

Basics of Four Wheel Drive

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Engage 4WD only on road surface that will allow some slippage of wheels. Severe damage may result to your vehicle if you engage and operate your vehicle in 4WD on hard surface roadways.

Check the operator's manual for your vehicle prior to using your 4WD system.

Generally 4WD is not that all 4 wheels are spinning to give traction. Usually only one wheel per axle will be pulling.

The tire that is the easiest to turn will get the power from the engine/ drive train.

Manual Hubs

You must physically turn the mechanism to lock in the hubs before 4WD can be engaged. Shift out of 4WD prior to unlocking the hubs.



You may have to “rock” the vehicle to lock-in and unlock hubs. Never use anything other than your hands to turn hubs.

Automatic Hubs

Auto hubs only require you to shift into 4WD. Once you start moving the hubs will engage by themselves. They engage by either vacuum, cam lever, gear mechanism, or springs. Check your vehicle operator's manual.

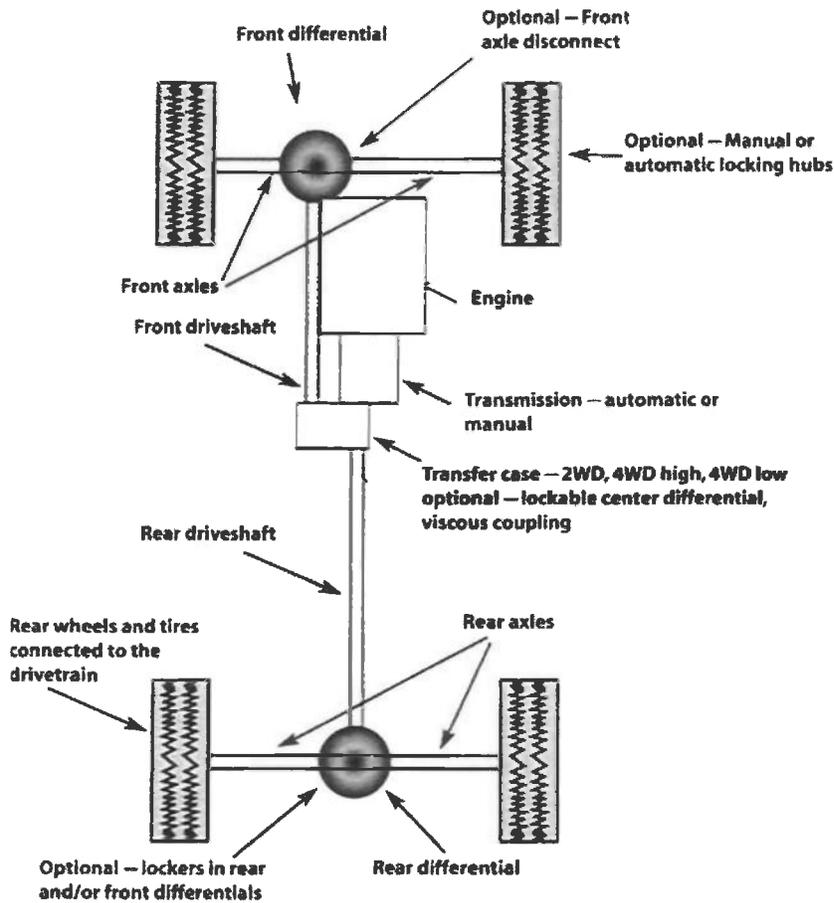
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The gear mechanism inside the hubs can be made of plastic, Teflon or metal. These are small parts and can break easily. Limit “rocking” motion of vehicle if you get in a sticky situation.

4WD High, which is the same gear ratio of 2WD, allows for higher speeds and vehicle control on dirt roads, slippery, snowy or roads that need a bit more traction.

4WD Low gives a much lower gear ratio for more control on difficult terrain. Most off road driving should be done in low range.

When shifting from 4WD High/Low or Low/High, stop vehicle or decrease speed to less than 2 MPH. If difficulty shifting is experienced, turn off the vehicle and try shifting again.



