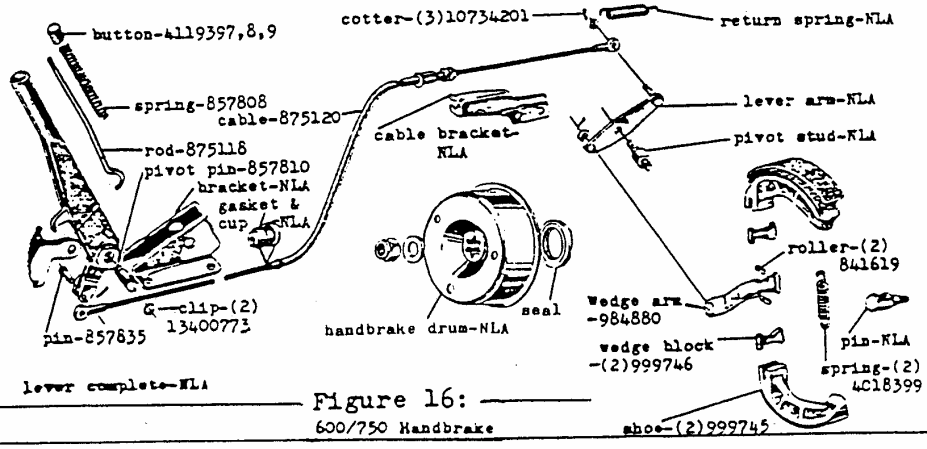


Figure 16:

600/750 Handbrake

Fig. 17,18,19
93

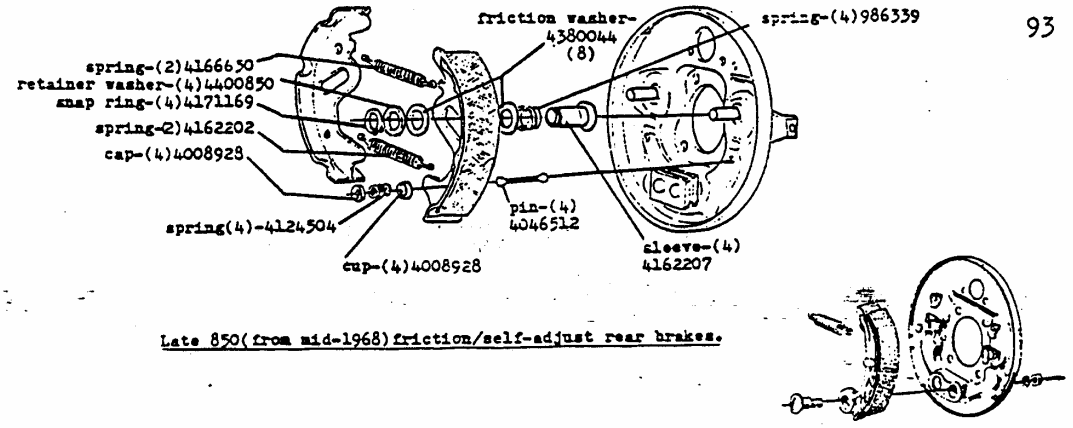
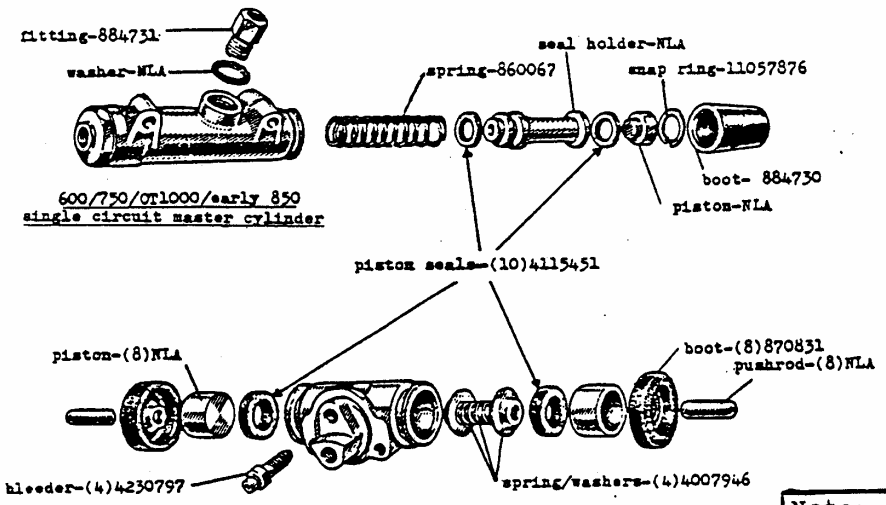


Figure 17: 600/750 Drum Brakes with Aluminum Shoes



Note:
600D types have larger wheel cyl. diameter

Figure 18: Hydraulic Brake Cylinders

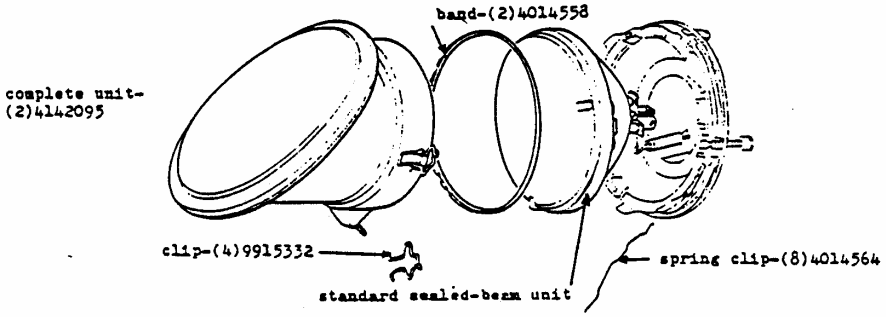


Figure 19: 850/GT1000 Spider early "covered headlights" for USA.

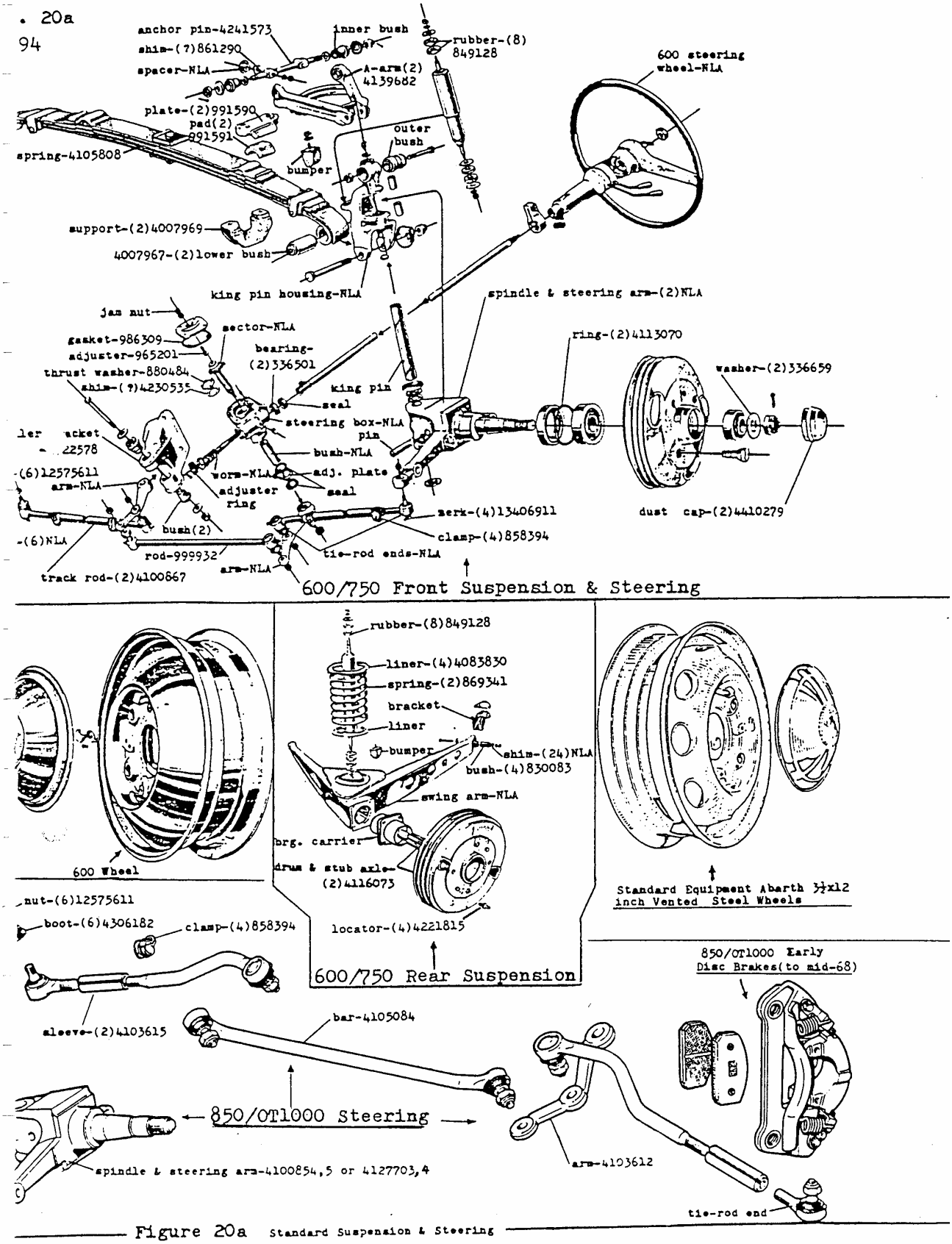
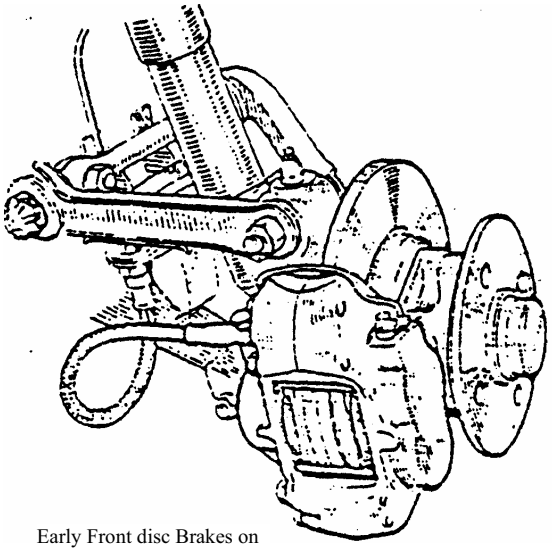
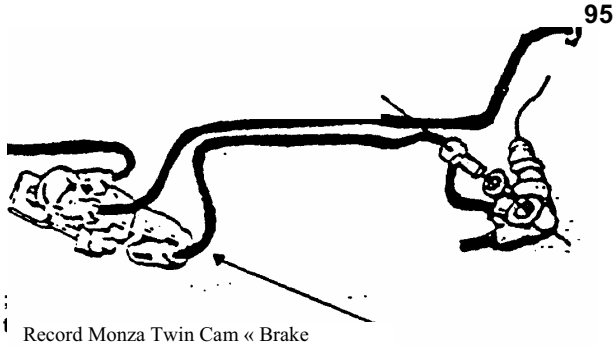


