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RACE WARS

As the first movie in the *Fast & Furious* franchise shows us, Race Wars is one of the gatherings most eagerly awaited by car lovers. There, besides being able to see some of the most amazing cars in the country, drivers have the chance to compete with one another, making bets that can go from a few hundred dollars to the ownership of a car.

The gathering takes place in the grounds of an abandoned military base, in the desert near Los Angeles. Thousands of vehicles wait in a long queue to enter and enjoy a few hours full of thrills. In the vicinity of a huge factory building, the participants show off their cars. With the bonnets open, they allow fans to enjoy and inspect their latest creations in the art of tuning. Many of them go in trailers to spend the night there, and they protect themselves from the blistering California sun with large sunshades, or with more ingenious solutions. For example, Dom Toretto and his team use nothing less than a hot-air balloon to stay in the shade while they're waiting to race.

LETTY'S CHALLENGE

Like many other drivers, Letty waits behind the wheel of her vehicle for the chance to demonstrate her skill as a driver. Just like all those who are going to race, she has allowed the organisers to place a number on one of its windows, so that all the vehicles are properly identified. As she waits, she hears a young guy who has parked next to her. "Hey, baby!" he shouts from his window. "You should watch from the side. I wouldn't want to get exhaust on that pretty face." Letty doesn't fall for the provocation. She immediately realises that he is just a boastful amateur who she can easily beat, so she replies, "Why don't you put your money where your mouth is? You want an adrenaline rush, it'll be two grand. Right here right now. What's it gonna be?"

The challenge has been made. Both vehicles move on to the starting line. In front of them there is a long straight track on which to test the power of their engines. They wait for the judge to start the race and step on the accelerator. The poor kid pushes his engine to the limit and takes the lead. But, when he thinks he has won, Letty pushes the nitrous button and her vehicle easily crosses the line first. The win tastes especially sweet, as it is the best way to take the arrogant driver down a peg or two.

As revealed in the seventh movie in the franchise, the Race Wars was an event created by Dominic Toretto so that lovers of fast cars could race one another.

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REGGIE LEE

Reggie Lee, whose real surname is Valdez, was born on October 4, 1974, in Quezon City in the Philippines. If he had followed his parents' advice he would have ended up as a doctor, but Reggie preferred the world of show business. After being in the dance troupe of his musical idol Prince, he began his career as an actor in the late nineties, with small parts in TV series like Diagnosis: Murder, Dangerous Minds and ER. The director Rob Cohen gave him one of his first significant roles in the cinema, as Lance Nguyen, Johnny Tran's henchman, in The Fast and the Furious. Later on, he got the chance to appear in two of the movies in the Pirates of the Caribbean franchise, *Dead Man's Chest* (2006) and *At World's End* (2007). He also appeared briefly in the films *Drag Me To Hell* (2009), *Crazy, Stupid Love* (2011) and *The Dark Knight Rises* (2012). Recently, Reggie has continued working in the movies and on TV, achieving his greatest popularity thanks to the role of Sergeant Wu in the series *Grimm*.

JESSE GETS INTO TROUBLE

Brian is the last to arrive at Race Wars. The first member of the group he meets is Jesse, who is walking very excitedly towards the track. When he asks him what he's going to do, Jesse tells him that he's going to drive in a race in which he has bet the ownership of his father's car, a fabulous Jetta. Brian tries to get him to change his mind, especially when he finds out that the rival is none other than Johnny Tran. But all his attempts are in vain.

Jesse and Johnny get off to a good start. In this case, Toretto's mechanic acts too hastily by using his nitrous too soon. The pressure and the desire to win put paid to his chances. Tran, keeping a cool head, waits for the right moment and overtakes his rival before he reaches the finishing line.

FIGHTING FOR HONOR

Jesse is so disappointed that he just wants to disappear in his car. But Johnny Tran is not prepared to go without his trophy, so he quickly heads over to where Toretto's group is. "Where's he going?" asks Johnny angrily. "He went to the car wash," Dom replies sarcastically. The tension can be felt in the atmosphere. "Go fetch my car," Tran tells him. Furious, Toretto looks at him and replies, "Go fetch your car? We're not on your block, you better watch who you talk to like that." But far from following this advice, Johnny Tran accuses him of being the informant who led the police to his house. Faced with this serious accusation, Dominic goes crazy and lunges at his enemy to get even. It is a moment of total confusion. Vince and Leon cover their boss. Even Letty has to throw a punch to stop things getting out of hand. Eventually, the race security team run over and manage to pull the two apart, while Toretto shouts angrily: "I never narked on nobody!" For a man of honor like him, there can be no worse accusation than being a rat.

A furious start could be the key to victory in the Race wars, where the vehicles compete with one another on the track of an old airbase.