4 Wheel Drive



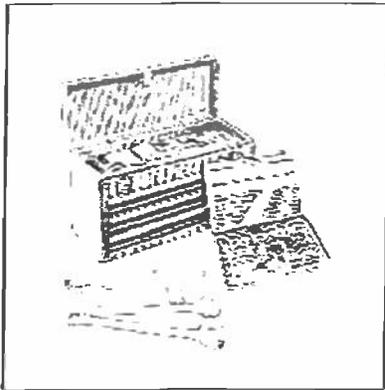
chain with hooks



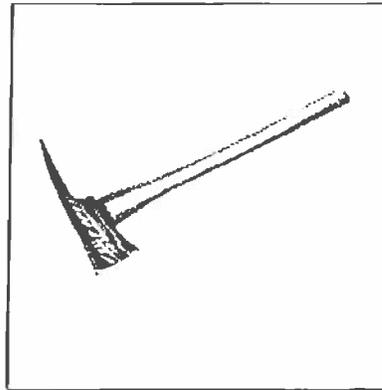
jumper cables



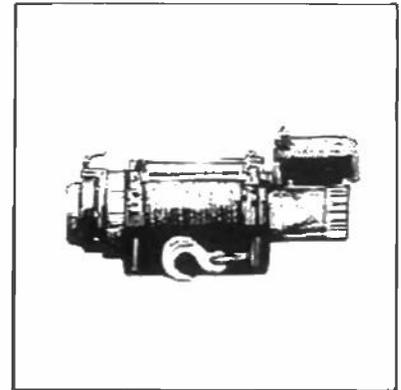
recovery strap



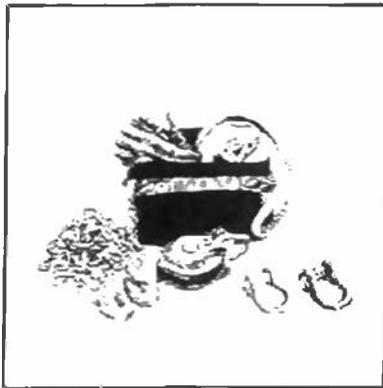
tool kit



pulaski (or axe)



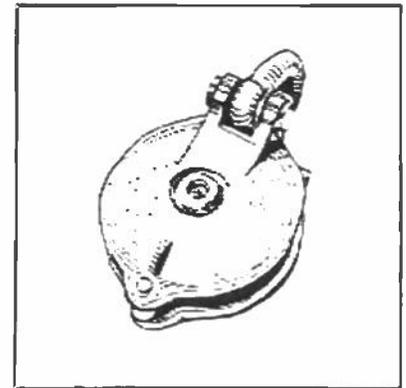
winch



winch accessory kit



tree strap



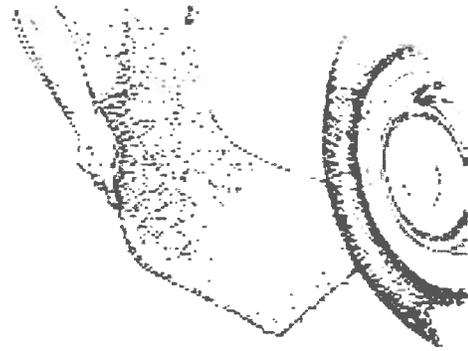
snatch block

Driving through poor traction conditions

Engage 4WD as soon as leaving established roadway. Newer vehicles do not engage as soon as shifted into 4WD. It may take 10 to 30 seconds for the 4WD to engage. If you are waiting until you come to a poor traction condition prior to engaging 4WD you may become stuck before your 4WD engages.

Sand Driving

1. Go/No-Go.
2. Proceed steadily forward, do not spin tires.
3. You may want to reduce tire pressure, possibly down to 10 psi. If you drop tire pressure, make sure to air back up prior to getting on hard surface. Slow speeds, less than 25 m.p.h., for short distances of two to four miles are okay to get to an air source.
4. Stop on a level or down hill area while in sandy soils.
5. Make wide, sweeping turns.
6. Do not spin tires and dig down to frame.
7. You may want to carry 4 strips of carpet to place under tires to keep vehicle from sinking. This spreads pressure and weight of vehicle over greater surface area.



