



The "transfer case" is the heart of a vehicle that determines its four-wheel drive characteristics. Two wheel drive cars lack this mechanical gear set linked to the transmission that splits the power coming from the engine and directs it to the front and rear axles. The transfer case may also offer a "low" gear mode that provides maximum gear reduction to the wheels, multiplying the power to the wheels for special low-speed situations, like trailer towing or navigating particularly treacherous off-the-road terrain.

With a "part time" type transfer case design, a car can only safely be run in four-wheel drive on slippery road surfaces or snow, ice, mud, loose dirt, and sand. Because the transfer case locks the front and rear axles into turning at exactly the same speed, they lack a means to vary the axle speed front to rear when going around turns. On dry, hard-surfaced roads, a driver might experience steering resistance called "windup" or a jerking and popping of the tires called "wheel hop." A "full time" transfer case adds a mechanism called either a "center differential" or a "viscous coupling" This device lets each axle to turn at its own rate through turns making driving on dry pavement possible without building up dangerous torque forces.

"Part-time" four-wheel drive, the least expensive and most common type of transfer case, comes in two flavors. The Isuzu Rodeo and the Suzuki Samurai have "stationary shifting" part-time systems, in that they require that a driver come to a complete stop before shifting between two-wheel and four-wheel drive. The various "shift-on-the-fly" or "on-demand" part-time systems standard in the Jeep Wrangler, the Ford Bronco, the Nissan Pathfinder, and the Toyota 4Runner are more convenient at a cost premium. With shift-on-the-fly, the transfer case allows shifting in and out of four-wheel drive while the vehicle is in gear. Depending on the model, shifting might be possible at speeds as fast as 55 mph. For normal road conditions, drivers are advised to stay in two wheel drive for greater fuel economy, a quieter ride, and reduced mechanical wear.

Besides relying on the driver to decide when to activate four-wheel drive, part-time systems, both stationary and shift-on-the-fly, typically have either manual or automatically-locking, front-wheel hubs that must engage the front axle for a driver to shift into four-wheel drive mode. When returning to two-wheel drive, a driver must either, for manual-locking hubs, stop and get out of the car to twist the lock on the hubs back to the "free" position, or back the vehicle up as much as fifteen feet to disengage automatic-locking hubs. Were this unlocking not done, driving in two-wheel drive would result in unnecessary and damaging friction and wear and much lower fuel economy.

The most convenient and expensive four wheel drive sport utility vehicles have "full-time" four-wheel drive. Full time four-wheel drive also come in two varieties: selectable, set-and-forget transfer cases that can be shifted into two-wheel drive or permanent, all-the-time four-wheel drive transfer cases that only operate in a four wheel drive mode. The selectable full-time cars disengage the front axle driveshaft automatically, eliminating the need to unlock the front wheel hubs when leaving four wheel drive. The 1995 Ford Explorer, the Mitsubishi Montero, and Jeeps with Accu-Trac, like the one Debbie drives, are equipped with selectable, full-time systems. All Land Rover models, the Toyota Land Cruiser and the Chrysler Jeep Grand Cherokee Limited with Quadra-Trac have permanent full-time transfer cases. All of these full-time four wheel drive vehicles safely operate in any weather, over the worst terrain, and all road surfaces. But these full-time models invariably

require special preparation before being towed or can only be transported on a flatbed towtruck.

All wheel drive is another animal altogether, operating exclusively in full-time, four-wheel drive, for enhanced road holding. But all wheel drive vehicles lack the extra-low gear range, mechanical durability, and high ground clearance necessary for rugged, off-the-road driving. Varieties of A.W.D. systems are found on selected passenger cars from Audi and Subaru, certain models of sports cars from Mitsubishi and Porsche, specially equipped vans like the Chevrolet Astro, the GMC Safari, the Ford Aerostar and the Chrysler minivans, and in an occasional sports utility like the 1995 Chevrolet Blazer or the 1994 Oldsmobile Bravado.

Finally, potential buyers should not equate the styling of a popular sports-utility brand like Chrysler's Jeep or Ford's Explorer with four-wheel drive. Twenty percent of all sports utilities sold actually lack four-wheel drive but still look tough, according to Keith Takasawa, an executive engineer at Ford. Many advertisements touting attractive, low prices are actually for the two wheel drive versions of the vehicle. As for Debbie, she is trading in her beloved Jeep for a new all-wheel-drive Audi Quattro with better gas mileage.