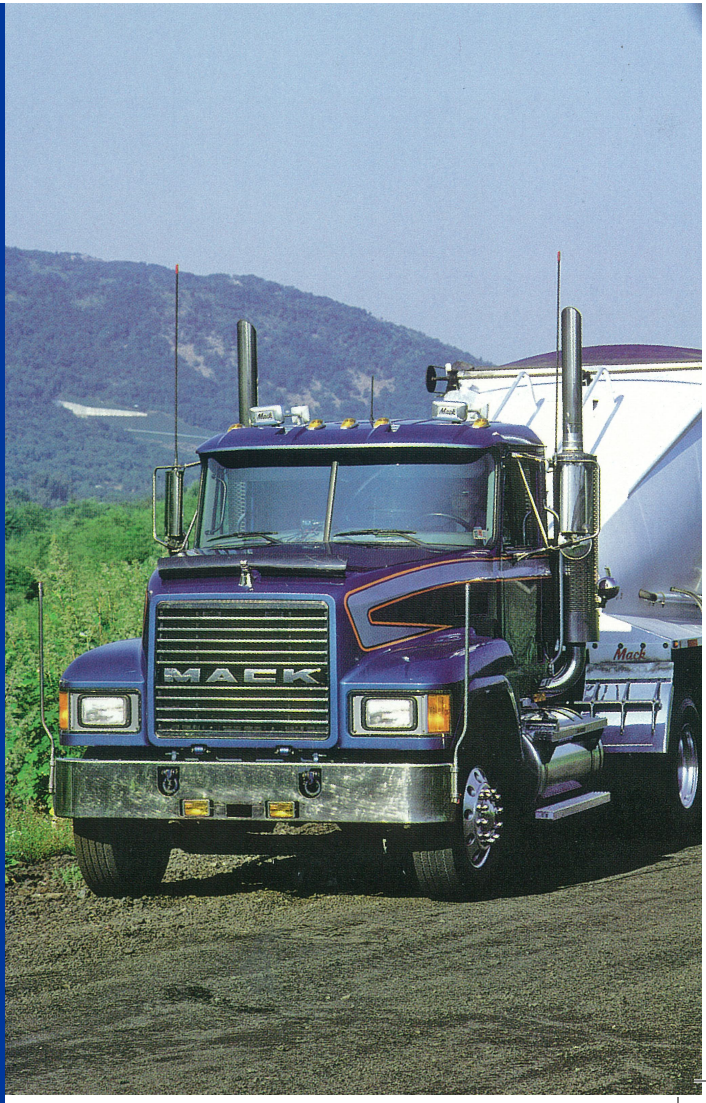
OPERATOR'S HANDBOOK

CHN Series



TS78407

CALIFORNIA PROPOSITION 65 WARNING

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

CALIFORNIA PROPOSITION 65 WARNING

Battery posts, terminals and other related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and other reproductive harm.

Batteries also contain other chemicals known to the State of California to cause cancer.

Wash hands after handling.

IMPORTANT

Your new MACK® truck contains many new technological advancements that may require new servicing techniques and methods. An authorized MACK® truck dealer is in the best position to provide technicians who have the necessary training, experience and tools to properly service your truck.

CHN SERIES
OPERATOR'S HANDBOOK
TS78407

THE INFORMATION CONTAINED IN THIS HANDBOOK IS CURRENT AT TIME OF PUBLICATION.

Mack Trucks, Inc. reserves the right to make changes without prior notification.

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TO THE OWNER

In Appreciation

Thank you for buying a MACK® vehicle. With proper care and maintenance, your new CHN model will help you gain a competitive edge with its fuel-efficient drivetrain combinations, low maintenance, extended service intervals and, eventually, good resale value.

The CHN model is available for a wide range of applications. Because of this versatility, drivetrains and components vary and operating instructions may differ from one model to another. While every effort has been made to cover all current arrangements, do not hesitate to consult your MACK distributor if a question arises. Honest, personal service is standard with every MACK sale.

⚠ CAUTION

Mack Trucks, Inc. would like to point out the important role that the driver plays in the life of the vehicle. Only trained and informed drivers should operate this vehicle.

We, at Mack Trucks, Inc., hope that you will be happy with your new CHN model, and that you see many years of trouble-free driving.

This vehicle was built to conform to all federal standards and regulations applicable at the time of manufacture.

About This Handbook

This handbook is referred to as the *CHN Series Operator's Handbook*. It covers all CHN models. Its identification number is TS784. Keep this handbook with the vehicle at all times to ensure that each owner and/or operator will have access to all pertinent information relating to the operation and handling of this vehicle.

This handbook was prepared to provide the driver with all relevant information concerning the daily operation of this vehicle. Please read it thoroughly; pay particular attention to advisory labels that have been included to draw attention to important issues of operator safety and overall performance.

Information and illustrations in this handbook are based on the latest production usage at the time of printing and are subject to change without prior notice.

NOTE

Basic maintenance and lubrication procedures are found in this manual beginning with "MAINTENANCE INTRODUCTION" on page 248. For further information, refer to the *Maintenance and Lubrication Manual (TS494)*. Other important information can be found in the *Emission Control Systems for MACK Diesel Engine Manual (TS505)*.

THE VEHICLE

Basic Configuration

The CHN model features a conventionally styled, aerodynamic cab.

Vehicle Management and Control System (V-MAC®)

The Vehicle Management and Control System (V-MAC) is an electronic control system that manages engine and vehicle functions. In addition, the DataMax™ portion of V-MAC monitors and stores a variety of information (i.e., maintenance schedules, overspeed logs, fault tables, trip summaries).

For a complete description of the V-MAC IV system, refer to the applicable *V-MAC® Operator's Guide*, which is supplied with the vehicle.

Additional information concerning service, diagnostics, programming and vendor equipment interface application is available from the Mack Trucks, Inc. Service Publications Department. Contact your local MACK dealer for details.

⚠ WARNING

Never cut into the V-MAC system wire harness to power additional equipment. If such equipment is to be installed, contact your MACK dealer for assistance.