PARTY NIGHT

When night falls, things calm down and the party gets started and keeps things hot. After all the races, the visitors start dancing and having fun. The atmosphere is incredible. People from all over the country share experiences and even take the opportunity to have a romantic adventure. Perhaps with this in mind, Brian goes over to the Torettos' trailer looking for Mia. But there's no one there. But before he leaves, Brian catches sight of Mia arguing with Dom just outside of the trailer. "You're not doing it for me, you're doing it for you. Please don't go." For some reason, she is clearly worried. However, Dom does not give in and meets up with Letty, Vince and Leon before heading off in their cars.

Mia is left with a mixture of resignation and anger. When Brian goes after her, far from improving, things just get worse.

THE BIG REVEAL

Race Wars is obviously one of the most important sequences in *The Fast and the Furious* because it is where Brian makes his most important confession.

Intrigued by the sudden departure of Dominic and his friends, Brian accosts Mia rather brusquely. She tries to ignore him. Just at that moment, she does not want a scene. But he insists and gets rather unpleasant: "What's going on?" he shouts. "Do you always have tears in your eyes when Dom drives away? Come on, tell me. What's he racing off in the middle of the night for? Do you know something about the trucks?"

Mia snorts angrily and tries to continue on her way. Brian realizes that he has no option but to come clean once and for all, so he grabs hold of her arm and looks her in the eye. "Listen to me. Mia, I'm a cop." Her first reaction is one of total disbelief. "What are you taking about, Brian? What is this?" When he insists, the girl's face changes to one of fury. She immediately feels betrayed by the man she's fallen in love with. Her eyes are ablaze as she fights back the tears in her eyes. Despite that, Brian goes on. Besides doing his duty, he has to be truly honest with her. And that's what he tries to express: "Everything I ever said I felt about you was real. You have to believe me, but this isn't about you and me. Your brother's out there to pull a job and time's running out. If you don't want anything to happen to Dom, Letty, Vince and Leon, you have to get in that car with me. You're the only person who can help me. Please, Mia."

Dazed by what she's just heard, Mia hesitates for a few seconds. Finally, she decides that it's the best thing to do for Dom and the others and she agrees to leave Race Wars in Brian's car.

With the passage of time, the Race Wars turned into a unique gathering of car lovers that eventually held flamboyant exhibitions of all kinds of vehicles.



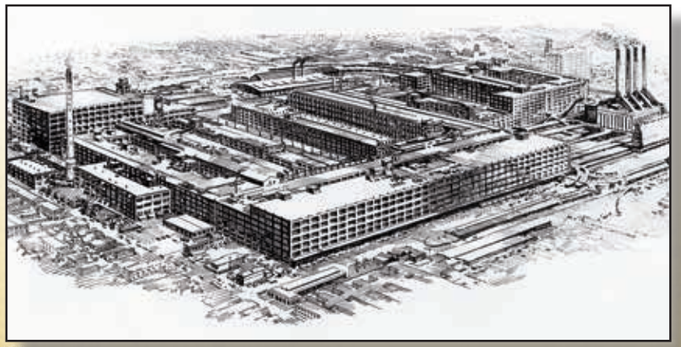
In the factory, which had its own power station and a smelting plant, virtually all the component parts of the first Dodge models launched from 1914 onwards were manufactured.

THE DODGE MAIN PLANT

Built in 1910, the Dodge Main Plant was the most important production factory in the early years of the marque and the headquarters of Dodge Brothers until it was purchased by the Chrysler Group. It stood in Hamtramck, a suburb of Detroit, and included different smelting, stamping, painting and assembly workshops.

The Hamtramck Assembly plant, the most important for eight decades, was called the "Main Plant" to distinguish it from the other Dodge factories.

The majority of the buildings of the Dodge Main Plant were designed by the architect Albert Kahn, who took into account the factory's need for good road connections, with different entrances for trucks, and by rail.



The Main Plant had its own foundry, so the engine blocks, the steel parts (such as the intake and exhaust pipes) and the clutch and gearbox casings were made on site. A power station produced the necessary electricity and outside there was a full test circuit. The Dodge brothers even offered their customers the possibility of visiting the factory and leaving with their new car.

