9- and 10-Speed Manual Transmissions
Operator Manual TP-8989
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Section 1
Nomenclature

Meritor Model Number

R M X 10 165 C

Meritor

M = Manual
S = ESS**

X = Overdrive
No Letter = Direct Drive

9 = 9-Speed
10 = 10-Speed
13 = 13-Speed

Ratio
A
B
C
R

Torque Rating (lb-ft)
115 = 1150
125 = 1250
135 = 1350
145 = 1450
155 = 1550
165 = 1650

* Progressive torque is an engine feature that requires a Torq-2™ transmission. In models not featuring progressive torque, this number will be the same as the torque rating.

** Engine Synchro Shift™
Section 2
Operating Guidelines

⚠️ WARNING
Use the information in this section to correctly operate the vehicle and prevent serious personal injury and damage to components.

How to Use the Clutch

Use the Clutch for Initial Gear Engagement When the Vehicle is Stationary
Use the clutch brake for initial gear engagement when the vehicle is stationary. If you use the clutch brake when the vehicle is moving, the clutch brake tabs can break and damage the input shaft, transmission, and first and reverse sliding collar.

Do Not Coast in Neutral With the Clutch Disengaged
If you coast in Neutral with the clutch disengaged, lubricants will be unable to pass to the thrust washers. Damage to the washers and mainshaft can result.

Always Use the Clutch to Change Gears
You must use the clutch to change gears. The clutch enables the gear teeth to engage correctly.

What Happens When You Do Not Use the Clutch
• The gear teeth grind instead of engage and can damage the shift forks, sliding collars and gears.
• Metal particles from the damaged parts can fall into the lubricant and damage the bearings.
• The transmission becomes difficult to shift or slips out of gear.

Operating a Vehicle on a Hill or Grade
• Downshift to the next lower gear before descending a hill or grade.
• Upshift to the next higher gear before ascending a hill or grade.
Use the Correct Gear to Prevent Shock Load

Use the correct gear to prevent shock load. Shock load can damage gear teeth immediately or cause damage that appears later.

When to Shift the Transmission

Shift the transmission at the correct engine speed (RPM) and at the manufacturer’s recommended vehicle speed to prevent gears from grinding.

Engine Torque Curves Define Correct RPM or MPH Speeds

Shifting at the correct RPM enables the transmission to operate economically. Engine torque curves vary by vehicle, because RPM and MPH values are determined by engine specifications, rear axle ratio and tire size.

If you change the engine, rear axle or tires from the vehicle’s original equipment, you must obtain a new Torque Split Chart to ensure that the transmission operates correctly.

Refer to the vehicle manufacturer’s engine torque curves to determine a vehicle’s correct RPM or MPH. A typical chart is shown below.
Section 2
Operating Guidelines

Shift the Range Selector When the Transmission is in Gear (Preselect)
Do not move the shift lever to Neutral and then move the range selector. This causes the gear change to occur BEFORE the range changes. Damage to the synchronizer can result.

Drain Moisture from the Air Reservoir Every Day
When you drain moisture from the air reservoir, you help prevent moisture and contaminants from entering the system, which can affect operation and damage components.

Remove Axle Shafts When You Tow a Vehicle With the Rear Wheels on the Ground
Remove axle shafts when you tow a vehicle with the rear wheels on the ground. If you do not remove the axle shafts, the towing angle will not allow lubricants to reach the transmission mainshaft thrust washers and axle pinion bearings. Damage to these components will result.

Refer to technical bulletin TP-9579, Driver Instruction Kit, for complete procedures on how to correctly tow a vehicle. Call ArvinMeritor’s Customer Service Center at 800-535-5560 to obtain this publication.
Optional Transmission Temperature Indicator Light or Temperature Gauge

⚠️ CAUTION

Do not operate the transmission when the optional temperature indicator light comes ON, or the optional temperature indicator gauge is in the “WARNING” area. These are indications that the transmission is overheating. Stop the vehicle. Service the transmission as required to prevent damage to components.