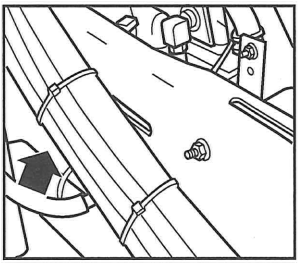
COMPONENT IDENTIFICATION

Locate the following serial numbers and write them in the boxes provided next to each illustration.

VIN Locations

The Vehicle Identification Number (VIN) is displayed in two locations (a frame rail stamping and a label). The 17-digit VIN must be identical in both locations.

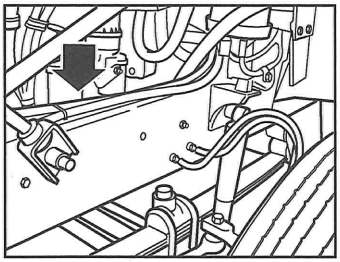
The **VIN frame stamping** is located on the bottom right frame rail flange and the top left rail flange. Note that the VIN location may vary if re-stamping of the frame becomes necessary.



Bottom right frame rail flange

VEHICLE IDENTIFICATION NUMBER

006707d

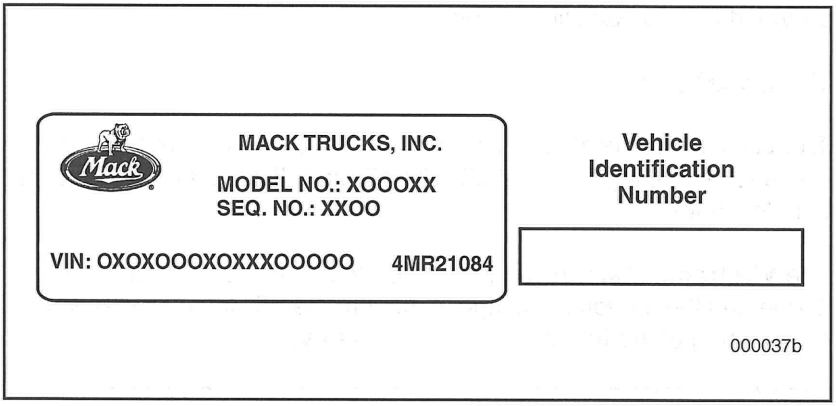


Top left rail flange

VEHICLE IDENTIFICATION NUMBER

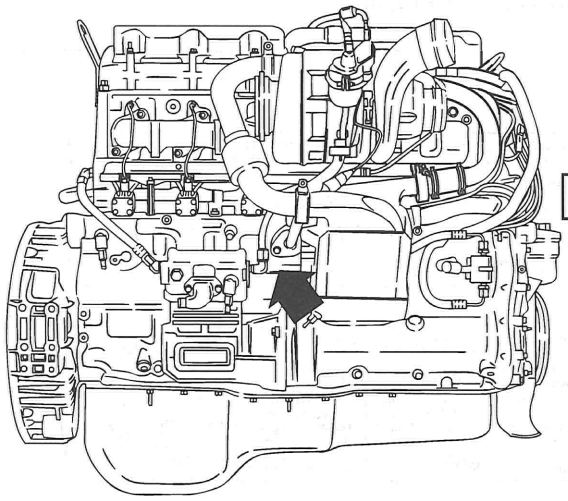
006709b

The **VIN label** is located on the driver-side door jamb, below the latch striker plate.



Engine Identification

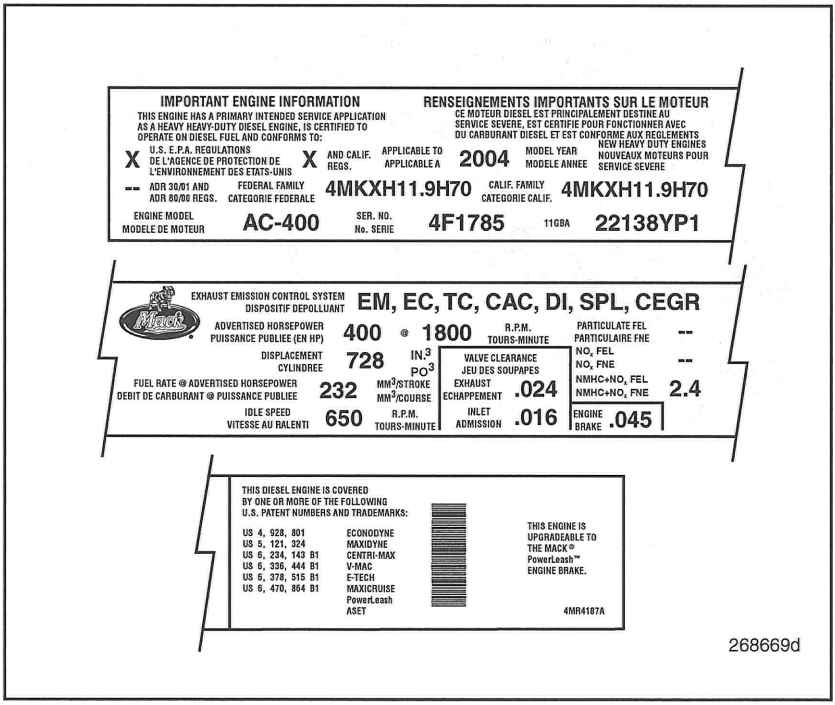
On **MACK ASET™** engines, the engine serial number is stamped on the right side of the engine block, below the turbocharger oil drain tube flange.



Engine Information Plate

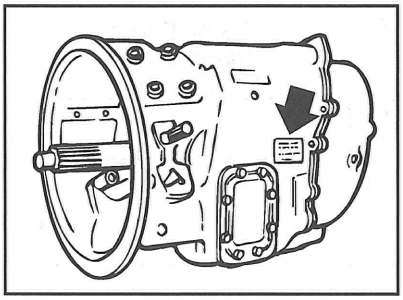
In compliance with the emissions standards requirements, an engine exhaust emissions control sticker is affixed to one of the engine valve covers for all MACK engines. This sticker provides basic engine identification information, as well as specifications for injection pump-to-engine timing and valve clearances.

The engine information sticker is found on the top of the front cylinder head cover on **MACK ASET™** engines.