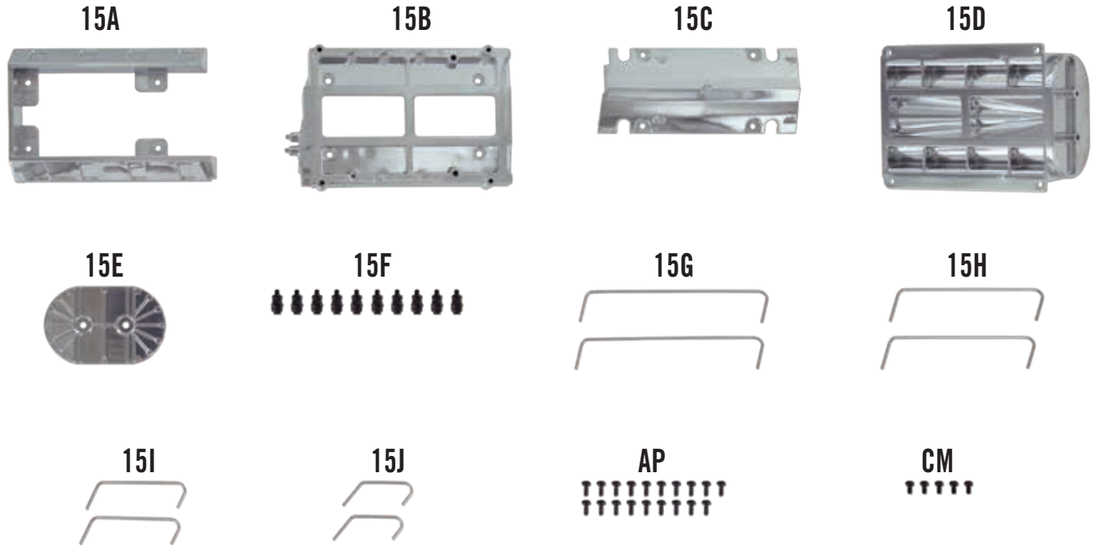
The Dodge Main Plant eventually had as many as 35 buildings. Hamtramck grew along with it and became a prosperous city that attracted many immigrant workers, most of them Polish, to work in the factory. In 1979 the Chrysler Group's crisis forced the Main Plant to close. Chrysler sold it for one dollar to a consortium, made up of local bodies and General Motors, who demolished the historic Dodge headquarters and opened a new plant in 1986.



ASSEMBLING THE ENGINE BLOCK (III)

In this assembly session, you will be working with the inlet manifold and the air intake of the supercharger. Follow our instructions carefully, using the illustrations to help you.

PIECES FOR THIS STAGE



15A Inlet manifold (piece 1)
15B Inlet manifold (piece 2)
15C Inlet manifold (piece 3)
15D Supercharger base
15E Supercharger backplate
15F Fuel injectors (x 10)*
15G Fuel injection lines 1 (x 2)
15H Fuel injection lines 2 (x 2)
15I Fuel injection lines 3 (x 2)
15J Fuel injection lines 4 (x 2)
AP Screws 1,7 × 4 mm, (x 19)*
CM Screws 1,7 × 3 mm, (x 5)*

* Some of the parts are spares.

Editor's note: The parts shown here may differ slightly from the parts supplied with this issue. This does not affect the quality or the assembly instructions in any way.

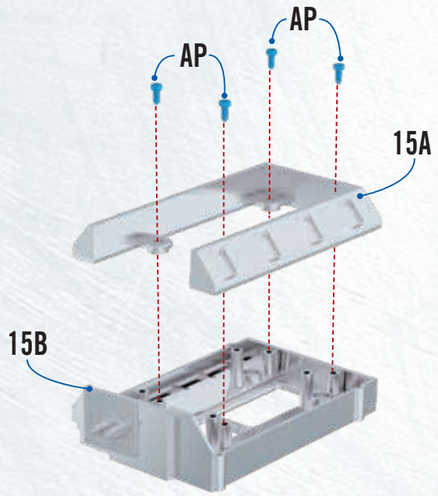
ASSEMBLY AREA



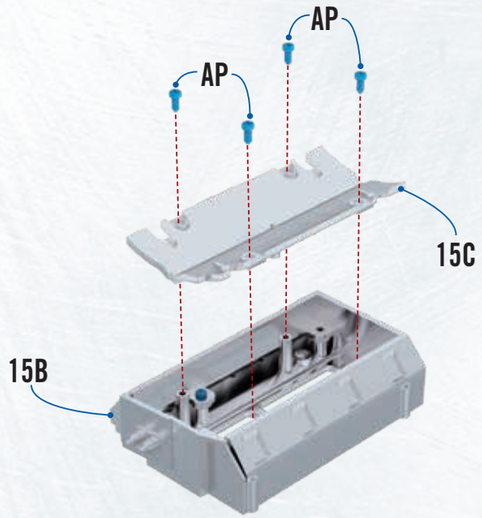
ENGINE BLOCK

Assembling the engine block (III)