Some vehicles use an optional transmission temperature light or optional transmission temperature gauge that enables you to verify that the transmission is operating within normal temperatures. Refer to the vehicle’s operating instructions for more information.

The temperature indicator light will come ON, or the gauge indicator will be in the “WARNING” area, when the transmission is overheating.

- If the transmission is overheating: Stop the vehicle. Service the transmission as required.

Parking a Vehicle

⚠️ WARNING

You must place the transmission into Neutral and follow the vehicle manufacturer’s procedures when you park a vehicle. If the transmission is in gear when you start the vehicle, the vehicle can suddenly move forward. Serious personal injury and damage to components can result.

1. Bring the vehicle to a stop.
2. Place the transmission into Neutral.
3. Apply the parking brake. Refer to the vehicle manufacturer’s instructions for the correct procedures.
Section 2
Operating Guidelines

Shift-n-Cruise™ Speed Control Feature

**WARNING**
Only use the Shift-n-Cruise™ speed control feature when you operate a vehicle under normal operating conditions. Do not use this feature in heavy traffic or on winding, wet or slippery roads. These conditions can affect cruise control performance, which can result in loss of vehicle control, serious personal injury and damage to components.

**CAUTION**
You must use your finger to press the Shift-n-Cruise™ speed control PAUSE, RESUME or SET buttons located on the shift knob. If you use a screwdriver, ballpoint pen or any sharp item, a button can stick in the switch assembly and affect speed control operation. Damage to components can result.

The Shift-n-Cruise™ speed control feature integrates cruise control functions into the transmission shift knob. You can use the cruise feature after a shift without removing your hand from the shift knob.

The PAUSE, RESUME and SET buttons are located on the TOP of the shift knob. Figure 2.1. The ON/OFF controls are located on the instrument panel.

**How to Use the Shift-n-Cruise™ Speed Control Feature**

- Press the SET button to select cruise speed.
- Press the PAUSE button to temporarily deactivate speed control.
- Press the RESUME button to return to the speed you selected at SET.

**Figure 2.1**
How to Shift 9-Speed “A” and “B” Ratio Manual Transmissions

⚠️ CAUTION
You must use the correct starting gear when you operate the transmission. Do not shift into Neutral and coast. Damage to the transmission can result.

Use the clutch brake only for initial gear engagement when the vehicle is stationary to prevent damage to the input shaft and the clutch brake.

Before You Start the Vehicle
1. Check that transmission fluid is at the specified level.
2. Check that the transmission is in Neutral.

Start the Vehicle

⚠️ WARNING
The transmission must be in Neutral when you start the vehicle. If the transmission is in gear, the vehicle will move forward suddenly. Serious personal injury and damage to components can result.

1. The shift lever must be in Neutral.
2. Press the clutch pedal to the end of travel.
3. Start the engine. Allow air pressure in the system to reach the specified range on the gauge.
4. Release the clutch pedal.
5. Release the parking brakes.
Section 3
9-Speed Transmissions

Shifting Into Reverse

⚠️ CAUTION
Only use the clutch brake for initial gear engagement when the vehicle is stationary. If you use the clutch brake when the vehicle is moving, the clutch brake tabs can break. Damage to the input shaft, transmission, and first and reverse sliding collar can result.

Never range shift while in reverse. The synchronizer will not function in reverse. Range shifting while in Reverse can result in damage to the transmission.

NOTE: Use low range when you shift into Reverse.

1. Move the range lever DOWN into low range. Figure 3.1.

NOTE: Disengaging the clutch stops the transmission for initial gear engagement.

2. Disengage the clutch. Press the clutch pedal to the end of travel. The clutch release bearing will engage the clutch brake.

3. With the clutch pedal at the end of travel, move the shift lever into Reverse. Figure 3.1.

4. Slowly release the clutch pedal to move the vehicle in the reverse direction.

Figure 3.1

![Diagram of gear shifts and range levers for 9-Speed Direct or Overdrive Transmissions with the standard shifting pattern and 9-Speed RMO Models.]
Shifting Into a Forward Starting Gear and Upshifting

**CAUTION**

Only use the clutch brake for initial gear engagement when the vehicle is stationary. If you use the clutch brake when the vehicle is moving, the clutch brake tabs can break. Damage to the input shaft, transmission, and first and reverse sliding collar can result.

