FRONT ENGINE REAR WHEEL DRIVE pdf

1: How to Convert From Front to Rear Wheel Drive | It Still Runs

In automotive design, an FR, or front-engine, rear-wheel-drive layout is one where the engine is located at the front of the vehicle and driven wheels are located at the rear.

However, some manufacturers placelocate the engine at some location point behind the driver. The goal of this article is to discuss the dynamic differences among front-, mid-, and rear-engine configurations. Have you ever lifted the hood of a modern passenger car, only to find no motor? But if you drive a mid- or rear-engine vehicle, you would be accustomed to having only storage space up front under the hood. The goal of this article is to discuss the different engine locations and their impact on vehicle dynamics. Front-Engine Vehicles By far the most common engine location is at the front of the vehicle, ahead of the driver and the front axle line. While the earliest automobiles used a variety of engine locations, front-engine vehicles quickly became the norm for financial and engineering reasons. For example, most front-engine vehicles feature relatively easy access to the motor for maintenance and repair. Positioning the engine ahead of the driver also impacts space considerations such as permitting permits a full-size interior. In addition, most front-engine vehicles feature large cabins, usually with seating for four or more occupants, including relatively spacious rear seating areas. Interior sound levels are also reduced because the engine is not directly adjacent to the cabin. Most front-engine vehicles feature relatively easy access to the motor for maintenance and repair. Placing the engine up front also has some disadvantages. First, braking ability is somewhat diminished. Diminished braking occurs because weight transfers forward under braking Karasa, , leaving relatively little weight remaining over the rear wheels during braking and thus, limiting the ability of the rear tires to contribute the braking task. Second, accelerative ability is limited somewhat by the relative lack of static weight over the rear tires when, the weight of the vehicle shifts rearward upon acceleration Scotti, Despite its relative drawbacks, the front-engine layout remains the most popular. Mid-Engine Vehicles In a mid-engine configuration the engine is located directly behind the cabin just ahead of the rear axle line. Essentially, the engine is located in the rear seat area. A rare configuration, the mid-engine vehicle is usually associated with high performance automobiles for several reasons. Rear-Engine Vehicles In rear-engine vehicles, the motor is located in the rearmost portion, behind the rear axle line. Essentially, the engine is located in the trunk. Also a rare configuration, rear-engine automobiles tend to demonstrate exceptional braking ability due to a greater amount of weight from the engine remaining over the rear tires during braking. Thus, all four tires are heavily involved during braking instead of just the front tires. Acceleration is also enhanced, as the rearward transfer of weight and the engine weight combine to put maximum downward force on the rear tires the tires responsible for acceleration in this configuration resulting in a larger rear tire contact patch that enhances accelerative traction Bentley, While it may appear that rear-engine vehicles are the answer to all automotive needs, they do have drawbacks. First, the cabin generally has less room for rear passengers than does a front-engine vehicle. Some rear-engine cars do feature rear seats, but many do not offer enough room to carry rear passengers. Even in vehicles that do feature rear seats, the seats are often so smal that the only passengers able to sit comfortably in them are children. Recall that oversteer rear wheel skids occur when the rear tires lose traction before the front tires, resulting in the rear of the car sliding out sideways or "fishtailing. As oversteer skids are less easily corrected than understeer front wheel skids, this can be a problem for drivers not experienced and skilled in the driving dynamics of rear-engine cars" Rich, To help visualize this situation, imagine that you are playing a friendly game of darts. Instead of throwing your next dart normally, with the nose-heavy pointed end leading, you turn the dart around, throwing it fin-first toward the dartboard. Which end of the dart will eventually contact the dartboard? Indeed, the heavier end will spin in mid air during flight and contact the dartboard first. Front-engine vehicles can be either front or rear wheel drive, while all mid- and rear-engine vehicles are rear wheel drive. Table 1 displays a summary of the relative advantages and disadvantages of each engine location. In dry conditions under normal driving conditions, the location of the engine does not make much of a difference in terms of driving dynamics. However, as the driving turns more spirited or involved emergency situations requiring abrupt driver inputs, these differences can surface,

sometimes to the negative surprise of the driver. Generally, mid- and rear-engine vehicles will benefit the driver by offering shorter potential stopping distances and will disadvantage the driver to the degree that these layouts are more ends" with the front. Generally, mid- and rear-engine vehicles will benefit the driver by offering shorter potential stopping distances and will disadvantage the driver to the degree that these layouts are more likely to oversteer than their front-engine counterparts. As with front-, rear- and all-wheel-drive, modern traction maintenance systems tend to equalize the dynamic differences among front-, mid- and rear-engine vehicles Wilson, Maufacturers currently offer few mid- and rear-engine vehicles. The front-engine configuration remains the most popular layout. However, driving instructors may find themselves in a position to field questions about the difference among engine locations. It is hoped that this article contributes to preparing instructors to provide accurate information on this topic. How to go on ice and snow. Bob Bondurant on high performance driving.

FRONT ENGINE REAR WHEEL DRIVE pdf

2: FR layout - Wikicars

Front-wheel-drive layouts are those in which the front wheels of the vehicle are driven. The most popular layout used in cars today is the front-engine, front-wheel drive - with the engine transversely in front of the front axle, driving the front wheels.

