

OPEL MOTORSPORT CLUB

The Blitz



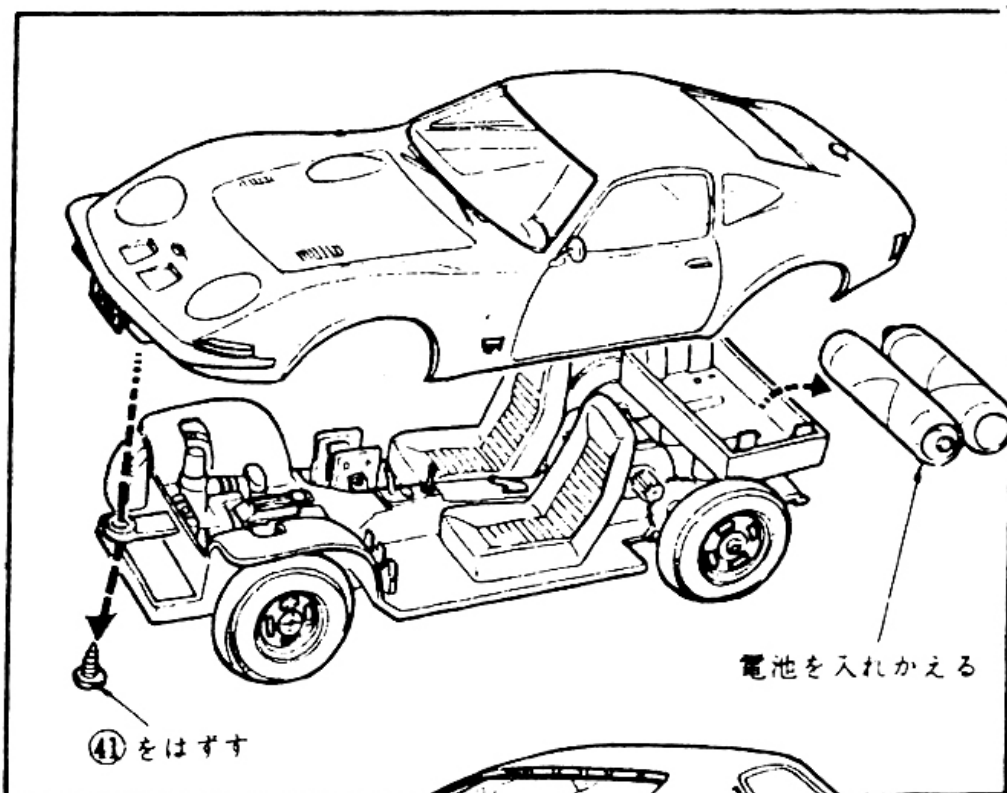
ACHTUNG!

Inside this issue:

ZDDP: What you NEED to know
OMC 2008 Election Results
OMC Member Letters
Tech Tip, Part 2: Engine Rebuilds and
Drivetrain Installations

Volume 28, Issue 2

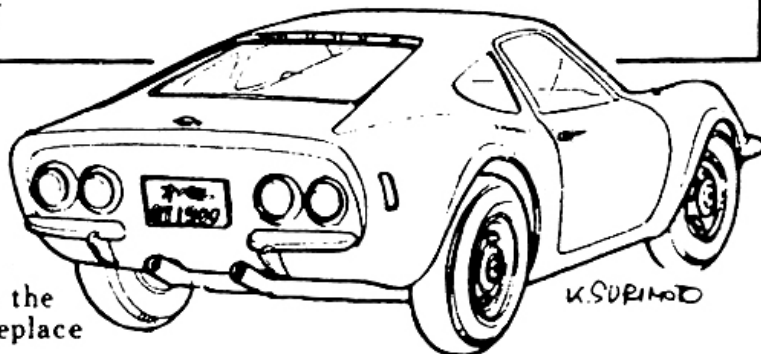
March/April 2008



35

電池を入れかえる
ときは④①をはずし
シャーシをはずし
て下さい。

Unscrew 41 and disconnect the
body from the chassis to replace
the batteries.



Simplifying Opel Drivetrain Rebuilds

Welcome to the Opel Motorsport Club

THE OPEL MOTORSPORT CLUB IS CELEBRATING ITS 28TH YEAR OF DEDICATION TO THE PRESERVATION AND APPRECIATION OF ALL GERMAN OPELS, WITH SPECIAL EMPHASIS ON MODELS IMPORTED INTO THE UNITED STATES. WE ARE HEADQUARTERED IN THE LOS ANGELES AREA, AND HAVE CHAPTERS ACROSS THE COUNTRY, IN EUROPE, AS WELL AS MEMBERS IN CANADA AND MEXICO. MEMBERSHIP BENEFITS INCLUDE SUBSCRIPTION TO OUR NEWSLETTER, THE *BLITZ*, LISTINGS FOR PARTS AND SERVICE SUPPLIERS, *BLITZ* INDEX & TECH TIP INDEX (1985-DATE), FREE CLASSIFIED ADS (3 PER YEAR), CLUB ITEMS, MEMBER ROSTER, OWNER SUPPORT AND ACTIVITIES, INCLUDING MEETINGS AND OUR ANNUAL PICNIC & CAR SHOW

The Club

TO APPLY FOR MEMBERSHIP CONTACT:

OMC TREASURER, c/o Dick Council
3824 Franklin Street
La Crescenta, CA 91214-1607

MEMBERSHIP DUES:

Regular: \$45 Annually via Checks and Money Orders (US funds only, made payable to Opel Motorsport Club) or \$47 annually via PayPal.

Online: \$20 annually or \$21 via PayPal

Send PayPal funds to:

JoinOMC@opelclub.com

Include your name and address information.

MEETINGS:

The OMC meetings are as announced, at varying locations. Please consult the OMC Blitz calendar or OMC website to find out who is hosting the next meeting or event.

Online Opel Sites

OMC is on the Internet. The site features Club News, Event Coverage, Tech Tips, OMC & Opel History, features and much more.

Visit us at: www.opelclub.com

Other Good Opel Sites:

www.opelgt.com

Website of the NEOC

Includes a Tech help Bulletin Board

Classicopels@yahoogroups.com

Subscribe to this useful e-mail posting site

<http://clubs.hemmings.com/frameset.cfm?club=oana>

The OANA Website

CLUB OFFICER'S E-MAIL ADDRESS

JoinOMC@opelclub.com

Regional Chapters

European Chapter (Netherlands)

Contact Louis van Steen: (011 31) 297 340 536 (please take note of the time zone before calling), fast60gt (at) yahoo.com

Florida Chapter (Coral Gables, FL)

Contact John Malone: 305-443-8513

Michigan Chapter

Contact John Brooks: 616-233-9050 ext 12
Johncinquo (at) hotmail.com.

Mid Atlantic Opel Club (Richmond, VA)

Contact Charles Goin: 804-379-9737
cgoin (at) mindspring.com

New England Opel Club (Swansea, MA)

Contact Gary Farias: 508-679-2740
Gary (at) opelgt.com

North American Opel GT Chapter (Chicago, IL)

Contact Jim Toler: 630-964-9797

Northern California Chapter (Sonora, CA)

Contact Gil Wesson: 209-928-1110
Opelgts (at) opelgtsource.com

Ohio Chapter (Columbus, OH)

Contact Larry Shal: 614-861-1565

Pacific Northwest Chapter (Shelton, WA)

Contact Paul Kaman: 360-426-9267

Rocky Mountain Opels (Security, CO)

Contact Branston DiBrell Jr 719-391-9421
dibrellb (at) rmi.net

San Diego Opel Motorsport Club

Contact TBA when available.

Texas Opel Club (Leonard, TX)

Contact Rodney Killingsworth, 903-587-9640 Tyrodck (at) fanninelectric.com

Carolina Opel Club

Contact Roy Bell: 704-782-1866
E-mail: CarolinaOpelClub (at) aol.com

We chose to use (at) in place of @ for spam

2008 OPEL MOTORSPORT CLUB OFFICERS & STAFF

President-Elect: Paul H.

Vice President/Secretary: Matt N.

Treasurer: Dick Council 818-248-5504

Blitz Editor: "Guest"

Activities: TBA

Webmaster: Rich

The Blitz

SEND EVENT INFORMATION, TECH TIPS, PARTS INFORMATION, LETTERS, CHAPTER ACTIVITY ANNOUNCEMENTS, ADVERTISEMENTS AND ALL OTHER ITEMS OF INTEREST TO:

Opel BLITZ Editor
P.O Box 4004
Sonora, CA 95370-4004 USA

Deadline: (At Discretion of OMC Editor)

Submissions will be accepted either typewritten, on *Microsoft Word*, *Publisher* or *Works* compatible disk or e-mailed to the Editor.

manta16v@yahoo.com

Drawings or Photos accepted and encouraged. Contributions to the *Blitz* will be published on a space-available basis.

The *Blitz* is the official publication of the Opel Motorsport Club (OMC). Published bi-monthly. Circulation is limited to club members and prospective club members. All submissions become the property of the OMC and will not be returned. Articles, photographs, drawings, technical tips, and other materials appearing in the *Blitz* may not be reproduced without the expressed, written permission of the OMC.

Views expressed are not necessarily those of the officers or members of the OMC.

ADVERTISING IN THE BLITZ CLASSIFIEDS (CARS & PARTS FOR SALE OR WANTED):

Up to 50 words, plus name & phone, and a single photo:

1 Month \$6.00 3 Months \$15.00
6 Months \$23.00 12 Months \$39.00

(3 Free Ads per year for members)

BUSINESS ADS: (SUBJECT TO CHANGE)

Half Page \$35 for 1 month,

Full Page (Temporarily Unavailable)

Insert \$120 for 1 month,

Business Card \$60 for 1year

Color Back Cover (Temporarily Unavailable)

Send Ad Copy and payment (payable to Opel Motorsport Club) to *Blitz* Editor.

CHANGE OF ADDRESS:

To minimize delays, please provide the OMC Treasurer with address changes at least one month in advance.

ON THE COVER:

"Zen and the Art of Opel Repair"

(Caution: Only replace #41 screw with a fastener of equal strength, and torque to factory specifications)

OMC Officer's Message:

This month's issue-long tech tip, is the continuation and companion, to Sept/Oct 2007's Engine Rebuild article. (An addendum, with clarifications/corrections is also forwarded and should be kept with that earlier issue, to avoid undue confusion with future reference).

Results of the belated OMC Officer's Election for 2008 are on the following page. The transition will evolve behind-the-scenes, so that projects in-progress can be completed and released without undue delays. The energy typically brought in with new officers will also help us to refocus OMC into interactive growth areas.

We're also encouraged by some of the responses to the requests for greater interaction from OMC's membership. The more printable materials members submit to us, the lighter our workload (which allows us more time to complete longer-range projects, like scanning all the old Blitzes). So, keep them coming!

Looking back, a lot of hard work has kept OMC progressing over the past 4 years (since our late Editor John Seaman passed away). While the tone of civility has decreased somewhat, that time frame has also seen marked improvements in the club website and in The Blitz. OMC's name has been more widely represented, by the rotating designation of "National" Events, and our officer corps has received increasing recognition by GM/Opel and the automotive reporting media.

Financially, we're in the black. In the spirit of what OMC's founders did back in 1980, we've solidly rebuilt and maintained the club's foundations, so that they're ready for a handoff to the next generation of leaders. Just as GM/Saturn now views Saturn/Opel, the future offers promise (particularly once OMC evolves its means and quantity of member interaction—to the demands and satisfaction of today's "Web 2.0" society).

Read Elsewhere:

(from: "Hemming's Sports and Exotic Car" of October 2007,
in response to the "Power to the Opel" article of August 2007)

"...Regarding the Opel Manta story, when I was in college I had a 1969 Opel GT for a few months. Most GT's seemed to have the smaller engine, a 1300(*), I believe, but mine had the optional 1900 engine. That car was a real screamer. Gray with red interior, four-speed tranny—that thing flew, and handled well, too.

Going to the local Buick dealership for parts was a nightmare. The mental pygmies who worked there hated "furren" cars and wanted nothing to do with Opel. The parts counter people would give you a sneering look and grumble as they looked up a part.

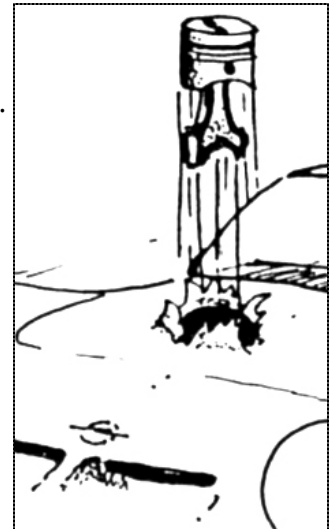
They apparently thought that everyone buying an Opel was personally driving the American car companies out of business. It was like walking into an enemy camp - a really hostile environment, I have no question that Opel is no longer here mainly due to the idiots who were supposed to service and maintain them. Like Fiat, who built some pretty decent cars and gave franchises to shifty used car dealers out on bail from their indictments.

Opel was such a good car that it could have been in our market today, like VW and BMW, but the morons at Buick did their best to drive people away from their showrooms. Well, at least Buick now has the blue-hair market cornered...

Lance N., Savannah, Georgia

Response: We have hope and confidence, that the "new" Saturn (and dealers of its "cousin", the Pontiac Solstice) will learn, the lessons of Buick (from long ago). They'll have more time to do this, as the 21st century Opels are far more durable than their classic predecessors.

In the meantime, it's hoped that this OMC Blitz Engine/Drivetrain tech tip article series will not only become "the service manual that Buick/Opel should have written" but will also encourage today's owners of these classic cars to fulfill long-desired wishes for having "More Power" available on demand, under the hood of their Opels.



**Keep These Blitzes Handy
(in case you need them later)**



Above: Scrutinizing the Factory Warranty

(* Note: 1100cc was the base engine size for 1968-1969, and a few 1970, GT's)



Hardtop 2009 Solstice, as seen at the New York Auto Show. (Will the Opel GT, also get its hatch-back, back ?)

OMC Club News: 2008 Election Results

President (-Elect): Paul Heebink (100%)

It's become almost an OMC tradition, that unusual events apply to the election of an OMC President, and once again, this year was no exception. The morning of the day that we were to tabulate the returned ballots and begin a formal transfer of that office, we received a message that stated (for personal reasons) that the President-elect had been advised not to assume the title. Clarification was requested, and an alternate plan developed. So, yes, OMC will welcome member Paul Heebink as our President, just not right away (the tentative date is April). While that may not be soon enough (for some critics of the present administration), it affords some time to tie up a few loose ends.

Vice-President/Secretary: Matt Newman (67%) Paul Campbell (33%)

Our congratulations go to Matt Newman, but our understanding should also go to Paul Campbell. This was not originally arranged to be a competition for this office, as these candidates originally volunteered for separate offices. It was only after we rechecked the (overlooked) by-law revisions enacted in 2003, that we realized these offices had already been combined. Matt is better known nationally via his postings online, whereas only the local OMC community knows Paul personally by his attendance at OMC meetings and events. Matt has advanced an activist agenda, particularly in the area of communications with new members. Combined with the digital "new member packet" that has been drafted (with club history, updated bylaws and index to recent Blitzes), OMC can expect to be better-served in this area in 2008.

Treasurer: Dick Counsil (100%)

OMC's treasury is in the black, and "OMC's backbone" received a well-deserved unanimous endorsement for 2008.

Editor: (Write-In) Dennis Gardiner (50%), (Write-In) "The Secret Agent" (50%)

Unfortunately, Dennis declined the nomination (and no one could find "T-S-M"). It'll be guest editors again in 2008.

Activities Coordinator: (Write-In) Roger Wilson (100%)

After some consideration, this write-in office was declined. A Volunteer is requested, to arrange OMC activities in 2008.

Member Survey Results:

(Counts exceed 100%, due to multiple-selection format)

Question 6: In 2008, what kind of OMC participation will you commit to?

I will provide a profile of my Opel (or an Opel-related story) for the Blitz:	40% of respondents
I will provide a profile a recap of an Opel-related event for the Blitz:	10% of respondents
I will provide a tech tip for the Blitz:	10% of respondents
I will volunteer to serve as an officer for OMC:	20% of respondents
I will assist with activities of my local OMC Chapter:	30% of respondents

Question 7: What interactive features, should OMC provide?

Send bi-monthly emails (in between Blitzes) with club & event updates:	50% of respondents
Add an "article submission" form page, to the OMC website:	50% of respondents
Add message boards (cars & parts wanted & for sale) on OMC Website:	10% of respondents
Develop Interactive Forums:	0% of respondents

Question 8: How would you like OMC to become more interactive?

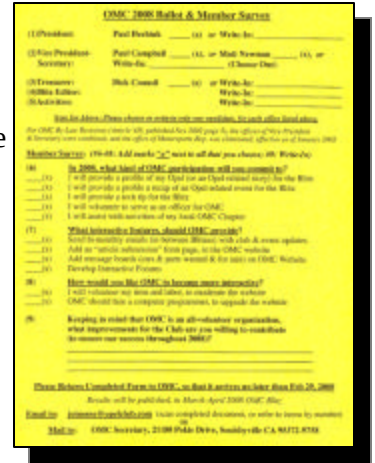
I will volunteer my time and labor, to moderate the website:	0% of respondents
OMC should hire a computer programmer, to upgrade the website:	40% of respondents

Question 9: Keeping in mind that OMC is an all-volunteer organization, what improvements for the Club are you willing to contribute (to ensure our success throughout 2008)?

- "I'll continue to own at least 2 Opels, and read my Blitz every 2 months" "Higher OMC member fee"
- "I will send in a submission to the Blitz on my turn signal problems and probable (steering column) replacement with photos — once it gets above 40 degrees (f), I'll start work"
- "Keep being the money changer" "Thank You for your efforts in 2007! Great year for the Blitz!"

Comments:

Some club improvements have already been developed (new member's packet, updated roster spreadsheets) and others are in the pipeline (more tech tips, online upgrades, email newsletter, results of the "incentive" offer for articles). When these projects are rolled out (by the administration of 2007), this hopefully will allow our new officer's corps to start fresh and focus on OMC's challenges of 2008.



Letters to the Blitz Editor:

In reply to your letter requesting my e-mail address: Unfortunately I am not on-line, nor do I have an e-mail address. I guess I'm one in a minority who have not completely embraced the electronic age. Although I type this on a Sony Vaio computer I bought in late 2000, I never took the plunge to attach that phone line connection to it!

While I'm typing away here I just want to commend what you, Gil and everyone else involved did in basically running that new Opel GT introduction in California. General Motors owes you guys a huge debt of gratitude and then some as far as I'm concerned.

I've always been curious as to the history of the GT and just how close it's design was to my favorite all time show car, the Mako Shark and it's production off-spring, the 68 to 77 sugar-scooped Corvettes. With that, it was with great pleasure that I finally got this 40 year old question in my mind answered with your GT history! Bill Mitchell, Chuck Jordan, Clare McKichan, Erhard Schnell and Mourad Nasr are the people behind a car that to this day, has brought complete strangers walking up to me whenever or wherever I take my 73 GT and begin talking to me about how they had a car just like this one and how it was always a favorite of theirs.

As nice as the new Sky/GT is, the real challenge for the present day design is to integrate a fixed roof to the present body that will do justice to the look. Whatever they do, I hope it reflects the sporting nature of the car it represents.

In my opinion, Porsche "got it" with the Cayman and BMW "blew it" with the Z-4 coupe. Let's hope it borrows more from the C-6 Corvette rather than the Z-4. Another sore point to the Saturn and Pontiac is the price. Around here 31 grand is what they are asking for a new model and I think that is a bit too much to ask for such a small car with a 4 cylinder engine, high technology or not. It looks like my future Opel GT will remain my only Opel GT!

Finally, I want to thank everyone involved in putting out the Blitz. I can only hope that the people who take over the open leadership positions maintain the same high standards that the present administration has done over the short time I've maintained membership in the club. For someone like me, the magazine IS the club. The articles on the history of the GT and the maintenance articles are gold to me. Nowhere else can I get this information (please refer to paragraph one!). Your maintenance and repair articles allow me to safely make repairs to my car, which in turn allows me to avoid the 80 dollar an hour repair shops that don't have a clue as to what the car is in the first place. I can only hope that the exceptional high quality of the Blitz that I have seen since I signed on in 2006 continues on.

The only thing I got from the new Opel GT issue was the deep love that you people have for the car and the company. It was not lost in my eyes the commitment it took to maintain the classic GT's everyday during the debut. It's always the behind the scenes work by the troops that wins the battles and you guys pulled it off. A job well done. Keep up the good work and I look forward to the next adventure with the OMC.