Meritor recommends shifting into low, first, second or third gear as a starting gear.

**Low Gear**

**NOTE:** Use low gear when moving a loaded vehicle from a stationary position up a grade.

1. Push the range lever DOWN into low range. *Figure 3.2.*
2. Disengage the clutch. Press the clutch pedal to the end of travel. The clutch release bearing will engage the clutch brake.
3. With the clutch pedal at the end of travel, move the shift lever into low gear. *Figure 3.2.*
4. Slowly release the clutch pedal.

---

**Figure 3.2**

- LOW RANGE
- HIGH RANGE

**NINE-SPEED DIRECT OR OVERDRIVE TRANSMISSIONS WITH THE STANDARD SHIFTING PATTERN**

- NINE-SPEED RMO MODELS
Section 3
9-Speed Transmissions

First Gear
1. Release the accelerator.
2. Press the clutch pedal until the clutch disengages.
3. Move the shift lever into Neutral.
4. Release the clutch pedal.
5. Allow the engine to slow to the correct RPM.
6. Press the clutch pedal until the clutch disengages.
7. Move the shift lever into first gear. Figure 3.3.
8. Release the clutch pedal. Apply the accelerator.

Second, Third and Fourth Gears
To upshift into second, third and fourth gears: Repeat Steps 1-8 above, but move the shift lever into the correct second, third and fourth gears. Figure 3.3.

Figure 3.3

NINE-SPEED DIRECT OR OVERDRIVE TRANSMISSIONS WITH THE STANDARD SHIFTING PATTERN

NINE-SPEED RMO MODELS

LOW RANGE
HIGH RANGE
Fifth Gear

⚠️ CAUTION
Move the range lever only when the transmission is in gear to prevent damage to the transmission.

1. While in fourth gear, preselect by moving the range lever UP to shift the range selector valve into high range. Figure 3.4.
2. Release the accelerator.
3. Press the clutch pedal until the clutch disengages.

NOTE: The range cylinder will automatically shift into high range when the shift lever is in Neutral.

4. Move the shift lever into Neutral.
5. Release the clutch pedal.
6. Allow the engine to slow to the correct RPM.
7. Press the clutch pedal until the clutch disengages.
8. Move the shift lever into fifth gear. Figure 3.4.
9. Release the clutch pedal. Apply the accelerator.
Section 3
9-Speed Transmissions

Sixth, Seventh and Eighth Gears
To upshift into sixth, seventh and eighth gears: Repeat Steps 2-9 on the previous page, but move the shift lever into the correct sixth, seventh and eighth gears. Figure 3.5.

Figure 3.5
NINE-SPEED DIRECT OR OVERDRIVE TRANSMISSIONS WITH THE STANDARD SHIFTING PATTERN

LOW RANGE
HIGH RANGE

NINE-SPEED RMO MODELS
How to Downshift

Eighth, Seventh and Sixth Gears
1. Release the accelerator.
2. Press the clutch pedal until the clutch disengages.
3. Move the shift lever into Neutral.
4. Release the clutch pedal.
5. Apply the accelerator to increase the engine speed to the correct RPM.
6. Release the accelerator and immediately press the clutch pedal until the clutch disengages.
7. Move the shift lever into the correct gear. Figure 3.6.
8. Release the clutch pedal.

Figure 3.6

NINE-SPEED DIRECT OR OVERDRIVE TRANSMISSIONS WITH THE STANDARD SHIFTING PATTERN

LOW RANGE  HIGH RANGE

NINE-SPEED RMO MODELS

LOW RANGE  HIGH RANGE
Section 3
9-Speed Transmissions

Fifth Into Fourth Gear

⚠️ CAUTION
Move the range lever only when the transmission is in gear to prevent damage to the transmission.