In short, a transaxle performs both the gear-changing function of a transmission and the power-splitting ability of an axle differential in one integrated unit. A transmission performs the gear-changing function only, delivering power via a single output shaft at the back of the unit. This diagram shows a typical front-wheel-drive layout with a transaxle that performs both the gear-changing function of a transmission and the power-splitting ability of a differential in one integrated unit. This diagram shows a typical rear-wheel-drive layout with a transmission that performs the gear-changing function only, delivering power via a single driveshaft to a separate differential unit on the rear axle. Transmission More specifically, looking up the word "transmission" in any number of locations brings similar yet varying descriptions when it comes to automotive applications. Some authoritative sources refer to a transmission vaguely as "an enclosed unit of gears that transmits power from the engine to the driving wheels of a motor vehicle. A closer look at a typical "transmission" designed to mount directly behind an engine. While it routes power from the engine through gears of various ratios, a single driveshaft exits the rear. Transmissions are not designed to be mounted in between left- and right-side axle shafts the way a transaxle assembly is. A closer look at a typical transaxle designed for a front-engine, front-wheel-drive vehicle. No definition of a transmission actually mentions an ability to split torque to two different axles while being located directly between them. Also, the presence of a drive shaft mentioned confirms there is also a separate differential located elsewhere that splits power in the middle of an axle. There is no single driveshaft exiting a transaxle, because there is no separate differential unit located elsewhere to receive it. Instead, shafts for both the left- and right-side drive axles themselves are directly connected to each side of the transaxle. While they may be separated, transmission cogs and differential gears are contained within one large transaxle housing. This picture of the rear of a late-model Corvette chassis allows a good look at the layout of a front engine, rear-wheel-drive vehicle with a transaxle integrated into the rear axle. Transmissions are mostly found in cars and trucks designed with a front-engine, rear-wheel-drive layout. In such vehicles both the transmission and engine will be mounted front-to-back rather than sideways. Both part-time and full-time 4-wheel-drive drivetrains usually feature this same layout - adding a separate, self-contained transfer case to direct power to front and rear axles via a separate set of drive shafts. An example of a Jaguar front-engine, all-wheel-drive layout where the rear output shaft of a transmission goes on to power a center transfer case, which splits power to separate front and rear axle differentials. While this powertrain is full-time all-wheel-drive, part-time 4-wheel-drive vehicles use this same basic layout - varying only in differential function. In two-wheel-drive vehicles, transaxles are found in all configurations where the engine is located at the same end of the vehicle as the drive wheels are. Vehicles with the engine mounted behind the rear axle line are known as "rear engine" models, while vehicles with the engine behind the driver but in front of the rear axle line are known as "mid engine" models. This diagram of a Chevrolet Corvair gives a closer look at its rear-engine placement behind the rear axle line, and its rear transaxle. Notable rear-engine vehicles with a rear transaxle include original Volkswagen Beetles and all derivative models sold in the United States through the s, Chevrolet Corvairs from , Porsche and models from the s through present day, and s DeLorean sports cars. This mockup of a Acura NSX powertrain allows a good look at a mid-engine, rear-wheel-drive layout with a rear transaxle. Notice how the mid-engine design places the engine behind the driver but ahead of the rear axle line. Continuosly Variable Transmissions CVTs Continuously variable transmissions CVTs popular in modern vehicles can also be configured as either a transmission or a transaxle. A CVT is an automatic transmission that uses two pulley wheels with adjustable diameters connected by a steel band to vary gear ratios between engine and transmission output shafts. So instead having of a fixed number of gears the way traditional transmissions do, a CVT can create an infinite number of gear ratios. CVTs are most commonly found in smaller front-wheel-drive vehicles, and are usually

engineered as transaxles. Should you find yourself in need of a complete new or rebuilt transmissions, or the parts to service or repair your existing transmission, such as overhaul kits, torque converters , valve bodies , filters , and fluid , CARiD has all the high-quality parts you need in our Replacement Transmission Parts section. Items Discussed in Article.

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3: Comparison of Engine Placement

Comparing front wheel to rear wheel drive, for acceleration, rear wheel drive has the advantage of dynamic weight transfer to the rear, increasing traction at the drive wheels. By comparison, front wheel drive sees traction at the drive wheels diminish under acceleration.