(Sincerely, Mike in NJ)

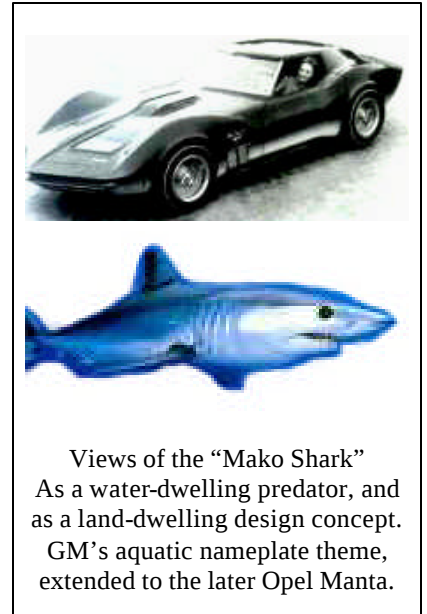
I am renewing membership gladly this year for only \$45. I am sorry to hear the Blitz newsletter may be in jeopardy for the lack of support. I wonder if it might be insensitive to anyone out there, if OMC could afford to pay a reporter/newspaper person to take on the job for compensation. I feel \$45 is a bargain to us for the Blitz alone, not to mention the activities support. I would be happy to pay say \$60. for a semi-annual Blitz if necessary.

I am a firm believer in having a hard copy, for reference. The fact that OMC charges only \$20 for online members seems wrong. The Blitz info/pictures is worth more than \$20. Membership alone in any club should be more. If all members paid the same, would this extra money be enough to keep the Blitz hard copy afloat with a paid writer?

Anyway I thought I would vent my mind. Surely there is an OMC member who has experience as a writer/reporter person. Perhaps money will persuade.

To Gil & Dennis; My sincere thanks. I enjoy reading the Blitz, no matter how long it takes to write!

(Sincerely, Rick in NY)



Views of the "Mako Shark"
As a water-dwelling predator, and
as a land-dwelling design concept.
GM's aquatic nameplate theme,
extended to the later Opel Manta.

Editors note: The most detailed response to the Mako Shark and Opel GT show car question, was answered and published in the April '07 issue of Corvette Magazine page 76 - 81, as referenced in the Jan/Feb 08 issue of the Blitz.

The article in Corvette Magazine was written by an Opel GT owner who also happens owns a Corvette, and as a part of our article-seeking efforts, OMC is requesting reprint rights for inclusion in an upcoming Blitz.

The Truth About Today's Oil

and

- What we as Opel owners can do about it. -

Back in January of this year I was made aware of the negative effects some modern motor oils have on our flat tappet camshaft engines, by my local engine builder. He explained to me that key anti-wear additives had been reduced from most of today's oils and that they were leading to camshaft lobe and lifter failures. He strongly urged me to purchase a few bottles of Comp Cam, Camshaft Break-In Oil Additive and use it to not only break-in the new engine but to keep using it with each oil change.

This led me to do some research on my own and determine the validity of his claims. To my astonishment, I found this topic to be a hot-button issue and a cause for great concern by most car owners. The reformulation of engine oil, to meet modern emissions requirements, was causing problems for many vintage car owners, cam and lifter manufactures, engine builders and owners alike. This topic was discussed by Porsche owners, MG owners, Chevy and Ford owners, etc. I was happy to find that many oil companies were aware of these problems and have begun to address them.



In the following pages, I have what industry experts had to say on the topic, what they were doing to help us and 'what engine oils' & 'oil additives' they recommended. The list is not intended to be exhaustive, but should give our readers a good overview. I also encourage our readers to further educate themselves on this topic. **Dennis G.**



Amsoil

AMSOIL was the first company to market fully synthetic motor oils for all types of internal combustion engines. Its first gasoline engine offering was released in 1972, which spawned an entire industry.

AMSOIL's Director of Advertising, Ed Newman was asked:

Does your company offer any products intended for use with flat tappet camshafts?

'We offer a full line that contains an extreme pressure additive package that have a proven history. Products like our (AMO) 10W-40 and (ARO) 20W-50 gasoline-engine oils contain high ZDDP levels, and are perfectly suitable for flat-tappet cams.' 'We're very committed and are actively pursuing ways to specifically market these lubricants to classic car hobbyists.'



Shell Rotella T

Designed for the harsh environment within a diesel engine, Shell ROTELLA T has aptly earned the reputation as a high quality, maximum protection lubricant. With reformulation of gasoline engine oil a few years ago, many hobbyists with flat tappet camshaft engines have found salvation in commercial grade oils like ROTELLA T, which have typically maintained high levels of the desirable anti-wear additives. Current ZDDP levels are 1,200 ppm.

Shell's OEM Technical Service Manager, Stede Granger, was asked:

You're likely aware that ROTELLA T is used by many automotive hobbyists with flat tappet camshafts. Are there any negative effects when using ROTELLA T in gasoline engines?

For older gasoline engines that are no longer under warranty, and emissions aren't a concern, there are no major negative effects when using ROTELLA T. In fact, it carries an API S series rating. The only possible concern I see is viscosity, 15W-40 will not circulate as quickly during initial start up in 'extremely cold' weather. In these harsh situations 5W-40 synthetic is then an option.

Is there any chance your company could reformulate ROTELLA T in the near future, and drastically reduce its high zinc content?

'A point to remember is that zinc not only protects flat tappet camshafts against wear, but also any high pressure metallic surface that relies on pressurized oil for lubrication, such as the piston rings, cylinder walls, and rocker arms/pushrods. When oil can't carry the load, zinc steps up and creates a chemical barrier, and the high levels of zinc in commercial grade oil contribute to the fact that some diesel engines run a million miles or more. I don't see us reducing the zinc content in ROTELLA T unless an organization like API imposes a lesser chemical limit on a subsequent category. **Note:** Rotella T is also recommended by the Porsche owners club.

"If you're currently putting mileage on your classic vehicle and using the latest API grade SM oil, you are almost certainly doing irreversible damage to your engine."

William C. Anderson, 'New Oils and Old Cars', Old Cars Weekly 48 (2007-08030)

ZDDP Additive

After 70+ years of trouble free, metal-to-metal engine protection, the E.P.A. is forcing ZDDP (Zinc Dialkyl-Dithio-Phosphate which is, Zinc and Phosphorus) from domestic motor oil. Our Opel engines were designed with conventional solid or hydraulic flat tappets (lifters) which require the friction modifier ZDDP in the engine oil to avoid premature deterioration.

ZDDP is a surface modifier that alters bearing and journal surface characteristics to prevent metal-to-metal contact. Under high rpm (3000+ rpm) heat and pressures quickly increase, the ZDDP molecule quickly plates over the contact surface with an extremely thin glass-like film and provides a sacrificial coating. As soon as the engine conditions get back to normal, the film dissipates back into the oil solution. This action prevents the lifter and cam from making contact and greatly reduces the tendency of parts to scuff under the heavy-load boundary lubrication situations.

Camshafts and lifters found in the our older Opel engines definitely fit this category. These high load conditions also exist in the piston wrist pins. In other words, this description clearly fits the characteristics of our engines.

Back before 1988, normal amounts of ZDDP could be found in our domestic engine oils. The API grade "SG" oils contained in excess of 0.12% ZDDP by weight. The API grade of oil prior to this was "SF" and had concentrations in excess of 0.15%.

For more than 38 years, it was possible to buy E.O.S. {Engine Oil Supplement} from GM in a 16 ounce bottle. **Note:** E.O.S. was even mentioned in the 1969 Opel Owner's Manual, as being available at your local Buick dealer. Unfortunately E.O.S. was withdrawn in the second quarter of 2007. However, as of this writing it appears, E.O.S. may be making a comeback at GM dealers.

GAS ENGINE OIL SPECIFICATIONS

Oil Grade Category	Availability Status	Specifications
SM	Current	For all current vehicle engines
SL	Current	For engines 2004 and older
SJ	Current	For engines 2001 and older
SH	Discontinued	For engines 1996 and older
SG	Discontinued	For engines 1993 and older
SF	Discontinued	For engines 1988 and older
SE	Discontinued	Not acceptable for gasoline-powered vehicles engines made after 1979
SD	Discontinued	Not acceptable for gasoline-powered vehicles engines made after 1971

You may be asking: Why reduce ZDDP levels out of engine oil, if it can cause so much harm to flat tappet engines?

The EPA has required new car manufacturers to guarantee catalytic converters for over 100,000 miles. So oil companies have been forced to drastically reduce ZDDP levels because today's car manufacturers now have to warranty catalytic converters for over 100,000 miles. It seems ZDDP may actually shorten the life span of the catalytic converter, raising warranty issues. Also, since modern cars now have roller lifters, it eliminates the need for ZDDP.

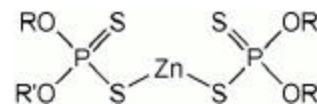
The vehicles that fall through the cracks are the older performance and classic cars, which include our Opels.

ZDDP QUESTIONS & ANSWERS

What is ZDDP?

ZDDP is an oil additive, known as Zinc Dialkyl-Dithio-Phosphate, which has been the primary Extreme Pressure ingredient in all quality motor oils for over 70 years.

The ZDDP Molecule

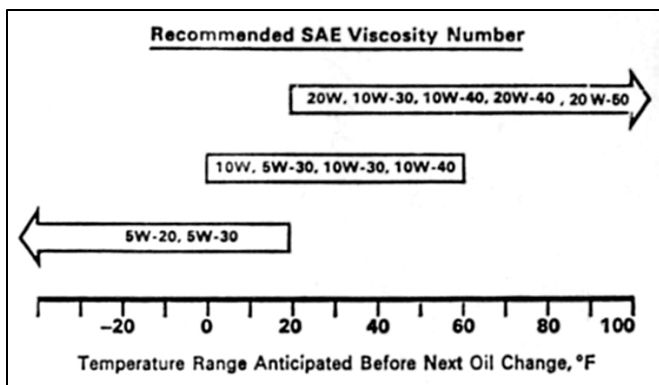


Why do I need ZDDP?

The EPA has put stricter emission requirements on new cars, which have influenced manufacturers to remove ZDDP from motor oils. Opel specified 'SE' high quality engine oils and made specific mention to use detergent oils. The modern 'SM' grade oils have greatly reduced amounts of these Opel specified qualities.

ENGINE OIL RECOMMENDATION - Use only high quality SE oils. The chart below will serve for selecting proper oil viscosity.

API Label



What do the oil grades such as SE, SF or SM indicate?

In the API { American Petroleum Institute } Classification System, "S" and "C" are the two basic application categories of oil. "S" is intended for gasoline use and "C" is intended for diesel use. "A" was the first grade in each category and resulted in "SA" and "CA" grade oils. Each progressed farther up the alphabet as new grades of oil were introduced. The newest grades are "SM" and "CJ" respectively.

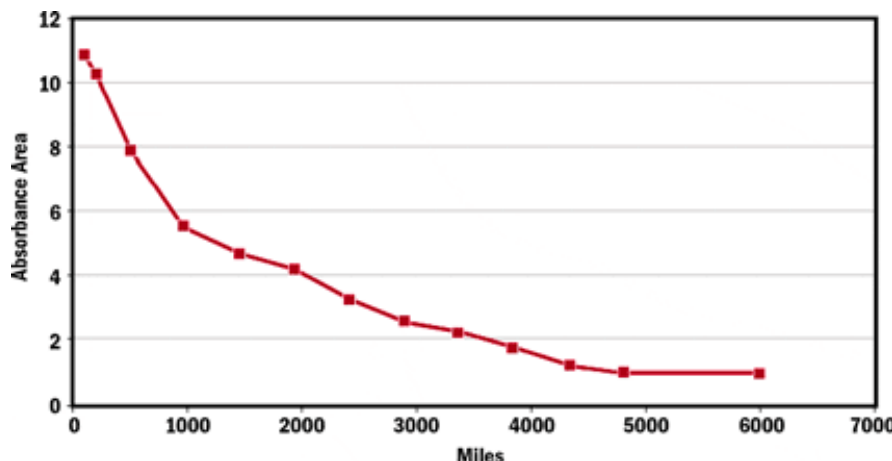
Aren't the newer oils better than the older oils?

Historically, every new grade of oil introduced since the 1930s was better than the previous grade and could be considered "improved" with one exception. The original SA grade was straight mineral oil (non-detergent and without additives) and SB contained additives, which could not be used in the earliest cars specified for SA. While it is true that SM oils are better for newer cars, they are not better for older cars. Simply put, the newer and/or better oils are not backward compatible for older cars, primarily due to the gradual reduction of ZDDP starting with SG grade in 1988.

How much ZDDP should I have in my Opel's engine oil?

ZDDP is most effective if the concentration is between 0.18 % and 0.20 % by weight. Higher ZDDP concentration has no effect except to prolong additive life.

Opel also noted in the '**Opel Maintenance Schedule**' that the oil should be changed every 3000 miles if any of the following severe driving conditions were experienced: **A.** the excessive idling {stop-and-go traffic}, **B.** short trip operation in freezing temperatures, **C.** driving in dusty conditions or **D.** trailer pulling.



The chart above is a good illustration of engine additive depletion experienced during 'Optimal' engine operation, and not 'Severe Service' operation as described above.

But My Engines Stock! I don't drive hard, What's the big deal?

Engines with flat tappet cams have extremely high pressure loading at the contact point between the lifter crown and the cam lobe. According to Mark Ferner, from Quaker State Motor Oil Research and Development, "**Even stock passenger cars can see pressure in excess of 200,000 psi. at the point of lifter and cam lobe contact.**" To prevent excess wear, traditional motor oil included a generous dose of anti-wear additives, primarily zinc-dialkyl-dithio-phosphate ZDDP.



Brad Penn

Industry experts have long considered Pennsylvania grade crude oil among the best in the world, and one of the most popular engine oils refined from it was Kendall GT-1. The American Refining Group now operates the Bradford, Pennsylvania based refinery. Brad Penn's Penn Grade 1 (PG 1) is available as a partial synthetic or conventional engine oil, and in varying viscosities.

Of Director of Branded Lubricants Sales and Marketing, Dick Gladys, it was asked:
Are Brad Penn's Penn Grade 1 products intended for use with flat tappet camshafts?

Yes, PG 1 has been evaluated by a number of camshaft manufacturers, and is now recommended by many for flat tappets (a.k.a. "solid valve lifters"). We add to it a high concentration of ZDDP, and our additive package, the result is high quality race oil that offers outstanding anti-wear and anti-scuffing protection for flat tappet cams. We also offer Penn Grade 1 Break-In Oil a specially formulated, 30 weight oil developed for flat tappet camshaft break in, and features enhanced levels of ZDDP.

Is there a specific amount of ZDDP that your company feels is the minimum required for flat tappet camshafts?

Our typical ZDDP content is 1,200 ppm. Our lubricant is actually a uniquely formulated race oil that's suitable for older flat tappet camshaft engines, and it offers additional engine protection beyond high levels of ZDDP.

Where can hobbyists purchase Brad Penn products?

Penn Grade 1 products aren't available through local retailers. Instead, present distribution goes through select independent lubricant wholesalers, engine builders, and specialty racing/performance outlets. Contact us via our Web site, and we'll reply with the nearest authorized Brad Penn Racing distributor.



Comp Cams - Cam Manufacture -

COMP Cams is a well-known aftermarket camshaft manufacturer. With word of oil reformulation buzzing about, Comp Cams has addressed this issue.

Comp Cam's Tony McCurdy was contacted and asked:
Is current oil formulation an area of concern for COMP Cams?

Yes, definitely. Because of tightening environmental regulations, modern engine oil isn't the same as it was just a few years back. The federal government recently required the reduction of key ingredients such as zinc and manganese in all types of gasoline and diesel engine oils, which continues to plague flat tappet camshaft engines.

What Break-In procedure does Comp Cams recommend?

Proper engine break-in is a key element in the longevity of any flat tappet camshaft. We strongly recommend that the new flat tappet camshaft and its lifters be liberally coated with our No.153 Cam & Lifter Installation Lube. We also suggest adding a 12 ounce bottle of our No. 159 Camshaft Break-In Oil Additive to the crankcase. As soon as the engine fires, increase the rpm to 2,000 to 2,500 rpm for the first 30 minutes of operation, while periodically varying the rpm to ensure direct splash oiling on all areas of the camshaft.

After the break in process is complete, we suggest changing the oil and filter to remove contaminants, filling the crankcase with the customer's choice of high quality conventional or synthetic oil, and adding a fresh bottle of our No. 159 Camshaft Break-In Oil Additive.

You suggest Cam-shaft Break-In Oil Additive for long-term use. Can you explain the advantages?

The product was initially developed specifically for break-in protection, but subsequent testing has proven long term durability benefits for flat tappet cams. It contains a special blend of additives that replace some of the desirable ingredients that the oil companies have removed from modern oil, and protects the camshaft and lifters against premature wear.



Shown at Right:

Typical Cam Shaft Lobe and Lifter damage.

What about STP Oil Treatment?

STP ("Scientifically Treated Petroleum") is a well known brand in the United States with a long automotive history. The reference to ZDDP on its label suggests that STP (now owned by Clorox) could be the most widely distributed and the most conveniently available additive.



Of STP's Media Liaison/Technical Advisor, OMC asked:

STP Oil Treatment claims on its label that it 'Contains ZDDP', can you state how much ZDDP is in your product?

STP Oil Treatment and STP 4 Cylinder Oil Treatment contains 1 to 1.5% of the ZDDP additive per bottle.

For clarification, if STP Oil Treatment was to be added to 4 quarts of the standard current grade SM engine oils, which is regulated to 870 parts per million ZDDP, can you tell me what the overall ZDDP levels will be, and would that level be safe for engines requiring SE grade oils?

Response: Unfortunately, we do not have that specification.

After this brief conversation speaking with STP's technical representative, I regret to inform readers that I can not endorse using STP (for ZDDP additives) over other specialty products.

CRANE CAMS
Camshafts



Crane Cams - Cam Manufacture-

Crane Cams has been a flat tappet camshaft manufacturing leader since the early '50s, and though the company has ventured into various other valve train and ignition related components over the years, camshafts remain among its most popular products. Like any camshaft manufacturer, Crane Cams admits that today's oil formulation is an area of concern.

Of Tony Vigo, Crane Cams' Media Liaison and Technical Advisor, it was asked: Is current oil formulation an area of concern for Crane Cams?

Yes, the reduction of the zinc phosphorus compound (ZDDP) from most modern engine oil has definitely accelerated flat tappet camshaft & lifter wear.

Have these changes affected the way your company manufactures flat tappet cams? Or has your company changed your recommendations regarding Break-In procedures?

No, not at all. Our flat tappet camshafts remain a popular hobbyist choice, and to ensure longevity, we are recommending specific break in procedures using products like Brad Penn motor oil, or such diesel specific oils as Shell ROTELLA T, Mobil Delvac, and Chevron Delo 400. We recommend that each lobe and lifter be thoroughly coated with our No. 99004-1 Super Moly Assembly Lube, and to combine said oil with an 8 ounce bottle of our No. 99003-1 Super Lube Break-in Concentrate. After setting valve lash or lifter preload and priming the fuel and oil system start the engine and immediately begin cycling its speed from 1,500 to 3,000 rpm for 20 to 30 minutes. If the camshaft requires dual valve springs, we suggest removing the inner spring during break-in. Once the process is complete, the camshaft should be ready for normal use.

What are your suggested oil change practices during normal use?

We recommend that the first oil change occurs within 500 miles of initial break-in, and then follow that with normal oil change intervals that include any high quality engine oil, and at least 4 ounces of our Super Lube Break-In Concentrate.

General Motors - E.O.S.

General Motor's E.O.S. anti-wear additive containing a high concentration of ZDDP that's designed to protect the camshaft lobe and lifter against scuffing and wear during break in. When used moderately at each oil change, it has little effect on emissions equipment, and greatly enhances the long term life of the cam.



Conclusion

Myriad other lubricant companies and camshaft manufacturers have certainly addressed these issues and developed their own solutions, but it was not practical for us to contact all of them. After hearing a recurring trend from those we spoke with, we are confident that answers from most others would closely follow what was presented here.

We learned that current spec commercial grade oil, like ROTELLA T, remains a suitable off the shelf lubricant for Opel owners. Other options include specialized lubricants like those from Brad Penn, or to combine modern spec gasoline engine oil and an additive such as that from COMP Cams or Crane Cams.

While it's still recommended to follow your engine builder and/or camshaft manufacturer's specific suggestions for break in and long term use, Opel owners can rest easier knowing that a variety of solutions are presently available, and after hearing what these companies have to say, we are confident that we can safely drive our Opels without feeling as if our camshafts are living on borrowed time.



Above: Quaker State 'Q' Racing Oil, Mobil Delvac 1300 & Chevron Delo 400 diesel engine oils.