Transmission Identification

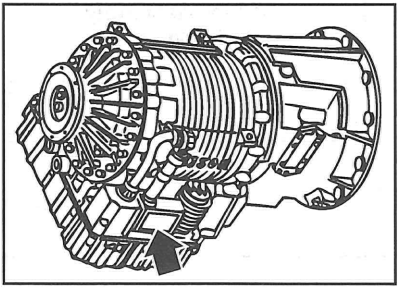
The **MACK T300 Series transmission** serial number is located on the rear left side of the main case.



MACK T300
Transmission
Serial Number

300130c

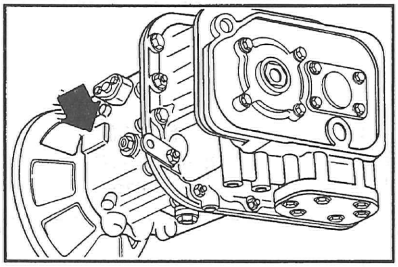
The **Allison RDS and HS transmission** identification plate is located on the rear right side of the main case, near the lower end.



Allison RDS and HS
Transmission
Serial Number

306299b

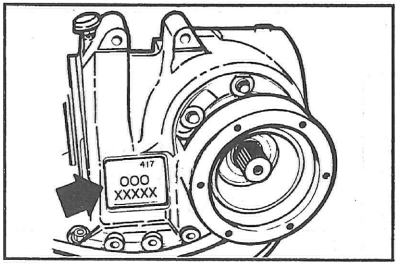
All **Eaton® Fuller® transmission** identification plates are located on the front left side of the main case.



Eaton Fuller Transmission Serial Number

300003b

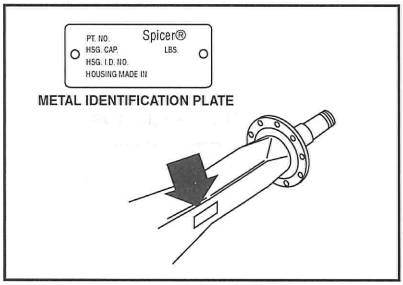
The **MACK carrier assembly** serial number is located on the front right side of the housing.



Carrier Assembly Serial Number

400024b

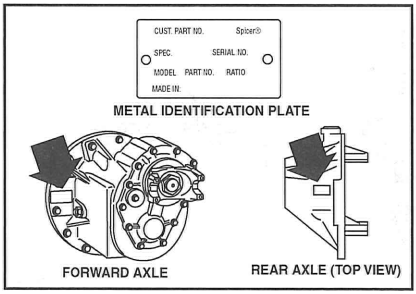
The **Eaton® Spicer® rear axle** serial number is located on the rear of the axle housing toward the carrier.



Rear Axle Serial Number

400019b

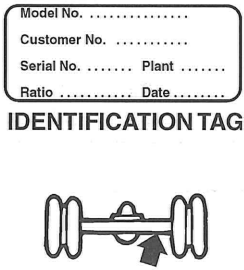
The **Eaton® Spicer® carrier assembly** serial number is located on the left side of the forward carrier, and the top of the rear carrier.



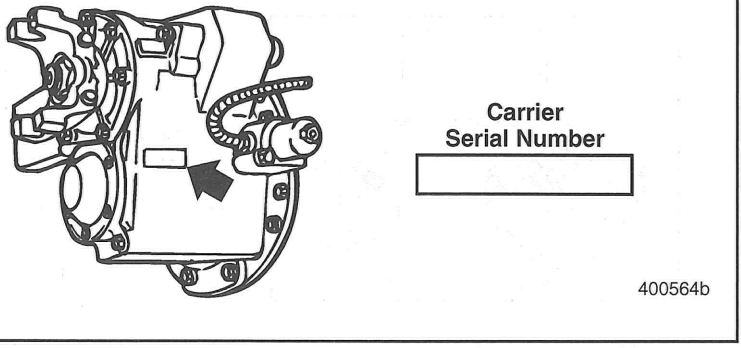
Carrier Serial Number

400020b

The **MERITOR rear axle** identification tag is located on the left or right rear of the rear axle housing, next to the carrier.



The **MERITOR carrier assembly** serial number is located on the left side of the forward carrier, and the top of the rear carrier.



WARRANTY INFORMATION

Air Brake System

The MACK Standard Vehicle Warranty applies to the air brake system, as set forth in the Warranty, but only if the air brake system has not been subjected to unauthorized additions, deletions or modifications. If any such unauthorized additions, deletions or modifications are performed, Mack Trucks, Inc. disclaims any and all liability for any loss or damage arising out of a malfunction of the air brake system.

The air brake system was designed and built to conform to all applicable federal motor vehicle safety standards in effect at the time of manufacture.

Tractor air systems are designed for operation as a tractor only, and truck air systems are designed to be operated as a truck only. If a tractor is going to be converted for operation as a truck, the air brake system must be reconfigured to that of a truck. Conversely, if a truck is going to be converted for operation as a tractor, the air brake system must be reconfigured to that of a tractor. Consult your local MACK distributor for additional information.

If any unauthorized additions, deletions or modifications are made to any portion of the air brake system which is required by Federal Motor Vehicle Safety Standards, Mack Trucks, Inc. makes no representation as to conformity with the Standards.

For complete warranty information, refer to the *Pedigreed Protection Plan (US-TS468, CANADA-TS590)* or *Standard Vehicle Warranty (Form F034)* provided with each vehicle.

SERVICE LITERATURE

The MACK Service Publications department offers a variety of service literature (including individual service manuals) that can be ordered through any MACK dealer or on the Mack Trucks, Inc. website at www.macktrucks.com.

NOTE

Mack Trucks, Inc. would like to emphasize the importance of proper service and maintenance procedures. Service, repair and replacements must be performed by certified, licensed mechanics in accordance with MACK standards.

TS576 — MACK Class 8 – Components Service Manual

This multi-binder set contains service information covering all MACK components (i.e., engines, transmissions, front and rear axles, cabs, fuel systems, electrical systems).

NOTE

If your vehicle contains a number of non-MACK (vendor) components, the *Class 8 – Custom Collated Service Manual (TS473)*, might be more appropriate.

