

CHAPTER 17

MANUAL SHIFT AND AUTOMATIC TRANSMISSIONS

The vehicle driver must be prepared to drive vehicles with either manual or automatic transmission. Each transmission type requires specific methods to ensure smooth operation.

MANUAL SHIFT OPERATION

Clutch Operation

A clutch provides the means to apply engine power to the wheels smoothly and gradually. Learn where the clutch starts to engage, how far the pedal moves to become fully engaged, how much free play the pedal has, and how fast you should engage the clutch.

Keep your foot off the clutch pedal except when actually starting, stopping, or shifting gears. Even a slight constant pressure on the clutch pedal causes excessive wear. For this reason, when stopped on a hill, never slip your clutch to keep from rolling backward. Instead use your brakes. While waiting for a long line at traffic lights or when halted for other reasons, depress the clutch pedal and move the transmission shift lever into neutral. Release the clutch after shifting into neutral.

When slowing a government vehicle to stop or to turn, be sure to reduce speed to 15 MPH or less before depressing the clutch pedal. Coasting a vehicle at a high speed with the clutch pedal depressed is dangerous. Vehicle control becomes more difficult, and the clutch may be damaged. Damage resulting from this practice is considered vehicle abuse.

Skill in manual shifting is a requirement of good driving. Poor manual shifting results in poor vehicle performance and can damage the vehicle. Know the gearshift lever positions so well that you can shift to any gear without looking at the shift lever. The gearshift pattern is usually diagramed on the vehicle caution plate. Never move the gear shift lever from one position to another while the engine is running until you have fully depressed the clutch pedal with your left foot. To shift gears smoothly and quietly,

keep the pedal fully depressed until the shift has been completed. When shifting gears in a 1 1/2-ton or larger truck, you may be required to use the double-clutching instructions.

Clutch Shifting Procedure. After acquainting yourself with the vehicle's instruments and controls, you are ready to begin driving operations. Start and warm the engine with the transmission in neutral. Then start moving the vehicle in low or first gear. Follow these steps:

- Depress the clutch pedal and shift into low gear.
- Check the inside and outside rearview mirrors.
- Check blind spots and give signal.
- Let the clutch pedal up slowly, pausing at friction point or when you feel it taking hold. Hesitate; then check mirrors again for traffic.
- Release the parking brake.
- Slowly release the clutch pedal and at the same time slightly depress the accelerator.
- When driving operation is underway, remove your left foot from the clutch pedal completely.

Double-Clutch Shifting Procedure. Good driving practice in trucks (1 1/2-ton or larger) often requires double-clutching to properly engage the gears and to prevent loss of momentum. To shift to a lower gear by double-clutching—

- Release pressure from the accelerator as you begin depressing the clutch pedal.
- When the clutch pedal is fully depressed, move the gearshift lever to the neutral position.
- Release the clutch pedal and at the same time depress the accelerator to speed up the engine.
- Let up on the accelerator and depress the clutch pedal.

- While the clutch pedal is depressed, move the gearshift lever to the next lower gear speed
- Release the clutch pedal and at the same time depress the accelerator to maintain engine speed as the load is again connected to the engine.

The procedure is the same for shifting to a higher gear speed, except that the engine is not accelerated while the gear is in neutral.

CAUTION

When shifting gears in rough terrain and on hills, never let your vehicle slow down to a point where the engine begins to labor or jerk before shifting into a lower gear ratio. Always anticipate the need for extra power and shift gears accordingly. When descending a hill, with or without a heavy cargo, always drive with your vehicle in gear and the clutch pedal out.

Spark Ignition Engine Braking Operation

If the hill is steep enough to require using brakes to reduce speed, shift into the next lower gear at the crest of the hill and use the engine compression as a brake. Take extreme care to prevent excessive engine speed while descending a hill. Judge the necessary gear and shift, if necessary, at the crest of the hill **BEFORE SPEED HAS INCREASED FROM DOWNHILL MOVEMENT**. Ordinarily, the gear required to ascend a hill is proper to use to descend it. **GEARING DOWN AFTER ENGINE SPEED HAS INCREASED MAY EXTENSIVELY DAMAGE THE ENGINE**. Except when used to compensate for brake failure, damage resulting from this practice is considered vehicle abuse. With proper gear selection, intermittent application of brakes will reduce the speed of the vehicle to safe limits.

CAUTION

The preceding paragraph applies to spark ignition engines only. Compression ignition (multifuel/diesel) engines should not be used to reduce speed. This practice will damage compression ignition engines.