Gravel/Rocks Driving

1. Go/No-Go.
2. Slow speeds.
3. Poor traction.
4. Dust/low visibility.
5. Moguls/bumps may cause loss of control.
6. Rough terrain.
7. Allow suspension to move up and down with terrain by placing tires on level spots and avoiding moguls.
8. If vehicle is empty try softening the tires by letting a few pounds of air out. This gives good traction and better ride.
9. Expect rocks to tumble, logs to roll and soft ground to cause you to slip and slide.
10. Tire placement is very important when driving in rough terrain.
11. Look over hood down road. Do not drive with head out of window, trying to look down at wheels.
12. Keep picture of road in your mind, feel the road as the terrain goes by.
13. Know your undercarriage clearance. Know approach and departure angles.
14. Do not straddle rocks. Place tires on rocks, stumps, etc.

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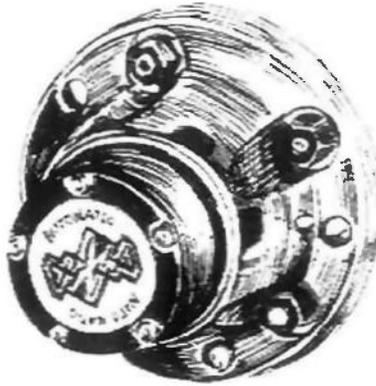
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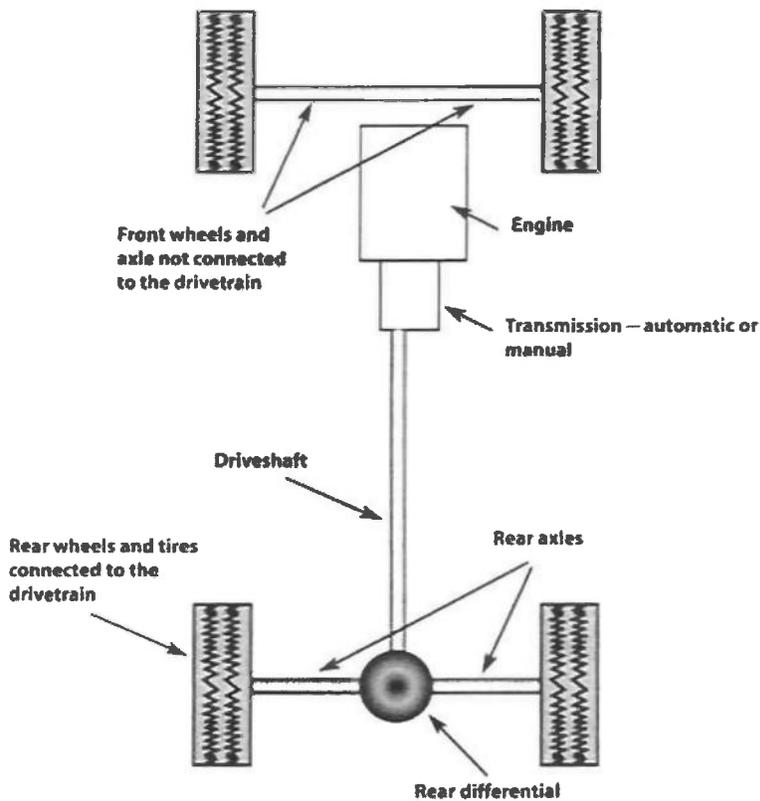
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Transfer Case (2WD, 4WD Low and 4WD High)