ZDDP CONTENT

API Oil Designation/Brand	Year	Zinc	Phosphorous
SH	1996	0.130	0.120
SJ & SL	2001-04	0.110	0.100
SM	2005	0.087	0.080
Shell Rotella T	2006	0.140	0.130
Pennzoil 20W50 Racing	2006	0.196	0.180
Quaker State Q Racing	2006	0.200	0.180

Opel GT Drivetrain Removal

An 1989 OMC Blitz article just presumed that an engine was either serviced on the car (by removing the head and oil pan) or that the reader had removed the engine completely from the car. As anyone who's worked on Opels knows; It's a lot easier to just write that, than it is to do.

The factory service manual notes that it was only possible to lower a GT engine to the floor. This isn't true, as owners have removed the GT hood and lifted engines out of the car – but experience has shown this can be risky, difficult, and more trouble than it's worth. If for some reason you absolutely have to lift it out, it's best to remove the cylinder head and detach the transmission first. Even then, you'll have to dangle an unbalanced 150+ pound engine a minimum of 32" high to clear the vulnerable metal of the front end of a GT body. (We do not advise using unsecured garage roof beams as attaching points for pulleys or cable lifts, even when you insist on this approach).

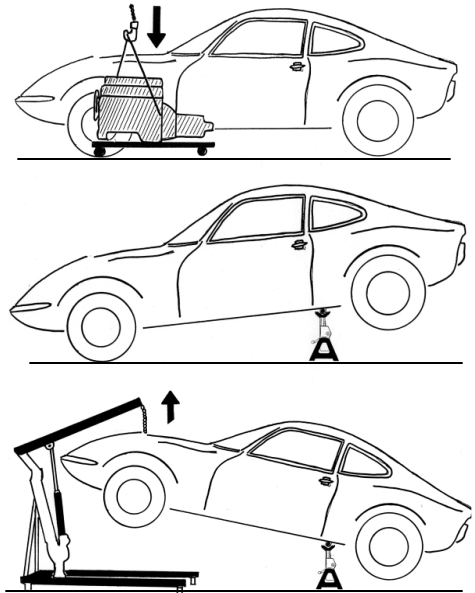
Lowering the drivetrain from the car is safer and much more easily controlled. From there the Opel is raised, so that the engine/transmission combination can be pulled out from under the car.

The best device for this procedure, is a full-size 8' lift 4-wheel garage rack -- if an associate has access to one, by all means ask for permission to use it. But if you have to do this at home, this actually means a job to be done in the garage or a flat section of a driveway. You will need the means to lift the front end of a GT high enough that the engine can slide out from under the belly pan, which is commonly done with 2-ton capacity engine lift (better known as a "cherry picker") with a minimum 6 1/2 feet boom height

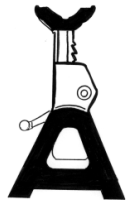
Lowering the engine or drive-train onto a moveable board like a thick plywood sheet (possibly with added wheel casters), can make it easier to slide out of the way. Always use a chain that is thicker than is actually needed, and attach at the driver's side upper starter bolt & on the passenger side front threaded bolt hole (see diagrams on next page)

Make the decision, if you will or won't separate the transmission, prior to engine removal. Engines modified with aftermarket installations like exhaust headers, fuel injection, solid-state ignitions, etc., also require more steps to remove. Also note additional removal requirements, when vehicle is equipped with automatic transmission, emissions reduction devices or air conditioning system components.

Before beginning, collect required tools and supplies, including an extra sturdy jack, jack stands, and "cherry picker". Set up a well-lit ventilated work area, with a clear safety perimeter, cleaning materials and handy beverages. Use a notepad and sandwich baggies, to identify and bag removed bolts (for easier reassembly later). Allow extra time to be able to deal with unplanned obstacles (like hard-to-remove parts, rusted bolts, etc.). Have a radio or good music source nearby, to keep the working atmosphere positive. Have a list of phone numbers for local auto part and tool supply stores handy (just in case you need them).

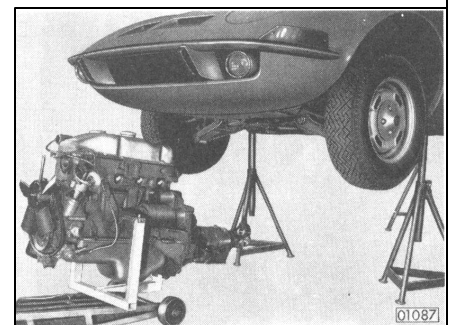
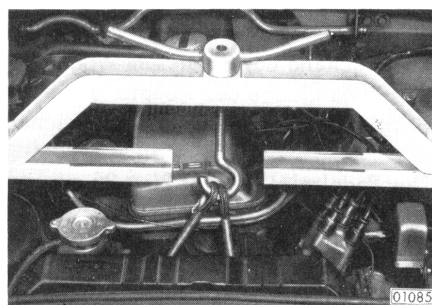
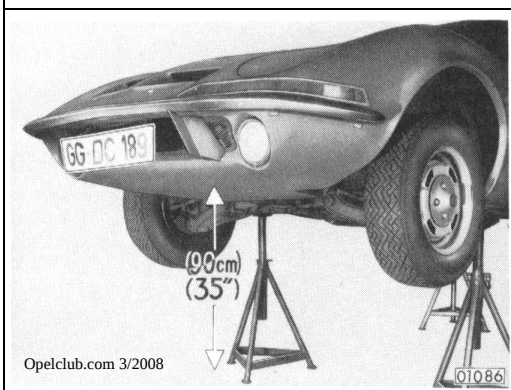


Above : 3-step engine removal, using jack stands, and "cherry picker" lift device. (Verify mount areas are solid) Also block wheels.



The "Werkhandstatbuch" (1960's GT German service manual) illustrated another approach, including couple of special tools for owners to construct: A wood engine holding tool for support, and a metal frame to hold the engine when it was to be wheeled out on a jack (shown below) . We DO NOT recommend this approach, as safety could be compromised by shifts of the unbalanced engine weight, because the vehicle is not as steady when it's placed on 4 tall jack stands

(Left to Right: Vehicle suspended about 3 feet above ground on 4 stands, Wood engine holding tool, and engine wheeled out on steel support frame)



Opel GT Engine Lowering

This procedure presumes that the transmission and attached parts, have already been detached from the engine, and possibly removed from the vehicle. It also presumes that many parts attached to the engine (hoses, wires, brackets, manifolds, alternator, sway bar, etc.) have been detached or removed as well



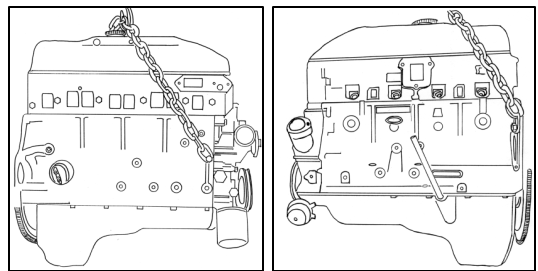
Support Engine:

- (1) Remove top 15mm nuts from motor mounts
 - (2) Place a wood block on the jack surface (so as to not damage the oil pan) and use this to raise the engine slightly (for support).
- (Note: The "homemade" device employing wood 2by4's bolted together, illustrated in some service manuals, is not recommended on the GT, as it may damage upper fender metal. It was suggested for oil pan removal on the car, but a later Opel tool #J-23375 was developed for that application).

Opel #J-23375 Tool-



Bolts to mount tops, to support engine, for oil pan removal



Chain Mount Locations: Passenger & Driver's Side of Engine Shown

- (3) Remove the hood (mark locations of 4 attaching bolts first).
- (4) Roll up a "cherry picker" lift to front of the car, then attach to engine with sturdy chain (minimum 1/4" wide with 2" links) connected by original high-grade original hardened metric bolts, at locations on the engine block (as shown in diagrams). Raise engine slightly.
- (5) Remove wood block and hydraulic jack from under the engine.

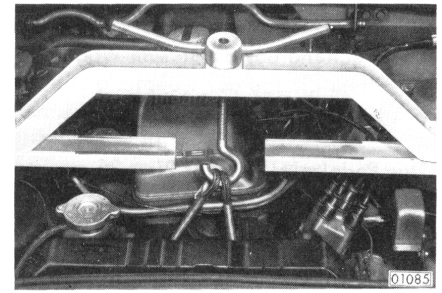
Unbolt Engine Cross-Member:

- (6) Remove the two 13mm side-mount bolts that attach at the side arms. Remove clutch cable, and make sure exhaust heat shield isn't in the way.
- (7) Carefully remove the 6x 15mm bolts (3 bolts per side) that connect the engine cross-member to the sub-frames of the car. Cross member will drop to the floor after it has been unbolted.

Opelclub.com 3/2008

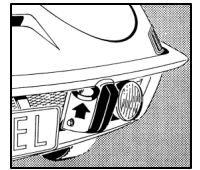
Lower Engine then Raise Car:

- (8) Use "cherry picker" lift to steadily lower engine to plywood board or dolly (do not use a mechanics creeper, as the wheel mounts will break). To clear front suspension, move engine rearward a bit. Detach chain.
- (9) Wrap chain around front suspension cross member (but not the rack/pinion) then use "cherry picker" to raise vehicle a minimum of 30 inches.
- (10) Slide out engine, by pulling on an attached rope, from under vehicle.
- (11) If engine is to be stored, drain coolant, then prevent damaging dirt and moisture intake by plugging all cylinder head ports with oiled rags (and re-install spark plugs), then cover engine with layers of plastic bags.



Not Recommended: "Alternate" Lifts

"Alternate" approaches, including the use of a "homemade" device (above), or raising the car with a thick rope through the "tow hook" (at the inside of the front bumperette), are not recommended. These can be extremely risky, and also cause damage to the car itself.



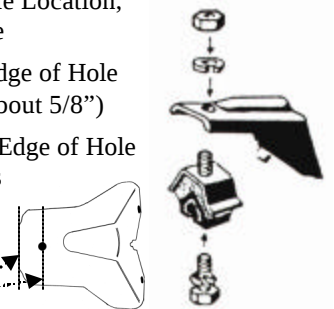
Motor Mount Brackets

Upper Mount Hole Location, varies side to side

(Driver's Side: Edge of Hole to bracket edge about 5/8")

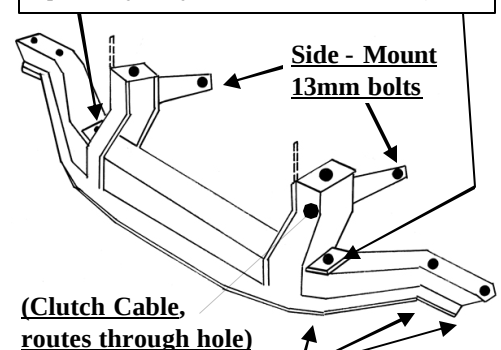
(Passenger Side: Edge of Hole to bracket edge is closer, about 5/16")

(Measure Here)



Engine Cross Member:

Rectangular Shims were installed on each side on US GT's, between cross-member and sub-frames (These are sometimes replaced by sway-bar mount "J" brackets)



15mm Mount Bolt Locations
(3x 15mm bolts on each side of cross member)

Dashed Lines: Shows locations of "extra" front-facing plates on 1973 GT's (an added safety feature that year, to keep motor mounts from shearing forward in a collision).

Opel GT Engine Removal Steps

The factory service manuals lists a number of steps for engine removal from a GT.
(Where applicable, we've added details to complete this list, for the home/garage mechanic)
Read all instructions before beginning, and decide if you'll detach the transmission or not.

(1) Disconnect battery ground cable. (2) In a well-ventilated area, drain all fuel from tank & system (remove via hose at fuel pump inlet; place fuel in certified gas containers). (3) Drain engine oil.

Cooling System:

Drain coolant by disconnecting lower radiator hose (use a wide pan, and quickly wipe up any spillage), then remove upper radiator hose (also unbolt fan shroud, if equipped).
Unbolt the lower mount bracket 13mm bolt, swivel the lower bracket clear of the fan blades, and carefully lift the radiator out of the car.

Disconnect the heater hoses from the thermostat housing and water pump inlet (and from the carburetor water choke, if equipped).

Transmission:

If "late style" (1971-1973) 4 speed manual transmission, consider draining gear oil (by removing the reverse switch)

If "early style (1968-1970) 4 speed transmission, consider draining gear oil (by removing drain pan, then reattaching it)

If Automatic Transmission, consider draining trans fluid (by removing drain plug, then detaching both flex hoses near radiator)

Electrical Wires:

With battery disconnected, remove wires to engine components (such as the starter, alternator, distributor, etc.; see details on another page)

Vacuum Hoses:

Remove the hoses that connect to the intake manifold from the brake booster, the distributor vacuum retard, and the thinner of the 2 ports on the valve cover.

Carburetor/Fuel System:

Detach the hose to the distributor vacuum advance.

Remove the small linkage pin, then detach the throttle linkage from the ball-shaped connector at the carburetor.

Disconnect Choke: Electric choke wire, or hoses to water choke, or cable

Remove hoses from fuel pump (catch any fuel spillage), then carefully pull hose off of any attachment clips to engine or transmission

Remove the air cleaner (if equipped, remove the lower inside 13mm bolt and pull the round canister from fender).

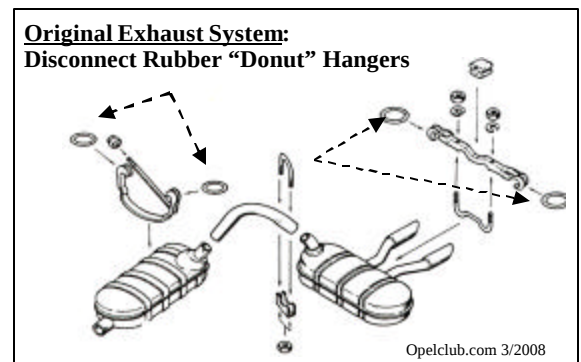
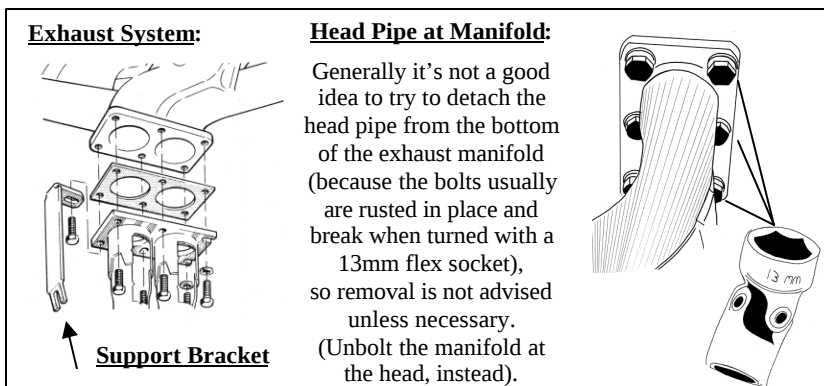
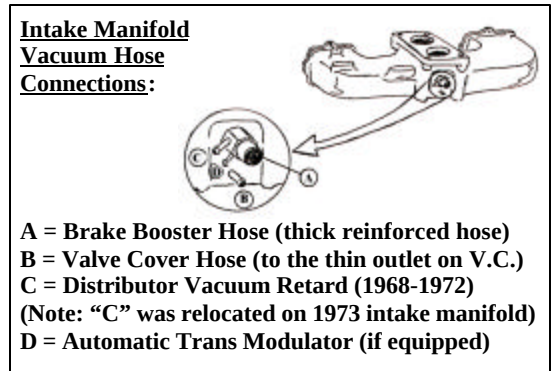
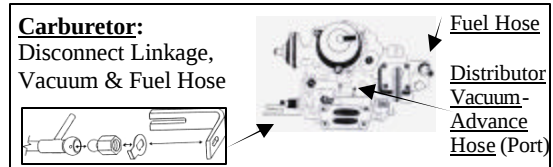
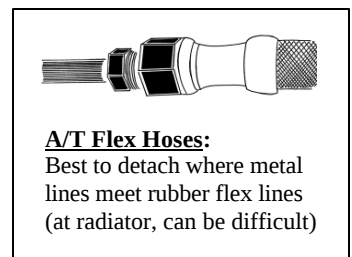
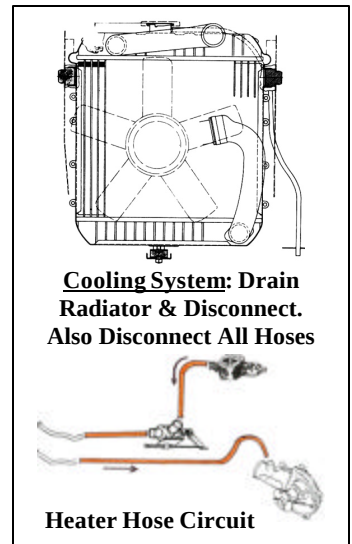
Exhaust System:

Remove rubber hangers "donuts" from muffler and rear resonator

Detach support bracket to engine (if connected at bottom of manifold).

Detach the intake/exhaust manifold assembly bolts from the cylinder head (If you have headers, they have to be disconnected)

Hang exhaust manifold (use wires or bungee cords) towards fender

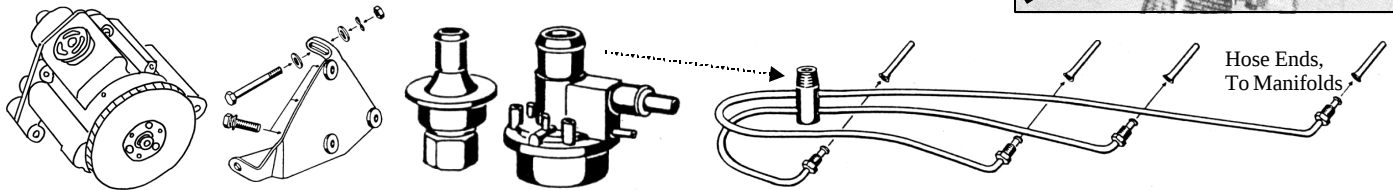
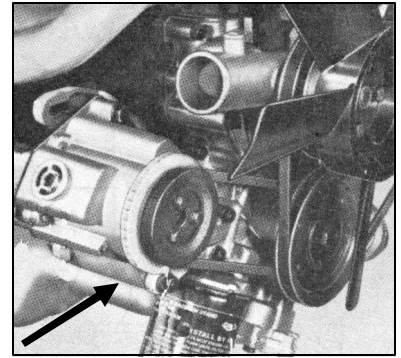


Opel GT External Engine Hardware: Emission Controls

1969 "Air Injection Reactor" Pump, Valves and Hoses:

Required years ago to be operational on a registered 1969 Opel GT, they're now very rare. The belt-driven pump drove air through a pair of valves then into the exhaust manifold (to more fully combust unburned fuel). But in real-life the horsepower-robbing pump often froze, and the metal hoses rusted solid at the manifold ports (mechanics sawed these off).

If the vehicle has an original A.I.R. pump and manifold hose installation, carefully unbolt and disconnect the pump (leave the valves on the pipe assembly) to remove your engine. Many early 1.9 engines (up to serial #19S-262029) retained the double-grooved crank pulley (the inner pulley had a small-diameter), and the lower engine side pump mount brackets can be adapted to custom-mount an air conditioner compressor.



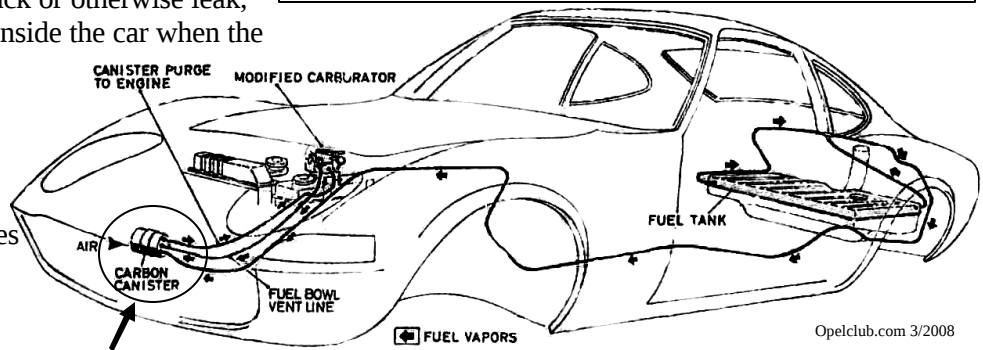
1970-1973 Evaporative Canister:

The most common system, the sideways-mounted canister near the battery, passively captures and filters fuel tank and carburetor fuel bowl vapor emissions.