TS473 — Class 8 – Custom Collated Service Manual

TS473E — Class 8 – Custom Collated Service Manual on CD

This tailor-made set provides complete service information for all components in the specified vehicle (including both MACK and vendor service manuals). When ordering a *Class 8 – Custom Collated Service Manual (TS473)* or *Class 8 – Custom Collated Service Manual on CD (TS473E)*, be sure to include the complete Model-Serial number and General Sales Order (GSO) number.

CUSTOMER SERVICE

Call 1-800-866-1177 for MACK OneCall™

The OneCall customer support system is a toll-free nationwide hotline that operates 24 hours a day, seven days a week, including holidays. If you break down on the road, simply call 1-800-866-1177. There is a staff of trained, experienced technicians ready to help. They can help troubleshoot a problem to get you back on the road, arrange to send roadside assistance or arrange for towing to the nearest MACK dealership.

OneCall provides personalized service. The person who initially takes your call will be the same person who sees that your situation is resolved quickly and to your satisfaction. If a follow-up call is necessary, the same familiar voice will be on the other end of the line.

OneCall technicians can also help you plan ahead to keep your operation running efficiently by scheduling routine maintenance and lubrication service, or by locating the nearest MACK dealership.

Questions and Complaints

Your satisfaction is our most important concern.

If questions or complaints arise, first discuss the matter with the service manager at the MACK facility involved. If you are not satisfied with the service manager's response, contact the branch manager, principal or general manager of the distributorship. If assistance is required at a service dealer, contact the owner of the establishment.

If, for any reason, you need further assistance after dealing with the personnel at a MACK subsidiary or distributor, contact the regional service manager at the nearest MACK regional service office. The regional service manager has the responsibility and the authority to recommend action in most cases and (with the aid of relevant district service personnel) will make every effort to conduct a fair review of the situation.

Addresses

The addresses, telephone and fax numbers of the Mack Trucks, Inc. regional offices are:

United States

Northeast Region — 2100 Mack Blvd., Mail: P.O. Box M, Allentown, PA 18105-5000, TEL: (610) 966-8093, FAX: (610) 966-8005

Southeast Region — 6768 Southlake Parkway, Morrow, GA 30260, TEL: (770) 960-0511, FAX: (770) 960-0593

Central Region — 900 S. Frontage Rd., Suite 100, Woodridge, IL 60517, TEL: (630) 910-3330, FAX: (630) 910-3331

Southwestern and Western Regions — 5605 N. MacArthur Blvd., #550, Mail: P.O. Box 165408, Irving, TX 75016-5408, TEL: (972) 518-1614, FAX: (972) 550-0389

Canada

Executive Office — Mack Canada, Inc., 5600A Cancross Court, Mississauga, ON L5R 3E9, TEL: (905) 366-3400, FAX: (905) 366-0165

Australia

Mack Trucks Australia Pty. Ltd., CNR Archerfield and Boundary Roads, Mail: P.O. Box 364, Richlands, QLD 4077, Australia, TEL: 61-7-3853-3333, FAX: 61-7-3853-3392

International

2100 Mack Blvd., Mail: P.O. Box M, Allentown, PA 18105-5000, TEL: (610) 709-3405, FAX: (610) 709-2323

Additional Assistance

If additional assistance is required, Mack Trucks, Inc. maintains a Customer Service Department (staffed by experienced personnel) to aid customers who need information or assistance not provided at the local or regional level.

The Customer Service Department phone number is **(610) 709-3961**.

When contacting the regional service offices or Customer Service Department, provide the following information:

- ❑ Vehicle Identification Number (VIN) — This 17-digit number is typically located on a label on the driver-side door latch post and behind the front axle on the right, front frame rail.
- ❑ Model and year of the vehicle
- ❑ Date that the vehicle was purchased and put into service
- ❑ Date(s) and mileage of repair(s)
- ❑ Dealer that sold and/or serviced the vehicle
- ❑ Description of unresolved service complaint or inquiry
- ❑ Summary of action taken to date (by the dealer and the regional service office)
- ❑ Names of individuals (if known) contacted at the dealer and the Mack Trucks, Inc. regional service office

REPORTING SAFETY DEFECTS

United States

If you believe that your vehicle has a defect which could cause a crash, injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA), in addition to notifying Mack Trucks, Inc.

If NHTSA receives similar complaints, it may open an investigation and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your distributor, or Mack Trucks, Inc.

To contact NHTSA, either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in Washington, D.C. area) or write to: NHTSA, U.S. Department of Transportation, Washington, D.C. 20590. You can also obtain other information about motor vehicle safety from the Auto Safety Hotline.

Canada

Canadian customers who wish to report a safety-related defect to Transport Canada — Defect Investigations and Recalls, may telephone the toll free hotline at 1-800-333-0510, or contact Transport Canada by mail at Transport Canada, ASFAD, Place de Ville Tower C, 330 Sparks Street, Ottawa ON K1A 0N5. For additional road safety information, please visit the Road Safety website at http://www.tc.gc.ca/roadsafety/menu.htm.

EVENT DATA RECORDING DEVICES

Your MACK vehicle is equipped with a device generally referred to as an "event data recorder" or "EDR." Please note that while the term "event data recorder" is typically used throughout the motor vehicle industry, not every EDR is the same; i.e., they do not all record the same data elements. The EDR on your MACK vehicle records vehicle speed, engine rpm, time and date, plus a variety of pedal and switch positions, both before and after an "event." Sudden vehicle deceleration or the occurrence of certain other vehicle operational characteristics will define (trigger) an "event."

Optional equipment available for your MACK vehicle, such as the MACK RoadConnect™ telematic fleet data management system or the Eaton® VORAD® Collision Warning System, may also provide event data recording features.

If you have a question about your EDR, please contact your MACK dealer or regional service office.

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SAFETY STATEMENT

Mack Trucks, Inc. cannot anticipate every possible occurrence which may involve a potential hazard. An accident can be avoided by recognizing potentially hazardous situations before a dangerous situation occurs. Correctly performed service procedures are critical for technician safety and safe, reliable operation of the vehicle.

⚠ DANGER

Do not operate the engine in an enclosed area. All internal combustion engines give off various fumes and gases while running. Inhalation of exhaust fumes can cause death.

⚠ DANGER

Do not sit in a parked vehicle for any extended amount of time with the engine running if there are leaks in the exhaust system. Exhaust fumes could leak into the cab area and death can result. On a regular basis inspect the exhaust system for leaks and repair any leakage.