2 Wheel Drive

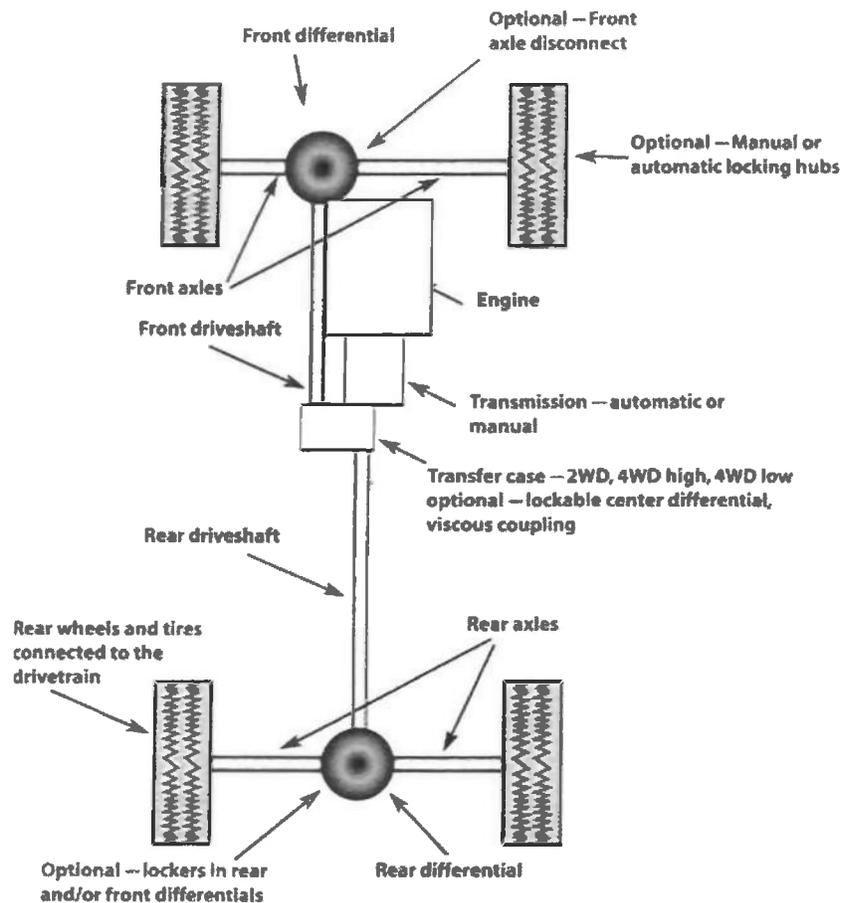
The transfer case causes the power to flow from the engine and transmission, which normally goes to the rear axle but also can go to the front axle (4WD).

In normal road operation the vehicle will be in 2WD. This allows for normal driving on roads and highways.

4WD High, which is the same gear ratio of 2WD, allows for higher speeds and vehicle control on dirt roads, slippery, snowy or roads that need a bit more traction.

4WD Low gives a much lower gear ratio for more control on difficult terrain. Most off road driving should be done in low range.

When shifting from 4WD High/Low or Low/High, stop vehicle or decrease speed to less than 2 MPH. If difficulty shifting is experienced, turn off the vehicle and try shifting again.



4 Wheel Drive

Off-road Driving

Use spotters where appropriate:

- Always use spotter if another person is available;
- Where vision is obstructed or route is uncertain;
- When backing up;

Go/No-Go Checklist

Operator needs to go through a personal Go/No-Go checklist prior to attempting to cross any poor traction or hazardous situations.

Items on the checklist may include:

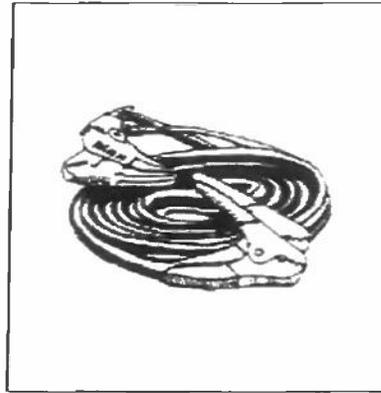
- Can you safely cross this hazard?
- If you cross the hazard once can you return on same path?
- Is there another route you can use that is safer and easier on the environment?
- Do you need to cross at this location?
- If you get stuck or breakdown will you be able to get out of this location without any other assistance?
- Have you scouted the path you are going to take?
- Do you know what is on the other side of the hazard?
- If you decide not to continue what effect will it have on completion of your assignment?
- Does anybody know where you are? Do you have radio or cellular telephone communication?

Tools needed for off-road driving

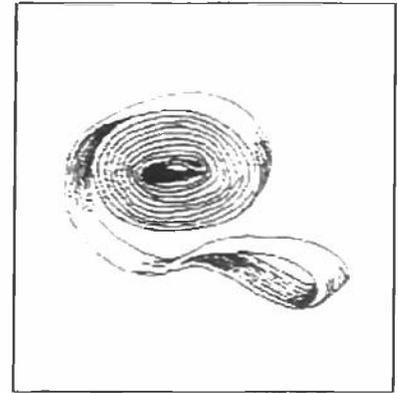
- Shovel
- Chain w/hooks
- Jumper cables
- Recovery strap (3" X 30')
- Tool kit
- Axe or pulaski
- Winch is operational if equipped
- Jack with board to stabilize