Gas Tank: Connected to the center canister port, one hose output helps to prevent a buildup of internal tank pressure. If the vent hoses are disconnected, crack or otherwise leak, a strong gas smell will be noticeable inside the car when the tank is half or more full of fuel.

Carburetor: Original Solex carbs had 2 output hoses to this canister, (which should be detached when engine is removed).

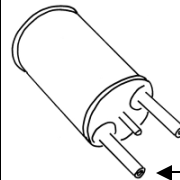
Some Weber 32/36 DGEV 33B1 series have a port for 1 hose. When not in use, either or both the upper and lower canister ports can be capped.



Carbon Canister:

Round outer foam filter should be replaced to retain internal charcoal pellets. Center port to vacuum on carb, and upper side port to float bowl on carburetor, aren't required for operation & can be capped.

Lower side port to fuel tank should always be attached and intact.



1973 Exhaust Gas Recirculation ("EGR") Valve:

The EGR valve was vacuum-driven, to redirect inert gas into the combustion chamber via a threaded port on top of the exhaust head pipe, back into the intake manifold (to lower unburnt gas/NOx emissions)

In practice, EGR valves clogged with carbon particulates and were rendered inoperative. The metal pipe also vibrated, deforming the threaded port on the intake manifold, causing vacuum leaks there too (on 1973 engines, that already had low power output).

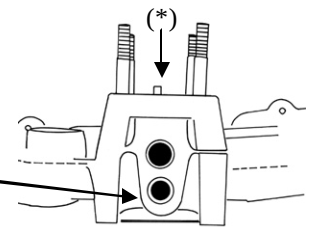
When a visual inspection of emissions equipment was required for registration, some mechanics blocked the attached metal hoses with a glob of fast-setting JB weld. When removing the engine, unscrew steel tube fitting at intake manifold and disconnect vacuum hose.

Threaded Intake Manifold Port:

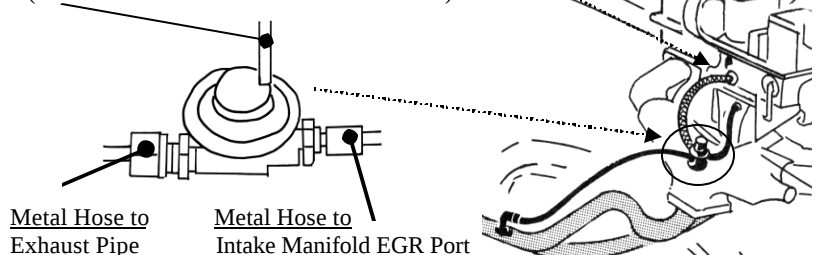
Unique to manifolds for Opels with EGR valves (1973-1974). (Some 1974 Mantas had a "double" valve style EGR).

~9/16" diameter Ported Gas Fitting (fits 1/4" PIPE thread)

(*Port for hose to valve cover, was relocated to the engine side of manifold).



Hose to "extra" carb vacuum advance port
(Port on Solex & Weber 32/36 series 33B1 carbs)



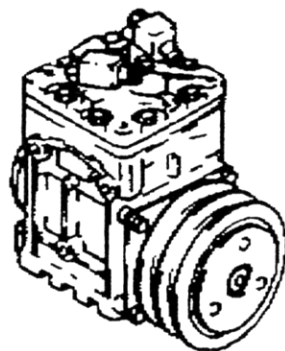
Opel GT External Engine Hardware: Air Conditioning

There was no factory-installed air conditioning originally made for the Opel GT. But when 1969 GT's were selling well, aftermarket air-conditioning manufacturer "A.R.A." (of Grand Prairie, Texas) adapted their kit for the 1969 Kadett 1.9 to fit the 1970 model-year Opel GT. The discontinuation of the 1969-only "A.I.R." emission control system, left available space on the passenger side of the engine for mounts and a compressor. Significant Buick dealer sales of ARA units for 1970 GT's, led to GM's development of their own air conditioner system for the 1971 model-year GT.

When removing cylinder heads or complete engines with a/c installed, it's important to detach the belt, remove adjustable idler arm/pulley, and unbolt the compressor. Unless you have a R-12 refrigerant recovery system on the premises, do NOT twist or disconnect the pressurized hoses. Instead, wrap compressor with a spare towel and securely set it aside. (*For more Opel GT A/C system information, including ARA installation diagrams, consult the May 1995 OMC Blitz)

"A.R.A." Air Conditioning System*

Visual identification of an A.R.A. system on a GT, is by the square gray "box" (York F206R; their 6" "mini" compressor) on the passenger side of the engine. Another distinct difference is the design of the center console (around the shift lever) for the vehicle interior.



Side Bracket
(to Engine
Side-Rear)

Compressor

Bottom Mount
(to Engine
Side-Front)

Schematic View (at Front of Engine):

Upper Mount Bracket

Tensioner Pulley

Idler Pulley

Gates 9510 belt

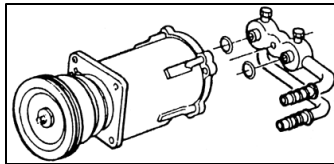


Some hardware (like a metal fan blade and bracket designs), varied between 1970-72 & 1973 year kits.

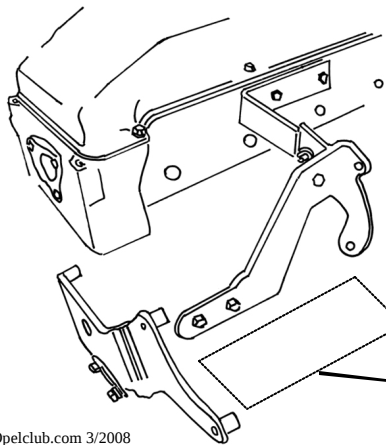
Crank Pulley
(AC on inner groove of
2-groove pulley design)

"G.M." (Frigidaire) Air Conditioning System*

Originally dealer-installed as an option on 1971-1973 GT's. Visual identification is by the large, heavy (40 lbs.) black cylinder (model A6), and unusual brackets (which cracked and required welding), on the driver's side of the engine, as well as the wedge-shaped "peak" of the console on the passenger-side interior (and blower borrowed from the GMC Suburban). A complete guide to GM A/C for the GT, is in the 1973 Opel Factory Service Manual.

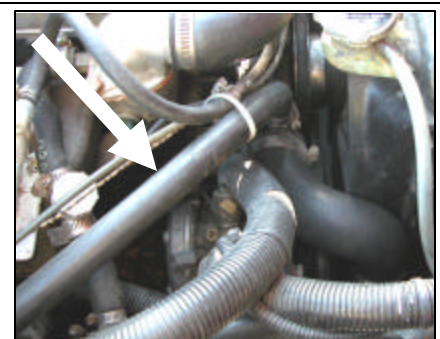


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Customized Air Conditioning Systems:

As original Opel GT systems are heavy, inefficient, and rely on outdated (and expensive) R-12 refrigerant, more GT owners are retrofitting with later-model air conditioner systems. Using Sanden compressors (from compact Geo Metros), custom mount brackets are usually installed on the lower passenger side of the engine. Other equipment frequently includes condensers (mounted in front of the radiator), thermostatically-controlled electric fans, and aftermarket R-134 compatible parts. Generic parts from aftermarket suppliers like Vintage Air, are added for modern interior installations.



Firewall Area:
Loom to Oil Switch
(choke wire is optional)

Upper Arrow
To wiper motor

GT Underhood Wiring Schematic

Applies to original 1970-1973 Harnesses

(Shown without Battery Cables)

Main Loom

Connects thru firewall grommet, to fusebox
("Squares," show where wires exit a loom)

Down Arrow (runs along upper fender lip):
Wire loom to headlights, horn, front lights,
and master cylinder warning switch

(Electric Choke Wire)
Optional firewall-routing shown

("Dashed Wire")
Coil to Starter
(within loom)

Loom:
3-wire alternator
to regulator

(5) Starter & Solenoid

Top Bolt Terminal ("A"):

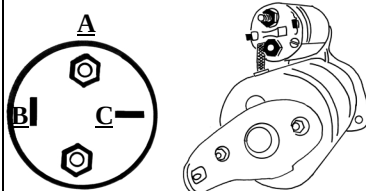
Positive battery cable attaches here.
Also, a Red/White striped 10-gauge wire
(with 5" fusible link) connects from here,
to a fusebox terminal.

Left (vertical) slide terminal ("B"):

Black 14-gauge wire, connects to positive
terminal on ignition coil (starter bypass).

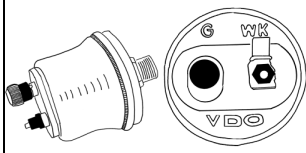
Right (horizontal) slide terminal ("C"):

Black/Red striped 14-gauge wire, connects
to ignition switch in steering column.
(Auto Trans Neutral Switch: Not shown)
(A protective relay, is also recommended
for installation between "A" and "C" here)



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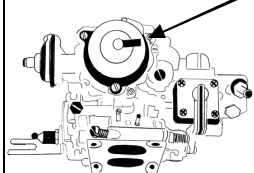
(1) Oil Pressure Sender



Connected with 2
light blue/green striped
18-gauge wires.

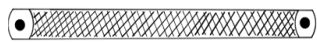
"G" (screw terminal)
is to the dash oil gauge
"WK" (slide-on) is to
the warning light

(2) Carburetor with Electric Choke



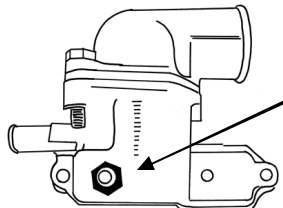
Standard on 1973 GT's, and a
popular choice on replacement
Weber carbs. Choke is powered
by switched 12-volt source
(at fusebox, not from ignition
coil), by an added wire (usually
run along the firewall - except
on 1973's, which is white/black
striped wire connected to the
passenger-side horn).

(3) Ground Strap



Bolted to the block and
passenger side chassis.
About 8" - 9" long, and
1" wide, copper-braid.

(4) Temperature Sender



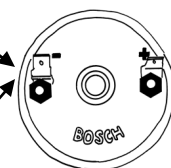
Connected by blue
18-gauge wire, to the
dash temperature
gauge. Most senders
are 13mm (early
models are 17mm).
GT senders have a
black-colored
insulator.
(Mantas are white)

(6) Ignition Coil

Negative (-) Terminal

Green 18-gauge wire
connects to condenser
and points
(on distributor)

Green 20 gauge wire
connects to dash
tachometer gauge



Positive (+) Terminal

Black 14-gauge wire connects to left slide
terminal on starter solenoid (shown as a
dashed line on above wire loom diagram)

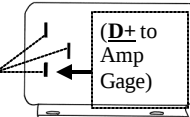
Clear 12-gauge "resistor wire" (1.8 ohms,
77" long) connects to a fusebox terminal.
(This resistance protects ignition points.
If wire fails, replace with standard wire &
add an early 70's Chrysler ballast resistor).
Replace wire w/o resistor, for Pertronix unit.

(7) Voltage Regulator

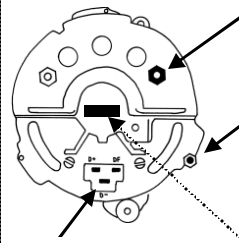
Loom: A 3-wire loom, connects
all 3 posts on the voltage regulator
to the alternator.

Amp Gauge: A Blue/White
striped 12-gauge wire (with 5"
inline fusible link) branches off
the D+ (red) wire, and connects
to the dash
amp gauge.

Loom



(8) Alternator



Output ("B+") terminal

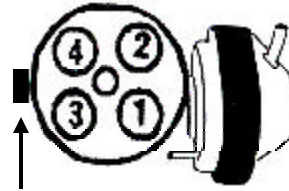
Red 10-gauge wire
(with 5" inline fusible link)
supplies 12V power to
main fusebox terminal

Ground

Brown 12-gauge wire
connects to 15mm bolt on
lower alt. mount bracket

(Some alternators also
have a radio noise suppres-
sion device on center-rear).

(9) Distributor



Original GT's have a green 18-gauge wire, that
connects to the negative output of the ignition coil.
It is important to clean & sand the condenser
mount area, for good conductivity & grounding.

Many GT's have the replacement Pertronix
ignition module (which has 2 wires: 1 red (+) &
1 black (-), each connects to a terminal on the coil).
Other ignition kits, have additional wires to an
external control module.

Opel GT Manual Transmission/Clutch Detachment

Option: Decide if you will detach transmission from engine in advance.

Arguments for detaching: The transmission adds unbalanced weight, and restricts side-to-side engine movement during drivetrain removal.

Argument against detaching: Process is tricky and time-consuming

--You need to jam flywheel teeth with a screwdriver (or other tool) to unbolt each of the flywheel's 6 bolts. Best to use is an air wrench & 6-point socket with flattened front edge.

--You need to pull the 50 pound gearbox (Wear gloves and keep body parts away from the gearbox bottom when it is dropped, also expect some gear oil to escape)

--You need to pull the bellhousing (This only applies to original Opel 4-speeds).

Raise vehicle and support securely on sturdy jack stands.

Block rear wheels.

Detach shifter from transmission.

(If it's in the way), unbolt parking brake cable.

Disconnect clutch cable from clutch arm

(and pull through engine support bracket hole).

Disconnect speedometer cable.

Disconnect 2 wires to reverse switch.

Detach driveshaft at rear universal joint (remove u-bolts) and let hang.

Loosen the lower bolts on the bellhousing dirt shield plate

Support transmission with jack, then unbolt cross-member from vehicle

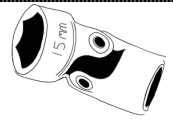
Place a wood block under the rear of the transmission as a temporary support.

Remove drive shaft (some gear oil will pour out)

Pull transmission shaft clear of bellhousing

Use 15mm flex-head

socket (for hard-to-reach upper bellhousing bolts)



Pressure Plate Surface

(Machine both flywheel surfaces evenly, if uneven or grooved)

Pressure Plate (4) 13mm Bolts

Torque to 18 ft. lbs. (NOT 33 ft lbs!)

Pilot Bearing

(install in correct direction, lip seal out, With writing visible on the seal side)

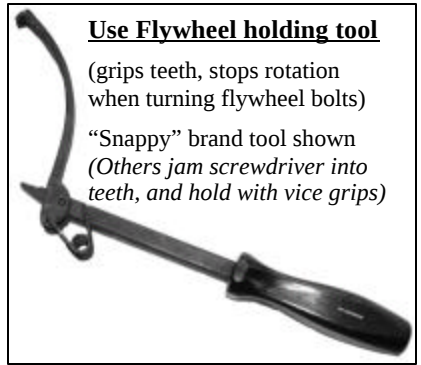
Flywheel (6) Bolts

(Hold flywheel in place to remove)

OK to use impact wrench to remove

(Flatten edge of 6-point socket, for better bolt grip)

Use torque wrench ONLY to install (to 43 ft. lbs)



Use Flywheel holding tool

(grips teeth, stops rotation when turning flywheel bolts)

"Snappy" brand tool shown (Others jam screwdriver into teeth, and hold with vice grips)

CAUTION/WARNING:

Transmission is heavy and can injure you when dropped (especially with outstretched arms).

Wear gloves & have a helper assist you to pull it out of bellhousing and lower it onto block.



Clutch Return Spring

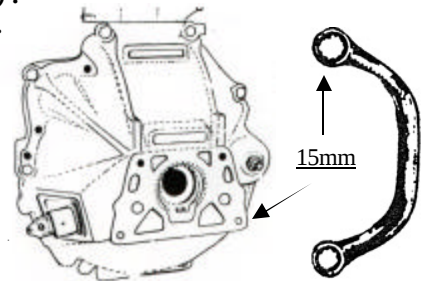
"Short Style" 1968-70 connects clutch arm to reverse switch

Reverse Switch

Gear Oil Fill Plug

(either 13mm head or 8mm hex-key bit insert)

Driver's Side

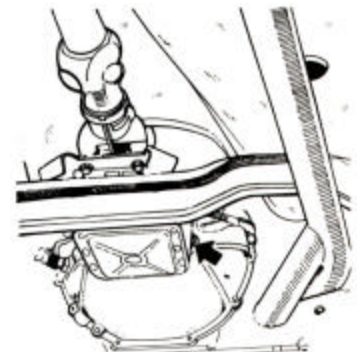


Transmission-Bellhousing Bolts:

"Short" (1 1/4") Lower Right bolt:

Use "curved" 15mm "obstruction" or "C-shaped" wrench, to access and turn

Top 2 (1 5/8" long) bolts: Use 15mm socket w/ ratchet extensions to reach. Factory Torque Spec: 32 ft. lbs.



"Short" 15mm bolt location

Passenger Side

Early-Model GT 1968-1970 Transmission shown

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Opel GT Automatic Transmission Detachment

Option: Decide if you will detach transmission from engine in advance.

Arguments for detaching: The transmission adds unbalanced weight, and restricts side-to-side engine movement during removal.

Argument against detaching: Process is difficult and time-consuming

-- Remove torque converter's 3 bolts by rotation, while under car

-- Torque converter tends to hang up on pilot shaft during detachment

-- Transmission removal can be very messy (lots of fluid runs out).

This can also be dangerous -- use gloves and keep body parts away as the shaft binds up, until the heavy transmission drops unevenly.

Also unscrew the 2 flexible fluid cooling tubes to the radiator (It's easiest to do this where the metal and rubber hoses couple).

Remove end of the long thin metal hose, from the manifold connection.

Raise vehicle and support securely on sturdy jack stands.

Block rear wheels.

Detach the speedometer cable.

Detach the detent "kickdown" cable from throttle linkage and engine support

Remove attaching nut and shifter linkage from transmission housing.

Detach driveshaft at rear universal joint (remove u-bolts) and let hang.

Loosen the lower bolts on the bellhousing dirt shield plate

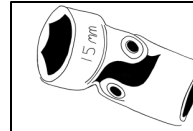
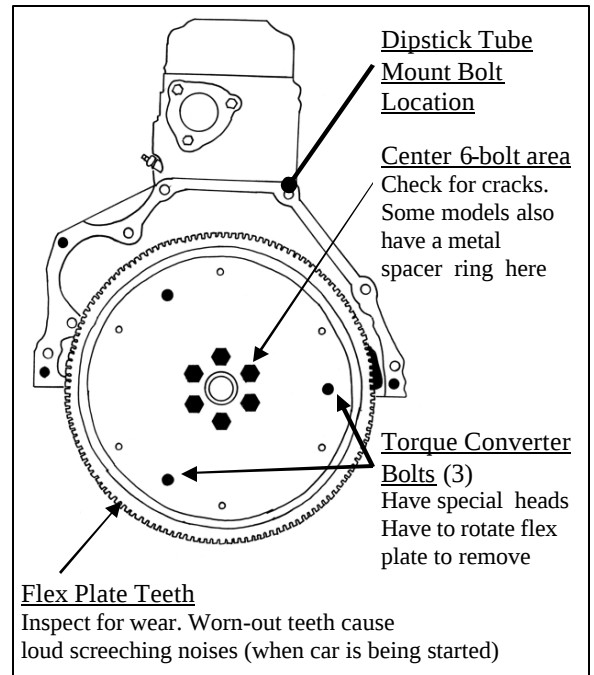
Remove the 3 15mm torque converter bolts (rotate flex plate to access each)

Support transmission with jack, then unbolt cross-member from vehicle

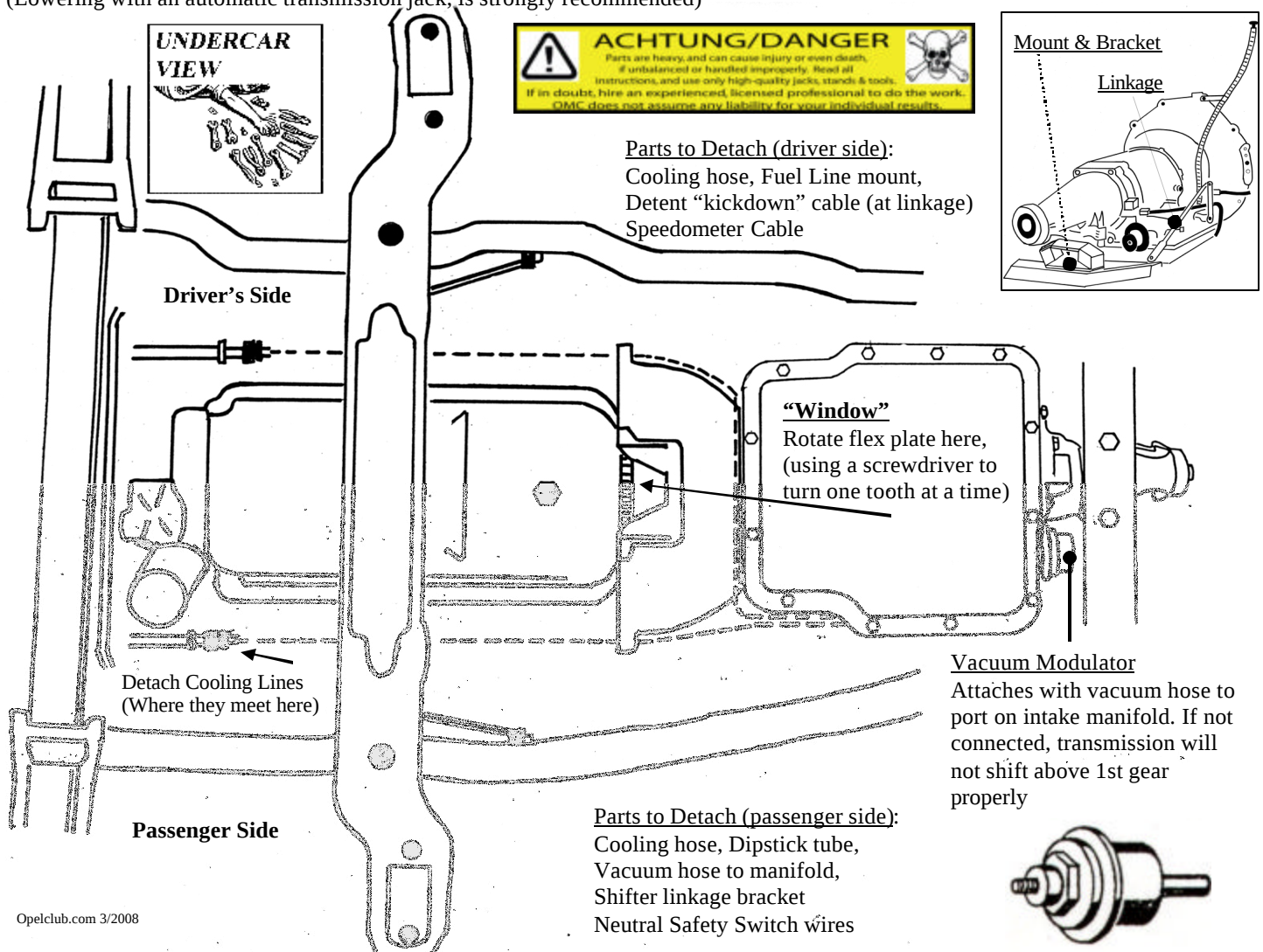
Place a wood block under the rear of the transmission as a temporary support

Wear gloves, and with a helper, pull and remove transmission

(Lowering with an automatic transmission jack, is strongly recommended)



Use 15mm flex-head socket (for hard-to-reach upper bellhousing bolts)



Transmission Conversions

Like the interior color, it seems that GT owners always figure the "grass is greener" for the other guy who drives another GT transmission type. While most conversions are from the 4-speed manual to the GETRAG 5-speed manual (which was well-covered in the August 1995 OMC Blitz issue), there are still numerous inquiries from those who inquire about swapping among the stock Opel transmission types.