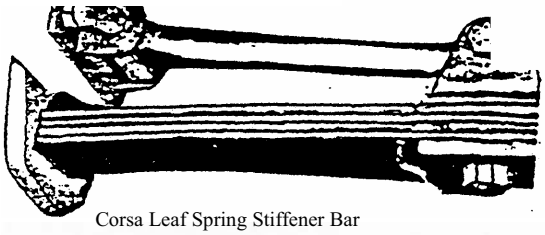
Figure 20a Standard Suspension & Steering



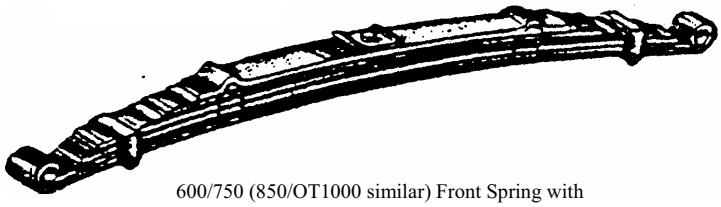
Early Front disc Brakes on
Standard Fiat suspension



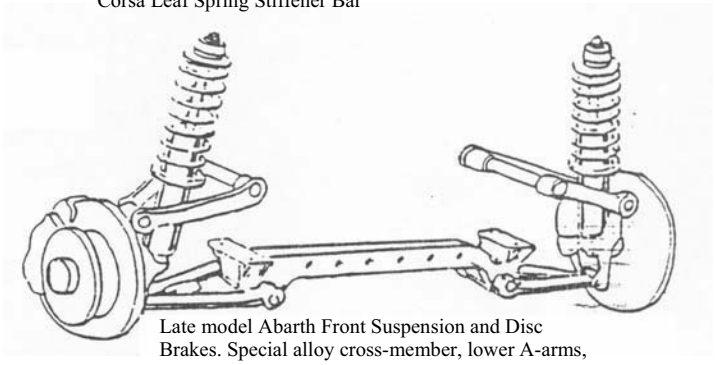
Record Monza Twin Cam « Brake
Booster » for front drum Brakes



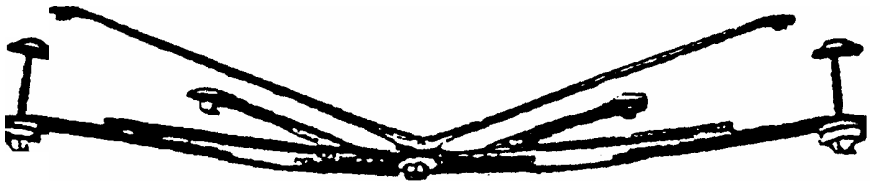
Corsa Leaf Spring Stiffener Bar



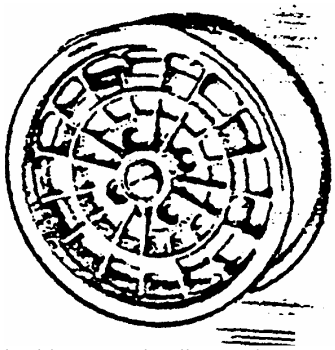
600/750 (850/OT1000 similar) Front Spring with main leaf flipped over & reverse-arched to lower suspension (compare to std. Spring with eyes facing down in fig 20a)



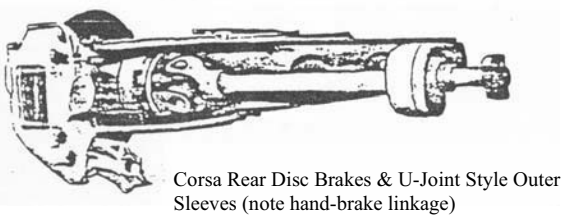
Late model Abarth Front Suspension and Disc Brakes. Special alloy cross-member, lower A-arms, and coil-over shocks replace the fiat transverse leaf spring.



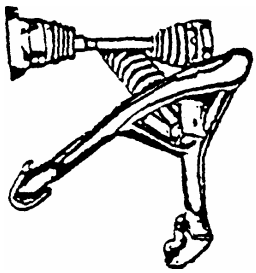
After-market Camber Compensator and transmission Mount Strengthener for 850/OT1000 Models



Abarth/Campagnolo Alloy Road &
Racing wheels



Corsa Rear Disc Brakes & U-Joint Style Outer Axle Sleeves (note hand-brake linkage)



Abarth Late Model Berlina Corsa Rear Suspension and CV-Joint Axles. No Fiat parts remain. Compare coil-over shocks, fabricated trailing are, and double jointed axles to standard 600/750 pieces/

g. 21
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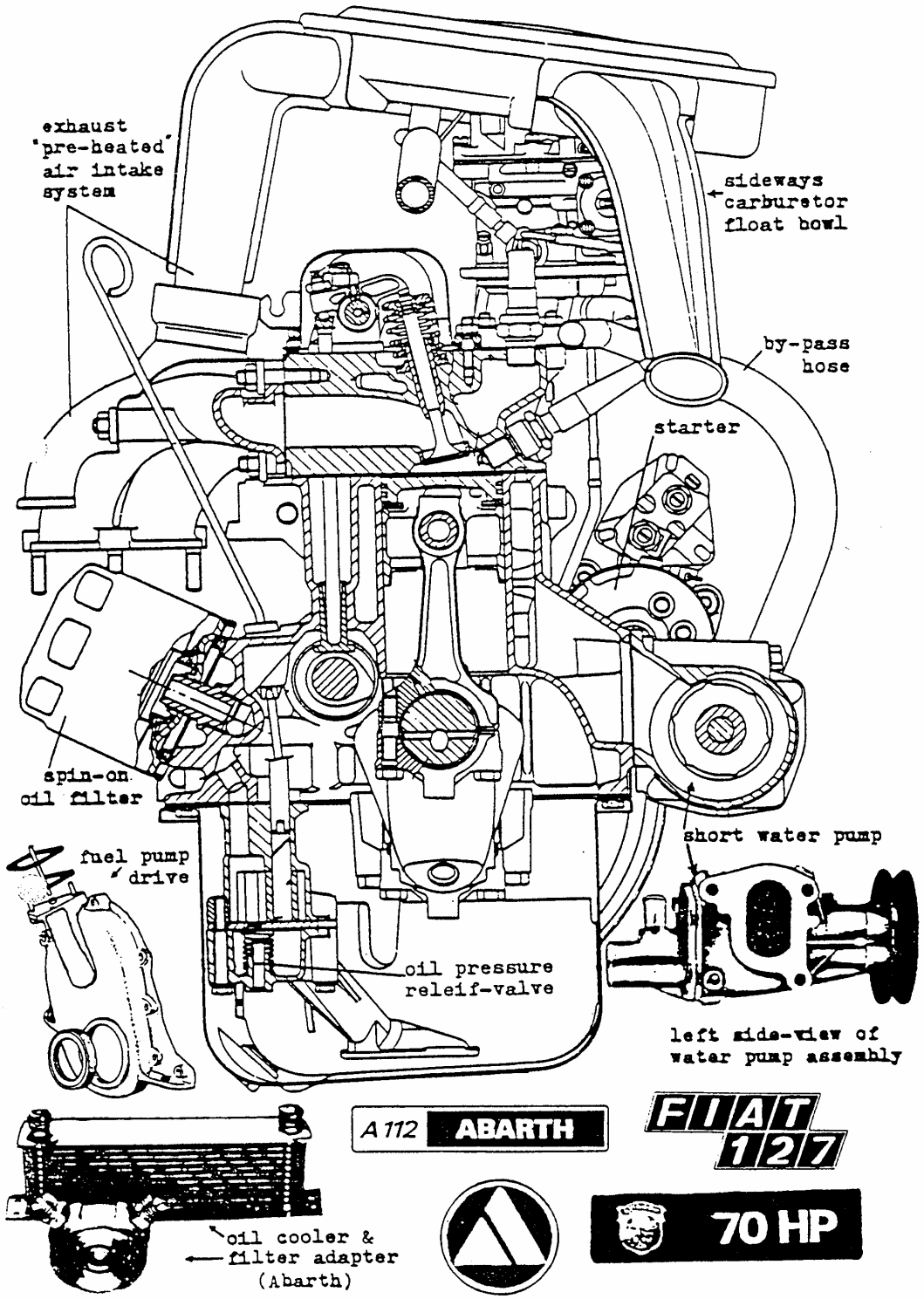