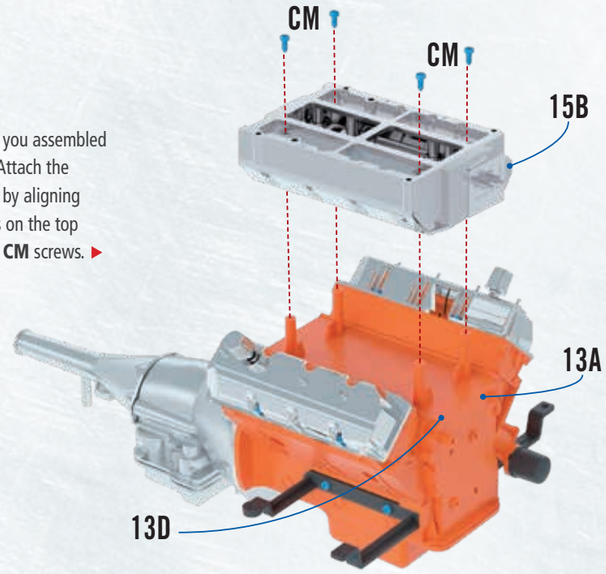
15.1 **ALIGN** the four mounting holes in piece 1 of the inlet manifold **15A** with the corresponding posts on piece 2 **15B**, ensuring the pieces face the same way as those in the illustration. Join them together with four **AP** screws. ▼

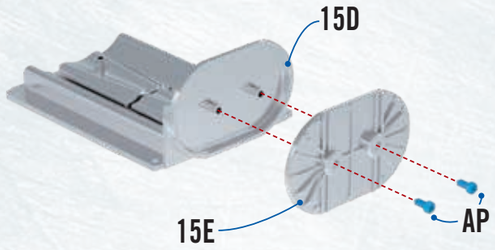


15.2 **NOW** attach piece 3 of the inlet manifold **15C**. Align the four mounting holes with the corresponding posts on piece 2 **15B**. Join the parts with four **AP** screws. ▼



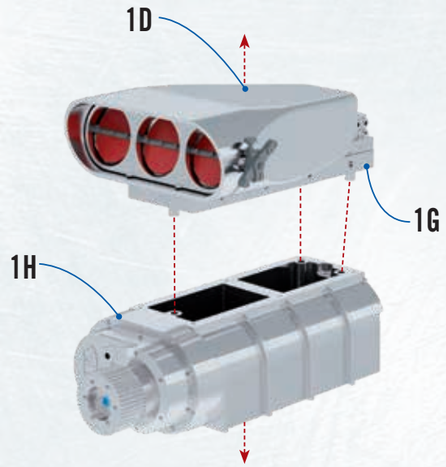
15.3 **TAKE** the engine block you assembled in the previous sessions. Attach the completed inlet manifold by aligning the four holes with the corresponding posts on the top of the block, and then fix in place with four **CM** screws. ▶

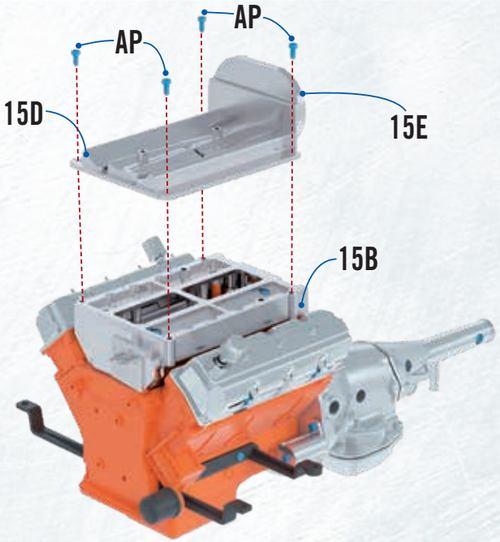




15.4 **JOIN** the two parts **15E** and **15D** of the supercharger together, using two **AP** screws. ◀

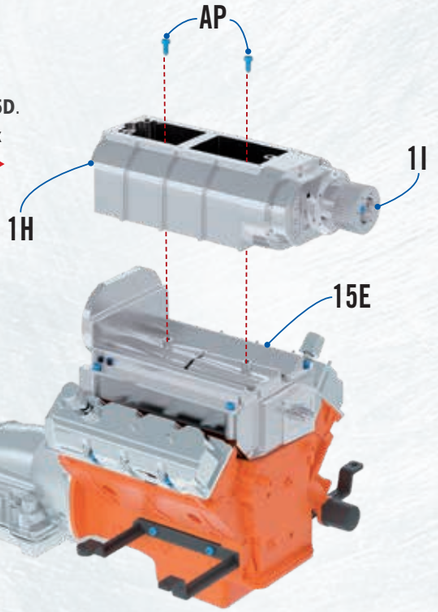
15.5 **ATTACH** the piece you assembled in step 15.4 to piece 2 of the inlet manifold **15B**, with the parts facing the same way as those in the illustration. Join with four **AP** screws. ▶