Frequently, inquiries for automatic installations are for city-drivers (or their non-shifter spouses), while the higher-performance crowd appreciates the 4-speed manual. Most of the time, it's a good idea to acquire all the parts (including some smaller, but critical, hardware components) from a wrecked "donor" GT, as time and costs can add up (if you try to do this from more than one GT parts supplier).

For reference, a summary from the Feb 1995 OMC Blitz list of the parts you'll need, is reprinted below.

Converting GT to 4-Speed Manual Transmission

Important: New Clutch Pilot Bearing, must be installed into engine crankshaft journal (Consider also changing rear seal and shifter shaft seal(s) on transmission prior to install)

Transmission with GT Shifter Linkage (different linkage than Kadett or Manta)
Transmission bolts (3 are 1 5/8" long, and 1 is short 1 1/4" long) to the Bellhousing
Drive Shaft and internal thrust spring (shaft is thinner than the automatic shaft)
Transmission Rubber Mount and 2x (8mm allen-head) attaching bolts
Transmission Mount Bracket (longer than automatic trans bracket) & 2x (13mm) bolts
Transmission Shifter, and smooth metal connector pin with "C" clip
Shift Boot

Brake Pedal (narrower than automatic transmission type) with Rubber Cover

Clutch Pedal

Pedal Attaching Bolt to interior firewall (longer than automatic transmission bolt)

Pedal Bolt Support Bracket (found on 1972-1973 GT's, attaches to engine firewall).

Throttle Linkage Rod to Accelerator Pedal (doesn't have external spring)

Bellhousing and 6x (15mm head) bolts to engine block

Bellhousing to Transmission Paper Gasket (a critical part)

Bellhousing lower dirt shield metal plate, with 6 13mm bolts

Bellhousing Ball Stud

Bellhousing Front Cup Seal

Clutch Arm

Clutch Arm Rubber Boot

Clutch Release ("Throw Out") Bearing

Clutch Bearing Release Sleeve

Clutch Disc

Clutch Pressure Plate, with 4x 13mm head bolts to flywheel)

Clutch Cable

Clutch Cable Hardware at Firewall: Metal Sleeve (size varies with GT vs. Manta),

Clutch Arm Spring (4 1/2" long on 1969-70 GT's, 10 1/2" long on later GT's)

Metal Washers, Rubber Bushings, E-Clip

(Note: Add a 1" diameter hose clamp, on clutch cable behind the E-Clip, for extra support)

Flywheel, with 6 17mm bolts

Gear Oil (suggest 85-90W, 2 1/2 pints; Can use 140W if transmission is worn or noisy)

Speedometer W=897 (If transmission is "early style" 1968-70 GT) or W=1062 (later GT)

Transmission Reverse Switch (Early style on driver's side, Later style on rear of trans.)

Rubber Cap on Vacuum Fitting (cap port on intake manifold for automatic trans vacuum)

Option: Higher-Performance Clutches

Opels with a higher-performance engines (over 110HP, such as an Opel 2.2L, 2.4L, or an engine converted to 2.4L), a clutch larger than the stock 8.0" is needed.

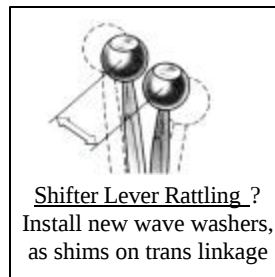
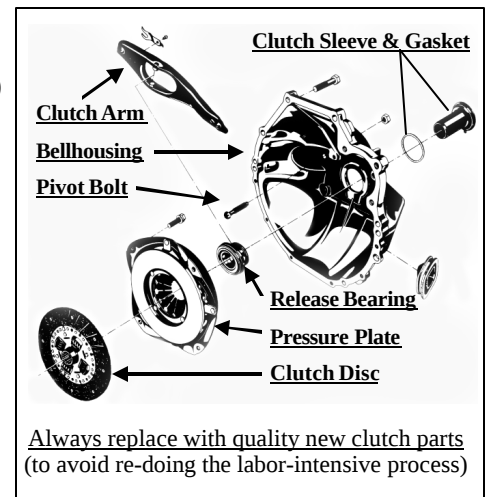
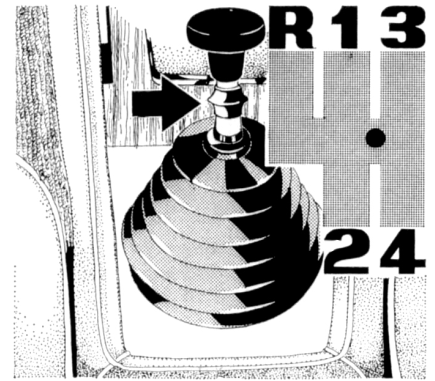
To do this, some use European Opel 9" wide clutches, as an easy bolt-on upgrade.

Others machine the flywheel flat & re-drill it for a later-model Chevy S-10 clutch.

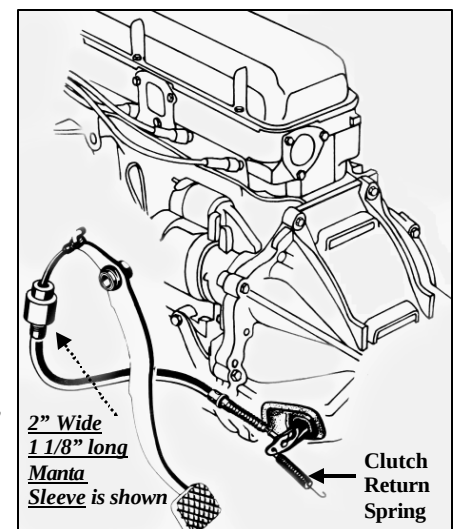
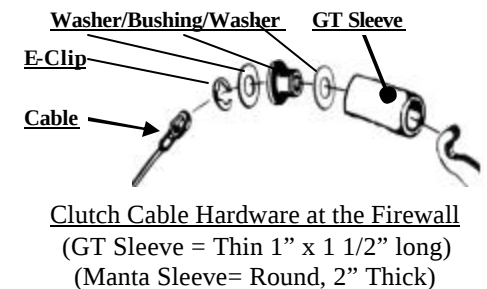
Advantages of the S-10 are initial replacement part price and availability, but

disadvantages offset this with higher machining costs (such as re-machining a longer clutch arm pivot bolt.

Long-term S-10 durability has also been questioned, due to asymmetrical clutch bearing to pressure plate contact angle.



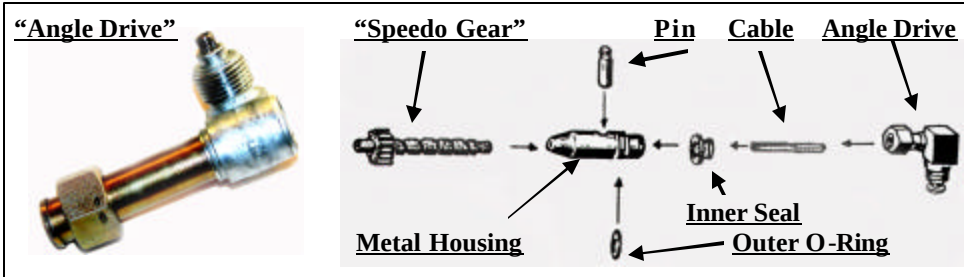
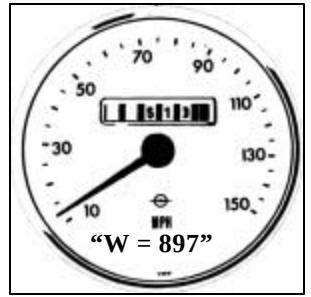
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Opel GT 4-Speed Transmission: "Early" Style 1968-1970:

Speedometer face reads W=897 in lower center, on 1969-1970 GT's
(Note: Some early 1968-1969 speedometers, are marked on the rear only. Speedometers marked "W=1020" are calibrated for the 1.1 engine in the GT).

Driver's Side linkage pivot point is bolted to the transmission case
Clutch Return Spring is 4 1/2" long (connects around the reverse switch bracket)



Drain Pan

Remove to drain gear oil.
Ball/Spring pops out of Passenger side.



Speedometer Gear: Early Model (details above)

Located on passenger side of transmission
Speedometer Gear is plastic, and brown in color
(Note: Metal gear housing is held in with a metal pin.)

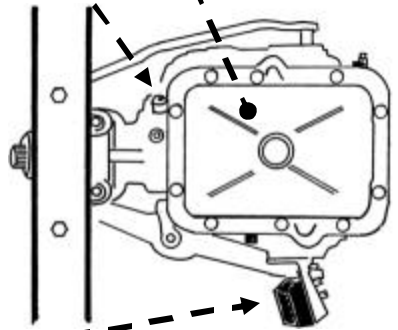
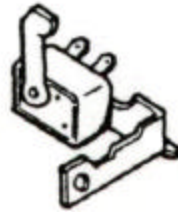
To remove, use a flat screwdriver blade to lever the head of that pin slowly straight away from casing, as the fragile head snaps off when twisted. Once the body is exposed, use smooth pliers to pull the rest of the body out. If stuck, use penetrating oil like WD40).

Speedometer cable attaches to gear via a metal "angle drive," which has a short internal cable piece (that can break).
The angle drive end can also loosen, causing the speedometer needle to "jump" up and down at speed on the road.

Replace inner seal & outer o-ring, when cable or "angle drive" leaks gear oil.

Reverse Switch

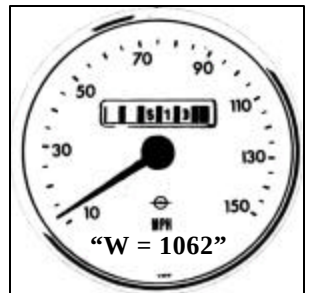
(Mounts on bracket, on driver's side of casing)



Opel GT 4-Speed Transmission: "Later" Style 1971-1973:

Speedometer face on 1971-1973 GT's reads W=1062 calibration
(Note: The "W=1062" calibrated speedometer was also originally installed on all 1968-1973 GT's with automatic transmissions, and adapts for the 5-speed GETRAG)

Driver's side linkage pivot point is part of the transmission case
Clutch Return Spring is 10 1/2" long (from clutch arm, to hole in trans mount bracket)



Speedometer Gear: Late Model

Located on Driver's Side of Transmission
Speedometer Gear is Plastic, blue in color

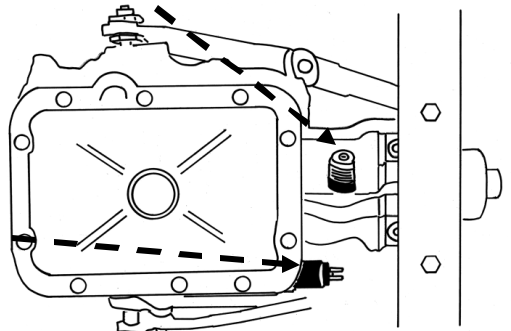
Metal gear housing is retained by a Shim held with a 10mm bolt.

Cable attaches to end of gear.



Reverse Switch

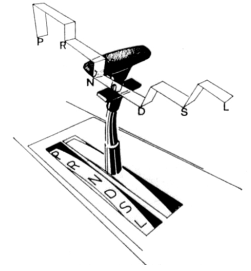
Screws into the rear of the transmission
Replace if gear oil leaks from switch.
(Use a 22mm wrench to remove this switch, to easily drain gear oil out of transmission)



Converting GT to Automatic Transmission

Most common reasons for converting to an automatic, are for stop-and-go city driving, or for operation by a family member (who doesn't want a clutch).

But the GT automatic transmission is bulky, heavy, and difficult to install without a lift. It produces a slower vehicle with less acceleration, runs coolant 10 to 20 degrees hotter, and some replacement parts (like a flex plate with undamaged teeth) can be pricey when you find them in good condition. Known problems are fluid leaks, and inability to shift out of 1st gear (caused by disconnection of vacuum line from the intake manifold fitting to the vacuum modulator).



List of Parts needed:

Automatic Transmission from an Opel GT (GM Turbo-Hydromatic 180)

Note: GT is unique, as it has linkage on the passenger side

(Other Opel automatic transmissions, have linkage on the driver's side)

Automatic Transmission Drive Shaft and Thrust Spring (short GT length)

Automatic Transmission Rubber Mount and 2x (13mm head) nuts

Automatic Transmission Mount Bracket (shorter than the 4 speed)

Automatic Transmission Flex Plate (with all teeth intact and undamaged)

Flex Plate Bolts 3x 15mm (to the Torque Converter)

Automatic Transmission Shifter with Neutral Safety switch and linkage

Automatic Transmission Interior Plastic Shifter Console with PRND21 Plate

Automatic Transmission Metal Hoses for fluid (from the transmission)

Automatic Transmission Rubber Flex Hoses for fluid (to the radiator)

Automatic Transmission Radiator for a GT (has trans cooler ports at bottom)

Metal hose, from vacuum modulator to intake manifold vacuum fitting

Rubber connector hoses, for long metal vacuum hose

Intake Manifold port fitting, with extra vacuum outlet, for A/T vacuum hose

Detent Cable (a.k.a "kickdown" cable)

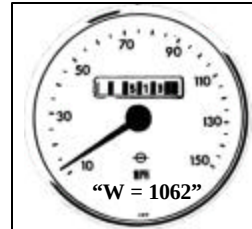
Detent Cable bracket on engine cross-member (near accelerator pedal)

Automatic Transmission Brake Pedal (wider than 4 speed pedal) and cover

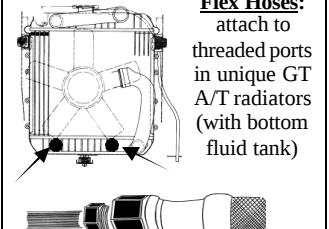
Pedal Bolt (shorter than 4 speed bolt)

Automatic Transmission Wire Harness (from neutral safety switch to starter)

Automatic Transmission Throttle Linkage (has external spring near pedal)



Speedometer: All GT's with an Auto Trans, use W=1062 calibration

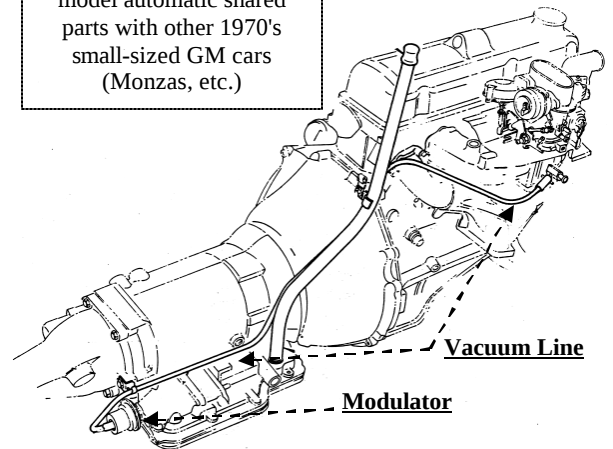


Flex Hoses: attach to threaded ports in unique GT A/T radiators (with bottom fluid tank)

Separation: Loosen where metal hoses meet rubber flex hoses

Many internal replacement components are available, because the Opel "TH180" model automatic shared parts with other 1970's small-sized GM cars (Monzas, etc.)

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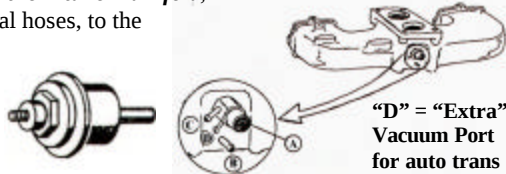


Vacuum Circuit:

Shifting out of first gear, requires a connected and operating vacuum circuit.

It starts with an **extra port off the intake manifold**, connects with rubber and metal hoses, to the **vacuum modulator** at the rear of the transmission.

You must fix all sources of (common) Opel vacuum leaks, for "crisp" shifting.

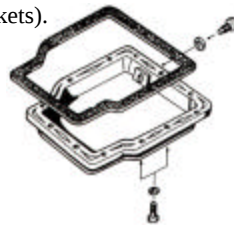


Important: Fluid Retention Areas:

Opel Auto Transmission Fluid leaks are common, but if they are not dealt with, not only cause poor drivability (sluggish shifting, slipping out of gears) but can cause total failure (if transmission gets too hot). It's easiest to replace all seals, when the transmission is out of the car.

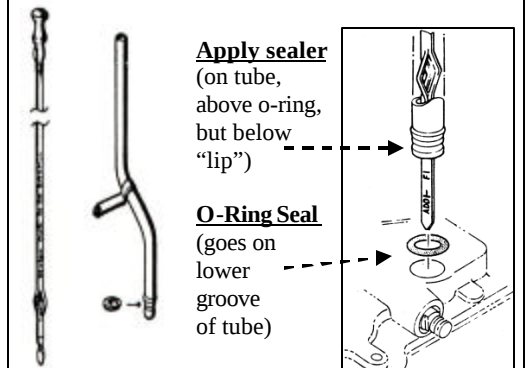
Pan Gasket (install with a new filter):

Overtorqued bolts deform metal around holes (which cuts gaskets). Flatten flanges with soft hammer on a wood board. Install gasket dry, and use tacky sealer sparingly (if needed)



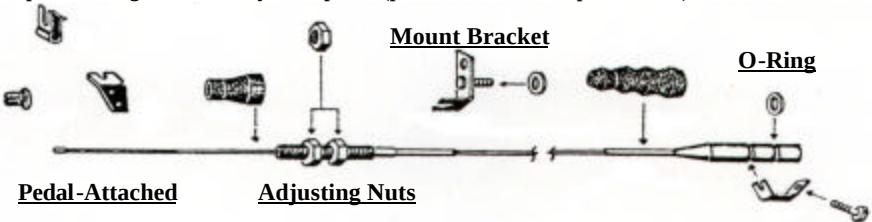
Dipstick Tube Seal:

A critical transmission fluid leakage location, is where the dipstick tube enters the transmission case. This is best fixed when the trans and engine are out of the car. Install a new o-ring seal and apply a thin ring of RTV/Silicone gasket sealer above the o-ring on the dipstick tube. Bolt the tube to the engine, and let cure 24 hours. Lift engine and transmission as an attached unit, into GT.