Figure 21: Fiat 127/Autobianchi A112 Engine

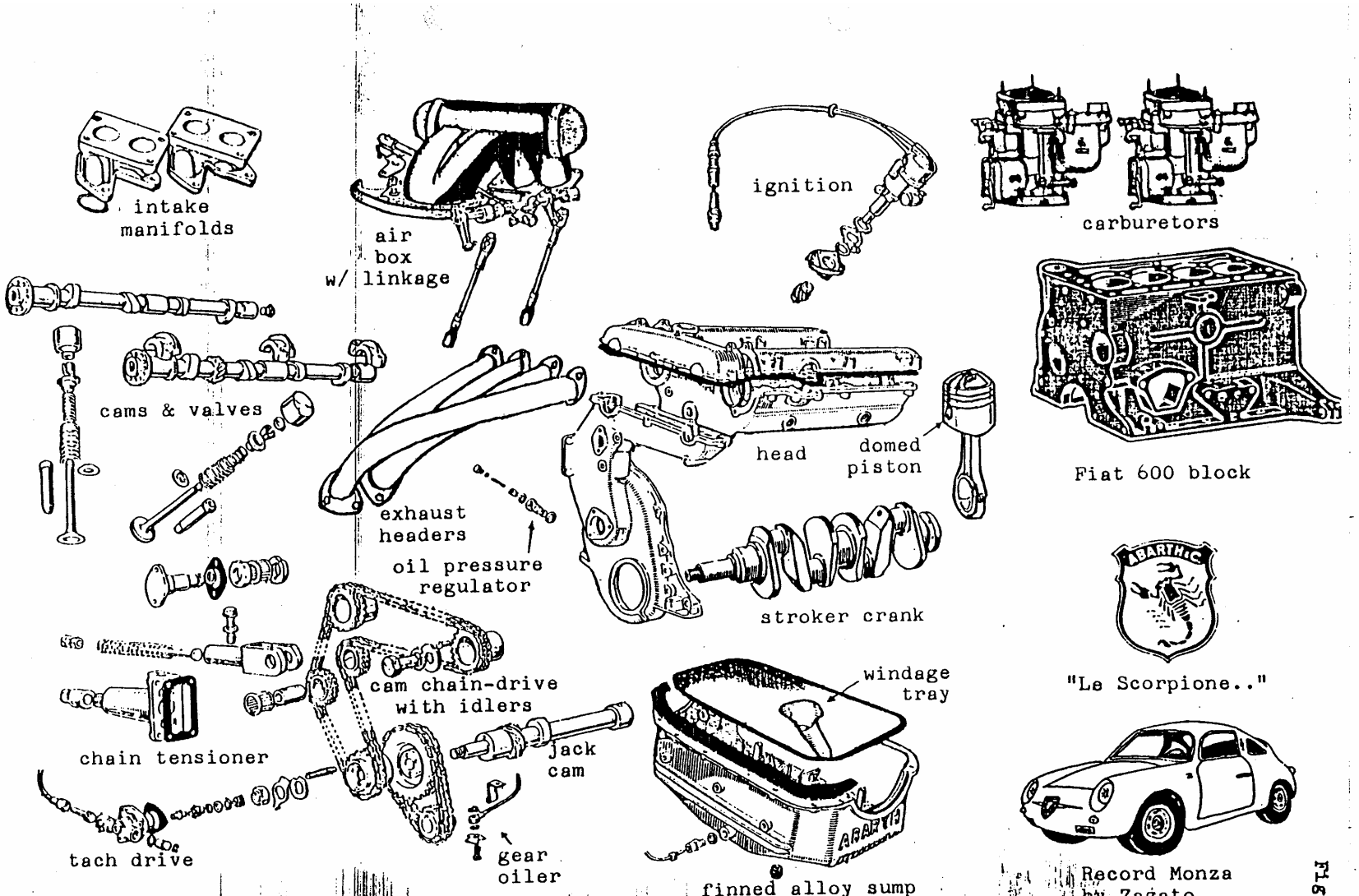


Fig. 22 - 97

Figure 22: The Original Abarth 750 Double Overhead Cam Engine.