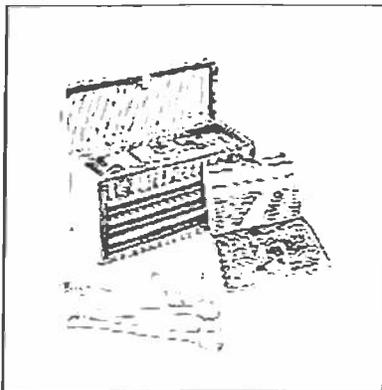
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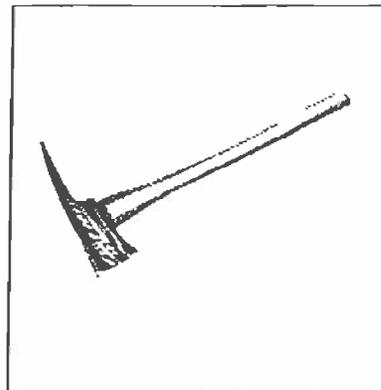
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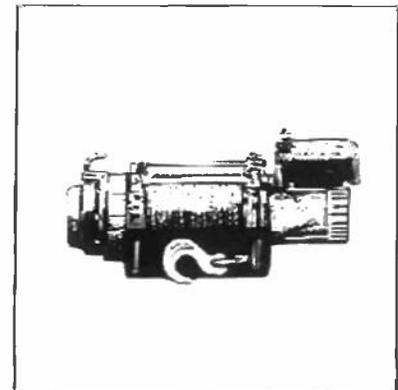
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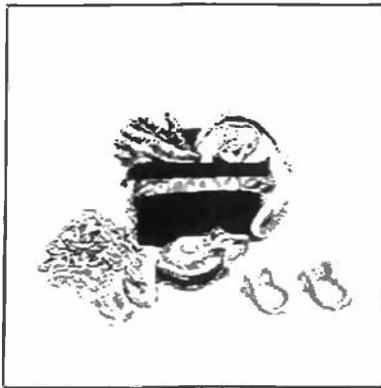
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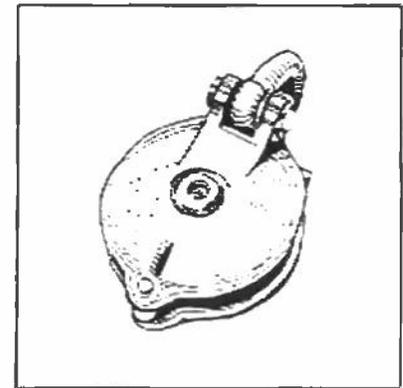
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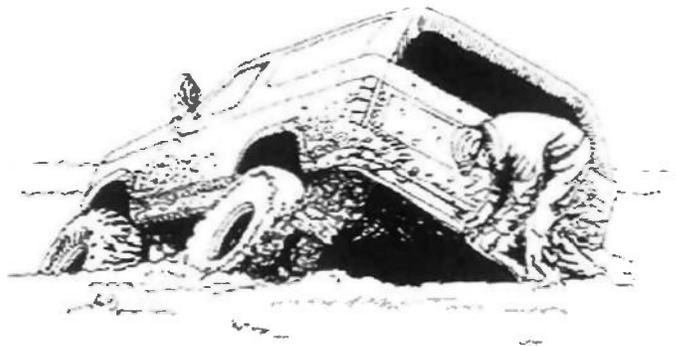
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Driving techniques

1. Drive at a slow speed.
2. Minimize the use of sudden acceleration, braking, or turns. They will cause the vehicles center of gravity to shift, destabilizing the vehicle and may lead to a collision or rollover.
3. Maintain steering wheel control at all times. Do not grip the steering wheel spokes. Anticipate steering wheel kickback and keep your fingers and thumbs (monkey grip) on the outside of the steering wheel. Position your hands at 9 and 3 o'clock on the steering wheel.



Mud Driving

1. Go/No-Go.
2. Proceed slowly but steadily through mud.
3. Be aware of deep mud holes.
4. Walk and scout difficult section of road to make sure you can get through.
5. Probe mud holes for deep pockets, rocks, roots and other debris.
6. Clean mud hole of debris prior to entering.
7. Expect to slip and slide, do not oversteer.
8. You may want to put on tire chains prior to entering mud hole.
9. Back out before you really get stuck, if possible.
10. Remember to clean undercarriage and inspect drive train.
11. If forward progress is slowed try turning wheels back and forth quickly to transfer torque from one tire to another.