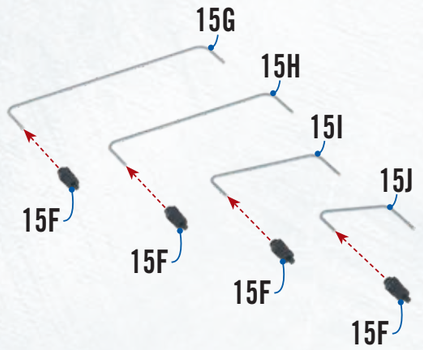


15.6 **TAKE** the air intake scoop **1D** and blower unit **1H** assembly that you built in the first construction session. Carefully separate the scoop from the blower case. ◀

15.7 **POSITION** the blower unit onto the supercharger base **15D**. Make sure the side with the pulley is facing the right way. Fix the blower case to its base with two **AP** screws, as shown. ▶

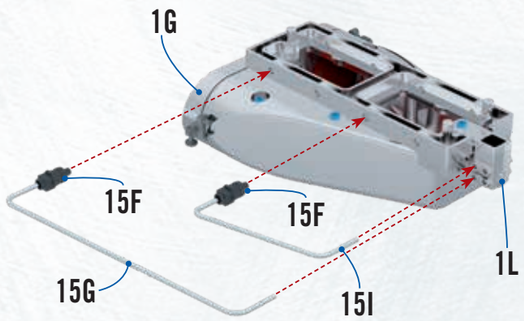


15.8 **ATTACH** the fuel injectors **15F** to the fuel injection lines **15G**, **15H**, **15I** and **15J**, by inserting the shortest end of each line into the fuel injectors. ▼



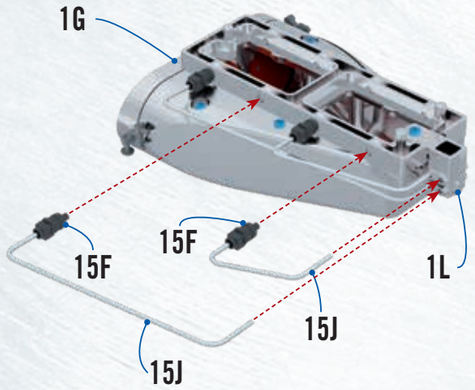
Assembling the engine block (III)

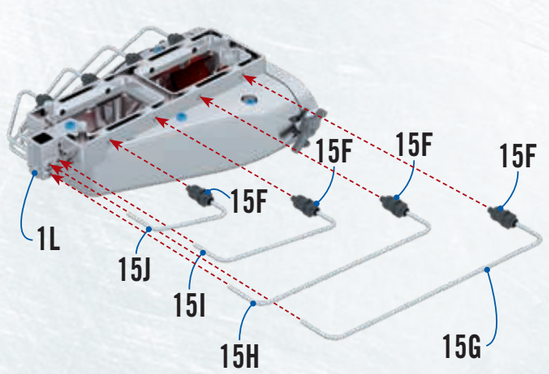
15.9 **Turn** the air scoop over, as shown in the illustration. Insert the free end of the fuel injection line 3 **15I** into the top left hole in the fuel distributor **1L**, and the pin on its fuel injector **15F** into the third hole from the left in the EFI adapter plate **1G**. Insert the free end of the fuel injection line 1 **15G** into the bottom left hole in the distributor **1L**, and the pin on its fuel injector **15F** into the first hole on the left in the EFI adapter plate **1G**. ▶



15.10 **Insert** the free end of the fuel injection line 4 **15J** into the top right hole in the distributor **1L**, and the pin on its fuel injector **15F** into the last hole in the adapter plate **1G**. Now insert the free end of the fuel injection line 2 **15H** into the bottom right hole in the distributor **1L**, and the pin on its fuel injector **15F** into the second to last hole in the adapter plate **1G**. ▼

15.11 **Attach** the remaining fuel injection lines to the right side of the adapter plate **1G**, in the same way you did for the left side. ▼