Detent "Kickdown" Cable:

Handle carefully: Brittle plastic housing cracks (causing continual). Replace cable, replace o-ring seal, and adjust to pedal (per service manual procedures) when needed.



OMC Blitz Reprint: Cylinder Head R&R

The original February 1998 OMC Blitz article on this subject, is described as having been received without attribution, although it reads very similar to one credited to Charles G. on the OANA web site. Because many Opel owners perform these procedures (when they swap cylinder heads, or reinstall theirs after servicing or installing larger valves), this subject is re-introduced here. Although the 1998 article was well-written, it's recapped here to revisit some of the steps (which could get you into trouble if you followed them verbatim), and to revise, reformat, or simplify others. Many new illustrations are also added. This is in support of the goal of the original article, which was to "avoid simple mistakes and time-consuming wild goose chases." Please read all the instructions, and take note of which approach(es) you will take to this procedure, prior to beginning work.

Recommended Tool List:

8mm and 12mm "Serrated" 12-point Bits (Required)

(Note: You may also want a second shorter 12mm bit, — cut to 2 1/2" long, to reach the harder-to-access passenger side head rear bolt on a GT)

Spark Plug socket

10mm, 11mm, 13mm, 15mm, 19mm Wrenches

"Special" short-handled 13mm wrench (recommended for carburetor nuts)

"Special" curved "obstruction" 15mm wrench (recommended for manifold bolts)

"Allen Head" 6mm socket-bit or wrench (if it's a 12-bolt cylinder head style)

10mm, 11mm, 13mm, 15mm, 19mm, 27mm or 1 1/16", (3/8" drive) sockets

13mm, 15mm (3/8" drive) deep sockets

13mm (1/2" drive) socket

3" Extension (3/8" drive)

3/8" drive Socket Wrench

1/2" Torque Wrench (1/2" breaker bar is also useful)

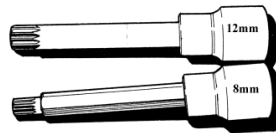
Gasket Scraper(s) (or Sharp-tip exacto-knives)

Screwdrivers: Flat Tip & Phillips: Various sizes

Hard Rubber Mallet/Hammer



Opel Head Bolt Tops:
"Serrated" (NOT Torx!)



(Special Bits Required)

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Required Supplies:

Oil: 4 Quarts of SAE 30W or 20/50W viscosity

Oil Treatment with ZDDP additive (helps protect camshaft lobes and lifters)

Coolant: 1 Quart (standard type 50% anti-freeze solution)

Gasket Set: Opel Head Gasket Set (identify, if 10-bolt or 12-bolt type is needed)

Carb Gasket(s): Thick main gasket (recommended) & thin heat shield gasket (if installed)

Sealers: Permatex "High-Tack," Silicone/RTV (Optional: Copper-Coat)

"Threadlocker" Lock-Tite Bolt: One tube, medium strength "blue"

Cleaner(s): Pint of Acetone or Lacquer-Thinner. Brake Cleaner Spray also helps.

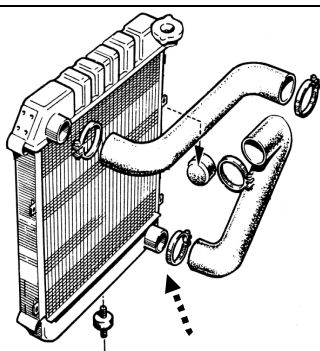
General Garage Supplies: Hand Cleaner, Lots of Rags

(Optional: Tune Up Parts: Points, Plugs, Cap, Rotor, Ignition Wire Set, Oil Filter)

(Check or Replace: Thermostat, Hoses, Hose Clamps, Belt(s), Vacuum Lines)

- (1) First thing that should be done is clean the engine and around the head. This makes for an easier job and helps keep you from getting loose dirt and other debris in the engine. SOS pads clean the inner fenders well.

- (2) Disconnect the battery. Set the parking brake, and block the wheels.

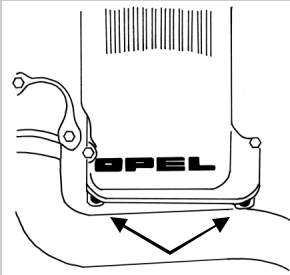


- (3) Drain the radiator. (Most often, this is done by removing the lower radiator hose, and catching the fluid in a wide, low drain pan. Some rebuilt radiators have had a "petcock valve" added for convenience).

Although the Opel factory service manual (and the original version of this article) tell you to also drain the engine block (by removing the small 10mm square-head threaded plug, located above the oil sending unit on the block), this isn't a good idea (typically over 30 years of corrosion on threads of this plug have seized it in place).

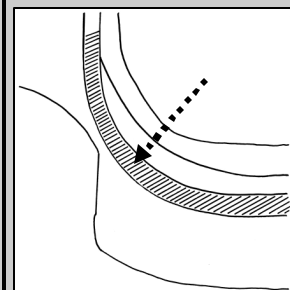
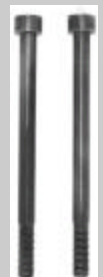
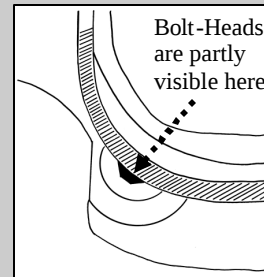
- (4) Drain the Oil, at the drain plug (Changing the oil after completing this procedure is highly recommended, contamination by dirt or coolant, is almost inevitable).

Do you have a **10-bolt (early)** or a **12-bolt (late)** style cylinder head??
(You need to identify this, to order & install a matching style of head gasket)



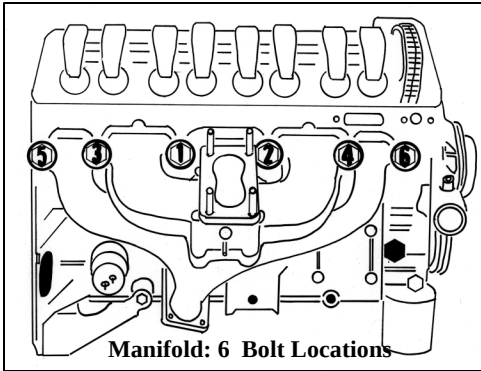
Later Model Opel CIH engines (after 1972)
had an extra pair of head bolts.

These can be seen at the front upper edge of the head. (They have 6mm allen-heads, are about 4 5/8" long, and bolt to 2 threaded holes on the top of late-style timing covers).



Inspect Your Engine Top, to Compare:
Earlier 10-bolt style Opel cylinder heads (1968-1972), do not have these 2 bolts.

- (5) Remove the Air Cleaner. Also "move out of the way" the heater hoses, vacuum lines, fuel hose, throttle linkage or cable, and the electrical leads for the thermostat, oil sending unit, and the spark plug wires and spark plugs themselves.
- (6) Set the Engine to #4 TDC. (Perform instructions, in box at right)
- (6a) (Another tactic to find #4TDC, is placing a screwdriver into the #4 cylinder spark plug hole and turning the engine until you feel the piston rise to TDC, including rotating the engine back and forth a bit to find exact middle of the piston's upper travel).



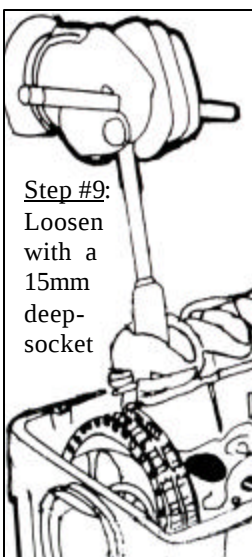
(7) Remove the Intake/Exhaust manifold. You can either just unbolt the manifold from the cylinder head (if the carb was mounted recently), or remove the carburetor from the intake manifold first (for easier access to the manifold bolts). You don't have to separate the manifolds from each other, and you don't have to unbolt it at the exhaust head pipe

(which usually just breaks the bottom bolts anyways). You should however place blocks or some other supporting devices under the exhaust system, then remove each of the "donuts" that connect the exhaust to the underbody of the car, before pulling the manifolds. You can just pull the manifold assembly off the 2 locating pins on the side of the cylinder head and set it aside on the inner passenger fender (or, hang and steady it with a coat hanger, off the underhood latch).

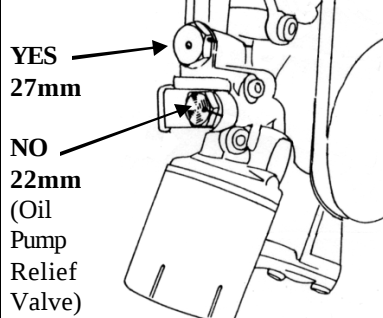
- (8) Remove the Valve Cover (you may have to lift the hood latch to twist the back end over the top side of the cylinder head).
- (9) If head is to be serviced or replaced, use a 15mm deep socket to loosen rocker nuts until the rocker arm becomes loose (and no longer touches the top of the valve, and you can easily move it with your hand side-to-side). The number of turns this takes can vary with the position of each individual camshaft lobe, but on a head I measured it required 6 full 360-degree counterclockwise turns on the 15mm rocker nut to do this.

Exception to #9:

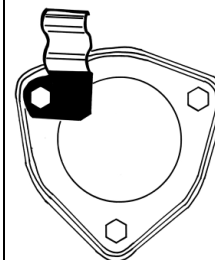
If you plan to reinstall the same head, then you can leave the valve settings where they are — (if you are careful to sit the head down ONLY on its side, during and after the removal process), to avoid damaging the exposed edges of the open valves on the underside of the head.



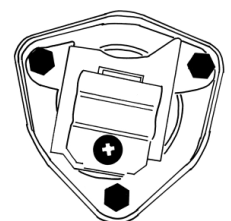
- (10) Loosen timing chain tensioner (until almost removed, about 12 full 360-degree turns); this is the large 1 1/16" or 27mm bolt-head, located above the oil filter.



- (11) Remove the triangular-shaped front camshaft cover plate and the fuel-line holding bracket located there.

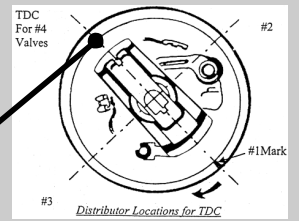


Below Right:
1973-1974 Style
(hardware here connects to upper radiator hose)

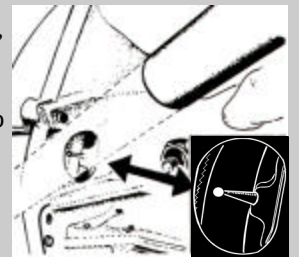


Setting an Opel CIH Engine to #4 TDC

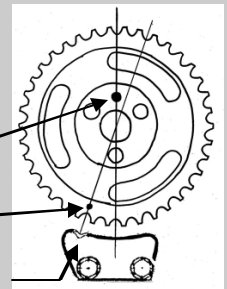
- (1) Rotate Engine (with all 4 spark plugs removed and with the transmission in Neutral gear), use a 19mm wrench to turn the crank pulley bolt Clockwise, until the distributor rotor points at **#4 TDC location** (opposite #1 mark)



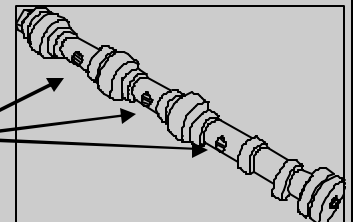
- (2) To verify accuracy, turn crank until the small flywheel "ball marker" lines up with a "indicator pin" in the window (at rear passenger side of the engine block).



- (3) At true #4 TDC (when installed correctly), the "index mark" on the camshaft upper sprocket gear should be at the top vertical "12 o'clock" position, and the "outer gear marker" should line up with the "notch" in the bottom plate. (You would have to remove the valve cover, and/or the front triangular camshaft cover, to see this).



- (4) Rotation to #4 TDC marks, is necessary because "grooves" that are located only in that camshaft position, allow access to 3 of the recessed head bolts.



(12) Carefully unscrew the (11mm head) nylon camshaft spacer "bolt" from camshaft front.

(13) Stuff a rag in below the camshaft sprocket (this is to prevent the loosened 8mm cam sprocket bolts from dropping into the engine). Use a small dot of white paint, or consider scratching a small "x" mark, to note the relative position of the timing chain to the camshaft sprocket gear (for accurate reassembly, if needed). Then, use a couple wire-ties to secure the chain to the sprocket.

(14) Remove the three 8mm camshaft sprocket bolts. (Make sure you clean the middle of each of these bolts, then firmly seat the tip of the special 8mm "serrated" bit, before you begin to unbolt them. These are vulnerable to stripping, and if they begin to stick in place, you may have to simultaneously use both a vice-grip on the bolt exterior at the same time as you turn the interior bit tool, to get these bolts to turn).

(15) Remove the rag (mentioned in step #13).

(16) Use rubber-faced mallet/hammer, to lightly tap the back of the cam sprocket, until it releases from the camshaft. Set this sprocket with chain a bit forward, on the metal support bracket.

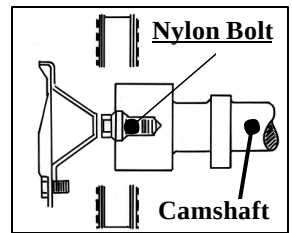
(17) Use the 12mm serrated bit tool and follow the sequence in the diagram, loosen the head bolts free. Make sure that the notches in the camshaft are perpendicular (which requires the cam at #4 TDC position), so you can fully remove all the driver's side bolts. Clean inside the tops of the individual bolts thoroughly, before inserting the bit, to assure an aligned and correct fit into the top of the head bolts. (You do not want to risk stripping these, as that requires drilling off the bolt top to remove). Also, make sure that you have enough clearance, to reach the 2 rear bolts with the serrated bit tool—if the wrench is jammed at the firewall, you may need to acquire either a shorter socket, a 1/2" breaker bar, or a second 12mm serrated bit (to be cut shorter with a dremel tool, to about 2 1/2" to fit, especially on the hard-to-reach passenger-side rear head bolt)

(18) If you have a 1972 or later cylinder head, use a 6mm allen-head bit or wrench, to remove the front 2 vertical bolts to the timing chain cover.

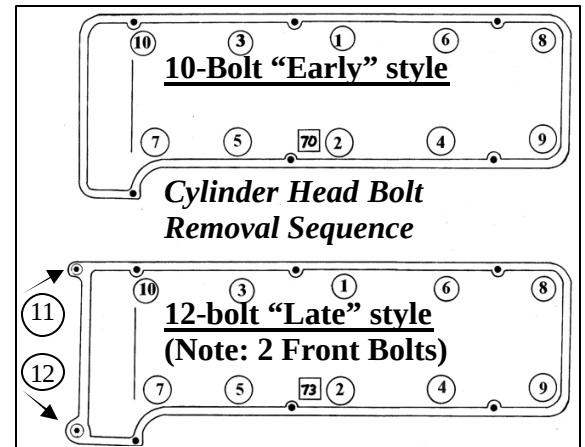
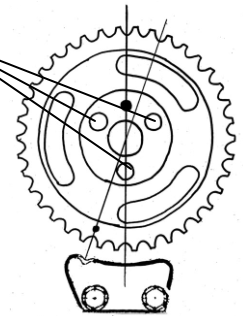
(19) Once all the bolts have been loosened, start to remove them. When doing this, keep track of which bolt came from which hole. (Once they are off the engine, degrease them with solvent, and clean out the threads with a wire brush or wire wheel, and then re-tap bolt threads by running them through a die tool).

(20) Prepare to remove the head. Most of the time, you need to use leverage to pry the head from the block. Use the factory casts for this: Place a flat-head screwdriver on the metal bar on top of the block (below the #4 spark plug hole), & lever a tang (about 1" right) extending from underside of the cylinder head. (There are other places you can pry from as well; but do not pry at a surface which extends into a cylinder such as at a spark-plug hole as that could cause internal damage. Never pry directly where the underside of the head meets the top side of the engine block, as marks left there could cause continual external oil leaks).

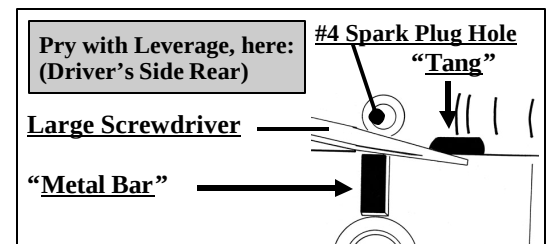
(21) When removing the head, prepare yourself for a challenging heavy (70lb.) lift with your arms outstretched. If you're not sure you can do it yourself, ask a friend to help, and place a thick wood board covered with a layer of soft towels as protective material in the under-hood area. (This can serve as a temporary "resting place"). Recommended are hand gloves for protection, thick style (but not so thick that you can lose a tight grip).
Lift the front: Grasp the head at the front camshaft access hole and pull it up, clear over top of the timing chain;
then Lift the Rear: Grasp under a rear rocker arm carefully (so it doesn't slip). Then dead-lift the head up & out. Try to pull the head either to the "temporary resting place", or if you have the strength then lift it clear of the car, and set on its side (avoid setting the bottom side down, to protect valves). Place the head on a surface with absorbent papers (to catch any dripping oil). Congratulations — Your Head is Now Ready to Prep to Reinstall.



Above:
Head of 8mm
Serrated Bolt
Right:
Camshaft
Sprocket at
#4TDC setting

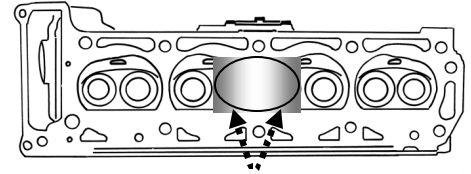


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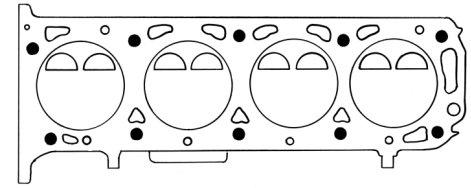
Part Preparation for Re-Installation:

- (22) Inspect the head for visible cracks. The critical area is indicated at right; cracks occur from the area around #2 & #3 cylinder exhaust valve seats. Have a machine shop magnaflux your head, if there is any question. Also inspect the cylinders for unusual wear patterns (pistons significantly off-center, ridges on cylinder tops, broken piston rings, etc.). Don't continue to the next steps, unless head & engine are known to be OK.



Inspect Head Underside for Cracks

- (23) Use gasket scraper(s) and cleaner to remove all traces of gasket, carbon & grease from the lower surface of the cylinder head. Clean the upper surface of the engine block. If you are using the "thick" edge blade type of gasket scraper, use that for initial scraping, and finish with a razor-blade type edge (a sharp-tipped exact-o knife also works well). On Engine Block, use paper towels and q-tips, to wick bolt holes of all oil. If you have a thread tap, go ahead and re-tap the head bolt holes. You can use a shop-vacuum to remove surface oil & other contaminants. If the coolant level is so high it almost reaches the top, you can also wick it down a bit with paper towels. Follow with a wipe from a rag moistened with some acetone or brake cleaner spray (use only in a open, well-ventilated area, with no flames or heat sources nearby). The goal is to have the top surface of the engine block clean & dry.

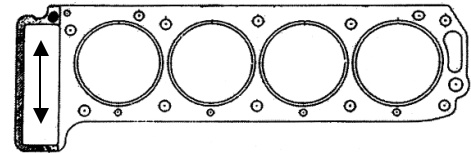


Block Top: Clean Thoroughly

- (24) Use gasket scraper(s) and cleaner, on the top front of the timing cover, until it is also clean and dry. Remove and discard coolant "o-ring" here.

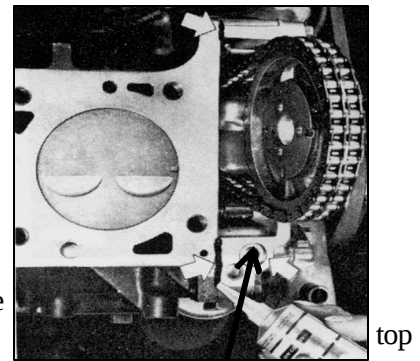
- (25) Prep Head Bolts. You can soak them in a container filled with a liquid solvent, wire-wheel them, or spray with carburetor cleaner and wipe dry. To assure accurate torque measurements, you can also clean the threads with a wire brush or wheel, and cut threads with a die tool.