1. While in fifth gear, preselect the moving the range lever DOWN to shift the range selector valve into low range. Figure 3.7.
2. Release the accelerator.
3. Press the clutch pedal until the clutch disengages.

NOTE: The range cylinder will automatically shift into low range when the shift lever is in Neutral.

4. Move the shift lever to Neutral.
5. Release the clutch pedal.
6. Apply the accelerator to increase engine speed to the correct RPM.
7. Press the clutch pedal until the clutch disengages.
8. Move the shift lever into fourth gear.
9. Release the clutch pedal. Apply the accelerator.

Figure 3.7

<table>
<thead>
<tr>
<th>LOW RANGE</th>
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<td>PUSH DOWN FOR LOW RANGE</td>
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NINE-SPEED DIRECT OR OVERDRIVE TRANSMISSIONS WITH THE STANDARD SHIFTING PATTERN

NINE-SPEED RMO MODELS
Section 3
9-Speed Transmissions

From Third, Second, First and Low Gears

To downshift into third, second, first and low gears: Repeat Steps 2-9 on page 14, but move the shift lever into the third, second, first and low gears. Figure 3.8.

Figure 3.8

NINE-SPEED DIRECT OR OVERDRIVE TRANSMISSIONS WITH THE STANDARD SHIFTING PATTERN

LOW RANGE

HIGH RANGE

NINE-SPEED RMO MODELS
Section 4
10-Speed Transmissions

How to Shift 10-Speed Manual Transmissions

⚠️ CAUTION
You must use the correct starting gear when you operate the transmission. Do not shift into Neutral and coast. Damage to the transmission can result.

Before You Start the Vehicle
1. Check that engine oil is at the specified level.
2. Check that the transmission is in Neutral.

Start the Vehicle

⚠️ WARNING
The transmission must be in Neutral when you start the vehicle. If the transmission is in gear, the vehicle will move forward suddenly. Serious personal injury and damage to components can result.

1. The shift lever must be in Neutral.
2. Press the clutch pedal to the end of travel.
3. Start the engine. Allow air pressure in the system to reach the specified range on the gauge.
4. Release the clutch pedal.
5. Release the parking brakes.
Section 4
10-Speed Transmissions

Shifting Into Reverse

⚠️ CAUTION
Only use the clutch brake for initial gear engagement when the vehicle is stationary. If you use the clutch brake when the vehicle is moving, the clutch brake tabs can break. Damage to the input shaft, transmission, and first and reverse sliding collar can result.

Never range shift while in reverse. The synchronizer will not function in reverse. Range shifting while in Reverse can result in damage to the transmission.

NOTE: Use low range when you shift into Reverse.

1. Move the range lever DOWN into low range. Figure 4.1.

NOTE: Disengaging the clutch stops the transmission for initial gear engagement.

2. Disengage the clutch. Press the clutch pedal to the end of travel. The clutch release bearing will engage the clutch brake.

3. With the clutch pedal at the end of travel, move the shift lever into Reverse. Figure 4.1.

4. Slowly release the clutch pedal to move the vehicle.

Figure 4.1

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<tr>
<th>LOW RANGE</th>
<th>PUSH DOWN FOR LOW RANGE</th>
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TEN-SPEED MODELS

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Shifting Into a Forward Starting Gear and Upshifting

**CAUTION**

Only use the clutch brake for initial gear engagement when the vehicle is stationary. If you use the clutch brake when the vehicle is moving, the clutch brake tabs can break. Damage to the input shaft, transmission, and first and reverse sliding collar can result.

Meritor recommends shifting into first, second or third gear as a starting gear.

**First Gear**

**NOTE:** Use first gear when moving a loaded vehicle up a grade from a stationary position.

1. Push the range lever DOWN into low range. **Figure 4.2.**
2. Disengage the clutch. Press the clutch pedal to the end of travel. The clutch release bearing will engage the clutch brake.
3. With the clutch pedal at the end of travel, move the shift lever into first gear. **Figure 4.2.**
4. Slowly release the clutch pedal.

