

MASTERTECH

***2.4L MultiAir[®]
Update***



**REFERENCE BOOK AND TECH NEWS
July 2012**

Introduction

In this month’s Master Tech program we’re going to take a look at the 2.4L MultiAir engine, being released in the 2013 Dodge Dart.

After discussing the unique features of the cylinder block, we’ll take a look at the cylinder head, focusing on the MultiAir system, the heart of this new engine.

We’ll not only cover the ways that the MultiAir system is unique, we’ll also cover the ways that the 2.4L MultiAir system differs from the MultiAir system found on the 1.4L (Fig. 1).



Figure 1: 1.4L and 2.4L MultiAir Engines

After exploring the MultiAir assembly and the rest of the valvetrain, we’ll go over the timing drive components, focusing on the aspects that will affect the technicians.

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As we discuss the timing drive components, we’ll also go over the procedure for replacing the timing chain to give a clear picture of how this process differs from the 2.0L shown in the April Master Tech program (Fig. 2).



Figure 2: 2.4L Timing Chain

After discussing the 2.4L MultiAir engine, we will highlight the brake pedal switch (Fig. 3) on the Dodge Dart, focusing on how service is impacted.



Figure 3: Dart Brake Pedal Switch

In the final segment, we'll be getting our first look at the all new for 2013 SRT Viper, SRT Viper GTS, and SRT Viper GTS-R (Fig. 4).



Figure 4: Viper GTS and Viper GTS-R

First, we'll cover the two different trim levels available on the Viper. Then take a look into the heart of the beast, the engine. What's different, what's new, and most importantly, what'll it do? Next we're going to talk about the chassis and brakes.

There are some new features in the body, suspension, and braking systems that will affect technicians out there. We'll close our quick look at the new SRT Viper with some of the impressive competition history the Viper has enjoyed (Fig. 5).



Figure 5: Viper Competition Car

This overview of the Viper will be just enough to whet your appetite for the Viper New Model Highlights you can look forward to in the September Master Tech.

Note that the Master Tech web course contains information not found in this month's book, and vice versa. However, you will need the web program and reference book, as well as the Tech News, to answer the questions in the online quiz.

2.4L MultiAir

If you are familiar with the 2.0L engine, then you are already familiar with the bottom end of the 2.4L MultiAir engine as it is largely unchanged. For those not as familiar, we'll hit the highlights now.

The 2.4L MultiAir engine has piston cooling jets mounted in the cylinder block to keep the pistons cool under load (Fig. 6). Each oil jet has a check valve that closes below approximately 1.5 bar (22 psi) to maintain ample oil pressure at idle.



Figure 6: Piston Cooling Jets

Another feature of note is the bearing beam that's found on both the 2.0L, and the 2.4L MultiAir engines (Fig. 7).

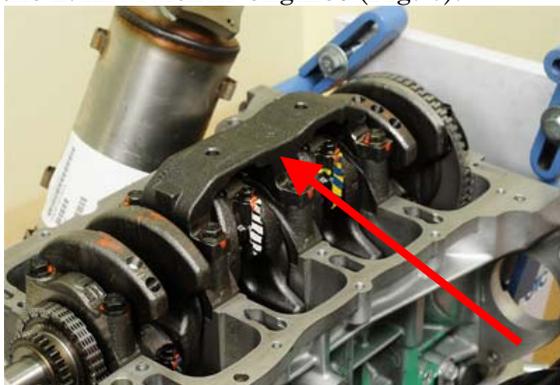


Figure 7: Bearing Beam

This beam is attached to the number 2, 3, and 4 main bearing caps and provides additional structural support and reduced noise, vibration, and harshness. This bearing beam can only be removed after the ladder frame has been removed from the cylinder block.

Like the 2.0L, the 2.4L engine features a filter screen installed in the block to prevent the small oil passages in the MultiAir assembly from becoming plugged or restricted (Fig. 8). This oil filter screen is located on the cylinder block deck and is only serviceable with the cylinder head removed.