Honda S oh yea u forgot about this powerhouse! Daniel Hannestad The cars are rated after price. Instant loss of credibilty as a car person. Chevy has been badging their cars with the Super Sport logo, since they first sold the package on the Impala. If you said that around a group car buffs, they shrug you off and ignore all your comments for the rest of the conversation. You sound like some chick, watching a football game and asking why the guys are all wearing helmets. Sky Excuse my several typos. Ford boldly borrowed GT from the Italians who badged cars like Ferrari with the grand touring designation. I mean come on! The SS badging has been on GM products for well over 50 years now. But yeah, they should have known it stood for super sport. It would squarely beat the Smart on this list in price, passenger capability and looks. That joke not only went over your head it skimmed the Moon and colonized Mars. The SS Schutzstaffel were Nazi special forces more or less. The joke being on the SS of Chevy. Raygun I own an older wrangler,love it except the miles I get to a tank on 18 gallons. I bought a smart fortwo to supplement the Jeep 6 months ago. The Jeep has been started 3 times, 2 to move it and once to take it on the road just for the sake of charging the battery. I feel safer in this car than I do on any motorcycle every produced in the history of mankind. People that scoff at the mileage are morons, I get from 37 to 45 depending on how I drive and what that means is going from mad man to not so mad man. I constantly run the car at 85 and it feels fine. The hp naturally aspirated engine combined with unbelievable handling has yet to be matched in the marketplace. Marvin I am fortunate enough to own a Shelby convertible that gets 18 mpg combined driving. Every now and then I put the pedal to the metal to make sure all the horses are still there but most of the time I just cruise. I had a v6 auto and I averaged 21 at best. I had a shelby gt, I was lucky to get averaged. Ed Sure, I like it, nevertheless it is slated over twice as heavy as my 93 operable fastback 2. Cypeq First of all this is not at all affordable carsâ€¦ all of them are entry level performance cars. Did the author had a little bit of bipolar event? AWD and below 20 grand. Aune The Chevy SS stands for Super Sportâ€¦ The SS trim level as been around for I wanna say over 50 years I think I really wish their writers would do a little bit of research before making a dumbass comment like compairing the car to a Nazi war machine. I have a GT with track pack and have had nothing but trouble with eh driveshaft, tranny input bearing, and rear diff. These were all repalced at 5K and now they are up for replacement again at 15K. This car is a turd. All the power in the world means nothing, when the car is junk. I have a GT with track pack and have had nothing but trouble with the driveshaft, tranny input bearing, and rear diff. These were all replaced at 5K and now they are up for replacement again at 15K. Keep being v-8 Andy and show everyone how smart you are along w the other less than what, may people who want the new gas hog boat SS? It is to do with leaving more room inside as there is no tunnel for the propshaft and gearbox. Di Thats ok guys, my 93 mr2 still gets me 30 mpg steady, as it always has. And its still a blast to drive. How more steady can you get? He just goes on and on about how the front-wheel-drive Chevy Spark gets better gas mileage with 2 extra seats than other small cars. Not exactly an affordable RWD car. You can buy a BMW 3 series for less than that. Guma Gutierrez Pretty much answered your own question there. Very possible as even the small Rogue SUV from nissan at lbs achieves Peace self loving pigs u are Not a single BMW.. I never see the SS on the road to work. Super Jeepin There are a few reasons. Because of the reduced parasitic loss, it offers better performance in low power applications and better fuel economy as well. It also frees up some space for the passengers like you said. Some reasons are more important than others, but all are valid reasons nonetheless.

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4: Front engine, rear wheel drive layout | Revolvy

Buy a running, automatic transmission, front-wheel drive donor car with the engine you want to use. If you're going to go through the trouble of converting the car, you might as well use the engine you really want for a huge bump in power.

Monday, October 21, , Should you be more concerned about your new car being front or rear wheel drive? The most common question asked is which of the two layouts is better. In most cases the answer to that question is RWD. However, most cars manufactured these days are front wheel driven. Read on for answers to all these questions. Why is a front wheel drive car more fun to drive than a real wheel drive car? Why is a rear wheel drive less expensive? Here are the answers. Front wheel drive As the name implies, the power from the engine is transferred to the front wheels. The only purpose the rear wheels serve is to provide balance and the front wheels are left to do all the work. Steering and handling the engine power. FWD cars always have their engines mounted at the front. Advantages Since the engine and the drivetrain are both at the front they form a compact package. Manufacturers require fewer components to connect the two, which helps weight reduction, which in turn improves fuel economy. Overall, production cost of FWD cars is considerably less. The reason why most cars come with FWD. Since all the components are at the front there is more interior space for the passengers and luggage. Advantages In a FWD car the weight of the engine and the drivetrain are concentrated towards the front end of the car. This provides a good amount of traction for the wheels in wet conditions, even without expensive electronic traction control. Advantages FWD does not promote oversteer or skidding in other words, which makes it easier for inexperienced drivers to control the car. Disadvantages While FWD cars do not promote oversteer, they tend to understeer because they are front heavy. Since the front wheels are over burdened front tyres wear out quickly. Disadvantages While a heavy front provides adequate starting traction on wet roads, in all other conditions traction from a FWD car is inferior to a RWD car. This is due to non-uniform weight distribution. The rear end of a FWD car is considerably lighter than its front end, which means the rear tyres do not grip the road very well. Disadvantages Since steering and engine power is handled by the front wheels, the latter sometimes tends to compromise the former. The force generated front the engine, especially in powerful cars sometimes tends to pull the car either to the right or to the left. This is referred to as torque steering. Rear wheel drive Almost all performance cars are rear wheel driven. FWD cars can have their engines placed either at the front or the rear, but front engine-rear wheel drive cars are the most common type and that is the one we are talking about. Advantages Engine at the front and drivetrain at the rear results in an even weight distribution. This one characteristics alone provides several advantages. This translates to better handling in corners, better control over the car at high speeds, even tyre wear and most of all better traction in dry conditions and inclinations. Advantages A RWD car accelerates faster than a FWD since the weight transfers to the rear of the car improving rear tyre grip when there is a forward shift in momentum. Advantages The engine compartment is freed from the added drivetrain, which now sits at the rear. The extra space can be utilised to accommodate larger, more powerful engines. Disadvantages RWD cars are heavier due to the additional hardware that is used to connect the front engine with the rear drivetrain. This also increases production cost. Thus, they are more expensive than equivalent FWD cars. Disadvantages The presence of the transmission tunnel the bump that runs in the middle of a RWD car reduces interior space. Disadvantages RWD cars, when cornering at high speeds, are more prone to become tail happy. As in, they oversteer and the rear end of the cars skids. They offer a better overall driving experience and are the better cars for drifting which is nothing but controlled oversteer. They can accelerate faster, corner faster and provide better grip. As for reduced traction in wet conditions, this can be remedied with modern electronic traction control. But RWD cars are almost always more expensive. FWD cars on the other hand may not be as much fun to drive, but they are more economical and sensible. For commuting inside the city at low speeds and for general everyday use inexpensive FWD cars make more sense.

FRONT ENGINE REAR WHEEL DRIVE pdf

5: Rear Wheel Drive Cars vs Front Wheel Drive Cars: Advantages & Disadvantages - DriveSpark News

Front-wheel drive reduces weight, decreases production costs, and improves fuel economy compared to a rear-wheel-drive system. It also improves traction since the weight of the engine and.