Sand Driving

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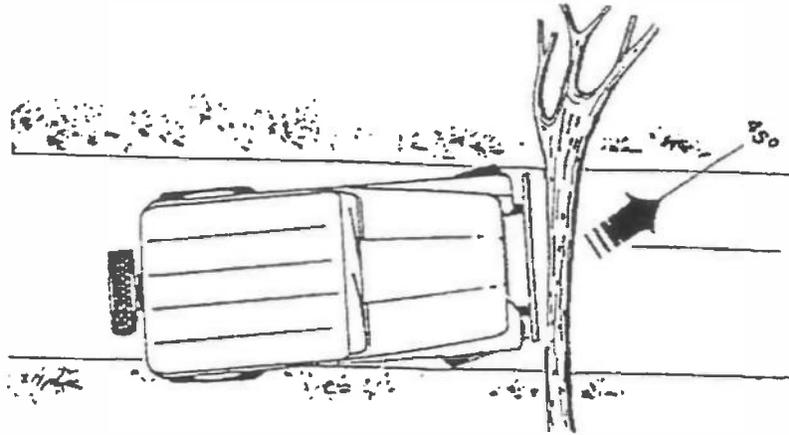
15. Speed on rough terrain 5 to 10 m.p.h.
16. Keep vehicle as level and even as possible.
17. Use spotter.



Gullies/ditches/logs/windfall and culverts

1. Go/No-Go
2. Scout route first if uncertain.
3. Cross at a diagonal/45 degree angle when possible.
4. This increases clearance and traction.
5. Proceed slowly.
6. Use spotter.
7. Ease in and power out.

8. Allow one tire at a time to cross obstacle while the other three help push and pull the other over.



9. Small gullies can be approached at less than 2 m.p.h. in first gear, 4-wheel drive, at right angle using foot brake to ease front wheels into and over the gully.
10. Whenever possible move logs, cut with axe or chainsaw or drag away.
11. If necessary, fill in with rocks, brush, dirt and wet down to solidify the aggregate before starting over.
12. Watch for branches, broken pieces, etc. kicking up and causing damage to the body parts or getting caught in drive train.
13. When traveling a road with gullies straddle "V" groove. If groove gets too wide you will have to drive down into gully. Keep vehicle as level as possible and centered over gully.





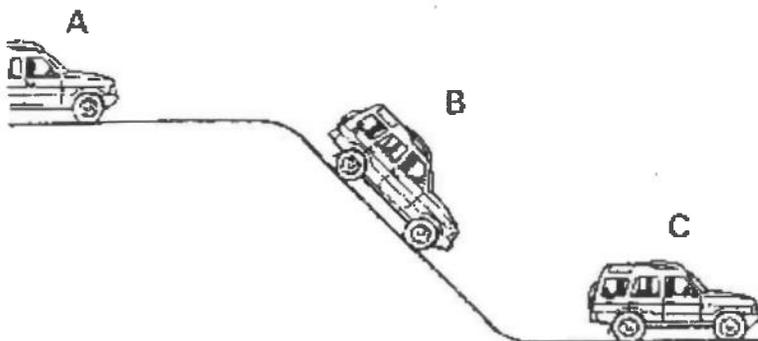
Side Hills

1. Go/No-Go
2. Avoid whenever possible
3. Vehicle with high center of gravity
4. Less traction/control of vehicle
5. Scout route
6. Use spotter
7. Proceed slowly but steadily
8. Avoid stumps and rocks on uphill side.
9. Watch for downhill holes, or uphill rocks and stumps that could exceed tilt degree.
10. Do not overreact. Vehicles tend to slide before they roll. If vehicle slides, stop-- then figure out easiest and quickest way to level surface.
11. Keep tires straight, do not turn uphill unless to follow tracks.
12. Stay on established roadways.
13. Do not turn around on side hill. Back vehicle down to level surface.
14. Do not attempt to side hill with high profile vehicle.
15. Avoid steep terrain
16. If the vehicle becomes unstable, steer downhill