Figure 8: Filter Screen Installed in Cylinder Block

Naturally, the valvetrain is very different on MultiAir engines, and the 2.4L MultiAir is different from the 1.4L MultiAir engine discussed in the April Master Tech program.

There is no phaser on the exhaust cam, just a simple sprocket for the timing chain (Fig. 9).



Figure 9: Exhaust Cam Sprocket

Obviously there is no intake camshaft on the MultiAir engines, but it should be noted that there is a significant difference between the 1.4L and 2.4L MultiAir units.

The valvetrain on the 2.4L engine has lash adjusters, as well as roller-finger followers to actuate the exhaust valves (Fig. 10).



Figure 10: 2.4L MultiAir Valvetrain

As we learned in the April Master Tech, the 1.4-liter MultiAir engine has the

camshaft acting directly on the exhaust valves.

The timing drive components are different as well. You'll notice the tensioner is now located on the cylinder head (Fig. 11). Due to this new location, the tension on the timing chain can be released with the engine in the car and the front cover in place. Note that the feature that allows for in-vehicle access will be a running change and will not be available on early production vehicles.



Figure 11: 2.4L Timing Chain Tensioner

We'll go over, in detail, how to release timing chain tension in the next lesson. Next we'll take a look at how upper-engine service is different on this new engine.

GLOBAL POWERTRAIN ENGINE CONTROLLER, 3rd EDITION

With the introduction of the 2.4L MultiAir engine in the Dodge Dart, Chrysler Group introduces a new powertrain control module (PCM). The global engine controller, 3rd edition (GPEC3) is physically similar to the GPEC2 controller in size and design. However, the GPEC3 contains a new processor to support new features of the MultiAir engine.

Significant features of the GPEC3 include:

- Connector configuration
 - Two 96-pin connectors like GPEC2
 - Unique circuit pin-out compared to GPEC2
 - Engine connector is keyed differently than GPEC2
 - Unique connector colors - blue (engine) and green (chassis)
- MultiAir solenoid power and ground circuits
- Wide band, six-wire, O2 (Lambda) sensor circuits
- Thermostat heating element circuit
- Active grille shutter LIN control
- Five ASD feed circuits
- Four ground circuits

The GPEC3 controller is NOT backward compatible to GPEC2 applications. Although the connectors are similar and the size is the same, a GPEC3 must not be installed in place of a GPEC2, and a GPEC2 must not be installed in place of a GPEC3.

See the job aid in the Reference section for a diagram showing the critical GPEC3 circuits.

VALVETRAIN SERVICE

The 2.4L MultiAir engine shares the cylinder block and many internal components with the standard 2.4L MultiAir engine, but there are significant differences. We'll explore one of those now.

The Dodge Dart will be the first Chrysler Group vehicle to use the new Parafull organic additive technology (OAT) coolant (Fig. 12).



Figure 12: New OAT Coolant

This new coolant is purple in color, and is not compatible with hybrid organic additive technology (HOAT) coolant still in use in other Chrysler Group vehicles. Note that most Chrysler products will be switching over to the OAT coolant for the 2013 model year. However, be sure to check service information before servicing the coolant system.

We'll go over the high points of upper-engine service in this segment of the July Master Tech. While this procedure can be done in-vehicle, we're doing it on a stand to give you a better view of what we are doing.

We start with the MultiAir brick removed. For information on the procedure up to that point, refer to the service information (Fig. 13).



Figure 13: MultiAir Brick Removed

At this point, while holding the camshaft in place with a wrench, remove the camshaft sprocket. When you slide the cam sprocket off the camshaft you will hear the fast ratcheting action of the timing chain tensioner extending (Fig. 14).



Figure 14: Timing Chain Tensioner Extended

If you are only removing the camshaft to service the valvetrain, this helps to hold the timing chain to the camshaft sprocket. If you are servicing the camshaft sprocket or timing chain, you will need to release the tension on the timing chain tensioner. We'll get to that in just a minute. After removing the camshaft, you can service the roller-finger followers, lash adjusters, and valve springs or seals.