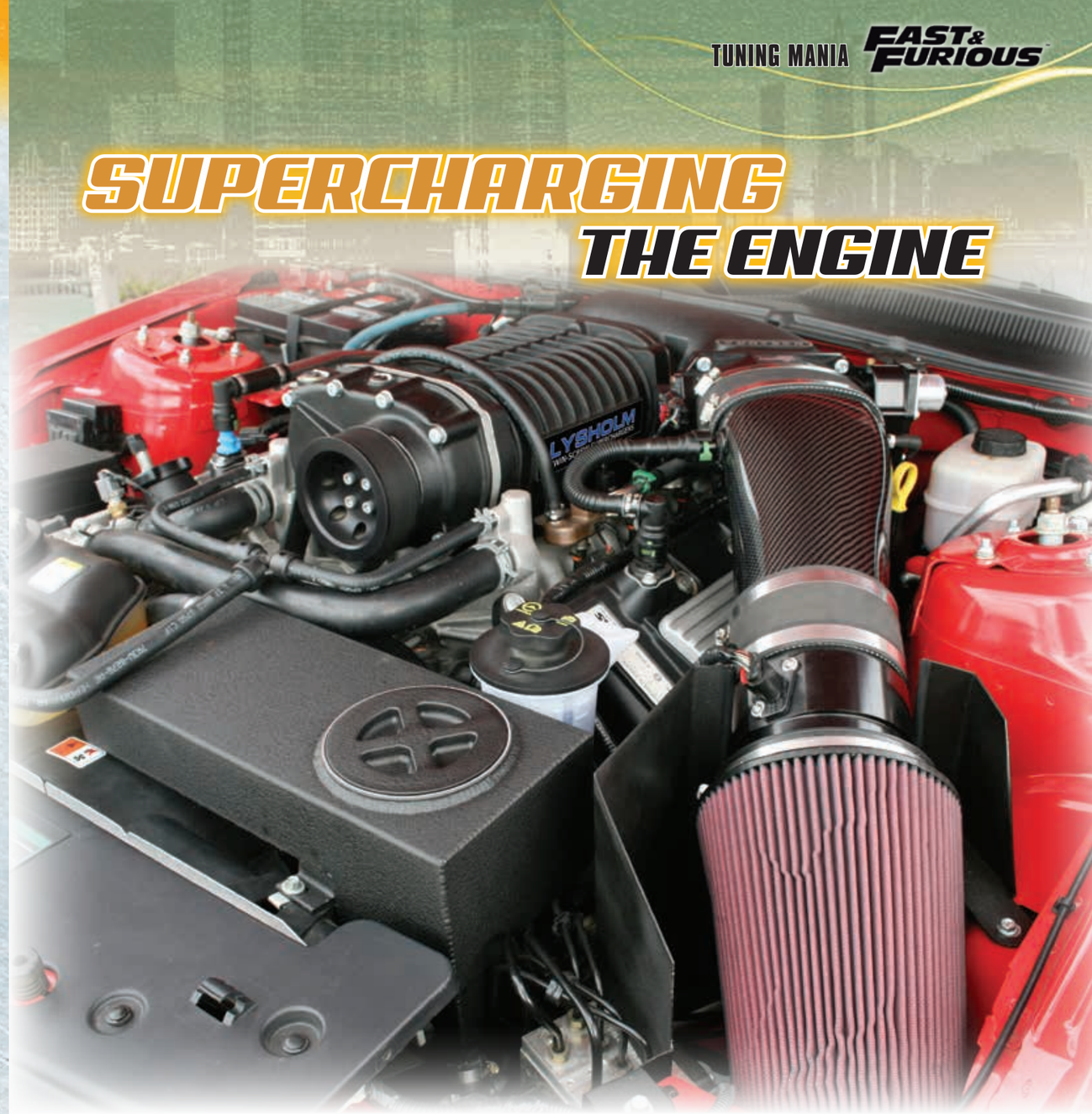


STAGE 15 FINAL RESULT



This picture shows the engine with the blower unit and the inlet manifold. For the time being, the air scoop with its fuel injection lines should not be mounted on top.

SUPERCHARGING THE ENGINE



How are air compressors used to increase engine performance? Here we let you in on some of the secrets of supercharging.

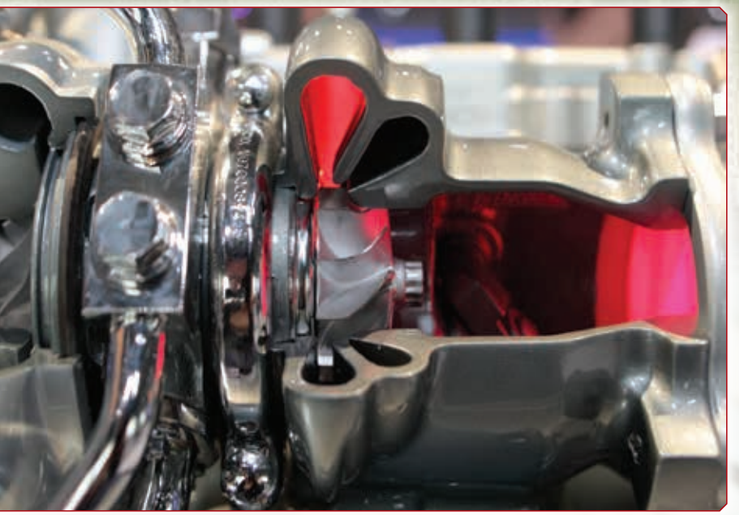
Before going into a detailed analysis of the different types of compressor, it is useful to understand that in simple terms they increase performance by compressing air and feeding it into the engine's combustion chamber. Higher pressure, denser air delivers more oxygen to the combustion process and you get a more powerful explosion in the chamber.