More predictable steering in low traction conditions ie: Less costly and easier maintenance - Rear wheel drive is mechanically simpler and typically does not involve packing as many parts into as small a space as does front wheel drive, thus requiring less disassembly or specialized tools in order to replace parts. Steering radius - As no complicated drive shaft joints are required at the front wheels, it is possible to turn them further than would be possible using front wheel drive, resulting in a smaller steering radius. Towing - Rear wheel drive puts the wheels which are pulling the load closer to the point where a trailer articulates, helping steering, especially for large loads. During heavy acceleration, the front end rises, and more weight is placed on the rear, or driving wheels. This is of course easier to do on slippery surfaces. Drifting can be used to help in cornering quickly, or in turning the car around in a very small space. Drifting requires a great deal of skill, and is not recommended for most drivers. When front wheel drive cars drift, the driver usually pulls on the emergency brake in order for the back wheels to stop and thus skid. Diadvantages of Rear Wheel Drive- More difficult to master - While the handling characteristics of rear-wheel drive may be more fun for some drivers, for others having rear wheel drive is less intuitive. The unique driving dynamics of rear wheel drive typically do not create a problem when used on vehicles that also offer electronic stability control and traction control. But in a passenger car, rear wheel drive means: Less front leg room the transmission tunnel takes up a lot of space between the driver and front passenger , less leg room for center rear passengers due to the tunnel needed for the drive shaft , and sometimes less trunk space since there is also more hardware that must be placed underneath the trunk. Increased weight - The drive shaft, which connects the engine at the front to the drive axle in the back, adds weight. There is extra sheet metal to form the transmission tunnel. A rear wheel drive car will weigh slightly more than a comparable front wheel drive car, but less than four wheel drive. Higher purchase price - Due to the added cost of materials, rear wheel drive is typically slightly more expensive to purchase than a comparable front wheel drive vehicle. Rear drive is typically the platform for luxury performance vehicles, which makes read drive appear to be more expensive. In reality, even luxury performance front drive vehicles are more expensive than average. More difficult handling on low grip surfaces wet road, ice, snow, gravel In modern rear drive cars, this disadvantage is offset by electronic stability control and traction control.

FRONT ENGINE REAR WHEEL DRIVE pdf

6: Front engine, front wheel drive layout | Revolvy

Rear-wheel drive, abbreviated as "RWD," is the oldest type of vehicle layout, where simply, the engine sends its power through a transmission to the rear axle of a vehicle.

Which configuration is the best: Reason being, these engine applications have a higher learning curve than other configurations. But for race cars under the control of a professional driver, rear engines are great. They provide a lot of power and traction to the back wheels, which makes them quick to accelerate. Although, that same power to the back wheels can come back to bite them. They are prone to oversteer â€” since the power and weight in the back wants to swing around to the front â€” but with the right suspension and chassis tuning, rear engine vehicles can be incredible sports cars. Just take a look at the Porsche By placing the engine in the middle of the car, engineers balance the front and rear weight and are able to maintain equal traction in all four wheels. This makes them incredibly stable in the corners. There are a few drawbacks to a mid-engine vehicle, though. The first being the lack of cabin space. Typically, that mid-engine is located where one might want a back seat. Second, if you ever lose control of a mid-engine vehicle and start to spin, it will be harder to overcome and stop the spin due to its low center of gravity. Think of it like the difference between throwing a baseball and a baseball bat. For starters, most vehicles are front-wheel drive FWD , so it makes sense to have the engine over the wheels that need traction. This makes the vehicle much more stable, and also helps maintain a relatively balanced weight distribution when accelerating. This makes them somewhat undesirable for racing applications. Rear-wheel drive RWD front engine cars are balanced better, though. Their weight is more evenly distributed, making them less prone to oversteer as compared to RWD rear-engine cars, and less prone to understeer as compared to FWD front-engine vehicles. The low center of gravity in a mid-engine vehicle still beats them out, though. So which is the best? Front-engine cars are generally the best for consumers. Rear-engine cars are unmatched in acceleration, but can be hard to handle at times. And mid-engine cars are incredibly stable, but also have their fair-share of drawbacks. Be sure to share this post with your friends, or on your Facebook if you enjoyed it! We always love to hear your feedback, so feel free to leave us a comment below. More from my site.

FRONT ENGINE REAR WHEEL DRIVE pdf

7: How the transmission works | How a Car Works

Front Engine/Four Wheel Drive. The vehicle in diagram PC3 below shows a front engine/4WD configuration. Four wheel drive itself provides a significant advantage in acceleration, but adds additional weight and complexity to the vehicle.