When re-installing the camshaft, you might find that the camshaft sits high at the rear, preventing you from re-installing the bearing caps and bolts (Fig. 15).

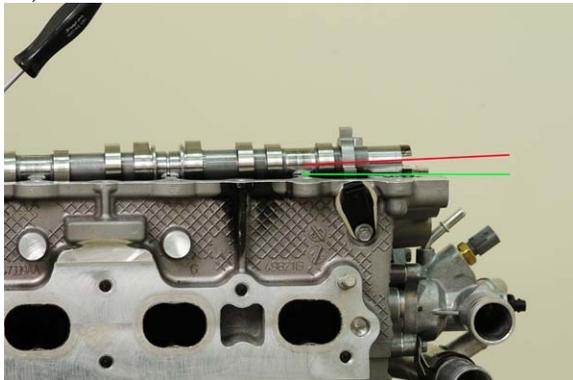


Figure 15: *Timing Chain Tension Affects How the Camshaft Sits*

When this happens, do not use the camshaft bearing caps to draw the camshaft down or damage may occur. You'll have to release the tension on the timing chain to get the camshaft into position.

Use a screwdriver to push the release lever on the tensioner, and then pull the chain firmly against the tensioner. With pressure held against the tensioner, remove the screwdriver (Fig. 16).

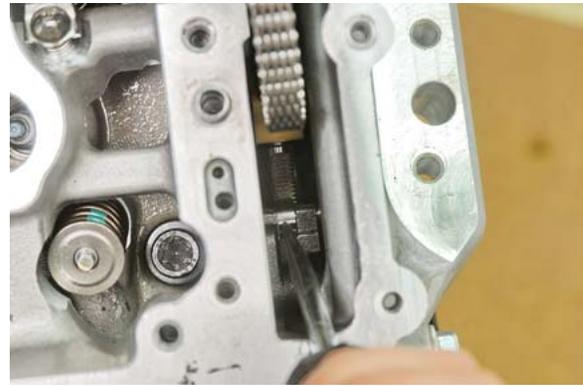


Figure 16: *Timing Chain Tension Released*

Then, while holding the timing chain against the tensioner, pass a long, thin screwdriver through the oil return hole in front of the cylinder head, making contact with the timing chain guide (Fig. 17).

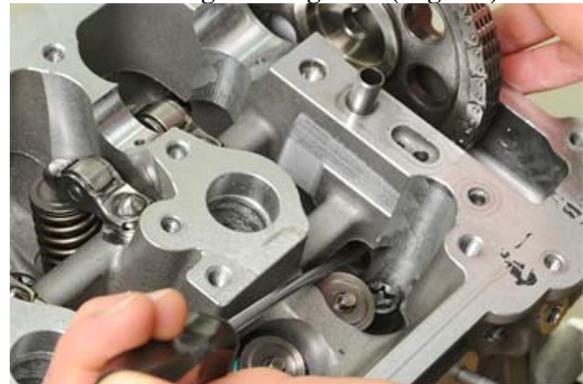


Figure 17: *Timing Chain Accessed Through the Oil Drain Hole*

Now you can wedge a larger screwdriver or suitable tool in the cylinder head, keep tension on the timing chain guide. No matter what you use as a wedge, be careful not to allow debris to fall into the cylinder head.

After you release the tension on the timing chain, you'll notice that while the camshaft will not sit completely flush, it will sit lower in the saddles, allowing you to install the camshaft bearing caps.

It is important to note three unique aspects of the 2.4L MultiAir timing cover you will appreciate. There is a lip machined into the timing chain cover, below the crankshaft sprocket, that prevents the timing chain from dropping off the crankshaft sprocket during service (Fig. 18).



Figure 18: Lip in the Timing Cover

Also of note, there is a mounting boss for the timing cover, just below the camshaft sprocket, but inside of the timing chain itself (Fig 19). This mounting boss will prevent the timing chain from falling down into the engine if you accidentally let go of the timing chain.