Climbing Hills

1. Go/No-Go
2. Scout route for hazards
3. Avoid deep ruts
4. Watch for hidden objects
5. Scout for a turn around spot on top of the hill
6. Evaluate surface conditions
7. Estimate slope
8. Drive straight uphill
9. Low range 4WD
10. Start out in low gear
11. Slow and steady
12. Don't spin tire
13. Just enough power to get up hill
14. Avoid shifting gears on the hill



Descending Hills

1. Go/No-Go
2. Scout route for hazards
3. Avoid deep ruts
4. Watch for hidden objects
5. Beware of a dead end at bottom, nowhere to go
6. Scout for a turn around spot
7. Estimate slope
8. Proceed slowly
9. Do not gun the engine. Gunning the engine can cause the wheels to spin and lead to a loss of traction.
10. Go straight down hill
11. Use gentle acceleration to avoid sliding
12. Low range 4WD
13. Use lowest gear for maximum engine braking effect
14. Easy on brakes, just enough to maintain desired speed and control. Rapid pumping of the brakes will slow the vehicle and still maintain steering control.
15. If you sense a loss of traction, turn the steering wheel rapidly from side-to-side. This may provide additional traction.

Negotiate Water Hazards

1. Go/No-Go
2. Scout route
3. Use a spotter
4. Determine water depth



5. Cross where others have crossed

6. Stream bed is:
 - a. Rock and gravel
 - b. Boulders
 - c. Mud or sand
7. The possibility of vehicle engine swallowing water exists. Note location of engine air intake is during inspection.
8. If possible do not go into water or mud over top of tires.
9. Make sure you can get out of other side and current is not too swift.
10. Once out, remember brakes are wet and give them time to dry out. You may apply light pressure to brakes to help them dry out faster.
11. If vehicle stalls in water and possibly swallows water do not restart engine as this could damage it. Remove vehicle from water using recovery methods, winching, pulling or pushing.
12. Take care to minimize damage and disturbance to stream bank and bed.

Negotiate brush, trees, etc., w/o damaging vehicles.

1. Go/No-Go
2. Use spotters
3. Proceed slowly
4. Scout route
5. Engage 4WD
6. Special hazards

Snow/Ice

1. Go/No-Go
2. Determine depth of snow
3. Know your undercarriage clearance
4. Proceed slowly but steadily through snow
5. Avoid sudden braking, acceleration, and steering
6. Walk and scout difficult section of road to make sure you can get through.
7. Expect to slip and slide, do not oversteer
8. Use engine braking effect to slow vehicle
9. You may want to put on tire chains prior to entering snow. Chains are essential on icy terrain.
10. Back out before you really get stuck, if possible.
11. Remember to clean undercarriage and inspect drive train.
12. If forward progress is slowed try turning wheels back and forth quickly to transfer torque from one tire to another.
13. Avoid steep slopes

If your vehicle becomes stuck

1. Do not gun the engine. That will cause the vehicle to sink deeper.
2. You may be able to rock the vehicle out by shifting from forward and reverse gears, stopping between shifts, in a steady pattern. Press lightly on the accelerator in each gear.
3. Use safe winching techniques

Post trip inspection

After returning to hard surface check vehicle:

1. Disengage 4WD
2. Rock between dual tires
3. Damage to body
4. Damage to undercarriage
5. Leaking fluids
6. Tire damage
7. Debris in undercarriage
8. Hanging wires

Stopping and Re-Starting on a Steep Incline

Standard Transmission

1. Use emergency brake to hold vehicle.
2. Put vehicle in lowest gear (4 low should be used).
3. Lift clutch until it tries to engage using idle of motor only. Do not lift all the way (like riding the clutch). This will feel like the vehicle wants to move forward. Hold the clutch in this position.
4. Take foot off the brake pedal.
5. As the clutch engages, and starts to move the vehicle forward, release the emergency brake and lift clutch slowly.
6. The vehicle will move in idle.
7. Then increase RPM. **SLOWLY...**

Automatic Transmission

1. Use emergency brake to hold vehicle.
2. Put vehicle in lowest gear (4 low should be used).
3. Press the accelerator until the transmission tries to engage (without using the brake pedal). This will feel like the vehicle wants to move forward.
4. As the transmission engages and starts to move the vehicle forward, release the brake.
5. As the vehicle moves increase the engine RPM.
6. This procedure will put less stress on running gears and drive train.