⚠ DANGER

Driver attitude is the most important part of any effective vehicle safety system. Mack Trucks, Inc. strongly encourages all drivers and passengers to use their seat belts, drive defensively, remain alert and respect the speed limits. Many accidents can also be avoided through regular vehicle maintenance.

⚠ WARNING

Certain everyday procedures such as washing the vehicle and cleaning the windshield can also be hazardous because of the vehicle's height. Mack Trucks, Inc. does NOT recommend climbing up on the vehicle to perform these operations. Instead, stand on the ground and use brushes and squeegees mounted on extension poles. When better access is necessary (for instance, when washing the cab roof), use sturdy ladders held in place by someone on the ground.

⚠ DANGER

Engine-driven components such as Power Take-Off (PTO) units, fans and fan belts, driveshafts and other related rotating assemblies, can be very dangerous. Do not service engine-driven components unless the engine is shut down. Always keep body parts and loose clothing out of range of these powerful components to prevent serious personal injury. Be aware of PTO engagement or nonengagement status. Always disengage the PTO when not in use.

⚠ WARNING

Secure loose objects. Loose objects in the cab or sleeper can be dangerous in a sudden stop or on bad roads. Secure any appliance added to the vehicle, such as a refrigerator or a radio.

⚠ WARNING

Keep clear of fan when engine is running. Fan may start to rotate at high speed without warning.

CERTIFICATION LABELS

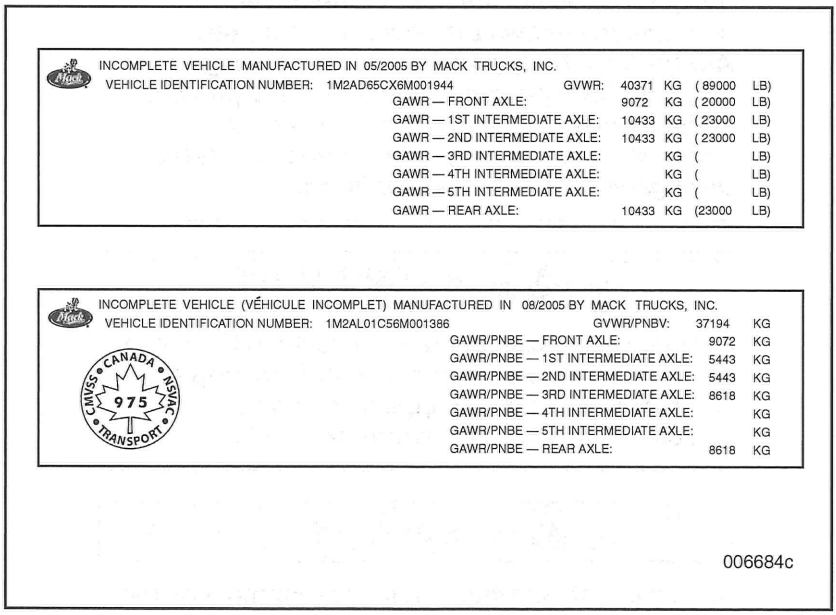
Safety Certification Label

National Highway Traffic Safety Administration (NHTSA) regulations require affixing a certification label to all vehicles.

NHTSA regulations also require that the certification label be affixed to either the hinge pillar, door latch post or the door edge that meets the door latch post next to the driver seat. If none of these locations are practical, it may be attached to the left side of the instrument panel or to an inward facing surface of the driver-side door.

In compliance with NHTSA regulations, your CHN has a safety certification label affixed in one of the NHTSA locations listed above. This label may be either an Incomplete Vehicle and/or Completed Vehicle label. Both labels are described below.

Incomplete Vehicles



INCOMPLETE VEHICLE MANUFACTURED IN 05/2005 BY MACK TRUCKS, INC.
VEHICLE IDENTIFICATION NUMBER: 1M2AD65CX6M001944

GVWR:	40371	KG	(89000	LB)
GAWR — FRONT AXLE:	9072	KG	(20000	LB)
GAWR — 1ST INTERMEDIATE AXLE:	10433	KG	(23000	LB)
GAWR — 2ND INTERMEDIATE AXLE:	10433	KG	(23000	LB)
GAWR — 3RD INTERMEDIATE AXLE:		KG	(	LB)
GAWR — 4TH INTERMEDIATE AXLE:		KG	(	LB)
GAWR — 5TH INTERMEDIATE AXLE:		KG	(	LB)
GAWR — REAR AXLE:	10433	KG	(23000	LB)

INCOMPLETE VEHICLE (VÉHICULE INCOMPLET) MANUFACTURED IN 08/2005 BY MACK TRUCKS, INC.
VEHICLE IDENTIFICATION NUMBER: 1M2AL01C56M001386

CANADA CMVSS TRANSPORT 975

GVWR/PNBV:	37194	KG
GAWR/PNBE — FRONT AXLE:	9072	KG
GAWR/PNBE — 1ST INTERMEDIATE AXLE:	5443	KG
GAWR/PNBE — 2ND INTERMEDIATE AXLE:	5443	KG
GAWR/PNBE — 3RD INTERMEDIATE AXLE:	8618	KG
GAWR/PNBE — 4TH INTERMEDIATE AXLE:		KG
GAWR/PNBE — 5TH INTERMEDIATE AXLE:		KG
GAWR/PNBE — REAR AXLE:	8618	KG

