Anti-lock brake hard, make the sly move and

Anti-Lock Braking Systems (AB) are designedto maintain driver control and stability of the car during emergency braking.

Locked wheels will slow a car down but will not provide steering ability. ABSallows maximum braking to be applied while retaining the ability to ‘ steer outof trouble’ The theory behind anti-lock brakes is simple. A skidding wheel(where the tire contact patch is sliding relative to the road) has lesstraction than a non-skidding wheel. By keeping the wheels from skidding whileyou slow down, anti-lock brakes benefit you in two ways: You’ll stop faster, and you’ll be able to steer while you stop. An ABS system monitors four wheelspeed sensors to evaluate wheel slippage.

Slip can be determined by calculatingthe ratio of wheel speed to vehicle speed, which is continuously calculatedfrom the four individual wheel speeds. During a braking event, the function ofthe control system is to maintain maximum possible wheel grip on the road -without the wheel locking – by adjusting the hydraulic fluid pressure to eachbrake by way of electronically controlled solenoid valves. 1. Introduction Auto producersworldwide are competing with each other to imagine more dependable contraptionsthere by coming nearer to the fantasy of the ‘ Propelled wellbeing vehicle’ or’Extreme security vehicle’, on which innovative work has been continuing for asfar back as a few year. The greater part of the more up to date vehicle modelsoffer ABS as either standard or discretionary gear .

Wheel lockup amid brakingcauses slipping which thusly cause lost footing and vehicle control. Thisdiminishes the controlling capacity to alter course.

So the auto slides crazy. In any case, the street wheel that is as yet pivoting can be directed. That isthe thing that ABS is about.

With such a framework, the driver can brake hard, make the sly move and still be responsible for the vehicle in any streetcondition at any speed and under any heap. ABS does not diminish haltingseparation, but rather repays the changing footing or tire stacking by avertingwheel lockup. Amid freeze braking when the wheels are going to lockup, sensorssense that the wheel has recently started turning slower than others on thevehicle. So they quickly diminish braking power on the influenced wheel.

Thisanticipates sliding of the wheels on the asphalt. At the point when the wheelresumes moving, full braking power is again connected. ABS rehashes theprocedure until there is never again any requirement for balanced braking. ABSacts speedier than any driver could, pumping the brakes a few times eachsecond. Contingent upon the kind of framework, ABS changes the braking power ateach wheel or set of wheels, though a driver’s foot on the brake pedal worksevery one of the brakes without a moment’s delay in typical braking. 2.

CONCEPT OFABS The theory behind anti-lock brakesis simple. A skidding wheel (where the tire contact patch is sliding relativeto the road) has less traction than a nonskidding wheel. If the vehicle havebeen stuck on ice and if the wheels are spinning then the vehicle have notraction. This is because the contact patch is sliding relative to the ice.

Bykeeping the wheels from skidding while you slow down, anti-lock brakes benefityou in two ways: You’ll stop faster, and you’ll be able to steer while

youstop. Good drivers have always pumped the brake pedal during panic stops toavoid wheel lock up and the loss of steering control. ABS simply gets thepumping job done much faster and in much precise manner than the fastest humanfoot. Fig2. 1 3.

PRINCIPLESOF ABS Fig3. 1 The brakes of vehicle not furnished with ABSwill very quickly bolt the wheels, when the driver all of a sudden applies thebrake. For this situation the vehicle slides instead of moves to a stop. Theslipping and absence of control was caused by the locking of wheels. Thedischarge and reapply of the brake pedal will stay away from the locking of thewheels which thus evade the slipping. This is precisely what an electronicallymonitored slowing mechanism does. 3.

1PressuremodulationWhen the brake pedal ispumped or pulsed the pressure is quickly applied and released at the wheels. This is called pressure modulation. Pressure modulation works to prevent thewheel locking. ABS can modulate the pressure to the brake as often as 15 timesper seconds. By modulating the pressure to the brakes the friction between thetires and the road is maintained and the vehicle is able to come to thecontrollable stop. Steering is anotherimportant consideration. As long as a tire doesn’t slip it goes only in thedirection in which it is turned. But once it is skid it has little or nodirectional stability.

The Maneuverability of the vehicle is reduced if thefront wheels are locked and the stability of the vehicle is reduced if the rearwheels are locked. ABS precisely controls the slip rate of the wheels to ensuremaximum grip force

from the tyre and it there by ensures maneuverability andstability of the vehicle. 4.

ABS COMPONENTS Many different ABS are found on today’svehicles. These designs are varied by their basic layout, operation and components. The ABScomponents can be divided into two categories. 1. Hydraulic components 2. Electrical/electronic components Besides these normal and conventional brake parts are part of theoverall brake system.

4. 1Hydraliccomponents 4. 1. 1Accumulator· An accumulatoris used to store hydraulic fluid to maintain high pressure in the brake systemand provide the residual pressure for power assisted braking. Normally theaccumulator is charged with nitrogen gas and is an integral part of themodulator unit. 4. 1. 2Antilockhydraulic control valve assembly ·This assembly controls the release andapplication of the brake system pressure to the wheel brake assemblies.