The acceleration potential is also less than rear wheel drive configurations. As the weight shifts off the front tires and onto the rear tires during acceleration, there is less grip to drive the vehicle forward, which creates front wheel spin that hampers acceleration and increases tire wear. However, front wheel drive cars generally have the advantage of being lower in cost than other drive configurations due to the integrated packaging and they represent great value in racing when matched against other front wheel drive machines. Four wheel drive itself provides a significant advantage in acceleration, but adds additional weight and complexity to the vehicle. It can enhance braking through the use of engine braking, but overall grip available at the tire contact patches will remain the same. The same situation exists for cornering. Four wheel drive might help avoid oversteer by more evenly applying acceleration forces through all four wheels, but the overall lateral and longitudinal grip remains the same. Maximum acceleration is possible with all four wheels driving, but weight distribution and suspension design are still key to putting down the power efficiently. At the time, the suspension, handling and driving techniques were undeveloped but once those aspects were worked out, the Auto Union cars became formidable race cars. Mid-engine cars offer several distinct advantages: By having the engine, transmission and final drive in close proximity it also reduces weight because fewer and shorter components are needed to form the driveline. By having the engine behind the driver, it also shortens the required length of the car and reduces the height of the front bodywork , allowing the driver to sit lower, which in turn lowers CG. The polar moment of inertia is reduced because the engine sits much closer to the CG point as well. What these advantages add up to is a more nimble carâ€”quicker to turn, brake and accelerate. See diagram PC5 below. The lightweight nature of the motorcycle engine and the integrated sequential gearbox present a massive all-in-one value to amateur builders. The chain drive output rotation happens to also coincide with the axle rotation, eliminating the need to route power through a 90 degree geared differential. Motorcycle engines are relatively low torque, high-revving power plants, which lend themselves well to using small car parts such as Austin Mini differentials for the final drive. Horsepower available can range up to HP with turbo or supercharging, so the range of vehicles a motorcycle engine can be used on is quite wide. The major drawback is the lack of a built-in reverse gear. Mid-mounted motorcycle engine with rear wheel chain drive. The four wheel drive system adds additional weight and complexity to the powertrain. Acceleration is the biggest benefit of having 4WD, but there is little practical effect on braking performance except if engine braking is used. The 4WD system can have a stabilizing effect in turns when designed to counter acceleration oversteer. It combines the advantages of the mid-engine with the best available acceleration. This configuration has the advantage of providing more weight transfer under acceleration than any other configuration. However, due to the leverage created by placing the engine outside the wheelbase, it has the negative side effect of reducing front wheel traction when under hard acceleration. Cars that make use of such a configuration generally escape significant penalty because they use lightweight engines and place the engine only a small distance past the rear axle. Unusual, but well-executed by VW and Porsche. Using lightweight engines makes this configuration possible. However, as Porsche has demonstrated, the configuration can be made to work well. The more compact wheelbase of the rear-engine design also overcomes some of the polar moment and CG issues, when the static weight distribution is done well. Consider that the design of the chassis , overall weight distribution and suspension components all depend on the engine and driveline selected. The approximate mass and power of the engine and the mass and loading of the driveline are basic, but important starting points. However, how components are fit into the package of the vehicle can make a big difference. Having an engine capable of being placed low in the chassis will have a large impact on final performance. Minimize Outboard Weight The unsprung weight of the suspension can be reduced if outboard driveline components are optimized for weight. For example, on an independent suspension, the longer the length of the half-shafts used to reach the wheels, the stronger they will need to be.

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This means more mass and more strength is required, which adds to unsprung weight. The design aspects use the airflow through each part of the engine as a basis for instruction. Provides detailed information on how to select, modify and tune each component to work at peak efficiency with others in the engine. This book covers applications such as drag racing, circle track, road racing and boats. How to Build Motorcycle-engined Racing Cars How to design and construct a motorcycle engine powered race car. This book explains how select and integrate the engine into a car as well as the design of the other aspects such as chassis, powertrain, brakes, fuel, coolant and electrics.

FRONT ENGINE REAR WHEEL DRIVE pdf

8: Front-engine, rear-wheel-drive layout - Wikipedia

Changing the engine orientation and the transmission (front wheel drive cars use a transaxle, usually, while rear wheel drive cars use a traditional transmission with a differential on the rear axle) would change everything from the weight distribution to frame structural supports and engine mounts to exhaust orientation and location to fuel.

Front-wheel drive FF layout Front-wheel-drive layouts are those in which the front wheels of the vehicle are driven. The most popular layout used in cars today is the front-engine, front-wheel drive â€" with the engine transversely in front of the front axle, driving the front wheels. This layout is typically chosen for its compact packaging; since the engine and driven wheels are on the same side of the vehicle, there is no need for a central tunnel through the passenger compartment to accommodate a prop-shaft between the engine and the driven wheels. As the steered wheels are also the driven wheels, FF front-engine, front-wheel-drive layout cars are generally considered superior to FR front-engine, rear-wheel-drive layout cars in low-traction conditions such as snow, mud, or wet tarmac. The weight of the engine over the driven wheels also improves grip in such conditions. However, powerful cars rarely use the FF layout because weight transference under acceleration reduces the weight on the front wheels and reduces their traction , limiting the torque which can be utilized. A transverse engine also known as "east-west" is commonly used in FF designs, in contrast to FR which uses a longitudinal engine. Characteristics[edit] Front-wheel drive gives more interior space since the powertrain is a single unit contained in the engine compartment of the vehicle and there is no need to devote interior space for a driveshaft tunnel or rear differential , increasing the volume available for passengers and cargo. It also has fewer components overall and thus lower weight. During heavy acceleration, weight is shifted to the back, improving traction at the rear wheels at the expense of the front driving wheels; consequently, most racing cars are rear-wheel drive for acceleration. However, since front-wheel-drive cars have the weight of the engine over the driving wheels, the problem only applies in extreme conditions in which case the car understeers. On snow, ice, and sand, rear-wheel drive loses its traction advantage to front or all-wheel-drive vehicles which have greater weight over the driven wheels. Rear-wheel-drive cars with rear engine or mid engine configuration retain traction over the driven wheels, although fishtailing remains an issue on hard acceleration while in a turn. Some rear engine cars e. Since the powertrain is a single unit contained in the engine compartment of the vehicle, there is no need to devote interior space for a driveshaft tunnel or rear differential , increasing the volume available for passengers and cargo. Fewer components usually means lower weight. Improved fuel efficiency due to less weight. Fewer material components and less installation complexity overall. Few modern "family" cars have rear-wheel drive as of , so a direct cost comparison is not necessarily possible. A contrast could be somewhat drawn between the Audi A4 FrontTrak which has an FF layout and front-wheel drive and a rear-wheel-drive BMW 3 Series which is FR , both which are in the compact executive car classification and use longitudinally mounted engines. It is easier to correct trailing-throttle or trailing-brake oversteer. Disadvantages[edit] Front-engine front-wheel-drive layouts are "nose heavy" with more weight distribution forward, which makes them prone to understeer , especially in high horsepower applications. If a front-engine front-wheel-drive layout is fitted with a four-wheel-drive , plus enthusiast driver aids, such as active front differential, active steering, and ultra-quick electrically adjustable shocks, this somewhat negate the understeer problem and allow the car to perform as well as a front-engine rear-wheel-drive car. It is a result of the offset between the point about which the wheel steers it is aligned with the points where the wheel is connected to the steering mechanisms and the centroid of its contact patch. The tractive force acts through the centroid of the contact patch, and the offset of the steering point means that a turning moment about the axis of steering is generated. In an ideal situation, the left and right wheels would generate equal and opposite moments, canceling each other out; however, in reality, this is less likely to happen. Torque steer can be addressed by using a longitudinal layout, equal length drive shafts, half shafts, a multilink suspension or centre-point steering geometry. This is one of the main reasons nearly all racing cars are rear-wheel drive. However, since front-wheel-drive cars have the weight of the engine over the driving wheels, the problem only applies in extreme conditions such as attempting to accelerate up a wet hill or