When preparing to stop the vehicle, remove your foot from the accelerator and use the engine compression as a brake to help stop the vehicle. Do not depress the clutch pedal until the motor is operating at low speed and is no longer serving as a brake. Then depress the clutch pedal before the engine begins to labor from slow speed. Apply the foot brake to help this braking action. When preparing to turn or stop, avoid downshifting above 20 MPH. (Braking on icy roads requires a special technique which is discussed in Chapter 21.)

NOTE: The above rules apply to most vehicles. To meet the military's transportation needs for moving heavy equipment and traveling over rough terrain, new vehicles are constantly being developed. These vehicles may have more complicated transmissions, such as multi-gear ranges and dual-speed axles or other special features. Be sure you understand how a new vehicle operates. Read the vehicle operator's technical manual before trying to operate it.

AUTOMATIC TRANSMISSION OPERATION

Selector Lever Positions

While some military vehicles are equipped with manual transmission, an increasing number are equipped with automatic transmissions. Though operation of automatic shift vehicles is quite simple, the good driver must learn to operate them smoothly and properly.

In vehicles equipped with automatic transmissions, initial gear selection is controlled with a selector lever. When in drive (D or DR), shifting from drive to low (L) and returning to drive is controlled automatically by engine speed. Acquaint yourself with the vehicle and learn the selector lever positions, since there are a number of different automatic transmissions. The selector lever positions are as follows:

- P (park position) is used to lock the transmission so the vehicle will not roll while parked, on light vehicles such as sedans and pickups. In some heavier vehicles, the park position does not lock the transmission. In vehicles with a park position, start the engine from the park position.

- N (neutral position) is used to start engines of vehicles without a park position. In the neutral position, the engine is disengaged from the drive shaft of the vehicle.
- D or DR (drive position) is used to move the vehicle forward. With the shift lever at D or DR, the vehicle moves forward as you depress the accelerator. After starting the engine in the neutral or park position, change the selector to D or DR to move forward. To avoid premature forward movement, apply the brake while in the drive position until you are ready to move the vehicle. The transmission automatically shifts to higher gears as the speed increases.
- L (low or power position) is used to negotiate steep grades and rough terrain or when the braking power of the engine is required. The transmission will not shift automatically to higher gear ratios when the lever is in the low position. When the low range is no longer needed, release the accelerator temporarily and move the shift lever to the drive position for normal gear progression. In the drive position, the low range is engaged automatically when the engine speed is reduced. If the accelerator is suddenly fully depressed when the vehicle is in the drive position, the low range becomes engaged. (This procedure may be used to provide a sudden burst of speed for passing.) When a predetermined engine speed has been attained, the transmission automatically returns to driving range.
- R (reverse position) is used to move the vehicle in reverse. Some shift levers must be raised slightly to be moved to the reverse position. Others require you to depress a button on the end of the lever before moving to R. Park vehicles without a park position in the reverse position. Bring your vehicle to a full halt before placing it in R; then set the parking brake.

A good driver will become thoroughly familiar with the vehicle instruments and controls before driving it. He will always check the selector positions before he moves the lever. Serious accidents can happen if you do not follow these rules. For example, R or reverse is on the

extreme right on some shift selectors, on the extreme left on others, and in an intermediate position on others. From force of habit, if you are in a different vehicle from the one you have been driving, you could move the selector to R, thinking you were moving it to D or L. The vehicle would move in an entirely opposite direction than you anticipated.

A good driver will shift from D or DR according to driving needs. Never shift from D or DR to L at a high rate of speed because this will seriously damage the transmission and could result in a severe accident by causing a skid on wet or slippery pavement.

Dual-Range Driving Positions

Tactical vehicles may be equipped with automatic transmissions. Due to the diverse conditions under which they may be required to operate, tactical vehicle automatic transmissions are designed for greater flexibility than commercial types. Flexibility is attained with low and high transmission ranges. The vehicle technical manual contains instructions for your particular vehicle. Consult it frequently.

Vehicles equipped with dual-range driving positions offer the operator a selection of two ranges in driving pattern D or DR. Use them according to your driving needs as prescribed below. (On some vehicles, these positions are F1 and F2.)

D (F1) position is used for all ordinary driving. It -

- Provides four forward speeds.
- Shifts automatically to fourth gear.
- Increases economy by reducing engine speed

DR (F2) position is used for congested areas, rough terrain, and mountain driving. It -

- Provides three forward speeds automatically.
- Will not shift into fourth speed unless the engine is accelerated to a very high RPM.
- Uses the engine as a brake on long, steep downgrades.

Operating Procedure

To put the vehicle in motion -

- Apply the foot brake.
- Select the proper transmission lever position — forward or reverse.
- Place the transfer shift lever in the appropriate range.
- Check traffic conditions front and rear, using mirrors if necessary.
- Release the parking brake.
- Check again for traffic blind spots to the left or right rear. Signal if pulling away from a curb.
- Release the foot brake.
- Depress the accelerator pedal gradually for a smooth start.