006684c

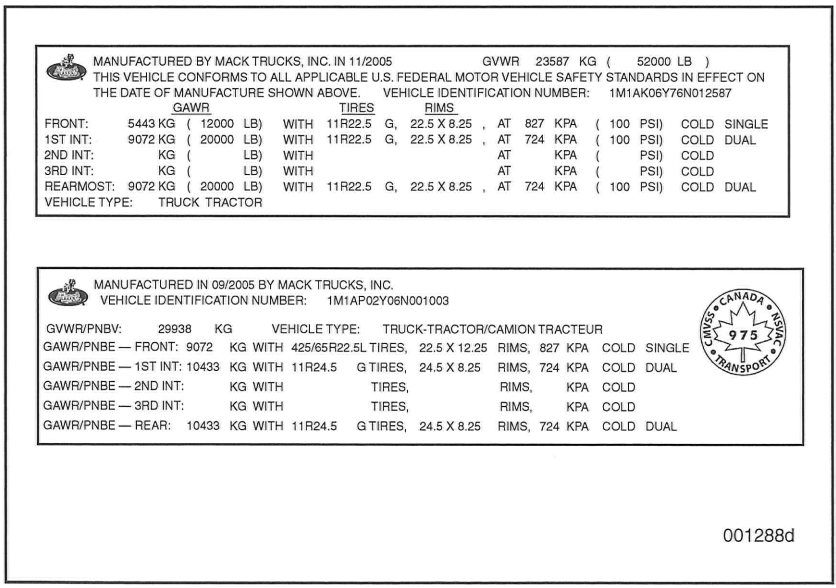
A chassis-cab is an incomplete vehicle with a completed occupant compartment that requires the addition of cargo-carrying, work-performing or load-bearing components to perform its intended functions.

The chassis-cab manufacturer must affix a label to the incomplete vehicle in one of the NHTSA locations listed above. This label provides the chassis-cab date of manufacture, VIN and vehicle certification information.

Completed Vehicles

In addition to the label supplied by Mack Trucks, Inc. as the chassis-cab manufacturer, a Completed Vehicle certification label, supplied by the body manufacturer, is affixed in the same general location. This label provides information pertaining to Gross Vehicle Weight Rating (GVWR), Gross Axle Weight Rating (GAWR), tire and rim information, etc.

On **MACK-completed vehicles**, this label contains the date of manufacture, VIN, GVWR, GAWR, and tire and rim data. It is found in one of the NHTSA locations listed above.



MANUFACTURED BY MACK TRUCKS, INC. IN 11/2005 GVWR 23587 KG (52000 LB)
THIS VEHICLE CONFORMS TO ALL APPLICABLE U.S. FEDERAL MOTOR VEHICLE SAFETY STANDARDS IN EFFECT ON THE DATE OF MANUFACTURE SHOWN ABOVE. VEHICLE IDENTIFICATION NUMBER: 1M1AK06Y76N012587

	GAWR		TIRES	RIMS				
FRONT:	5443 KG (12000 LB)	WITH	11R22.5 G,	22.5 X 8.25 ,	AT	827 KPA	(100 PSI)	COLD SINGLE
1ST INT:	9072 KG (20000 LB)	WITH	11R22.5 G,	22.5 X 8.25 ,	AT	724 KPA	(100 PSI)	COLD DUAL
2ND INT:	KG (LB)	WITH			AT	KPA	(PSI)	COLD
3RD INT:	KG (LB)	WITH			AT	KPA	(PSI)	COLD
REARMOST:	9072 KG (20000 LB)	WITH	11R22.5 G,	22.5 X 8.25 ,	AT	724 KPA	(100 PSI)	COLD DUAL

VEHICLE TYPE: TRUCK TRACTOR

MANUFACTURED IN 09/2005 BY MACK TRUCKS, INC.
VEHICLE IDENTIFICATION NUMBER: 1M1AP02Y06N001003

GVWR/PNBV: 29938 KG VEHICLE TYPE: TRUCK-TRACTOR/CAMION TRACTEUR

GAWR/PNBE — FRONT:	9072 KG	WITH	425/65R22.5L	TIRES,	22.5 X 12.25	RIMS, 827 KPA	COLD	SINGLE
GAWR/PNBE — 1ST INT:	10433 KG	WITH	11R24.5 G	TIRES,	24.5 X 8.25	RIMS, 724 KPA	COLD	DUAL
GAWR/PNBE — 2ND INT:	KG	WITH		TIRES,		RIMS, KPA	COLD	
GAWR/PNBE — 3RD INT:	KG	WITH		TIRES,		RIMS, KPA	COLD	
GAWR/PNBE — REAR:	10433 KG	WITH	11R24.5 G	TIRES,	24.5 X 8.25	RIMS, 724 KPA	COLD	DUAL

CANADA • CMVSS • NSVAC • 975 • TRANSPORT

001288d

ADVISORY LABELS

Throughout this book you will find paragraphs labeled *Danger*, *Warning*, *Caution*, *Note* and *Service Hint*. *Danger*, *Caution* and *Warning* labels are also found in various locations on the vehicle to alert drivers, operators and service technicians to situations which can cause personal injury or equipment damage. The labels shown are applicable to the CHN model chassis at the time of publication and are representative of what can be typically found on a CHN. (Your vehicle may not contain all of the labels illustrated in this handbook.) These labels are for your benefit. Please look through this section and note the labels, their locations and what they explain. Be sure to replace any label that is damaged.

Advisory Label Definitions (In Handbook)

Cautionary *signal words* (Danger-Warning-Caution) may appear in various locations throughout this manual. Information accented by one of these signal words must be observed to minimize the risk of personal injury to service personnel, or the possibility of improper service methods which may damage the vehicle or cause it to be unsafe. Additional Notes and Service Hints are used to emphasize areas of procedural importance and provide suggestions for ease of repair. The following definitions indicate the use of these advisory labels as they appear throughout the manual:

⚠ DANGER

Danger *indicates an unsafe practice that could result in death or serious personal injury. Serious personal injury is considered to be permanent injury from which full recovery is NOT expected, resulting in a change in life style.*

⚠ WARNING

Warning indicates an unsafe practice that could result in personal injury. Personal injury means that the injury is of a temporary nature and that full recovery is expected.

⚠ CAUTION

Caution indicates an unsafe practice that could result in damage to the product.