attempting to beat another RWD car off the line. In some towing situations, front-wheel-drive cars can be at a traction disadvantage since there will be less weight on the driving wheels. The weight of the trailer pushes down on the towbar at the rear of the car. The car pivots on the rear wheels and raises the front wheels, which now have less grip. Because of this, the weight that the vehicle is rated to safely tow is likely to be less than that of a rear-wheel-drive or four-wheel-drive vehicle of the same size and power. Due to geometry and packaging constraints, the CV joints constant-velocity joints attached to the wheel hub have a tendency to wear out much earlier than the universal joints typically used in their rear-wheel-drive counterparts although rear-wheel-drive vehicles with independent rear suspension also employ CV joints and half-shafts. The significantly shorter drive axles on a front-wheel-drive car causes the joint to flex through a much wider degree of motion, compounded by additional stress and angles of steering, while the CV joints of a rear-wheel-drive car regularly see angles and wear of less than half that of front-wheel-drive vehicles. A notable example is the original Mini. It is widely misconceived that this limitation is due to a limit on the angle at which a CV joint can be operated, but this is easily disproved by considering the turning circle of car models that use a longitudinal FF or F4 layout from Audi and prior to Saab. The FF transverse engine layout also known as "east-west" restricts the size of the engine that can be placed in modern engine compartments, so it is rarely adopted by powerful luxury and sports cars. One way around this problem is using a staggered engine. It makes heavier use of the front tyres i. Under extreme braking like for instance in a panic stop , the already front heavy layout further reduces traction to the rear wheels. This results in disproportionate gripping forces focused at the front while the rear does not have enough weight to effectively use its brakes. This is due to the extra weight of drive shafts and CV joint components that increase unsprung weight. FR layout RR layout Rear-wheel drive RWD typically places the engine in the front of the vehicle and the driven wheels are located at the rear, a configuration known as front-engine, rear-wheel-drive layout FR layout. The front mid-engine , rear mid-engine and rear engine layouts are also used. This was the traditional automobile layout for most vehicles up until the s and s. Characteristics[edit] The vast majority of rear-wheel-drive vehicles use a longitudinally mounted engine in the front of the vehicle, driving the rear wheels via a driveshaft linked via a differential between the rear axles. Some FR layout vehicles place the gearbox at the rear, though most attach it to the engine at the front. The FR layout is often chosen for its simple design and good handling characteristics. Placing the drive wheels at the rear allows ample room for the transmission in the centre of the vehicle and avoids the mechanical complexities associated with transmitting power to the front wheels. For performance-oriented vehicles, the FR layout is more suitable than front-wheel-drive designs because weight transfers to the rear of the vehicle during acceleration, which loads the rear wheels and increases their grip. Another advantage of the FR layout is relatively easy access to the engine compartment, a result of the longitudinal orientation of the drivetrain , as compared to the FF layout front-engine, front-wheel drive. The front and rear tyres are placed under more even loads, which allows for more grip while cornering. These engines are usually too long to fit in a FF transverse engine "east-west" layout; the FF configuration can typically accommodate at the maximum an inline-4 or V6. Disadvantages[edit] Under heavy acceleration as in racing , oversteer and fishtailing may occur as the rear wheels break free and spin. The corrective action is to let off the throttle this is what traction control automatically does for RWD vehicles. On snow, ice and sand, rear-wheel drive loses its traction advantage to front- or all-wheel-drive vehicles, which have greater weight on the driven wheels. This issue is particularly noticeable on pickup trucks, as the weight of the engine and cab will significantly shift the weight from the rear to the front wheels. Rear-wheel-drive cars with rear engine or mid engine configuration do not suffer from this, although fishtailing remains an issue. To correct this situation, owners of RWD vehicles can load sandbags in the back of the vehicle either in the bed, or boot in order to increase the weight over the rear axle, however speeds should be restricted to correctly predicted available grip of the road. Less front leg room as the transmission tunnel takes up a space between the driver and front passenger, less leg room for centre rear passengers due to the tunnel needed for the drive shaft , and sometimes less boot space since there is also more hardware that must be placed underneath the boot. Rear engine designs such as the Porsche and Volkswagen Beetle do not inherently take away interior space. A rear-wheel drive vehicle with four-wheel drive, compared to a front-wheel drive vehicle with four-wheel