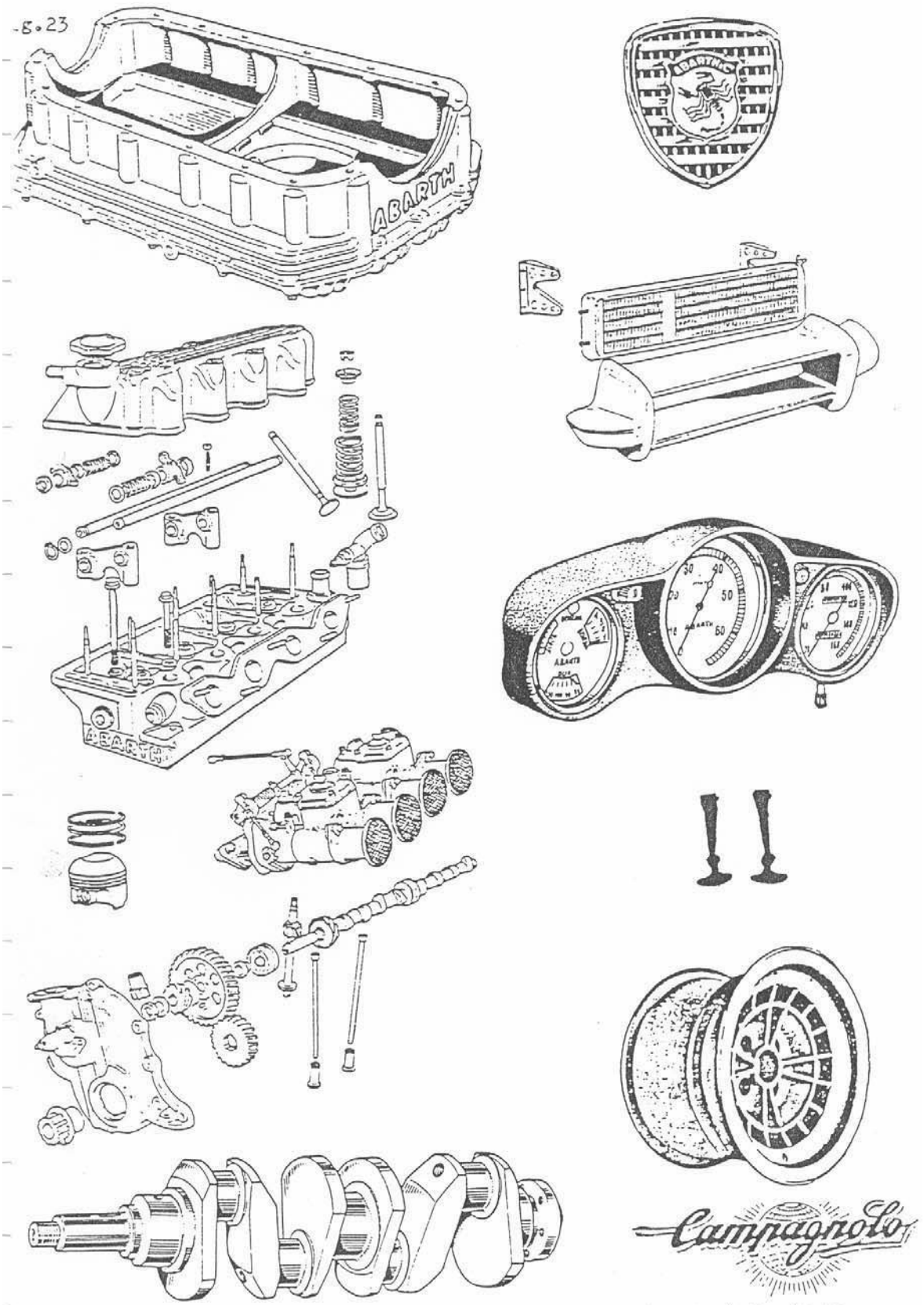
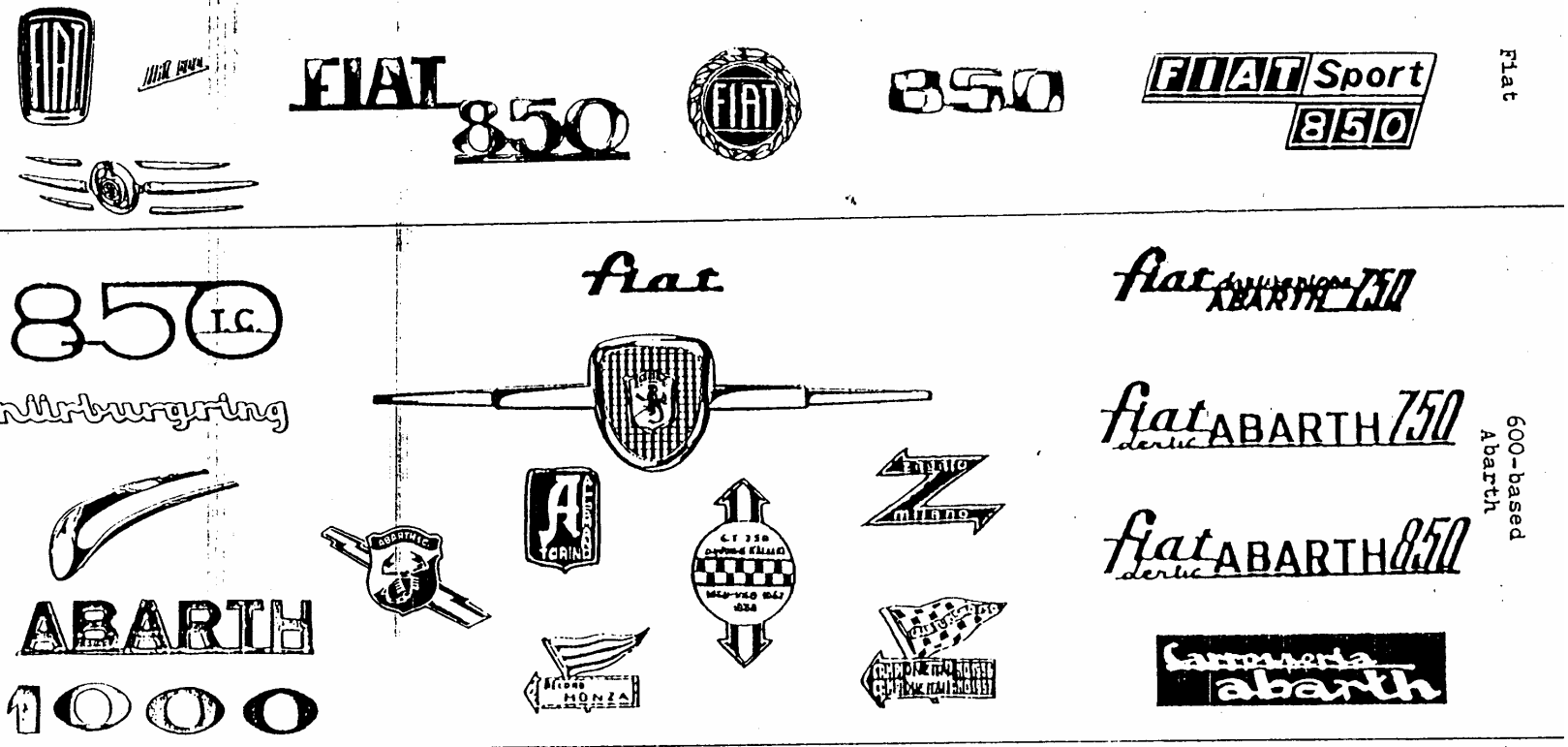


Figure 23: Berlina Corsa TC & TCR('Radiale Head'Engine) Hardware
(See figure 20b for suspension)

Figure 24: Fiat-Abarth Badges, Emblems, & Grills



Fiat

600-based Abarth

850-based Abarth

Fig. 21

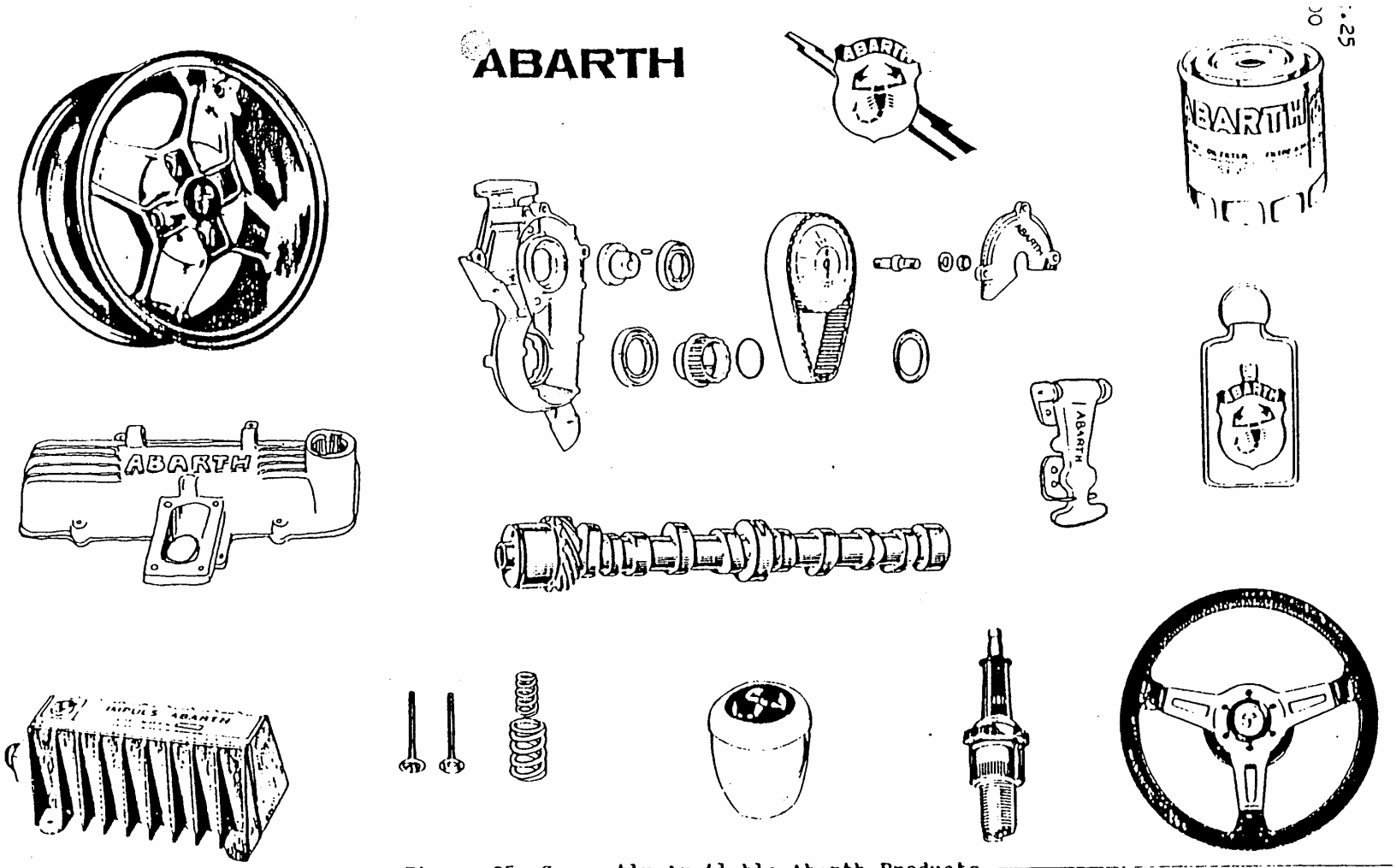


Figure 25: Currently Available Abarth Products Suitable For 600/850/127 Based Cars

Note: Before the 1971 "Fiat takeover", the Scorpione emblem said "Abarth & C" on it. Afterwards they say "Abarth".