Figure 19: Mounting Boss

The timing chain cover also features a cutout allowing access to the camshaft sprocket bolt with the timing cover in place (Fig. 20).



Figure 20: Timing Chain Access Cut-out

This cutout in the timing cover will be a running change during production. We are using the newer version of the timing chain cover for these procedures. When the Dart is released, the timing chain cover will not have this cutout. The timing chain cover will have to be removed to service the valvetrain components.

BRAKE SWITCH REPLACEMENT

Because the Dodge Dart is built on the new Compact U.S. Wide (CUSW) vehicle architecture, we know there will be things that are done differently. This segment is to discuss one specific item, the brake switch installation procedure.

The Dart and all other Compact U.S. Wide vehicles use a different style brake pedal position switch (Fig. 21). This new style switch must be installed in a different way than you may be used to.



Figure 21: *New Brake Pedal Position Switch*

Many times, while replacing a brake pedal switch, the technician will depress the brake pedal during the procedure to adjust the throw of the plunger. When replacing the brake pedal switch on a Compact U.S. Wide vehicle, the brake pedal must remain fully in the upright position during the procedure. If this is not done, the brake pedal switch can be internally damaged.

If the brake pedal was installed incorrectly, the customer may notice any or all of the following:

- Delay in brake light activation
- Delay in cruise control deactivation
- Malfunction indicator light (MIL) light illuminated, with diagnostic trouble code (DTC) P0703
- Brake lights always on

On Compact U.S. Wide vehicles, the brake pedal switch is hard-wired directly to the body control module (BCM). To test the switch, use wiTECH to monitor the switch state as you press and release the brake pedal.

A physical inspection of a broken brake switch shows either a plunger that is not extended to the proper length, between 16 and 18 mm (0.629 and 0.708 in.) or will show broken tabs (Fig. 22). If the tabs are rotated out from beneath the locking tabs when the switch is removed, the switch must be replaced.



Figure 22: *Undamaged Plunger Compared to Damaged Plungers*

When installing the brake pedal switch, with the brake pedal in the fully up position, push the switch all the way against the mounting bracket. Make sure the brake switch plunger is being depressed by the brake pedal tab (Fig. 23). Then rotate the switch counter-clockwise to lock it into position.



Figure 23: Brake Pedal Switch Comes in Contact with Bracket During Installation

After you verify that the customer concern is gone, you are all set. If this procedure does not correct the issue, contact the STAR Center for assistance.

SRT VIPER TEASER

After a long wait, we can finally give you a sneak peak at the new SRT Viper. Look for a complete new model highlights feature in the September Master Tech. The new SRT Viper is offered in two trim levels right out of the gate.

We have the SRT Viper and the SRT Viper GTS (Fig 24).



Figure 24: Two SRT Vipers Will Be Offered

The Viper is a car that stays true to the philosophy that has made the Viper what it is today. It's intended for the driver that wants to feel connected to the car and wants the driving experience to be raw. The Viper GTS has all the performance of the Viper, but adds a higher level of technology and creature comforts as standard equipment.

No matter which model is chosen, you get the same hand-built 8.4-liter V-10. This one though, is pumped up to 477 kw (640 hp) with 813 Nm (600 ft./lbs.) of torque while being lighter than the previous V-10 (Fig. 25).



Figure 25: 8.4L V-10

Of course, all the power in the world does no good if you can't get it to the ground. A new stiffer structure helps the suspension put that power to the pavement.

Standard on the Viper GTS, two-mode Bilstein® dampers, standard control, ABS, and launch control also help to corral all those horses.

Weight is the enemy of any serious performer, so the SRT folks gave both Vipers a carbon-fiber hood, roof, and deck lid to complement the new aluminum doors and sills (Fig. 26). This shaves another 37 kg (100 lbs.) off the new car.



Figure 26: Carbon fiber hood, roof, and deck lid shave weight

Going fast is fun, but you need to stop at some point right? The SRT is fitted with Brembo® four-piston calipers that squeeze 355 mm (14 in.) rotors all around, with available two-piece StopTech® rotors on the Track Package (Fig. 27).