drive, will have a less efficient interior packaging since the transmission is often under the front passenger compartment between the two seats, whereas the latter can package all the components under the hood. The driveshaft adds weight. There is extra sheet metal to form the transmission tunnel. There is a rear axle or rear half-shafts, which are typically longer than those in a front-wheel-drive car. A rear-wheel-drive car will weigh slightly more than a comparable front-wheel-drive car but less than four-wheel drive. Part of this can be explained by the added cost of materials and increased labor put into assembly of FR layouts, as the powertrain is not one compact unit. The long driveshaft on front engine cars adds to drivetrain elasticity. This section uses the term four-wheel drive to refer to both. Four-wheel drive Most 4WD layouts are front-engine and are derivatives of earlier front-engine, two-wheel-drive designs. They fall into two major categories: Transverse and longitudinal engine 4WD systems derived almost exclusively from front-engine, front-drive layouts , fitted to luxury, sporting and heavy duty segments, for example the transverse-engine Mitsubishi GT VR-4 and Toyota RAV4 and the longitudinal-engine Audi Quattro and most of the Subaru line. For a full explanation of 4WD engineering considerations, see the main article on four-wheel drive. Advantages[edit] In terms of handling, traction and performance, 4WD systems generally have most of the advantages of both front-wheel drive and rear-wheel drive. Some unique benefits are: Traction is nearly doubled compared to a two-wheel-drive layout. Given sufficient power, this results in unparalleled acceleration and driveability on surfaces with less than ideal grip, and superior engine braking on loose surfaces. The development of 4WD systems for high performance cars was stimulated primarily by rallying. Handling characteristics in normal conditions can be configured to emulate FWD or RWD, or some mixture, even to switch between these behaviours according to circumstance. However, at the limit of grip, a well balanced 4WD configuration will not degenerate into either understeer or oversteer, but instead break traction of all 4 wheels at the same time into a four-wheel drift. Combined with modern electronic driving aids, this flexibility allows production car engineers a wide range of freedom in selecting handling characteristics that will allow a 4WD car to be driven more safely at higher speeds by inexpert motorists than 2WD designs. Disadvantages[edit] 4WD systems require more machinery and complex transmission components, and so increase the manufacturing cost of the vehicle and complexity of maintenance procedures and repairs compared to 2WD designs 4WD systems increase powertrain mass, rotational inertia and power transmission losses, resulting in a reduction in performance in ideal dry conditions and increased fuel consumption compared to 2WD designs The handbrake may not be used to induce oversteer for maneuvering purposes, as the drivetrain couples the front and rear axles together. To overcome this limitation, some custom prepared stage rally cars have a special mechanism added to the transmission to disconnect the rear drive if the handbrake is applied when the vehicle is moving. Unusual 4WD layouts[edit] From onwards, some models of Porsche feature a rear-engine 4WD layout, which is akin to a longitudinal front-engine 4WD layout installed backwards with the engine at the rear of the car From onwards, the Nissan GT-R features a front-engine 4WD longitudinal layout, but with the gearbox at the rear of the vehicle. This layout necessitates a second prop-shaft to carry power to the front wheels. Some types of farm tractors and construction site machinery use a 4WD layout where the wheels on each side are coupled together, rather than the wheels on each axle, allowing these vehicles to pivot about their centre point. Such vehicles are controlled in a fashion similar to a military tank. The Jeep Hurricane concept had an all-wheel drive layout that featured two V8 engines powering a single driveshaft, with a gearbox mounted in the centre of the vehicle. The gears connected to two additional driveshafts, one on each side of the vehicle, that delivered power to the wheels via driveshaft joints. The Ferrari FF features a front-engine 4WD layout in which a separate transmission is used for each pair of driven wheels, [25] rather than the more conventional setup in which a single transmission is used, followed by a centre differential or viscous coupling unit to split power between the front and rear wheels. History and current use[edit] This section needs to be updated. Please update this article to reflect recent events or newly available information. Most American cars used the FR layout until the mids. Throughout the s and s, most American companies set as a priority the eventual removal of rear-wheel drive from their mainstream and luxury lineup. In , Hyundai introduced its own rear-wheel-drive car, the Hyundai Genesis. In Australia, FR cars remained popular throughout this period, with the Holden Commodore and Ford Falcon having had consistently strong sales. In Europe, front-wheel

drive was popularized by small cars like the Mini , Renault 5 and Volkswagen Golf and adopted for virtually all mainstream cars. Upscale marques like Mercedes-Benz , BMW , and Jaguar remained mostly independent of this trend, and retained a lineup mostly or entirely made up of FR cars.

FRONT ENGINE REAR WHEEL DRIVE pdf

9: Car layout - Wikipedia

Still the classic, rear drive was basically the only drivetrain system for many years. A longitudinally mounted engine, with the transmission bolted directly to it, sends power via a driveshaft to.