It maybe of integral type and non integral type. In integral type the unit iscombined with the power boost and master cylinder unit into one assembly. Thenon integral type is mounted externally from the master cylinder /power boosterunit and is located between the master cylinder and wheel brake assembly.

Bothtypes generally contain solenoid valve that control the releasing, holding andapplying of brake system pressure. 4. 1. 3 Booster pump· The booster pump is an assembly of an electric motorand pump.

The booster pump is used toprovide pressurized hydraulic fluid ABS. The pumps motor is controlled bysystems control unit. 4. 1. 4Booster/Master cylinder assembly· It is referred as the hydraulic unit, contains thevalves and pistons needed to modulate hydraulic pressure in the wheel circuitduring the ABS operations. 4. 1. 5Fluid accumulator·.

Different than a pressure accumulator, fluid accumulator temporarily store brake fluid, that is removed from the wheelbrake unit during ABS cycle. This fluid is then used by pump to build pressurefor the brake hydraulic system. 4. 1. 6 Hydrauliccontrol unit·This assembly contains solenoid valve, fluid accumulator, pump and electric motor. The unit may have one pump and onemotor or it have one motor and two pumps. 4. 1.

7Main Valve·This is a two position valve and is alsocontrolled by ABS control module and is open only in the ABS mode. When openpressurized brake fluid from the booster circuit is directed into the mastercircuit to prevent excessive pedal travel. 4. 1. 8Modulator unit·The modulator unit controls the flow of pressurizedbrake fluid to the individual wheel circuits. Normally the modulator is made upof solenoid that open and close valves, several valves that control flow offluid to wheel brake units and electrical relays that activate or deactivatethe solenoids through the commands of the control module. This unit may also becalled the hydraulic actuator, hydraulic power unit or the electro hydrauliccontrol valve.

4. 1. 9Solenoid valves·The solenoid valves are located in themodulator unit and are electrically operated by signals from the controlmodule. The control module switches the solenoids on or off to increase, decrease, or maintain

the hydraulic pressure to the individual wheel units. 4. 1. 10Wheelcircuit valves· Two solenoid valves are used to control each circuitor channel. One controls the inlet valve of the circuit, the controls theoutlet valve .

the position is determined by the control module. Outlet valvesare normally closed and inlet valves are normally open. Valves are activatedwhen abs control module switches 12 volts to the circuit solenoids.

Duringnormal driving the circuits are not activated. 5 Electricalelectronic components 5. 1 ABS controlmodule·Thissmall computer is normally mounted inside the trunk on the wheel housing, mounted to the master cylinder or is part of the hydraulic control unit. Itmonitors system operation and controls antilock function when needed. Themodule relies on input from the wheel speed sensors and feedback from thehydraulic unit to determine if the abs is operating correctly and to determinewhen the anti lock mode is required. 5. 2 Brakepedal sensor The antilock brake pedalsensor switch is normally closed. When the brake pedal exceeds the antilockbrake pedal sensor switch setting during an antilock stop, the antilock brakecontrol module senses that the antilock brake pedal sensor switch is open andgrounds the pump motor relay coil.

This energizes the relay and turns the pumpmotor on. When the pump motor is running, the hydraulic reservoir is filledwith high pressure brake fluid and the brake pedal will be pushed up untilantilock brake pedal sensor switch closes. when the antilock brake pedal sensorswitch closes , the pump motor is turned off and the brake pedal will drop somewith each abs control cycle

until the antilock brake pedal sensor switch opensand the pump motor is turned on again . this minimizes pedal feedback during abscycling . 5.

3 Pressuredifferential switch It is located in themodulator unit. This switch sends a signal to the control module whenever thereis an undesirable difference in the hydraulic pressures with in the brakesystem. 5. 4 Relays Relays areelectromagnetic devices used to control a high current circuit with a lowcurrent switching circuit. In absrelays are used to switch motors and solenoids.

A low current signal from thecontrol module energizes the relays that complete the electrical circuit forthe motor or solenoid. 5. 5Toothed ring Itcan be located on an axle shaft, differential gear or a wheels hub. This ringis used with conjunction with the wheel speed sensor. The ring has a number ofteeth around its circumference. As the ring rotates and each tooth passes bythe wheel speed sensor, an ac voltage signal is generated between the sensorand tooth. 5. 6 Wheel speedsensor Itis mounted near the different toothed ring.

As the rings teeth rotate past thesensor an ac voltage is generated. as the teeth move away from the sensor, thesignal is broken until the next tooth comes close to the sensor . the end resultis a pulsing signal that is sent to the control module. The control moduletranslates the signal in to wheel speed.

The sensor is normally a small coil ofwire with a permanent magnet in its center. 6. TYPES OF ANTILOCK BRAKE SYSTEMS Oneof the classifications of abs is integral and non integral type. Integral typethey combine the master

cylinder, hydraulic booster and abs hydraulic circuitin to single hydraulic assembly. In non integral type they use a conventionalvacuum-assist booster and master cylinder.