Figure 27: StopTech Rotor

The Viper is no stranger to the track and has enjoyed a very successful competition career that dates back to 1996. The Viper has taken five international GT-class championships since 1996, and the FIA GT championships from 1997 to 1999 (Fig. 28).



Figure 28: Viper Competition Car

The Viper has seen success in endurance racing as well, being the first production-based American car to take the overall win in the Rolex® 24 Hours of Daytona

race and a 1-2 finish in the 24 Hours of Le Mans in the GTS class.

How about today? Along with the Viper, SRT announced the purpose-built, competition-ready SRT Viper GTS-R that will be part of a factory-backed SRT Viper Racing team returning to the American Le Mans Series for 2012.

Understandably, SRT is tight-lipped about specifications, but you can be sure it will set the competition scrambling when it hits the start grid.

This completes our program on the 2.4L MultiAir engine. Be sure to see this month's web course for additional information about this month's topics. Also, visit the Chrysler Academy Learning Center site for training courses that cover subjects related to the these topics.

Please join us next month when we take an in-depth look at the 2013 Ram 1500, and we'll have a complete new model highlights for the SRT Viper in September.

Thank you for participating in the Master Tech program.

TECHNEWS

TECH'S CORNER

In looking through the surveys that each of you sent in after reviewing the June Master Tech program, we received several positive comments about our coverage of the new 2012.5 Ram 1500 CNG. One tech told us that he's never worked on a CNG vehicle so, "...this was a good source of information..." while others explained that they didn't know that the new Ram 1500 CNG was coming out for 2012.5.

We also received a few comments regarding one of the questions in the quiz at the end of the program. There was evidently some confusion about how many injectors are used for the gasoline operation and also for CNG injection on the Ram 1500 CNG. So, let's take a few moments to review the question in case there are any other techs out there that were also unclear as to the correct answer.

The question was worded as follows:

How many injectors are used for the gasoline operation and CNG injection?

- a. Two
- b. Four
- c. Six
- d. Eight

The correct answer is eight because there are eight injectors for the gasoline operation and also eight injectors used for CNG injection.

One of the technicians who was unclear as to what the question was asking is Bob Kerber from Percy's Auto Sales, Inc., in Presque Isle, Maine. We called Mr. Kerber to get his input on the question. He explained that he thought we were

asking how many injectors there are per cylinder. Another tech thought that we wanted to know how many total injectors there are for gasoline and CNG operation. So, we apologize for any confusion as to what the question was asking. We do our best to keep the questions as clear as possible, and we also write them based on what is actually stated in the program.

As our conversation continued with Bob, he told us that he finds the Master Tech program very helpful. He went on to explain that he's been a technician since 1972 and can remember when records and film strips were used to conduct the Master Tech training programs. As technology improved, he also recalls eight-track and cassette tapes being used as the method of delivering the content.

Bob made another very interesting point regarding the importance of the Master Tech program to technicians who live and work in rural areas. From the dealership where he works, it's a seven-hour drive to the closest Chrysler training center. As a result, other than on-line courses, the monthly Master Tech programs are his only other source of training.

Our thanks go out to Bob Kerber for sharing his insight with us, as well as for his 30 plus years as a technician and continued participation in the Master Tech program. In addition, we want to thank each of you for your participation, and for sending in the monthly surveys because that's how we receive feedback regarding program content as well as what training topics you would like to see in the future. So, please keep them coming, and who knows? You may be the next technician that we call for input!

WARRANTY TIPS

Labor Operations (LOP) Time Review Process

Back in the August 2011 Master Tech program, we covered the process for handling a Labor Time Review. We still get questions about this on a monthly basis so we thought it'd be a good idea to cover this material again.

There is a system put in place that allows the technician to request a labor operation be reviewed. We're going to cover that right here, keep in mind that this is the only way to request a review.

To request a review, you'll have to go to the Warranty Information Center (WIC). If you don't have access, just ask your service manager and he/she can set that up for you pretty quickly.