Automobile layout and Front-wheel-drive Front-engine position Historically, this designation was used regardless of whether the entire engine was behind the front axle line. In recent times, the manufacturers of some cars have added to the designation with the term front-mid which describes a car where the engine is in front of the passenger compartment but behind the front axle. Most pre- World War II front engine cars would qualify as front-mid engine, using the front-mid designation, or on the front axle. This layout is the most traditional form, and remains a popular, practical design. The engine which takes up a great deal of space is packaged in a location passengers and luggage typically would not use. The main deficit is weight distribution â€" the heaviest component is at one end of the vehicle. Car handling is not ideal, but usually predictable. In contrast with the front-engine, rear-wheel-drive layout RWD , the FWD layout eliminates the need for a central tunnel or a higher chassis clearance to accommodate a driveshaft providing power to the rear wheels. Like the rear-engine, rear-wheel-drive layout RR and rear mid-engine, rear-wheel-drive layout RMR layouts, it places the engine over the drive wheels, improving traction in many applications. As the steered wheels are also the driven wheels, FWD cars are generally considered superior to RWD cars in conditions where there is low traction such as snow, mud, gravel or wet tarmac. When hill climbing in low traction conditions RR is considered the best two-wheel-drive layout, primarily due to the shift of weight to the rear wheels when climbing. The cornering ability of a FWD vehicle is generally better, because the engine is placed over the steered wheels. Electronic traction control can avoid wheel-spin but largely negates the benefit of extra power. In the s, the traction and packaging advantages of this layout caused many compact and mid-sized vehicle makers to adopt it in the US. Toyota was the last Japanese company to switch in the early s. There are four different arrangements for this basic layout, depending on the location of the engine, which is the heaviest component of the drivetrain. The engine was mounted longitudinally fore-and-aft, or north-south behind the wheels, with the transmission ahead of the engine and differential at the very front of the car. With the engine so far back, the weight distribution of such cars as the Cord L was not ideal; the driven wheels did not carry a large enough proportion of weight for good traction and handling. Renault is the most recent user of this format - having used it on the Renault 4 , and the first generation Renault 5 , but it has since fallen out of favor since it encroaches into the interior space. Longitudinally mounted front-engine and front-wheel drive[edit] A Alfa Romeo Alfasud Sprint Veloce using a Longitudinally mounted front-engine and front-wheel drive. This arrangement, used by Panhard until , potentially had a weight distribution problem analogous to that of the Cord L29 mentioned above. This is the standard configuration of Audi and Subaru front-wheel-drive vehicles. In , Toyota introduced and launched their first front-wheel-drive car, the Tercel , and it had its engine longitudinally mounted, unlike most other front-wheel-drive cars on the market at that time. This arrangement continued also on the second-generation Tercel, until , the third generation received a new, transversely mounted engine. Other front-wheel-drive Toyota models, such as Camry , and Corolla , had transversely mounted engines from the beginning on. This family has the distinction of being the highest engine capacity 8. The Eagle Premier used a similar powertrain arrangement found in the Renault 21 and 25 â€" later becoming the basis for the Chrysler LH sedans produced until the model year. Today, Audi is the most prominent user of this mechanical layout, having used it since the s in its predecessor companies DKW and Auto Union , and it can be found in its larger models from the A4 upward. This is done by packaging the differential in front of the clutch, allowing the axle line to be further forward in relation to the rear face of the engine block. Saab copied this design on their first car, the Saab The Trabant in was also one of the only cars to have a transverse mounted engine, being a sort of DKW precursor. This was a novelty, especially for a car being made in a communist country. The transmission was located in the sump below the crankshaft, with power transmitted by transfer gears. Hence the driveshafts to the wheels are longer on one side than the other. This located the weight just a bit in front of the wheels. It is this system which dominates worldwide at present.

FRONT ENGINE REAR WHEEL DRIVE pdf

Front-wheel-drive vehicles tend to suffer from torque steer under heavy acceleration. The farther these joints are articulate, the less effective they are at delivering torque to the wheels. Front-wheel drive design characteristics[edit] Mid-engine, front-wheel drive MF layout: Renault 4 mid-engine, front-wheel-drive layout allows greater distance between front doors and wheelwells, and short front overhang. Longitudinally front-mounted engine, front-wheel drive FF longitudinal layout: Transverse front-mounted engine, front-wheel drive FF transverse layout: Fiat , followed the footsteps of the Autobianchi Primula. Front-wheel drive shafts[edit] In front wheel drive vehicles, the drive shafts transfer the drive directly from the differential to the front wheels. A short inner stub shaft is splined to the differential side gear and an outer stub shaft is splined to the front wheel hub. Each stub shaft has a yoke, or housing, to accommodate a universal joint , at each end of a connecting intermediate shaft. Universal joints let the shaft keep rotating while allowing for changes due to suspension movement, such as shaft length and horizontal angle, and shaft angle as the steering turns. Constant-velocity universal joints are normally used to transfer power smoothly between the components. The inner universal can be a plunge or tripod type joint. The tripod is splined to the intermediate shaft and held by a circlip. A ball, supported on needle roller bearings, is fitted to each post of the tripod, and these slide in a trunion inside the yoke. This caters for changes in shaft length and horizontal angle. The drive is transferred through the trunion and balls to rotate the shaft. The outer universal joint allows greater angular changes but not changes in shaft length. It is normally a ball and cage type with an inner race splined to the intermediate shaft. An outer race is formed in the yoke. The cage retains the balls in location in grooves in both races. The balls transfer the drive from the shaft to the hub and allow for changes in horizontal angle and for a wide steering angle to be achieved. A flexible rubber boot fitted to each joint retains grease and keeps out dirt and moisture. Where the differential is not located in the center line of the vehicle, an intermediate shaft can be fitted to maintain equal length drive shafts on each side. This keeps drive shaft angles equal on both sides and helps prevent steering irregularities and vibration. The outer end of the intermediate shaft is supported by a bearing secured to the transaxle case and a universal joint assists with alignment. In some cases a longer drive shaft is used on one side. A rubber dynamic damper may be fitted to absorb vibrations.

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