CAUTION

Government vehicle operators are not permitted to tow or push automatic shift vehicles for the purpose of starting them.

(For Air Force Only: During normal duty hours, contact the maintenance control section of vehicle maintenance to start the vehicle with a booster battery, jumper cables, or other equipment. After duty hours, contact vehicle operations for wrecker service. For detailed instructions, see your supervisor.)

JUMP STARTING VEHICLES

Thousands of people are injured each year from auto battery explosions. Nearly two-thirds of these injuries involve the eyes. Most soldiers, at one time or another, will use jumper cables to start a vehicle, and chances are they are not aware of the danger involved. As a commander or supervisor, you are responsible for the safety of your troops, both on and off duty. Stress that they should use one of the procedures below to jump start a vehicle.

Using Jumper Cables to Start Engine

Use the following procedure to start an engine using jumper cables on a 12-volt system (Figure 17-1):

- Position the jump starting vehicle with batteries opposite the batteries of the disabled vehicle.
- Stop the engine of the jump starting vehicle.
- Open battery compartment doors of both vehicles. Pull both battery boxes onto running boards.

WARNING

One jumper cable must connect positive terminals. The other jumper cable must connect the negative terminal of the jump starting vehicle to the body of the disabled vehicle away from the batteries. Failure to do so may cause batteries to explode, injuring or killing personnel.

- Clamp one jumper cable (2) to the positive terminal (1) of the jump starting vehicle and the positive terminal (3) of the disabled vehicle.
- Clamp the other jumper cable (5) to the negative terminal (6) of the jump starting vehicle and the body (4) of the disabled vehicle.
- Start the engine of the jump starting vehicle.
- Start the engine of the disabled vehicle. If the engine does not start after four tries, notify your supervisor.

WARNING

Be sure jumper cable clamps do not contact other jumper cable clamps or terminals. Failure to do so may cause batteries to explode, injuring or killing personnel.

- Remove jumper cables (2) and (5).

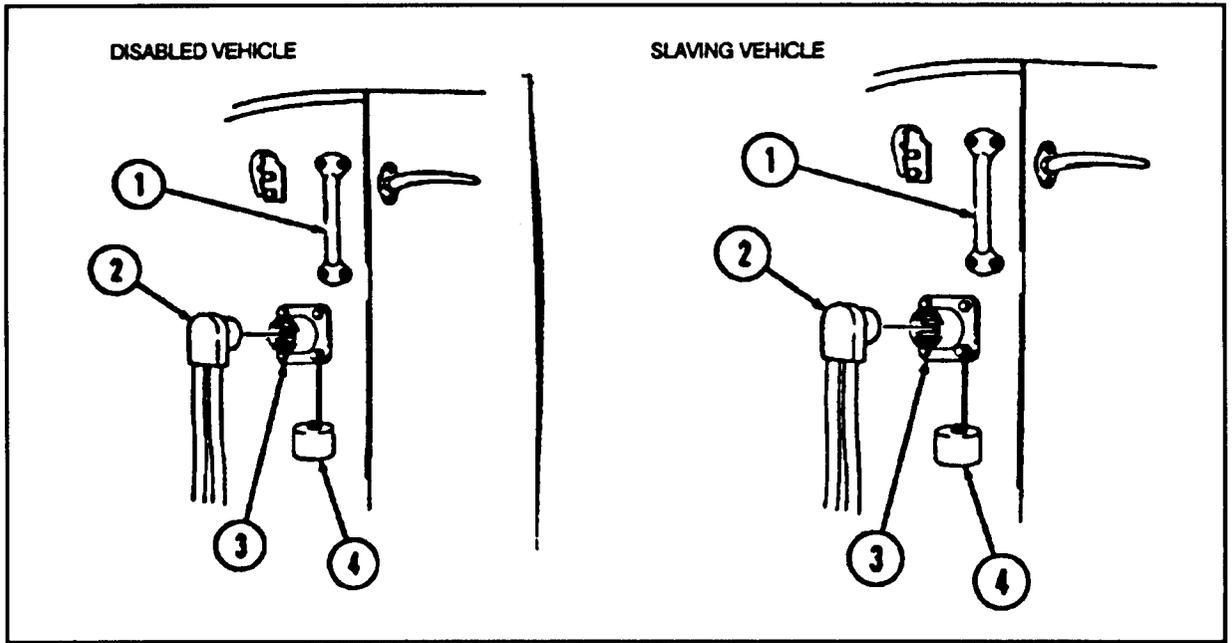


FIGURE 17-2. Parts Used in Slave Cable Hookup.