APPENDIX

Fiat and Abarth Specifications

Fiat 600 Major Changes & Improvements :

Fiat 600 in 1959
***handbrake moved from transaxle to rear wheels**
***fine spline transaxle input shaft and stub axles adopted**
***starter solenoid with switch incorporated in ignition switch replaces pull-cable starting system**
***self-centering steel brake shoes replace hinged aluminum type**
***carburetor size increased from 22 to 26mm':**
Fiat 600D From Mid-1960
***increased engine displacement 767cc vs 633*cc* (new crankshaft, block, pistons, connecting rods. etc.)**
***larger valves, improved cylinder head * and rocker arm assembly**
***larger carburetor 28mm vs 26mrn**
***larger water pump**
***oil filtering via centrifuge instead of paper element**
***higher ring and pinion ratio 4.86 vs 5.36 - (Sedan)**
***larger wheel cylinders (7/8" vs 3/4" on 600 Sedans)**
***movable vent windows in front doors**
Fiat 600D From 1965
***rear opening doors (hinged in front) with movable vent wing windows**

Fiat 850 Spider Improvements and U.S.A. Required Changes:

Fiat 850 Spyder U.S.A. very early 1968
***decreased engine displacement 817cc (engine # 100GS3 040) vs 843cc (# 100GS 000) via 64 mm bore rather than 65mm.**
***improved radiator, water pump. and hoses**
***improved design of front disc brakes**
***self-adjusting (friction type) rear drum brakes**
***dual master cylinder with tandem reservoirs**
***coarse thread front wheel lug-bolts (to match rear wheels)**
***non-recessed uncovered headlights**
***small round side marker lights added**
***backup light added to rear bumper (switch on transaxle)**
***high-back bucket seats**
***passenger-side sun visor added (early cars had only one)**
***passenger grab handle deleted from dashboard**
***new design outside mirror and relocated from fender to door *safety break-away interior mirror**
***'Windshield washer bag moved from luggage compartment to engine bay *minor changes to gauge faces and trim rings (black instead of gold)**
Fiat 850 Sport Spyder U.S.A. 1970-on
***increased engine displacement 903cc(#100GBS040) vs 817cc (new crankshaft. block, 65mm pistons from 843 engine, connecting rods, cylinder head, valves, pushrods, head bolts, distributor/oil pump drive shaft. finned alloy sump - 4.5 qt. capacity vs 3 qt.)**
***larger primary carburetor Venturi 23mm vs 21mm with pollution control devices added to fuel and exhaust systems plus transaxle switches**
***larger water pump with 4 bolt mounting (vs 3 bolt) and improved fan cooling-shroud**
***alternator charging system with regulator, 2 relays, and one in-line fuse replaces generator system**

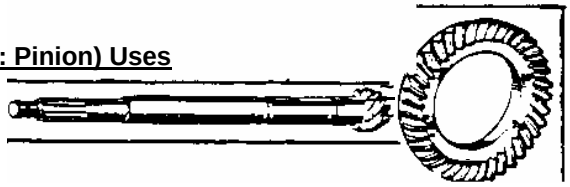
***600 combustion chamber volume in head is 24.3cc.600D is 29.5cc**

*ignition coil with external balast resistor
*new design ignition distributor manufactured by Ducillier (French) *wider wheels - 5" vs 4 1/2"
*redesigned rear body *panel and tail* lights with backup lights incorporated and separate rectangular rear reflectors fitted
*larger front turn signals
*larger rectangular shaped side marker lights

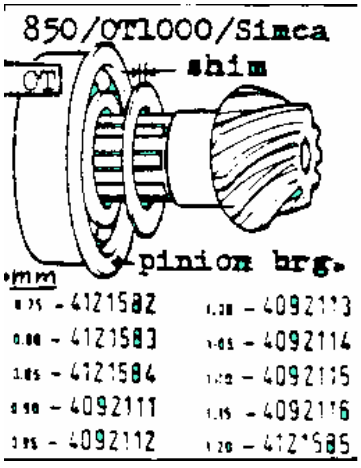
FIAT 850 Sport Spyder U.S.A. '72-'73

*engine lubrication modified to include pressurized center main bearing
*larger water pump pulley (6-bolt)
*new design ignition distributor manufactured by Marelli
*redesigned steering wheel, dashboard, hand throttle, heater box, switches, and electrical accessory equipment. Rocker switches '73 only
*redesigned bumpers, and license lights moved from bumper tips to rear body panel

Popular* final Drive (Ring &: Pinion) Uses



Tooth Count	Ratio	Common Use
7/45	6.43	600 Multipla
8/43	5.38	600, 600D MU1tipla, 5iata 750
8/39	4.88	600D,F-A 750 pushrod, Fiat 850w/13"wheels
8/38	4.75	F-A Monomille, 750 DOHCRecord Monza
8/37	4.63	OT/OTS/OTR 1000, 850 Sedan w/12" wheels
9/41	4.56	F-A 750/850 pushrod (DB,Berlina,Allemano)
9/39	4.33	750/850/1000 pushrod (Allemano,Berlina,Zagato, Monomille), 700/850/1000 DOHC (Bialbero TCR
8/35	4..38	Simca 1000(for conversions---see pp.63)
9/37	4.11	OTR 1000,A-S 1150,1000TC
10/39	3.90	1300/l24,scarpione,1.3-Z.
9/35	3.89	, A-S 1300/1600, 1000SP
10/37	3.70	F-A 1300/124,Scorpione
10/35	3.50	A-S 1.3/1.6/2.0,2.0/3.0 SP



Many other ratios were available for racing.
Note that *600/750, 600D/F-A* 1000, &: Fiat 850/OT 1000/Simca 1000/A-S 1150 belong to 3 different gearbox families; so pinion shafts do not interchange. ...600/750 pinion shim are NLA.
* Many models were commonly fitted with several different ratios as standard equipment.

Transmission Ratios(approximate)

	600/D 600		DOHC Close-	fiat-Abarth	850/	Abarth-Simca
Gear	750	Mult	Ratio'-4sp	5-sp	OT1000	6-sp
1st	3 -38	3-38	3.33	3-38 3.32	3.64	3.17.2.57
2nd	2.06	2.06	2.06,1.75	2.4,2.1,1.9,1.8, 1.6.1.4 1.3 1.2	2.06	2.00.1.89
3nd	1.33	1.28	1.33 *1.20*	1.6.1.4,1.3.1.2	1.41.	1.52.1.48
4th	.89	0.84	0.96 0.83 1.04 0.90 0.86	1.5, 1.2, 1.00, 0.90	0.96	1.30 1.25
5th				1.2, 1.0, 0.90, 0.80	(0.87)	1.17 1.12
6th						1.08.1.00

** see Lou Canut article ::m making your own close-ratio transmission in Abarth Register Newsletter #23 (Apri.l '82) *pp.6* and also #40 (Dec. 85) for Glenn Sipe article on pp. 27-30

Carburetor Jetting

Fiat 600-Based Cars

Application	55-59 Fiat 600	59-61 F 600	61-69 F 600D	F-A 750 ohv	F-A 850 ohv	1000ohv	750dohc	1000dohc
Carb model	Weber 22IM	Weber 26IM	Weber 28ICP	Weber 32IMP/E	Solex 32PBIC	34PBIC	2W.36DCL	2W.40DCDE
Throttle	.87”	1.02”	1.10”	1.26”	1.26”	1.34”	2-1.40”	2-1.57”
Main venturi	16mm(.63”)	19mm(.75”)	19mm(.75”)	22mm(.87”)	24mm(.94”)		25mm	33mm
Main Jet	.80	1.00	1.00	1.25, 1.30	1.30		.90	1.30
Air Jet	2.00 or 2.15	1.90	1.90	1.90,1.75, 1.80,2.00			2.25	2.50
Emulsion	F2	F3	F1	F4, F9, F1	T2			
Idle Jet	.45	.45	.45	.45, .50	.45		.45	.45
Needle & Seat	1.50	1.5	1.25	1.75				
Starting jet	F6 120	F5100	----	F5 150	110			
Float level	5mm (.197”)* 7mm(.275”)**	7mm	7mm	9mm(.354”)				
Flop Drop	7mm	7mm	7mm					
* plastic float ** brass float			Pump jet	.45			.45	.45

Fiat 850-Based Cars

Application	Fiat 850 Sedan	127/A112			850 Coupé & Spider		OT(OTS)1000		A112 Abarth 1050 (1000)		1300/124
Carb model	Weber 30ICF	Weber 32IBA			Weber 30DIC(A) 2-bl		Weber 30DIC 2-bl		Weber 32DMTR 2-bl		Weber 32DCOF
Throttle	1.18”	1.26”			P-1.18”	S-1.18”	P-1.18”	S-1.18”	P-1.26”	S-1.26”	2-1.26”
Main venturi	21 or 22	24	22	21	21(23	23	21	23	22	22	23
Main Jet	1.15 or 1.20	1.38, 1.35	1.20	1.10, 1.12	1.15(1.17)	1.15(1.17)	1.10, 1.15	1.20	1.00	1.15	1.10
Air Jet	1.45	-	-	1.40, 1.90	1.85	1.85(1.70)	1.85	1.85	1.65	2.00	1.65
Emulsion		-, F52	F52, F50	F52, F50	F15	F15		.45	F30	F30	F30
Idle Jet	.40	.45	.45	.47, .45	.40, .42(.45)	.45(.50)	.50		.45(.50)	.70	.45
Idle Air Jet	2.00	1.70	1.70	1.70, 1.40							
Aux. Venturi		5, 3.5	4	3.5, 4	4.5	4.5			4.0	4.0	
Pump Jet	.45 or .50	.40	.40	.40	.40(.50)	---	.40	---	.40(.45)	---	
Needle & Seat	1.50	1.50	1.50	1.5	1.5				1.50		1.50
Float level	7mm(.275)				6mm(.235)						

Mealsure float level with drill-bit as bowl lid is held verticle with gasket fitted & float arm tang just touching the spring-loaded ball at tip of needle valve

Main venturi diameter is often cast onto rear of carb body above throttle linkage.