NOTE

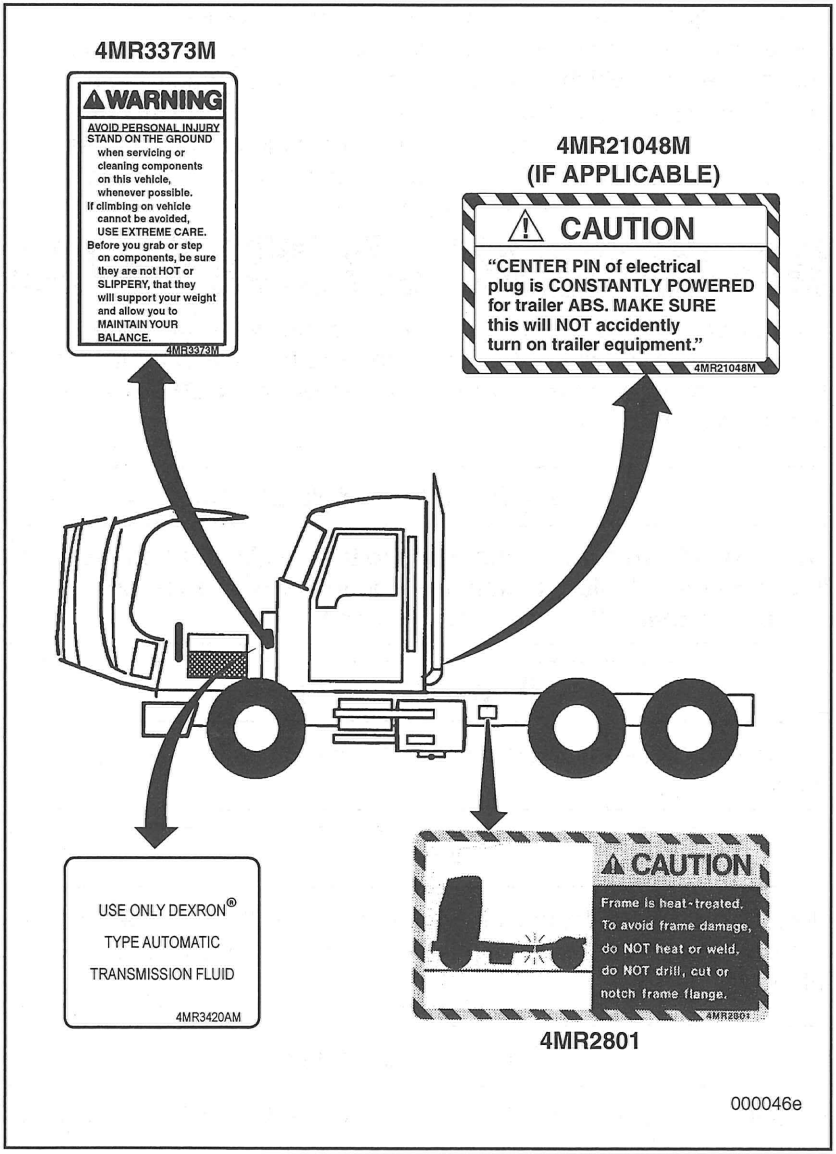
Note indicates a procedure, practice, or condition that must be followed in order for the vehicle or component to function in the manner intended.

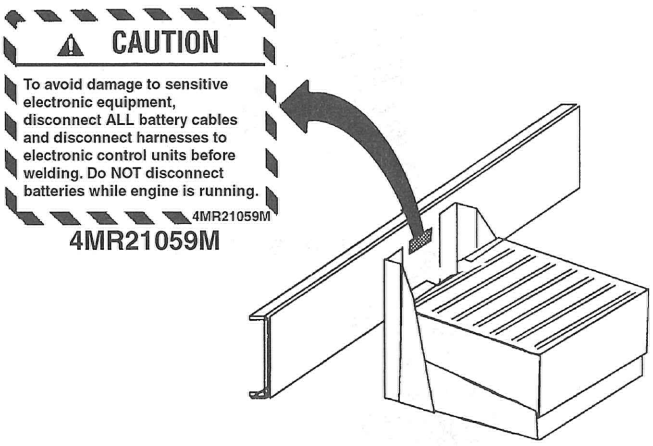
SERVICE HINT

A helpful suggestion that will make it quicker and/or easier to perform a procedure, while possibly reducing service cost.

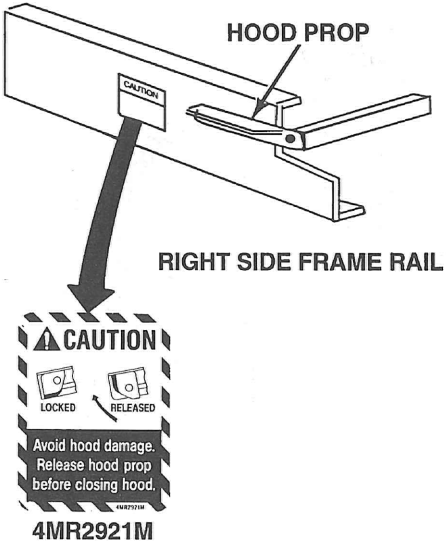
Advisory Label Locations (On Vehicle)

Labels Found on Chassis




CAUTION
To avoid damage to sensitive electronic equipment, disconnect ALL battery cables and disconnect harnesses to electronic control units before welding. Do NOT disconnect batteries while engine is running.
4MR21059M
4MR21059M

000755a


HOOD PROP
CAUTION
RIGHT SIDE FRAME RAIL
CAUTION
LOCKED
RELEASED
Avoid hood damage.
Release hood prop
before closing hood.
4MR2921M

000043a

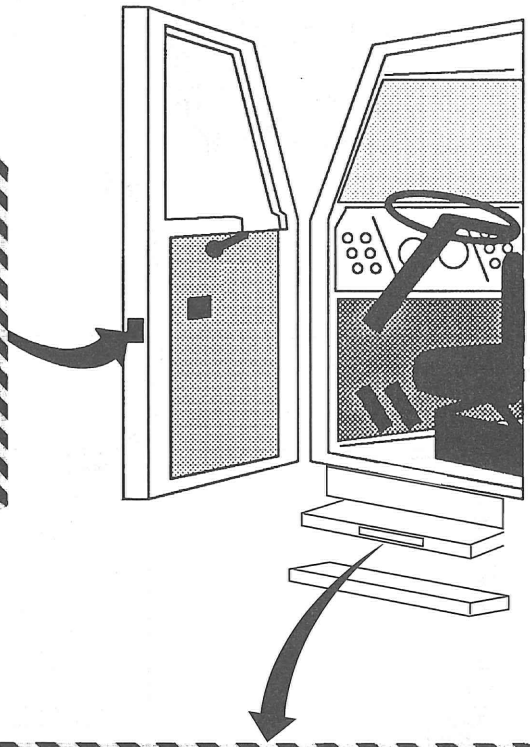
4MR3190M

⚠WARNING

GUIDELINES FOR ENTERING AND EXITING TO AVOID SERIOUS INJURY

Face cab when entering AND exiting.
Place papers, coats, etc., in cab BEFORE entering — take out AFTER exiting — keep hands free to grip handholds.
Keep hands and shoes clean — check hands and shoes for grease, mud, etc., BEFORE entering or exiting.
Keep 3 limbs (2 hands & 1 foot or 1 hand & 2 feet) in FIRM contact with steps and handholds at ALL times.
Be sure where you step and grab —keep the areas clean.
Be EXTRA careful in rainy, snowy, etc., weather.
Do NOT jump from vehicle.