As we saw in edition 14, turbochargers are powered by exhaust gases. By contrast, superchargers are driven by a direct connection to the crankshaft, normally a belt-drive.

VOLUMETRIC COMPRESSORS

Although there are several types of supercharger, often known as "blowers", on the market, the best-known one

The screw compressor has helicoid lobes that introduce the air steadily and constantly. The increased performance can exceed 200 HP thanks to kits designed specifically for the purpose.



To reduce turbo lag, some manufacturers use twin displacement turbo-compressors. The crankcase is split and the gases from the cylinders are transported separately, which reduces the interference between the flows and the pulsing effect.

is unquestionably the rotary-lobe compressor, such as the Roots-type "blower", a favourite with drag racers. Inside the housing of the compressor there are two rotors with two or three lobes synchronised by a pair of gear wheels. This design was improved by Eaton, the worlds largest manufacturer of superchargers, who began making rotors whose lobes were no longer straight but were twisted into a spiral. The first version, which had a three-lobe 60° twist, made way for the second, with a four-lobe 160° twist. Which is quieter and more efficient.

Another type of supercharger is the Lysholm compressor. As in other models, the blower uses two rotor blades housed inside it. However, in this case the airflow is axial – it runs longitudinally and not transversally, it does in the Roots blower. Moreover, compression takes place gradually inside thanks to the use of lobes with a helicoid pattern (for this reason, Lysholms are also known as "screw compressors"), and create a steady, uniform air flow. The complexity of their manufacturing process and the high production costs initially made them prohibitively expensive. Nowadays, these limitations have been largely overcome and Lysholm compressors are increasingly common, not just in high-end automobiles, but in boats too. The Volumex supercharger, for its part, was a variation on rotary-lobe compressors, patented by Abarth, and used in cars for everyday use or for racing. It has an aluminium casing housing two-lobe rotors resting on bearings at each end, turned by gear wheels and connected to the engine by a pulley. Lastly, Zoller or Centrics compressors are based on a single off-centre impeller inside a cylinder. This impeller has spring-loaded retracting vanes that seal the gap between the impeller and the cylinder and move the air from one side of the compressor to the other.

CENTRIFUGAL COMPRESSORS

From a practical point of view, centrifugal compressors are accurately described as "flow accelerators", whose flow varies considerably according to the speed of rotation (it increases exponentially). The American Paxton compressor is an excellent solution when you wish to supercharge hig-revving petrol or diesel engines. The main characteristic of these compressors is the close relationship between increased pressure and rotation speed. As the compressor is run

Large Roots compressors have become an essential item for dragsters. The way they work is very simple: two synchronised rotors with two or three lobes compress the air and pump it into the engine's air intake.



There are numerous prepared kits on the market that serve to upgrade the performance of naturally-aspirated engines. They include all the necessary components for installation, like this Vortech centrifugal supercharger kit that could set you back around £6,500 ($8,200).

off the car's crankshaft, the spin of the compressor follows the engine revolutions. So at low speeds, the supercharging effect is minimal. When the rpm of the the crankshaft increases, the compressor's centrifuge spins faster and increases the volume of air pushed into the engine. As we said before, the Paxton centrifugal compressor relies on a high-revving engine to have a significant impact. But once it gets into the right rpm range, the effect is almost exponential.

The big Roots-type blowers often require the car tuner to chop a large hole in the bonnet to accommodate the air scoop, possibly carburettors, and the supercharger housing. But there are smaller versions that can be squeezed into the engine bay, unnoticed from outside the car. And the Paxton-style centrifuge can also be hidden away, as can the turbochargers we discussed in Edition 14.

BEFORE YOU START

There are many kits on the market for increasing the performance of mass-produced engines, but for the uninitiated, making the right choice is a hazardous process. Unless you are a very competent, technically-trained auto mechanic, the wisest choice is to go to a specialist workshop, and have them advise you before you start wielding spanners. Supercharging an engine is a highly-skilled job, and getting it wrong can leave you with a badly damaged motor.

There are many things that need to be taken into account. One of the most important is the need for an intercooler to cool the air after it has been compressed. When air is compressed it heats up, and hot air going into your engine is not efficient. The larger the temperature difference between the inlet air and the temperature of combustion within the cylinder, the more energy is converted through the combustion. So colder air means a bigger temperature difference and therefore more power. Another consideration is your car's clutch – will it stand up to the increase in power and torque when you do your racing starts?. Then, unless your ECU is properly tuned and some thought it put into the correct compression ratio for your engine, you run the risk of engine damage caused by pre-ignition. This is when the engine gets so hot that fuel in a cylinder pre-ignites while its piston is still ascending, leading to major internal engine damage. Supercharging your car's engine can be an exciting journey – but make sure you get expert advice before starting – it will save you a lot of money in the long run.