Fiat

***600 &* 850 Engine Rebuilding**

Clearances g. Specifications

Main Journals: 1.9996 to 2..0002"
Main Brg. Clear: .001 to .0025
Rod Journals: 1.5742 to 1.5750"
Rod Brg. Clear.. - .001 to .002511
Crank End.-Play - .0025 to .010"
***600* Piston @ Sk1.rt - .0015 to .0020"**
850 Piston @ Sk1.rt - .0025 to .003"
600 Pin in Piston - .0001 to .0005"
6850 Pin in Piston - .0003 to .0006"00
Pin in Rod - .0002 to .0005"
Ring End-Gap - .008 to .014"
Top Ring to Groove - .002 to .0025"
2nd Ring to Groove - .001 to .002"
850 Inner Spring -39.7 lb. @.815"
Oil Ring to Groove - .001. to .0015"
Cam Brg. Clear. - *.001* to *.003"*

Oil Pump Gear to Housi.ng -.0004 to .004" (replace -.006")
O.P. End-Play -.0004 to .002" (replace -..004")
O.P. Gear Lash -.003 (repl -.006")
O.P./Dist.Shaft Bush -.001 to .0025"
600 Fuel Pump Rod Project.
850 F.P. Rod Project. -.040 to .060"
Tappet Clear - *.0005* to .0015"
Valve Stem to Guide -.001 to .0025"
850 Stem Diameter - .275 to .2755
600 Valve Spring -33.4kg @.24.5cm

850 Outer Spring -102.5 lb. @.972"
850 Cam Timing-25/51/64/12(sport) 16/50/56/16(sedan)

Abarth OT 1000 Characteristics & Engine Rebuilding Clearances

1000 type 202*:* 65x74-. 982cc, 9.5 compression (OTS 11.5), *26/75/67/30* valve timing, 8° in1tial adv., .016 paint gap, 29/26mm valves, .008"adj.

1000 type 200(Radiale) 10.5 compression, 27/65/67/25 v.timing, .010"adj.

Main Journals: 2.1228 to 2.1232". Main Clear.: .002 to .0024"
Rod Journals: 1.5734 to 1.5742". Rod Clear.: *.0018* to *.0022"*
Piston Skirt Clear: .0035 to .0045",. Cam Brg. Clear.:.0016 to .0028"

Abarth 750 & 1000 Bialbero (DORC) Characteristics & Engine Rebuiling Tolerances (courtesy of Lou Canut)

750 t.1pe 221: 61x64m.m, 747cc, 9.7 compression, 52/68/73/25 valve timing, 8° initial advance, .48m.m. pout gap, I-.28 E-.43mm valve adj.,33/29dia.

1000 type 22*9:* 65x74mm, 982cc, 10.5 compression,52/75/62/34 valve timing, 15° initial. advance(Bosch), .33mm point gap. I-.23 E-.43 valve adj.

Main Journals: 750 center-50.76 to .5O.77mm, 750 ends-50.79 to 50.80mm. 1000 all-53.92 to 53.93mm
Main Clearance: 750 center-.045 to .080mm. 750 ends..025 to .060mm, *1000* all-.051 to .087mml .Crank End Play: all-.06 to *.08mm*
Rod Journals: 750-35.988 to 35.998mm, *1000-39.964* to 39.985mm
Rod Clearance: *750-.22Z* to .057, 1000-.040 to .062mm.
Piston Skirt Clear.(90° from pin axis): *750-.09* to .1, *1000-.105* to.115mm
Pin in Piston: all- .002 to .013mm .Pin in Rod Bush: all- .001 to .013mm
Piston Ring to Groove: all top-.045 to .072, 2nd-.025 to .0;2, oil-.020 to .061mm .Ring End Gap: all-.1mm
Cam Follower Clear.: all-.005 to .037 . Valve Stems: I-7.97 to 7.96,
E-7.96 to 7.95 .Stem Clear.:I-.03 to .05,E-.04 to *.06*
Valve Spring& Tension: *750* In-14.8kg @ 21mmI. Out-24.7 @ 22.5mm, *1000* In -22.*5* @ 22mm,
Out-30.6kg @ *23.5mm.*
Cam Journal to Head. Clear.: all-.020 to .062mm . T.Chain Deflect.:8-10mm

Notes: 1. When rebuiding engine, it is desirable to obtain clearance. As close as possible to the minimum(smaller) figure.
2. See pp.132 *of* "Abarth." for tune-up & torque wrench specifications.
3. To convert troll inches to millimeters divide by .03937 To convert from mm to inches multiply by .03937
4 Optimum clearances are listed. Wear limits for replacement sometimes exceed then figures by several tenths of a mm..

Fiat 127, Autobianchi Al12, & Al12 Abarth
specifications & Engine Rebuilding Tolerances

127 type 100GL & A112 type A0 or A5: 65x68m.m, 903cc, 9.0 compression, *25/51/64/12* or *17/43/57/3* or 11/43/43/11 valve timing, 10° initial advance, .016" point gap, 29/26mm valve dia., I-.006 E-.008" adj.
A112 Abarth 1000 type A1: 65x74mm, 982cc, 10.0, 20/46/60/6, 10° adv., .016", 29/26mm, .008 & .01011 adj.
A112 Abarth 1050 type A2: 67.2x74mm, l050cc, 10.4, 16/56/56/16, 10° adv., .016", 29/26m.m, .010 & .012" adj.

Main Journals 903: 1.9994-2.0002"
Abarth: 2.1224-2.1232"
Mains Clear. 903: .0011- .0029"
Abarth: .0013- .0025"
Rod Journals 903 : 1.5741-1.5750"
Abarth: 1.5733-1.5743"
Rods Clear. 903: .001 - .0083"
Abarth: .0017- .0032"
Crank End-Play: .002 - .010 "
Piston @ Skirt 903: .002 - .0027"
Abarth: .0027- .0035"
Pin in Piston 903: .0003- .0004"
1000: .00008- .0003"
1050: .00016- .0004"
Pin in Rod 903: interference
Abarth: .0003 - .0006"
Ring End-Gap: .009 - .015 "

Top Ring Clear. : .0016- .0028"
2nd Ring Clear. : .0009- .0020"
Oil Ring Clear. : *.000b*- .0019"
End Cam Brgs.Clear: .0010- .0030"
Center C.Brg.Clear: .0018- .0036"
Oil Pump Gear-Housing: .002-.0055"
Oil Pump End-Play: .0008- .0041"
Oil *Pump* Gear Lash: .006"
Oil Pres.Releif Spring:9.5 lb.@.89"
Fuel *Pump* Rod Project.: .039-.059"
Tappet Clearance: .0004- .0018"
Valve Stem-Guide: .0009- .0023"
V.Stem Diameter: .2748- .2756"
Outer Valve Spring: 54 1b.@ 1.437'1
Inner Valve Spring: 12 lb.@ 1.279"
Rocker Arm Clear.: .0005- .0018"
***Oil* Pressure (hot): 43-57 lbs**

Fiat/Fiat- Abarth Quick Reference Engine Chart

Use	Fiat 600	F-A 700	F-A 750	Fiat 600D	F 850	F-A 850	F/OT 850	F-A 850	F850	127, * A112	F-A 1000	OT 1000	A112 abarth	A112 abarth
CC	633	695	747	767	817	833	843	847	903	903	982	982	982	1050
Bore	60	61	61	62	64	62	65	62.5	65	65	65	65	65	67.2
Stroke	56	59.5	64	63.5	63.5	69	63.5	69	68	68	74	74	74	74
Configuration	Ohv		Ohv	Ohv	Ohv	Ohv	Ohv	Ohv	Ohv	Ohv	Ohv	Ohv	Ohv	Ohv
		Dohc	Dohc					Dohv, hemi			Fohc, hemi	Hemi		
Based on	600	600	600	600D	850	600	850	600	850	127	600	850	127	127
Rotation	Cw	Cw	Cw	Cw	Ccw	Cw	Ccw	Cw	Ccw	Cw	Cw	Ccw	Cw	Cw
Engine number	100	222	215, 219, 221	100-D	100-G3	217	100G, 203	214, 220, 214G	100-GB	100GL, A112-A0	210/208, 229, 210G	202, 200	A112-A1	A112-A2
Years Produced	55-61	60-66	56-61	61-71	68-71	58-60	64-	60-71 60-61 69	70-	69-on	60-71, 60-66, 66-71	64-70	71-75	76-on