Also, keep in mind that, once you understand this process, it also applies to filling out a skill category or skill level review. The only thing that will change in the process is your question. So, let's get started!

First, be sure that you have access to the Warranty Information Center (WIC). If you do not have access, contact your service manager.

You'll need the LOP you want reviewed. LOPs can be located in two places, Quick Labor Operations (Quick LOPs) or TechCONNECT. Quick LOPs is a drill down process similar to TechCONNECT's service information. Recently, the majority of LOPs were added to TechCONNECT to assist with proper LOP selection, so this is what we'll cover here...

In TechCONNECT select the year, vehicle, and engine that you're interested in. Then, once the Service information tab is active, select it. Go to the removal/installation process for the repair that you are doing. For example: Cooling, Engine, Thermostat, Removal. Select engine type. This will pull up the repair process. Click on the "+" symbol to open labor operations and you will see all the labor operations associated with this procedure.

Write down the LOP, you'll need that. Now you're ready to proceed to the Warranty Information Center. If you're having a hard time finding an LOP number, ask the warranty claim processor in your dealership.

The screenshot shows a web interface for vehicle service information. At the top, there are navigation tabs: Home, Search, Service Bulletins/Recalls, Service Info, Wiring, Owner Manuals, Parts, Diagnostics, and Collision Info. Below these are search filters for VIN, Year (2011), Model (JK - JEEP WRANGLER), and Engine (3.8L V6 (SMPI)). A left-hand navigation menu lists various vehicle systems, with '07 - Cooling' selected. The main content area displays the title '07 - Cooling/Engine/THERMOSTAT/Removal' and '3.8L ENGINE'. Below this, there is a section for 'Labor Operations' with a table listing LOP numbers, types, descriptions, and skill levels. A list of steps for the procedure is provided, along with a technical diagram of the engine compartment showing the thermostat location.

LOP	LOP Type	Description	Skill Level
07400114	Primary	Thermostat, engine 3.8 liter engine	Semi Skilled
07400139	Primary	Thermostat, engine 2.8 liter diesel engine	Semi Skilled

1. Disconnect negative battery cable.
2. Remove air filter housing (Refer to 09 - Engine/Air Intake System/BODY Air Cleaner - Removal).
3. Drain cooling system down below the thermostat level. (Refer to 07 - Cooling - Standard Procedure)

Now that you have access to WIC and the LOP you want reviewed, you are ready to start. In the DealerCONNECT screen, click on the Service tab. Then, under the Reports and Information section, click on Warranty Information Center, which will take you to a new web browser. The Warranty Information Center screen opens in the new window shown below.

The screenshot shows the 'Warranty Information Center' web application. It features a search bar with a 'Find Answers' button and a 'Search' button. Below the search bar, there are search results for 'X34 Warranty Extension 2008-2010 Jeep Wrangler Transmission Oil Cooler Warranty Bulletin D-11'. The results include a 'New' tag, a brief description of the warranty extension, and the date updated (06/16/2011). Other results include 'GR8 15 Digit Battery Code for 2011 and Future vehicles and Quick Reference Guide New' and 'Recall L25 Information New'.

To begin the labor op time review process, enter the LOP into the “Find the answer to your question” box. Then click on the Search button.

Find Answers | Ask a Question | My Stuff ▾

Warranty Information Center

A search is required before the "Ask a Question" tab will appear. You can by Search by product, keywords, answer ID or phrases.

Limit by product: ▾

Find the answer to your question:

No results found.

Suggestions:

- Make sure all words are spelled correctly
- Use different words that mean the same thing

In this example, the search returned “No results found”. Because there were no results, the “Ask a Question” tab becomes active in the same screen, as shown below. Keep in mind that this tab will only become active after your initial search.

When the “Ask a Question” tab becomes blue, a question can be typed in the box, as shown above.

Tip: When asking for a labor op increase, instead of simply saying “because it’s not enough time” be specific by giving an example of why the time allotted is not accurate.