**Figure 4.2**

![Diagram of gear shift lever with range selections and gear numbers]
Section 4
10-Speed Transmissions

Second Gear
1. Release the accelerator.
2. Press the clutch pedal until the clutch disengages.
3. Move the shift lever to Neutral.
4. Release the clutch pedal.
5. Allow the engine to slow to the correct RPM.
6. Press the clutch pedal until the clutch disengages.
7. Move the shift lever into second gear. Figure 4.3.
8. Release the clutch pedal. Apply the accelerator.

Third, Fourth and Fifth Gears
To upshift into third, fourth and fifth gears: Repeat Steps 1-8 above, but move the shift lever into the third, fourth and fifth gears. Figure 4.3.

Figure 4.3

![Diagram of 10-Speed Models]

- LOW RANGE
- HIGH RANGE

TEN-SPEED MODELS

1 2 3 4 5 6 7 8 9 10

R R R R R R R R R R
Section 4
10-Speed Transmissions

Sixth Gear

CAUTION
Move the range lever only when the transmission is in gear to prevent damage to the transmission.

1. While in fifth gear, preselect by moving the range lever UP to shift the range selector valve into high range. Figure 4.4.
2. Release the accelerator.
3. Press the clutch pedal until the clutch disengages.

NOTE: The range cylinder will automatically shift into high range when the shift lever is in Neutral.

4. Move the shift lever into Neutral.
5. Release the clutch pedal.
6. Allow the engine to slow to the correct RPM.
7. Press the clutch pedal until the clutch disengages.
8. Move the shift lever into sixth gear. Figure 4.4.
9. Release the clutch pedal. Apply the accelerator.
Section 4
10-Speed Transmissions

Seventh, Eighth, Ninth and Tenth Gears
To upshift into the seventh, eighth, ninth and tenth gears: Repeat Steps 2-9 on page 20, but move the shift lever into the correct seventh, eighth, ninth and tenth gears. Figure 4.5.

Figure 4.5

![Diagram of 10-speed gear model]

TEN-SPEED MODELS

- LOW RANGE
- HIGH RANGE
Section 4
10-Speed Transmissions

How to Downshift

Tenth, Ninth, Eighth and Seventh Gears
1. Release the accelerator.
2. Press the clutch pedal until the clutch disengages.
3. Move the shift lever to Neutral.
4. Release the clutch pedal.
5. Apply the accelerator to increase the engine speed to the correct RPM.
6. Release the accelerator and immediately press the clutch pedal until the clutch disengages.
7. Move the shift lever into the correct gear. Figure 4.6.
8. Release the clutch pedal.

Figure 4.6

TEN-SPEED MODELS

LOW RANGE

HIGH RANGE

Figure 4.6
**Sixth Gear Into Fifth Gear**

⚠️ **CAUTION**

*Move the range lever only when the transmission is in gear to prevent damage to the transmission.*

1. While in sixth gear, preselect by moving the range lever DOWN to shift the range selector valve into low range. **Figure 4.7.**

2. Release the accelerator.

3. Press the clutch pedal until the clutch disengages.

**NOTE:** The range cylinder will automatically shift into low range when the shift lever is in Neutral.

4. Move the shift lever to Neutral.

5. Release the clutch pedal.

6. Apply the accelerator to increase engine speed to the correct RPM.

7. Press the clutch pedal until the clutch disengages.

8. Move the shift lever into fifth gear.

9. Release the clutch pedal. Apply the accelerator.

---

**Figure 4.7**

[Diagram showing low and high range positions]
Fourth, Third, Second and First Gears

To downshift into fourth, third, second and first gears: Repeat Steps 2-9 on page 23, but move the shift lever into the fourth, third, second and first gears. Figure 4.8.

Figure 4.8

[Diagram of ten-speed models showing low and high range]
Shift Labels Identify a Transmission

⚠️ CAUTION

Shift patterns vary by vehicle. You must use the correct shift pattern for the transmission in the vehicle you operate to avoid damage to the transmission.