- (26) Prep Head Gasket: Gently lay it on the block, and inspect how well it sits at the junction where the timing chain cover meets the block (especially if you have a 10-bolt type head gasket). It's a good idea to use a razor blade or exacto-knife to trim just a thin "sliver" of the top of the vertical timing cover gaskets, where they protrude on the block, to allow the head gasket to seal better (at the timing chain cover top junction, where oil often leaks from).

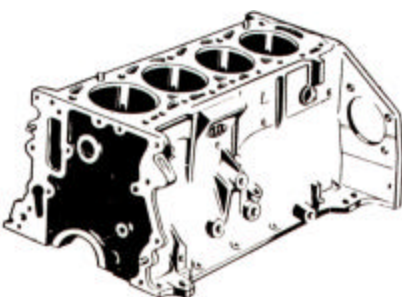


Head Gasket: Make sure underside of Front Gasket area sits flat (where underside contacts upper surface of the timing cover) As shown below, add sealer here too

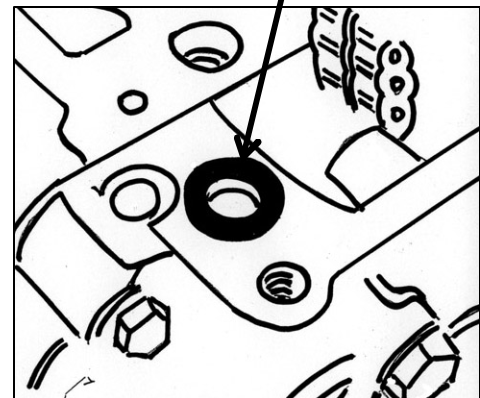
- (26a) (If you choose to use copper-coat spray (optional, generally not required) on the head gasket, mask off the front timing cover part of the gasket and use a coat hanger or wire to hold the gasket while it is being sprayed or while it dries a few minutes to a "tacky" state, prior to installation). Contrary to advice offered in various places, you should not use any other material or sealer on the engine block, when installing a new head gasket.
- (27) Prep Gasket Surfaces: Place thin line of RTV/Silicone sealer, at the junctions where the top of the timing chain cover meets the engine block (as shown by white arrows in image at right). Use a minimum amount of RTV, as excessive sealer can migrate and block narrow engine oil passages. Brush the rest of the of the timing chain cover with Permatex "High-Tack" sealer.



- (28) **IMPORTANT:** Place rubber "o-ring" in depression on top of timing chain cover (if you don't do this, coolant will leak out, and you'll have to repeat this entire process, again). Do NOT add sealer to the o-ring!

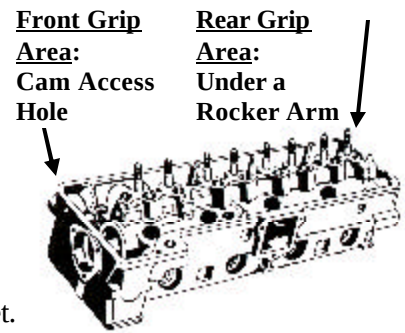


- (29) Place Head Gasket on top of block. Line up and slightly depress the gasket on the 2 "dowell" or guide pins on the top of the block. Also make sure all other holes in gasket are properly aligned to the block.

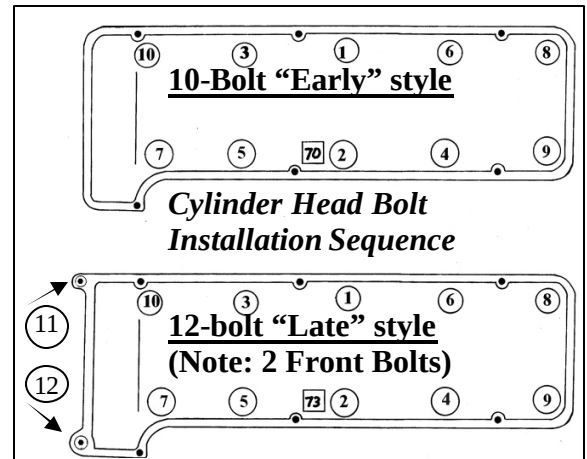


Cylinder Head Re-Installation:

- (30) Rotate camshaft in the cylinder head, until the slots in the cam are aligned near where the head bolts are installed (about #4 TDC setting). If this is hard to do, you can screw in the sprocket mounting bolts, then use a screwdriver.
- (31) Carefully lift and place cylinder head onto block. Good places to grab, are at the front camshaft access hole and under a rocker arm towards the rear. Think ahead and plan how you'll do this. You'll have to carry the weight yet maneuver the front of the head around the top of the timing chain, which might require some nimble finger-work when you are setting it in place. Ask a friend to help, to share this load. Take care not to damage the head gasket. It's on right, when all the exterior edges of the head line up with the block, and the head "plops" down on the 2 passenger side dowel pins.

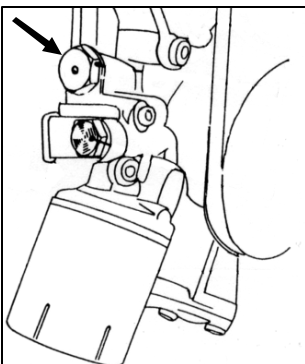


- (32) Prepare cylinder head bolts. Spray engine bolt threads with WD40, or apply a light coating of clean 10/30W engine oil. Don't dip them in oil, as excessive liquid affects accuracy of torque measurements you get, (and if you overtorque the bolts, it may attach the head unevenly or overstress bolts).
- (33) Insert the head bolts one at a time, in the numerical order and locations that are shown in the diagram at right.
- (33a) (If you have a 1972 or later cylinder head, don't forget to install the front 2 vertical bolts to the timing cover afterwards).
- (34) Use the special "serrated" 12-point bit tool to finger-tighten each bolt, in the same sequence as in the diagram.
- (34a) (If you have a 1972 or later cylinder head, use a 6mm allen head wrench, to torque the front 2 vertical bolts to 17 ft. lbs.)

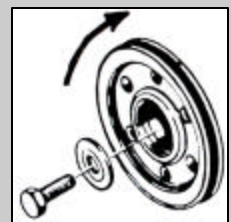


(35) Torque each "serrated" head bolt in sequence to about 20 ft. lbs. with a torque wrench, then torque each bolt in sequence to about 40 ft. lbs., then torque each bolt in sequence to about 60 ft. lbs., then in sequence to a final 72 ft. lbs, using the sequence shown in the diagram (which helps the head compress the head gasket evenly & firmly).

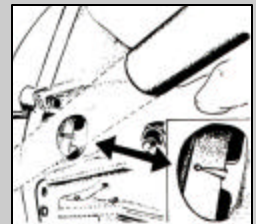
- (36) Again verify the engine is at #4TDC, by checking where the flywheel ball lines up with the pointer on the passenger side rear of the engine block. If not, rotate with a 19mm wrench on the crankshaft bolt, until the ball lines up with the pointer.
- (37) Place camshaft sprocket gear to camshaft, using the dowel pin to assure its aligned. Then place a rag below the camshaft sprocket gear (so loose bolts won't drop into the engine).
- (38) Use a bit of spray cleaner to clean out the holes in the camshaft, then clean and add a touch of anti-seize/thread-locker to the threads of each of the 3 bolts, and start threading them onto the camshaft. Tighten them a little at a time, so the gear tightens flat onto the camshaft. Final torque spec is to 18 ft. lbs.
- (39) Tighten tensioner bolt (large 1 1/16" or 27 mm head, on lower timing chain cover; see diagram at left) fully into the side of the timing cover.



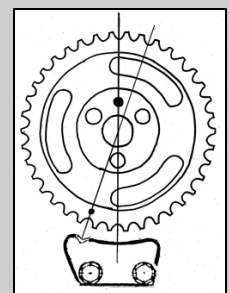
- (40) Verify timing mark on camshaft sprocket is at #4 TDC, and also verify that the timing mark at the flywheel is also at #4TDC. This is a critical step. If the marks are not lined up correctly, redo the process to make sure they are. (The mark added in an earlier step, should help you make sure the chain did not slip). If you are installing a new chain for the first time, then you have to check the various timing marks to make sure you get this right.



Resetting to,
and Verifying #4TDC



Ball Mark on Flywheel



Cam Sprocket Index Mark

Distributor, Manifold (and other part) Re-Installations :

- (41) Rotate the 19mm crankshaft bolt (#degrees) until the engine is at #1 TDC setting.
- (42) If the distributor was moved or removed, reinstall it now, with the rotor facing the #1TDC distributor mark. (instructions for doing this, are in the June 2006 OMC Blitz, or online — look under: “Tech Tip” “Engine Tune Up” for that June 2006 date). Accurate timing is important for restarting the engine.
- (43) Carefully install the front nylon camshaft spacer "bolt". Caution: Do not overtighten this bolt -- it damages easily. Add the triangular-shaped front cover, and bolt the 3 cover bolts in place (add the fuel line bracket too). Then use a feeler gauge, to correct installation of the nylon bolt, to a .004"-.008" gap. If this measurement is out of range, you may need to remove and adjust the triangular shaped front cover to achieve this gap (it limits camshaft movement).
- (44) Assemble the intake/exhaust manifold assembly onto the 2 pins on the side of the cylinder head. Clean 9mm threads of these bolts, then start the 4 interior bolts. Note that the thin washers are on the 2 outside bolts, where the exhaust manifolds are held exclusively.
You may need to lean a bit on the engine to tilt it, to get these bolts lined up to start in the holes. Torque these 6 bolts in the sequence shown.
- (45) If rocker nuts were loosened in step #9, or if valves were serviced, Perform a valve adjustment. (Instructions are in the OMC Blitz issue of June 2006; And are also available free online in the “tech tips” section of www.opelclub.com). This adjustment procedure will require use of a 15mm deep-socket on the rocker nuts, and engine rotation using a 19mm wrench.
- (46) Install Valve Cover gasket. It's a good idea to use gasket sealer to seal the lower surface, while sealing the upper surface is optional (makes it easier to remove in future if top isn't sealed). Permatex Ultra-Blue or Ultra-Black works good here. Feel around the back of the head, to make sure this gasket is in correct location.
- (47) Attach all exterior engine-mounted components: Wires, hoses, spark plugs, air cleaner, etc. Then reconnect all electrical wires. If you use a Weber air filter, make sure all bolts are snug, or use blue loc-tite so they won't not shake loose.
- (48) Refill engine oil. Refill radiator with coolant fluid.
- (49) Reattach battery
- (50) Restart car and Monitor engine performance.

(If you installed a new camshaft and lifters, use break-in lubricant, and perform important “break in” procedure — this requires running engine continuously at 2000-2500rpm's, for no less than 15 uninterrupted minutes).

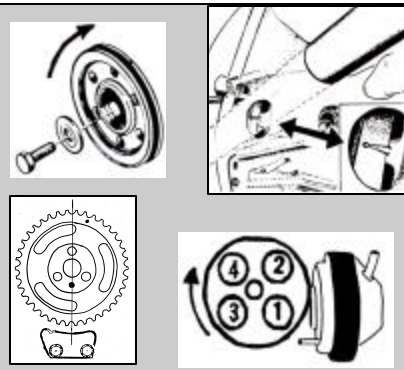
If you performed quality work and used a modern head gasket (such as the “printseal” design), there should be no need to re-torque cylinder head bolts.

- (51) If re-machined components were installed in head or engine, it's a good idea to change the oil and filter within 100-500 miles of initial start-up.

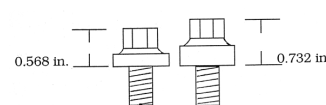
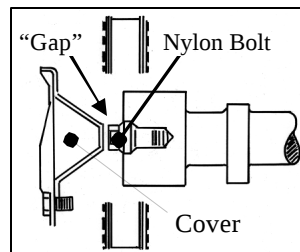
Verifying #1TDC:

Rotate 19mm Crank Pulley Bolt, Until:

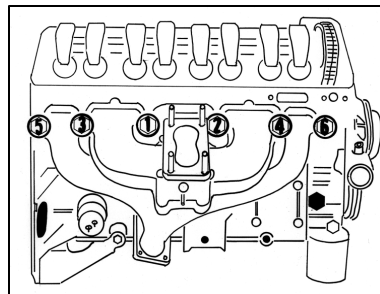
- (1) Flywheel Ball is at Pointer Mark
- (2) Distributor Rotor Points at #1 Mark
- (3) Camshaft Mark is at “6 O'Clock”



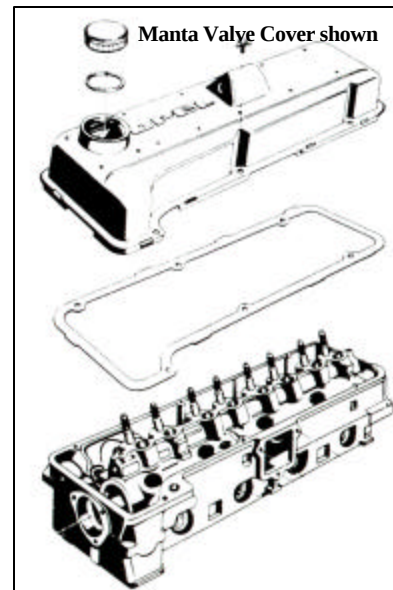
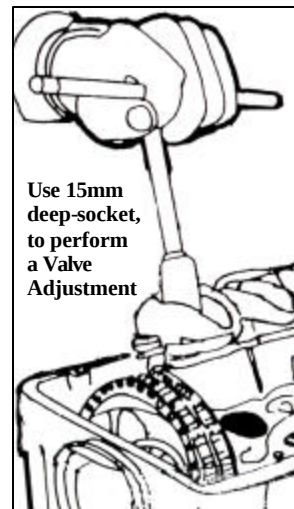
The “Nylon Bolt” in the camshaft is designed to limit front-to-back travel. It is not to be torqued, but a “gap” between the inside of the cam cover plate, is adjusted with a feeler gauge.



Above: Two bolt lengths: “Early” 10-bolt style is short “Later” 12-bolt style longer



Manifold Assembly bolt torque sequence



OMC Article Reprint: Engine Assembly (August 1989 Blitz)

There are specific and important steps involved, when reassembling freshly re-machined parts into an Opel block. To complete an engine rebuild correctly, they're elaborated here, with portions of OMC's 1989 tips restated and illustrated here too. Different points of view were compiled below, so consult all (and all your service manuals, too), before starting these procedures.

Assembling Crank to Block

When installing new main bearings into a spotlessly clean block, your hands should be clean, you should have a clean lint-free rag handy, and your block, main bearing caps, and main bearing bolts should be ready to go. The crankshaft should be fully clean (including using q-tips to wipe grit from all oil passages). Note that bearings are installed with their outer surfaces DRY (not lubricated). Carefully wipe the main bearing bore for the #1 main bearing, wipe the back of the bearing shell, and slide the bearing into place. Watch carefully for bits of dirt or lint since they will interfere with proper bearing seating. Repeat the wiping and installation procedure for each bearing in the block, and for each cap, noting that #5 main bearing is a different bearing than mains #1 through #4. Clean all dust and lint from the face of all bearings, carefully clean all journals on the crank, and gently lay the crank into the bearings.

Plastigage

Check the main bearing clearances with Plastigage. Lay a small strip of Plastigage on each main journal, then install each main bearing cap. **DO NOT ROTATE THE CRANK WHILE YOU HAVE PLASTIGAGE IN PLACE OR YOU WILL SMEAR IT.**

Note that the proper position for any split bearing is "tang to tang". The tang is the little bump on one end of each bearing shell which positions the bearing in its bore. The tangs for each bearing should be on the same side.

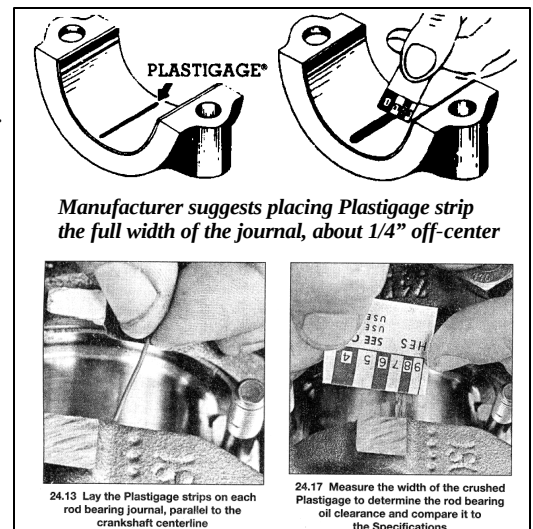
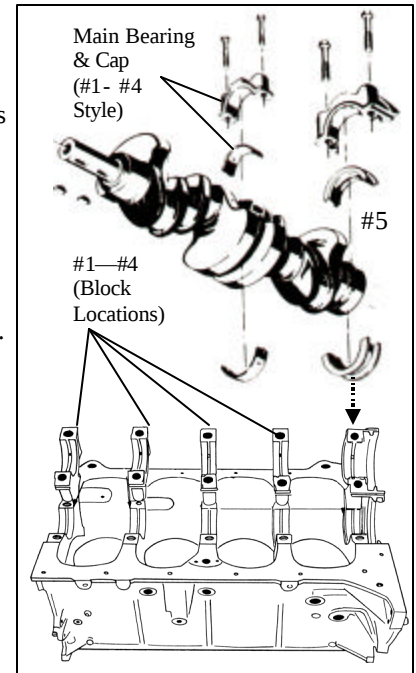
Torque each bearing cap to specified torque, in steps of 25, 50, then to maximum of 72 ft. lbs. (in most cases). Also be sure to work from the center-out in torquing bolts, just as if you were torquing a cylinder head.

Once all bolts are properly tightened, remove them all, then remove all bearing caps. Using the Plastigage wrapper, check clearance on each main bearing. Clearance (measured at it's widest) should be between .0015" and .003"

See illustrations right, for procedures to install and interpret readings of Plastigage.

Assuming all main bearings clearances are OK, use some carburetor cleaner spray to remove the Plastigage. Spread engine assembly lube (molybdenum or equivalent) on INSIDE surface of each main bearing (upper and lower). Leave the outside edge of the bearings dry!

The next step is important—spread the same lube on the inner lip of the rear main seal, then spread sealer on the outside diameter of the seal. **CAREFULLY** slip the seal over the rear of the crank, and lower the crank back into the bearings. Be very careful to align the rear main seal so it slides all the way into the block. Replace all main caps in their proper positions (remember, tang to tang on the bearings). Torque all main cap bolts to specs, again using the 3-step process, and moving from middle to ends during the process. After all mains are torqued, make sure you can spin the crank over by hand. If you can't, there is a problem which needs attention.

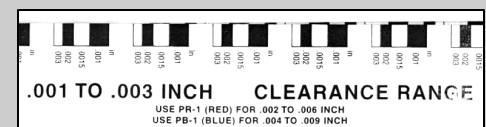


Reference: What is Plastigage?

What is Plastigage? Sources say it's "a very thin wire-like piece of special extruded plastic thread...with accurately controlled crush properties... which provides a fast and accurate way to check bearing clearances." What follows, is a compilation of notes on this product, used for an important engine assembly procedure.

Although it's trademarked now by the Dana Corporation, it's offered in different thicknesses, and can be found in most quality auto part stores (packaged by brands like Federal Mogul, Sealed Power, Powerbuilt, etc.)

While this is a critical measurement, required to be done (sometimes more than once) before you perform a final assembly of your engine, the good news is that this procedure is not unique to Opel engines -- so instruction on procedures for the application of Plastigage is much the same as on more common engines (like Chevy, Ford, etc). A more specific procedure was described in the August 1989 issue of the OMC Blitz (and is excerpted here too).



Above : Sample Plastigage Measuring Strip
(caution: this is not shown to scale)

Plastigage Usage Instructions (Continued)

The Plastigage package procedures state: Remove the bearing cap and wipe the oil from the bearing insert and crankshaft journal. (Note: When checking main bearing clearances with the engine in a position where the main bearing caps are supporting the weight of the crankshaft and the flywheel — ie engine is in the car - an erroneous reading due to weight of the crankshaft & flywheel can be eliminated by supporting the crankshaft weight by means of a jack under the counterweight adjoining the bearing being checked).

Cut or tear off a piece of Plastigage as long as the full bearing width, attempting not to squeeze the gage material. (Tear through both the envelope and plastic thread at the same time). Open the envelope lengthwise by cutting the edge with scissors, a knife or by tearing. With the envelope open, lift out the Plastigage by one end or roll out with the thumb if the material is lightly stuck to the paper. (If an attempt is made to lift the Plastigage from the paper when it is struck, it may break). Occasionally the color in the Plastigage material will transfer to the paper. This has no effect on the accuracy of the Plastigage.

Place a piece of Plastigage the full length of the bearing insert about 1/4" off center.