Once you’ve completed your question, move down to the Product drop down menu and select “Labor Time Review”. It’s very important to select this category because it will send your question to the correct individual who can answer your question. If you do not select Labor Time

Review, your response from the time study group will be delayed.

To submit the completed request, click on **Continue...**. The review process can take a couple of days, so to check for a response, click on the “My Stuff” tab.

We hope that this step-by-step process has helped you to better understand how to request a labor op time review, and that you will also use it when requesting a skill category or skill level review as well. Good luck with your inquiries, and be sure to watch for future Warranty Tips articles in upcoming Tech News publications.

Guess the cars below. You can put your answers in your surveys.

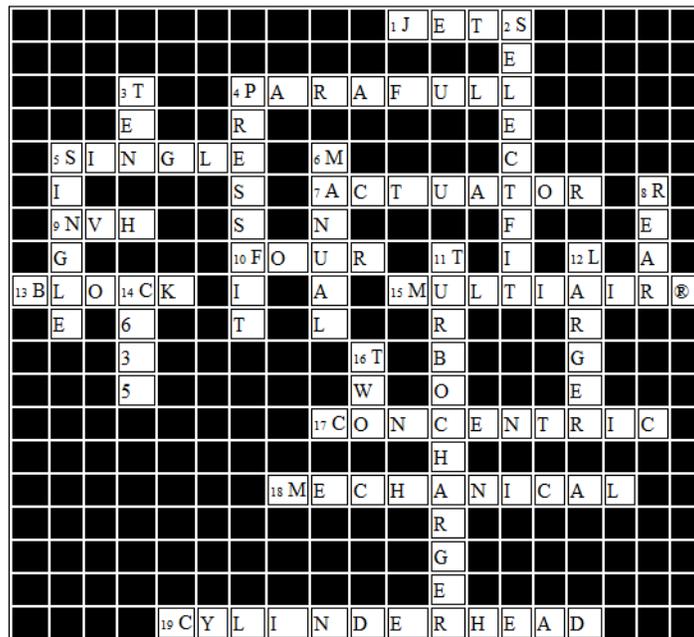
1)



2)



The answer to the April puzzle:



Across

Down

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. As power and stress on the 2.0-liter engine increases, these are needed to cool the underside of each piston. 4. The new Dodge Dart will be the first Chrysler Group vehicle to use this new brand of organic additive technology coolant. 5. The turbocharger on the 1.4-liter engine is a ____ scroll design. 7. The main change on the 2.4-liter engine is it will have a new cylinder head with a MultiAir II® ____. 9. On the 2.0-liter engine, a new bearing beam is attached to #2, #3, and #4 main bearing caps helps reduce ____. 10. How many piston cooling jets does the 1.4-liter cylinder block have? 13. The knock sensor is located on the left side of the ____. | <ol style="list-style-type: none"> 2. What type of main bearings and pistons are used on the 1.4-liter engine? 3. The pump on the 1.4-liter engine can run up to ____ minutes after a hot engine shut-down. 4. Most Chrysler Group crankshaft dampers are what type of design? 5. The timing system on the Dodge Dart's 1.4-liter engine features a ____ stage belt drive system. 6. All three available engines in the Dodge Dart can be mated to the C635 ____ transaxle. 8. One change to the 2.0-liter engine is that its intake manifold is ____ mounted. 11. The 1.4-liter engine features a ____ to improve performance. 12. The Clic E clamps are typically used on ____ diameter radiator hoses. 14. The ____ dual dry clutch transaxle |
|--|---|

15. What type of system provides variable control of the intake valves?
 17. What type of slave cylinder does the C635 manual transaxle use to actuate the clutch?
 18. To supplement the vacuum produced by the 2.0-liter engine, what type of vacuum pump is used?
 19. This component on the 1.4-liter engine is unique because it is made up of two pieces.
- will launch on the new Dodge Dart with the 1.4-liter engine.
16. The C635 manual transaxle on the Dodge Dart has how many output shafts?

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