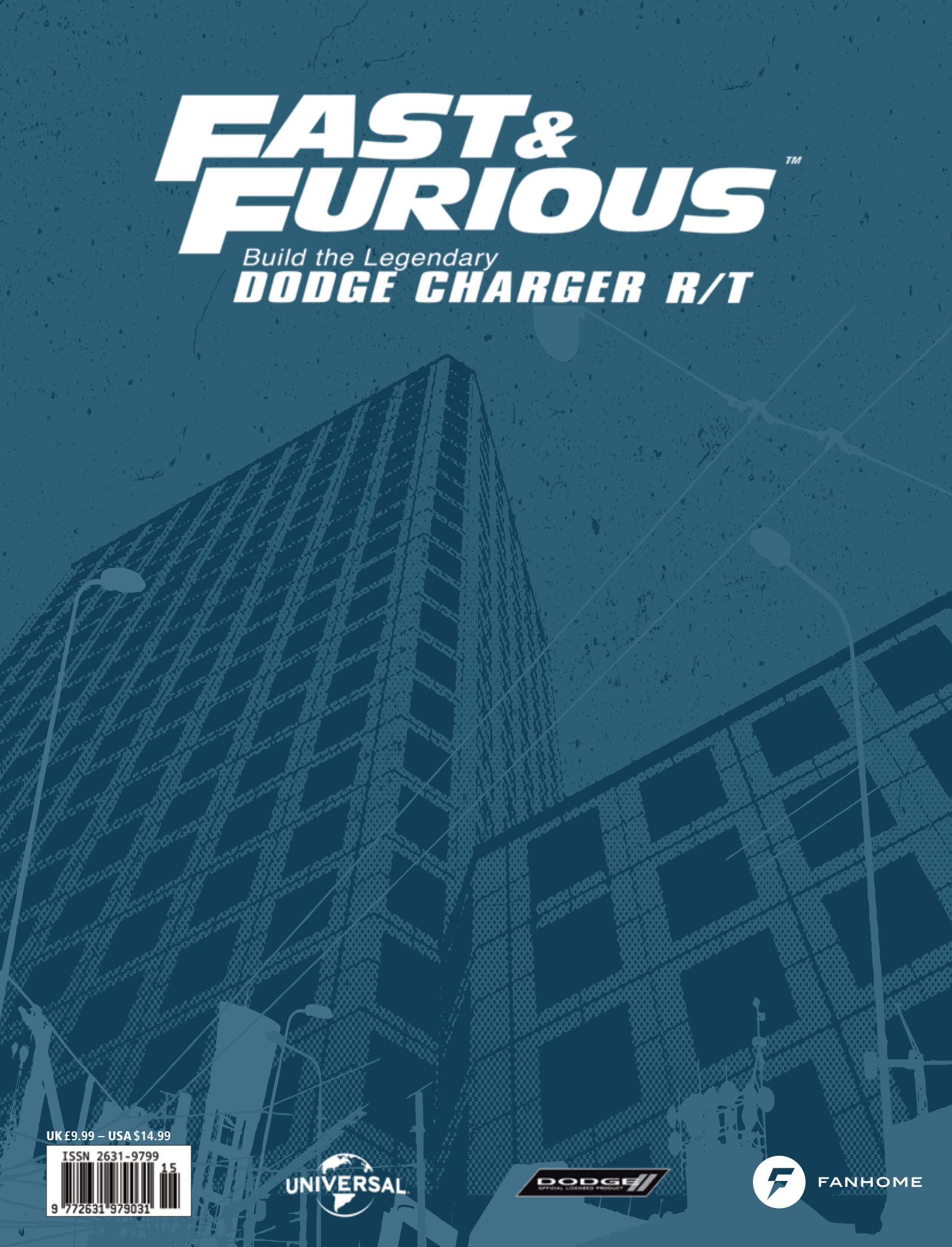
When the pressure rises

Detonation, also called pre-ignition or engine knock, occurs when fuel pre-ignites before the piston reaches its scheduled combustion point. This means that a premature explosion tries to reverse the direction of the upcoming piston and the engine. When that happens, the internal explosive forces can far exceed the normal forces acting upon a properly operating engine. Detonation is generally caused by excessive heat, a combustion ration that is too high, improper ignition timing, inadequate fuel octane or a combination of all of them. Of the previous, excessive heat is usually the culprit. As an engine is modified to generate more power, additional heat is produced. Today's standard octane fuel will only tolerate a finite amount of heat before it pre-ignites and causes detonation.



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