***also: Panda & Uno "45" models**

600 & 850 Drum Brakes

	600	600D	Multipla	850 Cp/Sp
Master cylinder	3/4"	3/4"	1"	3/4"
Front wheel Cyl.	3/4"	7/8"	1 1/8"	Disc
Rear Wheel Cyl.	3/4"	7/8"	3/4"	3/4"
Drum Diameter (Original)	7.293-7.304		8.672-8.683	7.292-7.303
Max Oversize	.040"		.040"	.040"
Lining Width	1.18"			

New Lining Thickness : all models .16"
Replace Linings: .040"
Note: Use Lubriplate #110 Brake lube at all points of metal-to-metal effort (from G. Mortensen)

600/750 Electrical

Group 22N/32amp.hr. Battery
Conversion(see pp. 70)
Lenght - 9 ¼"
Width - 5 ¼"
Height - 8"

Marelli Generator R90-180/12-2500 (600/750-180watt)	Regulator A/4-180/12 (14.5volt)
Bosch generator D90/12/16/3 (600/750-230watt)	Regulator GN 1/12/16 (14.2volt)
600 Starter- B76-0.5/12S	
600D Starter- E76-0.5/12S	

How About Installing The Complete Fiat 850 Drive-Line In A 600-Based Car?

At first glance, it seems highly desirable to use the nice all-syncro 850 transaxle and also not be required to reverse the 850 engine rotation....

As you might expect though; if this was a "clean & simple conversion", I wouldn't have spent all of chapter 13 in "ABARTH" talking about the reverse rotation 850 conversion (as well as pages 59-61 *at* this book regarding the 127/A112 engines which don't require a rotation change).

Here are some of the details of the Complete Drive-Line Conversion:

A) Major Fabrication & Welding

The rear suspension arms must be cut and the inboard pivot points relocated to allow room for the wider 850 transaxle. Needless to say, this is a precision job and it forever alters the originality of the CarNext, the left engine compartment firewall will need to be trimmed about 3 or 4 inches to accomodate the off-set 850 bellhousing. Some cutting under the rear seat area to allow linkage clearance will be necessary as well. With the gearbox in position and 850 axles. 600 splined-sleeves fiti.ad,.aeaB1lre 850 motor mount off-set so that the 600 mount perch on the rear body panel can be cut oft and moved to the left the correct amount. You'll want to beef-up the perch supports quite a bit as the rear panel was not meant to carry the motor off-to-one-side(as with 850s), not to mention the fact that the panel will be weakened even further when you trim away some of the surounding sheet metal tor crankshaft pulley clearance. With engine and rear panel fitted.. a new motor mounting bracket can be made. 850 trans mount brackets are retained and mounting holes drilled in body/frame channels for use with long bolts and rubber pads when mounting gearbox. Complete 850 shifter and all related hardware must be installed about one inch further to the rear than the 600 lever was positioned.

> **Careful alignment of everything is critical if you expect the wheels to rotate freely(without axle bind)when you're done.....**

B) Minor Details?

A special speedometer cable will need to be made-up. 850 radiator can be used but mounting holes on the firewall must be moved, and you may have some trouble making the tan and radiator shrouds line-up properly. The 600 radiator air-exit door must be permanently located in the open position.. Heater tube on lower radiator tank must he plugged. Heater tube on thermostat housing can be used for Jaeger water temp. sensor or plugged. Some 850 water pump pulleys may be too large to clear right inner tender.

600 valve cover with a special longer linkage rod Can be used. Choke cable will be too short. Air cleaner intake tube must be cut off to clear deck lid. Mufr1er heat- shield panel must be cut away to fit 850 exhaust system. 850 voltage regulator must be substituted. Some body styles will require deck lid modification to clear distributer. Oil gauge connection may necessitate minor alterations.

As you can see, the above conversion extensivly and permanently butchers the car. Doing it to a beat-up 600 might be OK, but don't even consider MUTILATING an Abarth in this way (and to little or no *real* advantage)....

And by-the-way, there is a company who will. sell you (for $10.00) a four page set of instructions which talks about suspension, mounting, shifter and clearance modifications but does not mention the Minor Details as listed in item B above ... The rest is up to you.

FIAT 850 CLUTCH BELL CRANK FLEX FIX

by Ken Ashley

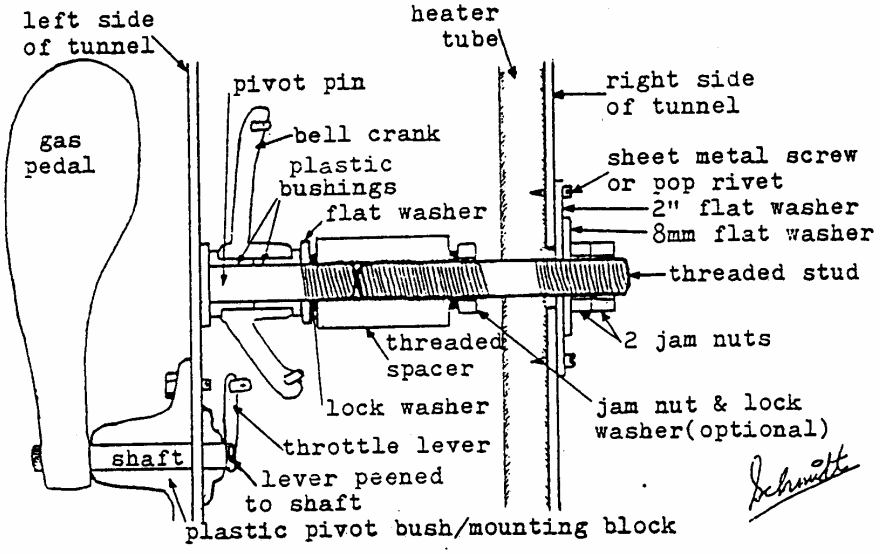
If your Fiat 850 has the following symptoms : the clutch won't release, hard pedal action, and movement of the central tunnel to the left in the area of the gas peddle with groaning when the clutch peddle is depressed, then you need to do the modification described here.

Remove the carpet and the cover over the forward part of the tunnel and check the pivot action as the pedal is depressed. It tends to bend up and back and get loose where it is mounted to the left side of the tunnel. The more it flexes or bends, the more leverage the rod has on the pivot ; thus friction and flexing accelerate. The flexing wastes motion that should be releasing the clutch. Here is a simple way to greatly improve the situation (see drawing on page 108 for clarification).

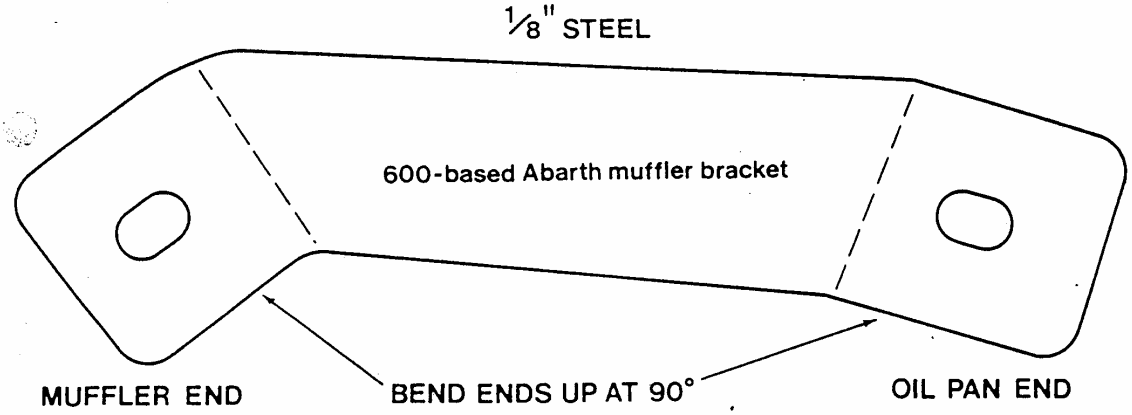
Collect or make the following parts:
1. A threaded spacer about three-quarter inch in diameter and seven-eighths to one inch long having a hole through the center with 8 mm X 1.25 mm pitch threads. This is the size that most often has a 13 mm nut on it and is the same as the thread on the pivot pin.
2. A 'stud or threaded rod, two and one-half inches long with matching threads.
3. A large flat washer or plate at least two inches in diameter with a hole in the center to clear the 8 mm stud and two one- eighth inch diameter holes drilled opposite each other near the edge.
4 . One small washer with an 8 mm role.
5. At least one more nut to fit the stud.
6. Two suitable self taping sheet metal screws such as # 6 X 1/2 in. .