Rotate the crank about 30 degrees from the bottom dead center and reinstall the bearing cap. Tighten the bolts with a torque indicating wrench as recommended by the manufacturer.

Remove the bearing cap. The flattened Plastigage will be found adhering to either the bearing shell or the crankshaft.

Compare the width of the flattened Plastigage at its WIDEST point, with the scale of graduations on the envelope/wrapper. The number within the graduation on the envelope indicates the bearing clearance in thousandths of an inch or in millimeters depending on which side of the envelope is used. Compare your measurement to the clearance specification, if you are within range then you are ok to assemble. If the measurement falls between two sizes then you can estimate what the size in between is. TAPER is indicated when one end of the flattened Plastigage is wider than the other. Measure each end of the flattened Plastigage. The difference between the readings is the approximate amount of taper.

Clearance Specification Notes:

Make sure you're using the right range of plastigage for your application. Too much clearance means that your engine will probably be low on oil pressure (Opel Factory Spec's: Main Bearing Clearance .0009-.0025 inch*; Connecting Rod Bearing Clearance .0006-.0025 inch*), and that's not very much space. New bearings should be installed if bearing clearance is not within specifications.

Excessive taper of the bearing journals (Opel Factory Spec's: Maximum Taper of both Main Bearing & Connecting Rod Bearing Journals: .0004 inch*) indicates that a new or reground crankshaft is required. (*Reference: 1973 Opel Factory Service Manual)

Additional Bearing Installation Notes:

In the December 1989 OMC Blitz, Blaine S. added that main bearings can be modified, just after they have been measured with plastigauge (and have been verified to be within clearance specifications). At that point, Blaine noted, that the bearing shells that have been seated into place will have a slight mis-alignment between the oil galleries (holes) in the bearing shells and the holes in the bearing journals.

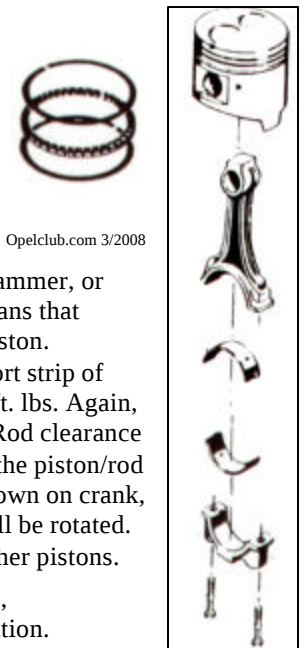
He suggested using a small 1/8" rat-tail file, to remove any bearing materials which blocked any part of an oil hole. He noted that the softer bearing material will cut easily (but not to cut the harder metal of the journal beneath it). Blaine recommended then removing the bearing shells and deburring them. Blaine also suggested checking rod bearings too, and although he noted their smaller bore holes are generally better aligned to the bearings, that they could be corrected (if needed) using the same general procedure.



Piston Installation

(Important: Pistons must be installed, before using plastigage to check your rod bearing clearances).

Double check the rings on each piston to insure that ring gaps are staggered from one side of the piston to the other, and that rod bearings are properly seated. Starting with number one piston, turn the cranks so it is at its lowest position (Bottom Dead Center). Dip the piston in clean motor oil, making sure that all rings are covered, and that the piston pin gets lubricated. Drain off excess oil, then place piston ring compressor over the rings, and carefully tighten the tool. Be careful when handling the ring compressor, since your hands will be slippery and the tool can easily cut you. Do NOT lube the rod bearing yet.



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Place piston into cylinder, making sure the notch in the piston top faces to the front. Use the handle of a hammer, or equivalent, to GENTLY tap the piston down into the cylinder. If you encounter resistance, it probably means that a ring had slipped out of the compressor—if you try to beat the piston in, you will break the ring and/or piston. Reposition the ring compressor on the piston and try again. Seat the rod on the crank journal, and lay a short strip of Plastigage in place. Install the rod cap (tang to tang), install bolts, and torque in place in three steps to 36 ft. lbs. Again, don't turn the crank, remove the rod bolts, and again check the width of the smashed piece of Plastigage. Rod clearance should be between (.0006" and .0025"). If OK, clean Plastigage from crank and bearing, and gently slide the piston/rod assembly up an inch or so in the cylinder. Lube the bearing halves in the rod and rod cap, push rod back down on crank, and reinstall rod cap. Reinstall bolts, and torque as described above. Check to make sure that crank can still be rotated. You will probably want to replace the front pulley bolt to make turning the crank easier. Repeat, for all other pistons.

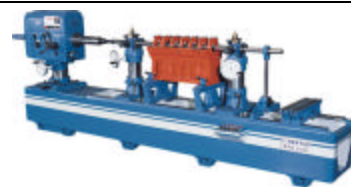
Note: Refer to prior instructions (in Sept/Oct 2007 OMC Blitz) on ensuring accurate torque measurements, by tapping out holes and using a die to cut bolt threads, and lightly lubricating bolt threads prior to installation.

Machining Specifications:

A critical step in rebuilding a 1.9 engine, is re-machining valve and bearing surfaces. Many service manuals didn't include all required specifications, so we've compiled some here too.

Note: Your rebuild results are only as good as your machinist's ability to adapt to real-world part availability realities. The information below, is best used as only approximate reference data from a selection of available materials (as indicated: Opel 1973 factory service manual, Buick tech bulletin, aftermarket manuals, part vendor catalogs, etc.). Depending on your engine part's wear, whether your replacement parts were reproduced to exact factory-designed specifications, accuracy of your machinist's tooling, and even the room temperature at the time of assembly, these measurements can vary. Therefore, none can be guaranteed for absolute accuracy.

Line-boring of engine heads and blocks, is best done by shops equipped with (expensive) precision cutting machines.



Camshaft Bearings: Early 3-Bearing Head

STD Housing Bores for "Early" 1968-1970 3-Bearing Cylinder Heads:

Opel Tech Bulletin Spec 2.07"

Opel Tech Bulletin Spec 2.06"

Opel Tech Bulletin Spec 2.05"

STD Camshaft Diameters:

#1 Journal Outer Diameter: 1.9266"-1.9272" (Haynes Manual)

#2 Journal Outer Diameter: 1.9167"-1.9173" (Haynes Manual)

#3 Journal Outer Diameter: 1.9069"-1.9075" (Haynes Manual)

Note: Semi-finished cam bearings require align-boring for installation

After pressing bearings in, STD diameter specifications for boring bearings are:

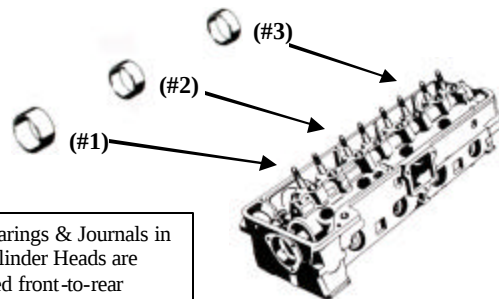
#1 Inner Bearing Bore Diameter: 1.930"-1.931" (Haynes Manual)

#2 Inner Bearing Bore Diameter: 1.920"-1.921" (Haynes Manual)

#3 Inner Bearing Bore Diameter: 1.910"-1.911" (Haynes Manual)

(Camshaft Bearing Clearance Specification: .001"-.003")

Note: Above dimensions apply only to standard sized cams & bearings. "Service" undersizes were sold by Opel.



Cam Bearings & Journals in Opel Cylinder Heads are numbered front-to-rear

Camshaft Bearings: "Delta Mark" Early 3-Bearing Head

STD Housing Bores for 1969 "Delta" Three-Bearing Cylinder Heads (Aftermarket Vendor Spec's):

Outer Diameter, Delta Head #1 Front Journal: : 2.1069" (Opel's bulletin said 2.09")

Outer Diameter, Delta Head #2 Center Journal: 2.097" (Opel's bulletin said 2.08")

Outer Diameter, Delta Head #3 Rear Journal: 2.0773" (Opel's bulletin said 2.07")

STD Camshaft Diameters:

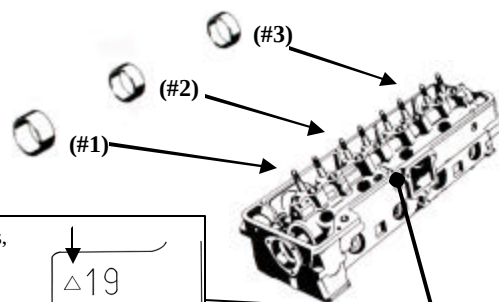
#1 Journal Outer Diameter: 1.9266"-1.9272" (Haynes Manual)

#2 Journal Outer Diameter: 1.9167"-1.9173" (Haynes Manual)

#3 Journal Outer Diameter: 1.9069"-1.9075" (Haynes Manual)

Note: Semi-finished cam bearings require align-boring for installation. Refer to STD bore diameter specs listed above.

Note: Above dimensions apply only to standard sized cams & bearings. "Service" undersizes were sold by Opel.



"Delta" 1969 3-bearing heads, are identified with triangle mark on driver's side (at left of the square side plate)

Camshaft Bearings: Later 4-Bearing Head

The later 4-bearing head, added a journal (located between the intake and exhaust valves of #3 cylinder).

STD Housing Bores for "Later" 1971-1975 Four-Bearing Cylinder Heads:

Outer Diameter of #1 Journal 2.1069" (Aftermarket Vendor Spec's):

Outer Diameter of #2 Journal: 2.097" (Aftermarket Vendor Spec's):

Outer Diameter of #3 Journal: 2.0872" (Aftermarket Vendor Spec's):

Outer Diameter of (Rear) #4 Journal is: 2.07735" (Aftermarket Vendor Spec's):

STD Camshaft Diameters:

#1 Journal Outer Diameter: 1.9266"-1.9272" (Haynes Manual)

#2 Journal Outer Diameter: 1.9167"-1.9173" (Haynes Manual)

#3 Journal Outer Diameter: 1.9118"-1.9124" (Haynes Manual)

#4 Journal Outer Diameter: 1.9069"-1.9075" (Haynes Manual)

Note: Semi-finished cam bearings require align-boring for installation

After pressing bearings in, STD diameter specifications for boring bearings are:

#1 Inner Bearing Bore Diameter: 1.930"-1.931" (Haynes Manual)

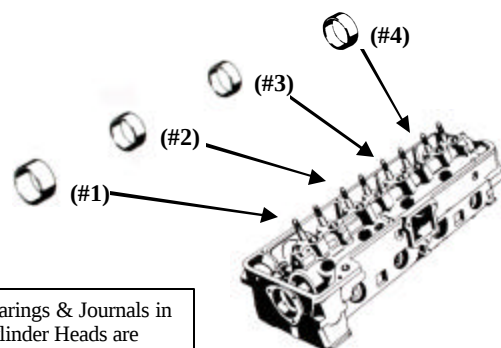
#2 Inner Bearing Bore Diameter: 1.920"-1.921" (Haynes Manual)

#3 Inner Bearing Bore Diameter: 1.915"-1.916" (Haynes Manual)

#4 Inner Bearing Bore Diameter: 1.910"-1.911" (Haynes Manual)

(Camshaft Bearing Clearance Specification: .001"-.003")

Note: Above dimension apply only to standard sized cams & bearings. "Service" undersizes were sold by Opel.



Cam Bearings & Journals in Opel Cylinder Heads are numbered front-to-rear

Valve Clearances:

Standard 1.9 Opel & Opel 2.0 engines share the same sized valve stem diameters. Measure valve guide clearances to ensure a fit.

Intake Stem: .3538" to .3543" (8.987mm to 9.00mm)

Exhaust Stem: .3524" to .3528" (8.952mm to 8.965mm)

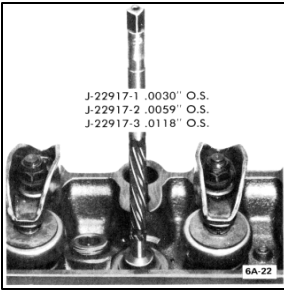
Intake Stem Clearance: .001" to .0029" (.025mm to .064mm)

Exhaust Stem Clearance: .0024" to .0039" (.06 to .098mm)

Maximum Head to Stem Runout, Intake: .0016" (.04mm)

Maximum Head to Stem Runout, Exhaust: .0019" (.05mm)

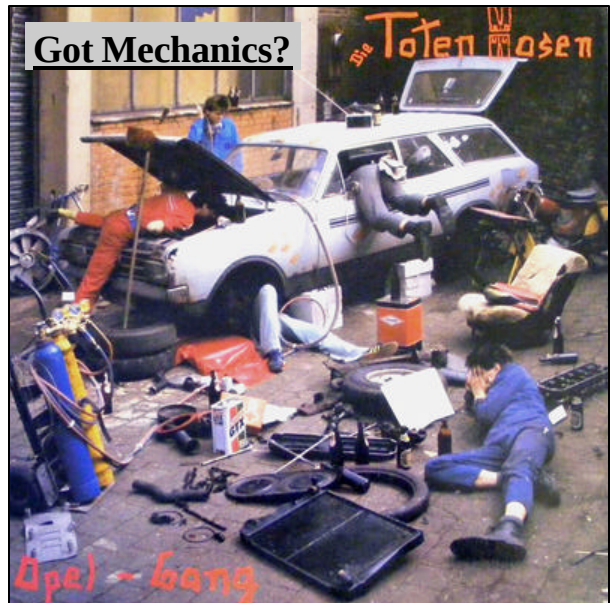
Standard-sized Opel valve guides (.3553" to .3562" = 9.025 to 9.05mm) in the head, can reamed for accuracy.



Note: Some aftermarket valves will vary from above factory specifications; Your machinist should adjust valve guide clearances accordingly.

When guides are worn beyond specification, (available) oversize replacement valves are recommended to be installed.

Got Mechanics?



To avoid (preventable) "adventures," our advice is that you insist that your mechanics actually read all the service procedures, before starting work on your car!

Crankshaft: Main Bearings

(Opel Factory) Standard 1, 2, 3, 4 & End Cap Bearing Diameter: 2.2829"-2.2835"

(Aftermarket Vendor) Standard 1, 2, 3, 4 & End Cap Bearing Diameter: 2.283"-2.284"

(Note: Chilton's Manual says: 2.2829"-2.2835")

(Opel Factory) Undersize .010" (.25mm)

1, 2, 3, 4 Bearing Diameter: 2.2733" (+/- .0002")

(Opel Factory) Undersize .020" (.50mm)

1, 2, 3, 4 Bearing Diameter: 2.2635" (+/- .0002")

Crankshaft: Rod Bearing Journals

(Aftermarket Parts Vendor) STD 2.046-2.0467"

(Chilton's Manual says: STD 2.0461" - 2.0467")

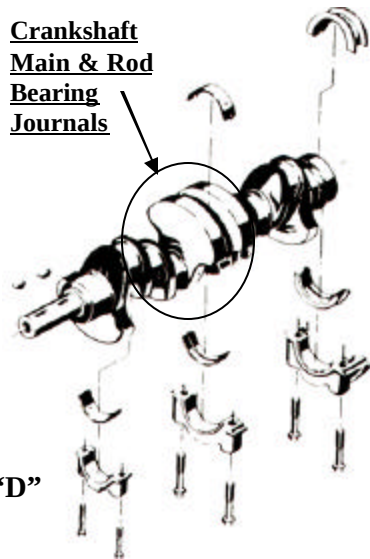
Crankshaft Schematic:

Crank Main Bearing Journals: "A", "B", "C", "D"

Rod Bearing Journals: "1", "2", "3", "4"

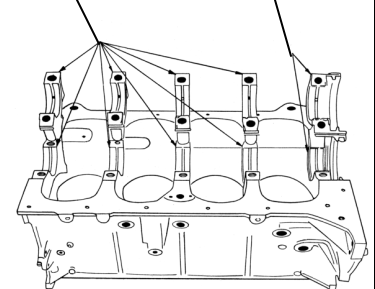
Crank Main End Cap Journal: "E"

Pilot Bearing: (Inside End of "E")



Engine Block:

Engine Block Mount Locations
Main Bearings #1, #2, #3, #4
Main End Cap



(Aftermarket Vendor)

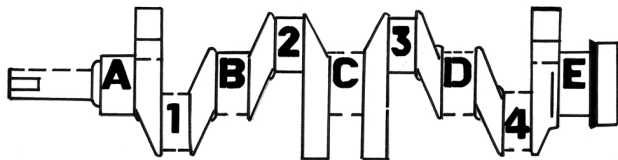
Main Bearing Bore Diameter: 2.4409-2.4415"

(when align bored)

(Another Aftermarket Vendor)

Main Bearing Bore Diameter: 2.441-2.442"

Front of Engine



Crankshaft: Pilot Bearing Diameter

STD Size: 1.0807" to 1.0831"

Connecting Rod: Housing Bores:

(Aftermarket Parts Vendor) STD 2.1653"-2.1658" (Another Aftermarket Parts Vendor) STD 2.165"-2.166"

Rod Bearings:

(Opel Factory) Standard Rod Bearing Journals (all): .9858" (=/- .0015"),

(Opel Factory) Connecting Rod Width: .9789" (+/- .0010")

(Opel Factory) With Undersize .010" (.25mm): .9858" (+/- .0015");

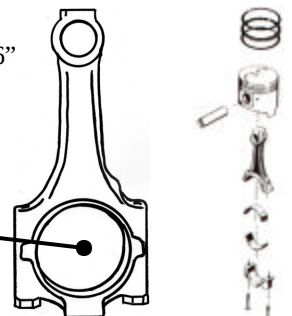
(Opel Factory) Connecting Rod Width: .9789" (+/- .0010")

(Opel Factory) With Undersize .020" (.50mm): .9937" (+/- .0016"),

(Opel Factory) Connecting Rod Width: .9867" (+/- .0010")

Connecting Rod

Housing Bore Area, for Rod Bearings





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From the internet:



This column, samples a variety of Opel models & narratives, that were recently posted for sale via the Craigslist.com free public listing service.

1958 Opel Rekord

The family is getting bigger and one of my projects has to go! The vehicle runs and drives and has a clear title. It has only 18000 mile on the odometer! The car has been sitting for a few years, so the battery is junk and the brake master needs to be rebuilt. I have all the trim and have new tail lights and turn signal lenses. My wife wants it gone and my friend is sick of storing it for me, so my loss is your gain! \$900. 303-598-2298 (CO)

1959 Opel Rekord

2dr needs work, have parts, \$1000,
Call Mike for info 707-526-7262 (CA)

1959 Opel Rekord Gasser Project

Early 60's race car, former 396, no motor or trans, rolls, complete removable front sheet metal, narrowed rear end A project, has title, and CA plates, extra parts \$2000 obo
Call Steve 707-824-9039 (CA)

1960 Opel Rekord Sedan

Talk about your 1955-1957 Chevy look-a-like...very original, very solid, very undamaged original California car. If you ever wanted a unique car that no one else has in the entire United States, you have just found it. \$1500.

Ask for Todd or leave message, 909-355-6735 (CA)

1968 Opel Kadett 2 Door Wagon

Everything there, except front windshield. All glass is good, ran when parked. To many projects, no time to finish.
This Buick needs a "V-6". Call 509-551-2486 (WA)

1970 Opel GT

The car is currently not running but needs some work. I don't know much about the car since I won it in a divorce and I'm just trying to sell my ex's baby. Please help me get revenge on him by buying this wonderful classic car for \$2000 =)

Reply to: sale-591730460@craigslist.org (ID)

1971 Opel GT

Turquoise, 137k, Strong engine, excellent drive train, second owner. Needs minor work: rugs & water pump, comes with extra car. \$7000, Call Jerry 415.868.0686 (CA)

1972 Opel Kadett wagon

Clean, mostly original, runs and drives great 35+ mpg \$1450
Call Vale at 503 760 6466 (OR)

1978 Buick Opel

Straight Body, good condition, engine runs great ,bad trans, moving/must sell

\$100 obo, Call 360-813-1801 (WA)

1970 Opel GT

Complete car, needs work. 4spd manual trans. Would make a great father son project. Runs and drives, but needs brake work. Exterior is solid. Has little rust and has some bondo work. Interior is there but needs to be redone. New tires, rebuilt calipers, rear brakes, new brake lines and hoses, new carb. Can be redone or just fixed and driven the way it is. Would need brake work and exhaust gasket between manifold and exhaust pipe. Odometer reads under 30k. Have a clean Pa title for it. Needs some work to lights also. \$2300. Buyer will have the opportunity to purchase a second Opel Gt that I have for parts. Its a 1971 that has complete engine and trans. Some interior parts and some usable exterior parts. No title on the 71. Good glass, body is rough. Will sell for an extra 400.
Any questions please email me: [jongraver77\(at\)hotmail\(dot\)com](mailto:jongraver77(at)hotmail(dot)com)

OPEL GT SOURCE

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