1. Refer to the shift label affixed to the sun visor or instrument panel for instructions on how to shift the transmission.
2. If the label is missing or unreadable, call ArvinMeritor’s Commercial Vehicle Aftermarket at 888-725-9355 to order a new label.
3. Install the new label in the vehicle.

Shift Patterns

- Nine-speed standard direct drive and overdrive manual transmissions with A and B ratios. Figure 5.1.
- Ten-speed manual transmissions. Figure 5.2.
Section 5
Shift Labels

Figure 5.1

9-Speed Transmission

Upshifting
- Start with range selector in DOWN position
- Shift Lo-1-2-3-4
- Raise range control while in 4th
- Shift to 5-6-7-8

Downshifting
- Shift 8-7-6-5
- Move range control DOWN while in 5th
- Shift 4-3-2-1-Lo

DO NOT MOVE RANGE CONTROL WHILE MOVING IN REVERSE
Figure 5.2

10-Speed Transmission

Upshifting
- Start with range selector in DOWN position
- Shift 1-2-3-4-5
- Raise range control while in 5th
- Shift to 6-7-8-9-10

Downshifting
- Shift 10-9-8-7-6
- Move range control DOWN while in 6th
- Shift 5-4-3-2-1

DO NOT MOVE RANGE CONTROL WHILE MOVING IN REVERSE

Press top for high range
Press bottom for low range

RANGE CONTROL

10-Speed Transmission

Upshifting
- Start with range selector in DOWN position
- Shift 1-2-3-4-5
- Raise range control while in 5th
- Shift to 6-7-8-9-10

Downshifting
- Shift 10-9-8-7-6
- Move range control DOWN while in 6th
- Shift 5-4-3-2-1

DO NOT MOVE RANGE CONTROL WHILE MOVING IN REVERSE

Press top for high range
Press bottom for low range

RANGE CONTROL
Section 5
Shift Labels

PTO Operation Decal — Part Number TP-90175

PTO Operation

⚠️ CAUTION
Use this procedure to put the PTO in the STATIONARY or ENGAGED position and to prevent damage to the transmission.

1. Place the transmission gear shift lever in the NEUTRAL position.
2. Place the range selector lever on the shift knob in the correct range for PTO operation. See the instructions of the PTO manufacturer.
3. Press the clutch pedal to the bottom of travel to disengage the clutch.
4. Move the shift lever to the REVERSE (R) position.
5. Slowly release the clutch pedal until the vehicle starts moving rearward.
6. Press the clutch pedal to the bottom of travel to disengage the clutch. Place the transmission gear shift lever in the NEUTRAL position.
7. Apply the parking brakes.
8. Place the PTO lever in the STATIONARY or ENGAGED position. Operate the PTO according to the procedure of the PTO manufacturer.

To change the position of the range selector lever, repeat the procedure.

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Section 6 Specifications

Manual Transmission Oil Capacities*

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<th>Transmission Model Numbers</th>
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<td>RMO13-145A</td>
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* Oil capacities are approximate. Fill the transmission to the bottom of the fill plug hole. On transmissions equipped with an oil pump or oil cooler, operate the engine for five minutes after the initial fill and check the oil level again.

Transmission Oil Specifications

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<tr>
<td>Heavy Duty Engine Oil MIL-L-2104B, C or D O or API-SF, -SG, -CD or -CE (Previous API Designations Acceptable)*</td>
<td>50, 40, 30</td>
<td>Above 10°F (-12°C), Above 10°F (-12°C), Below 10°F (-12°C)</td>
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<td>Mineral Gear Oil with Rust and Oxidation Inhibitor (API-GL-1)*</td>
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<td>Synthetic Oil Meritor Spec. 0-81*</td>
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* Multi-weight and EP gear oils are not recommended. DO NOT MIX OILS IN THE TRANSMISSION.
### Nine-Speed Transmission Ratios and Steps — “A” Ratio Transmissions

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