Note that a 8 mm X 1.25 mm tap will cut nice threads in a hole already, taped five-sixteenths coarse American size without re-drilling if you are careful and use cutting oil.

Step by step instructions:
1. If you haven't already done so, pull back the carpet and remove the access cover. Note the large hole for a socket wrench on the right side of the tunnel opposite the pivot.
2. Remove the nut and washers and pull out the right half of the bell-crank bushing. Inspect it for wear, lube it and turn it 180 degrees so the thrust (up and back) will be on the unworn side of the bushing. (The bushing does not turn because it is clamped in place by the nut.)
3. Replace the flat washer and lock washer. Thread the spacer on to the pivot instead of the nut and tighten it with Vice-grips.
4. Lock two nuts on the end of the stud. Put the small washer and large washer on it, thread it into the spacer and tighten it (lock washer and nut here optional).
5. Push down and forward on the stud (use a 13 mm socket and extension for leverage if necessary). When the pivot shaft looks "right" (or as far down as it will go) drill through the roles in the washer with a 3/32 drill and install the sheet metal screws. Feel the inside of the tunnel and position the roles to avoid drilling-into the heater water tubes.
6. Unlock, the -nuts., tighten the inner one until it pre loads the left side of the tunnel against flexing and jam the nuts together again.
7. Oil all the joints in sight and replace the cover and carpet. You are not going to believe the difference this makes in the way the car feels. Clutch action and shifting are much smother.



850/OT100
Clutch and Accelerator Pedal Linkages in Center Tunnel



Abarth 750 Muffler Support Strap
(courtesy of Gary Mortensen)

FUEL RECOMNDATIONS

The octane rating of todays so called "premium" fuel is not even as high as "regular" used to be a few years ago. In California, Union 76 premium is only good for Fiat and Abarth engines of less than about 9.5:1 compression ratio. A product like "Octane Boost 104" might help for engines in the 9.3 to 9.7:1 range. Keep in mind that many engines with a stated compression of 9.5:1 will be as much as 0.3 higher after- the cylinder head has been resurfaced two or three times (and most of them have been). One trick that you might want to try is to mix 50% premium leaded and 50% premium unleaded fuel in each tank-full. This can increase the octane slightly and, along with an octane booster additive, may allow satisfactory operation of engines with compression ratios in the 9. 8 to 10.0:1 area.

For any compression ion ratio above 10.0 : 1, you will need special racing fuel like: Union 76, Dayco, or H & H among others. You can try blending 50% high octane aviation fuel from a local airport with 50% premium gasoline. Do not. try using straight aviation fuel as it lacks the proper additives for automobile engines .

Naturally, backing-off the ignition timing a little, using one range colder spark plugs, and altering Your driving technique will help sane. The best idea is to use replacement pistons of lower compression or to shave Sate material off of the top of the "pop-up" or dated crowns of. the pistons currently fitted to your engine (see figure 1 of this book and page 120 of "Abarth"). Obtaining a cylinder head with enough "neat" and using a special "extra thick" head gasket are important items to consider also (see page 127 of " Abarth ") .

Whatever the details of your engine are, it is necessary for you to take sate kind of action if you are continually confronted with pinging and detonation under heavy -load conditions such as hill climbing and high speed. Page 118 of "Abarth" contains a set of general operating guidelines to follow with these engines …

WINDSHIELD REPAIR

A company called Novus has developed a process whereby an epoxy resin type chemical is injected into windshield cracks and chips. If the damage is small and fairly recent so that dirt has not settled into the crack, results are quite good. Often the repair is nearly invisible and further lengthening of the crack is stopped. The process is approved by the California Highway Patrol and may save you from having to have a special windshield made.

I tried this service on the windshield of a car which had set around for a number of years with an eighteen-inch horseshoe-shaped crack to check cut the results of the process. In several spots where small amounts of dirt had become embedded, improvement, but overall, the crack was about 60% less visible, and all but invisible from sore angles. It was much better than paying $500 for a new windshield, and they Come to your location to do the work. A small crack or chip repair usually costs around $50. Look for their ad in the Yellow Pages prone book under "Automobile Glass" or "Glass".

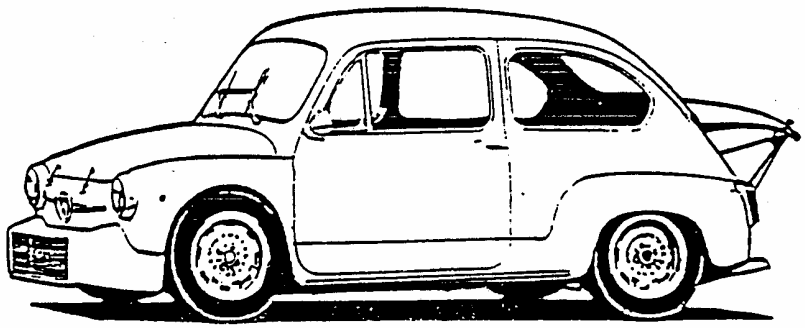
The Abarth Scorpionne and OTAS Grand prix look nearly same....
So What's the difference ?

Fiat-Abarth Scorpione 1300	Item	OTAS 820 GP- USA (Giannini 1000 GP-Europe)
Fiat 124(1197cc) pushrod bored to 1280cc w/10.5 comp.	Engine	Smog exempt modif. 817 Fiat 850 (Giannini modified 982 Fiat *850)*
3.90 or 3.70	Gearing	4.88 (?4.63)
Abarth conversion	Bellhousing	Fiat 850
special Marelli	starter	Fiat 850
Abarth tubular cross-member under sump(round section)	Engine mounting	Pressed steel cross-member in standard 850 position
2-bl Solex 32PHH or 2-bl Weber 32DCOF	Carburetor	1-bl 32 Solex or Weber(2-bl 30DIC Weber)
124 cast header, Abarth muffler	Exhaust	Abarth tube headers & muffler
Fiat 124- tin	Sump	Gianini alloy or 850 tin
Fiat 124 alloy or tin	Valve Cover	Fiat 850-tin
On right side of engine mount	Battery Location	Luggage Comp. std. 850 spot
Front w/electric fan, rear filler tank, plumbing under floorboards	Radiator	std. 850 in rear w/belt driven fan on water-pump
Behind radiator	Heater	mounted at nose w/long ducts
upper left rear * panel- exposed	Fuel Filler	Left interior of eng. compt.
Std. 7.9 US gallon or ? optional	Fuel Tank	std. 850 7.9 US gallon
5½" deep offset steel or late type Campagnolo magnesium alloy	Wheels	std 4½" 850 or various mag/alluminium types
Low-back buckets	Seats	high-back head rest added
2 small & 2 large	Gauges	3 small & 2 large
In center dashboard pod	Light/Wiper Switches	At left corner of dash
Special & w/left footrest	Control Pedals	moved 4" to rear, no footrest
Abarth 3-spoke alloy/leather	steering Wheel	Alloy/leather
In front of shifter (some cars)	Ash Tray	None
None in front, trim *strip* in rear.	Bumpers	Nickle plated strips *F&R*
Slit on nose, 3 more openings below	Grille Opening	Sli t on nose
One piece w/10 fore & aft slots	Engine Lid	3 individual louvers
2 vents or ducts 6 or 7 verticle slots in fiberglass panel	Rear Body	2 rectangular vents in fiberglass panel
At rear or front of door	Vent Window	windowing @ front of door
One above or 2 at sides	License Light	2 at sides of plate-rectangular
Red w/amber-upper turn portion	Tail Lights	All red 850 USA sedan/coupe
With map pocket	Interior Door Panel	*No* map pocket
Abarth & c/scorpione-Cloisonne	Front Emblem	OTAS Tiger-tin(or Giannini)
Fiat Abarth 1300-Chrome Lettering	*Rear* Emblem	OTAS 820 Grand Prix- script
One bullet-shaped on left fender	Exterior Mirror	Bullet mounted on door

Both cars utilise the Fiat 850 Sedan chassis with the addition of the Coupe/Spider front disc brakes. Although the body shape looks identical, it *is said* that only the windshieleld, doors, & rear panel will fit both cars.

<u>The Scorpionne 1300SS :</u>

High Performance Abarth Camshaft, Special Intake manifold with 2 Weber 32DCOF or Solex 32PHH 2-barrel Carburetors, Tubular exhaust Headers, Special Front Suspension (like late Corsa), Special Rear Suspension w/ CV Axles (like late Corsa), and Rear Disc Brakes are added to the basic Scorpione specification. Some cars may also have : 6 or 6½" wide wheels, battery mounting at right front of luggage compartment, a flat : luggage compartment lid (no power bulge in the center, "1300 ABARTH" chrome lettering - mounted at an angle on left side, leather seats.



derivazione 750 ABARTH