In addition they can be classifiedaccording to the control they provide. 6. 1Four channel, four sensors ABSThisis the best scheme. There is speed sensor on all four wheels and a separatevalve for all the four wheels. With this set up the controller monitors eachwheel individually to make sure it is achieving maximum braking force.

6. 2Threechannel, three sensor ABSThisscheme is commonly found on pick up trucks with four wheels ABS, has a speedsensor and a valve for each of the front wheels, with one valve and one sensorfor both rear wheels. The speed sensor for the rear wheel is located in therear axle. This system provides individual control of the wheels, so they canboth achieve maximum braking force.

The rear wheels however are monitoredtogether, they both have to start to lock up before the abs will activate onthe rear. With this system, it is possible that one of the rear wheels willlock during a stop, reducing brake effectiveness. 6. 3 Onechannel, one sensor absThisscheme is commonly found on pick up trucks with rear wheel abs . it has onevalve , which controls both rear wheels , and one speed sensor, located in therear axle . This system operates the same as the rear end of the rear channelsystem. The rear wheels are monitored together and both have to start to lockup before the abs kicks in. in this system is also possible that one of therear wheels will lock reducing brake effectiveness.

7. ADVANCEMENTS IN ABS Some systems, which work with theABS, are Automatic traction control and Automatic stability control, which arediscussed below. 7.

1AUTOMATICTRACTION CONTROL (ATC)Programmed footing control frameworks(ATC) apply thebrakes when a drive wheel endeavors to turn and lose footing. The frameworkworks best when one drive wheel is taking a shot at a decent footing surfaceand the other isn’t. The framework likewise functions admirably when thevehicle is quickening on tricky street surfaces, particularly when climbingslopes.

ATC is most useful on four wheel or all wheel drive vehicles in whichloss of footing at one wheel could hamper driver control. Amid street operationthe ATC framework utilizes an electronic control module to screen the wheelspeed sensors. On the off chance that a wheel enters lost footing circumstance, the module applies braking power to the wheel stuck in an unfortunatesituation. Loss of footing is distinguished by contrasting the vehicle speedwith the speed of the wheel. In the event that there is lost footing the speedof the wheel will be more noteworthy than anticipated for the specific vehiclespeed. ABS and ATC frameworks can be necessary and utilizations the basicvalves.

These frameworks are intended to diminish wheel slip and keep upfooting at the drive wheels when the street is wet or snow secured. The controlmodule screens wheel speed. On the off chance that amid increasing speed themodule distinguishes drive wheel slip and if brakes are not connected, thecontrol module goes into the footing control mode. The delta and

outletsolenoid valves are beat and enable the brake to be immediately connected and dischargedIna few systems when lost footing is detected, it cycles the brakes as well assigns the motor control module to impede start timing and somewhat shut thethrottle also, which thus lessens motor yield. Numerous frameworks arefurnished with a dash mounted cautioning light to alarm the driver that theframework is working. There will likewise be a manual cut off switch so thedriver can kill ATC operation. 7.

2 AUTOMATICSTABILITY CONTROL LikeATC, the solidness control frameworks are connected with the ABS. it canlikewise be called Electronic Stability Program (ESP). Soundness controlframeworks quickly apply the brakes at any one wheel to remedy over cow orunder cow.

The control unit gets signals from the run of the mill sensors inaddition to a yaw, horizontal speeding up (G-constrain) and a guiding edgesensor. The framework utilizes the point of the guiding haggle speed of thefour wheels to compute the way picked by the driver. It at that point takes agander at sidelong G-powers and vehicle yaw to gauge where the vehicle isgoing. (Yaw is characterized as the characteristic propensity for a vehicle toturn on its vertical focus pivot).

So it is likewise called Yaw control.. Fig7.

1 fig7.

2 Understeer is the condition in which the vehicle is slow to respond to steeringchanges. Over steer occurs when the rear wheels try to swing around causing thecar to spin. When the system senses under steer in a turn the brake at theinside rear wheel is applied. During over steer the outside

front brake isapplied. Relaying on the input from the sensors and computer programming thesystem calculates if the vehicle is going exactly in the same direction inwhich it is being steered. In case of any difference between what the driver isasking and what the vehicle is doing, the system corrects the situation byapplying one of the right or left brakes. 8. ADVANTAGESOF ABS· It allows thedriver to maintain directional stability and control over steering duringbraking · Safe andeffective· Automaticallychanges the brake fluid pressure at each wheel to maintain optimum brakeperformance.

· ABS absorbs theunwanted turbulence shock waves and modulates the pulses thus permitting thewheel to continue turning under maximum braking pressure. 9. DISADVANTAGES· It is verycostly · Maintenance costof a car equipped with ABS is more. 10. CONCLUSIONABShas been so far created to a framework, which gives fast, programmed braking inlight of indications of nascent wheel bolting by on the other hand expandingand diminishing water powered weight in the brake line Statistics demonstratethat around 40 % of car crashes are because of slipping. These issues usuallyhappen on vehicle with traditional stopping mechanism which can be evaded byincluding gadgets called ABS If there is an ABS disappointment, the frameworkwill return to ordinary brake operation.

Regularly the ABS cautioning lightwill turn on and let the driver know there is a blame.