4MR3190M

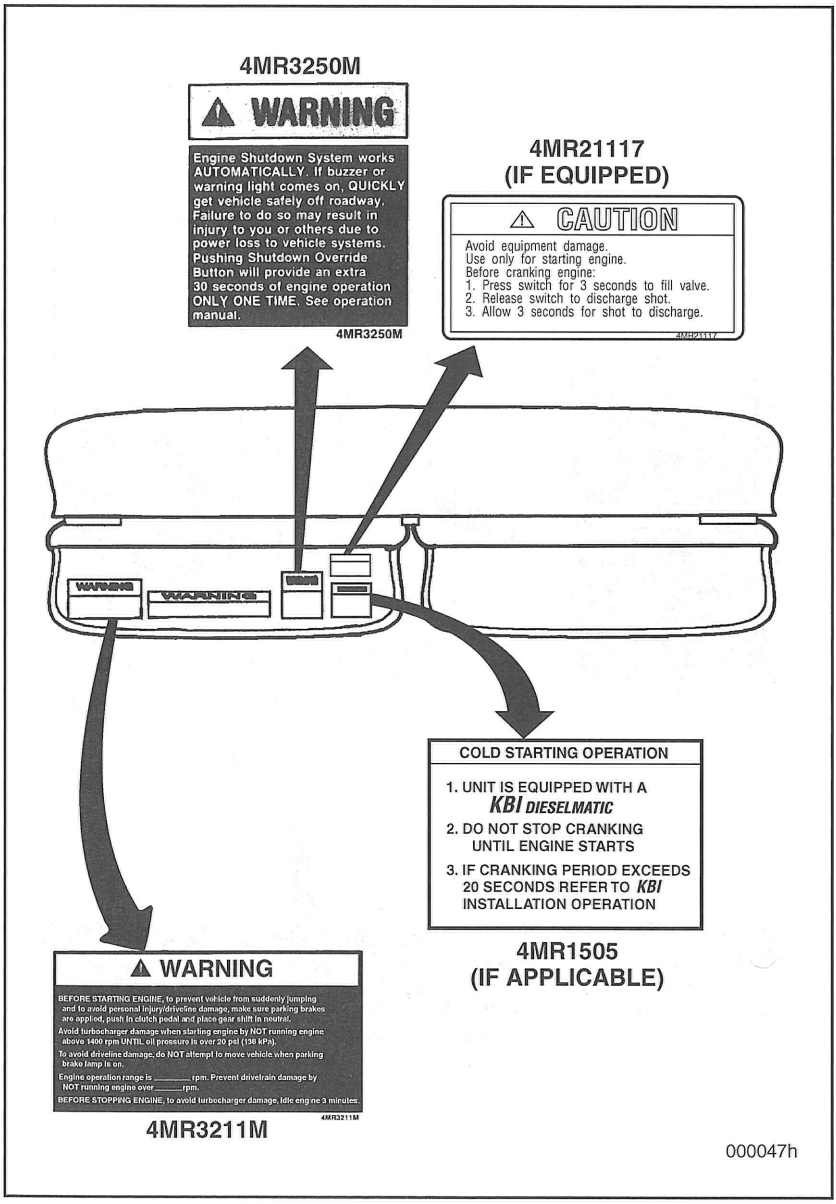




4MR2821M

000053e

Labels Found on Driver-Side Sun Visor



Labels Found on Windshield

⚠ CAUTION

This tractor has an air brake system designed for TRACTOR OPERATION ONLY. If this tractor is converted for operation as a TRUCK, the air brake system MUST be changed to provide SAFE OPERATION as a TRUCK. Contact your MACK Dealer for instructions.

DO NOT remove until delivered to the ultimate consumer. 4MR21027

⚠ CAUTION

This truck has an air brake system designed for TRUCK OPERATION ONLY. If this truck is converted for operation as a TRACTOR the air brake system MUST be changed to provide SAFE OPERATION as a TRACTOR. Contact your MACK Dealer for instructions.

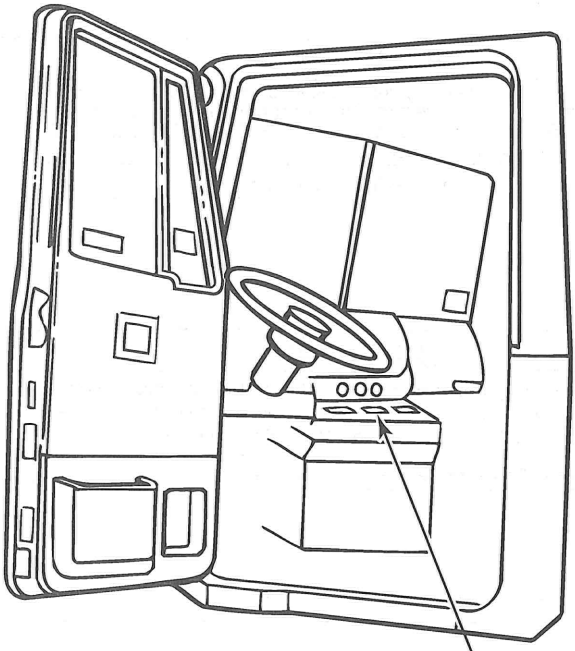
DO NOT remove until delivered to the ultimate consumer. 4MR21031

000247a

NOTE

Label to be removed upon delivery to the end user. Refer to "BRAKE OPERATION" on page 150 in the *OPERATION* section for additional information.

PTO Safety Label (If Equipped)

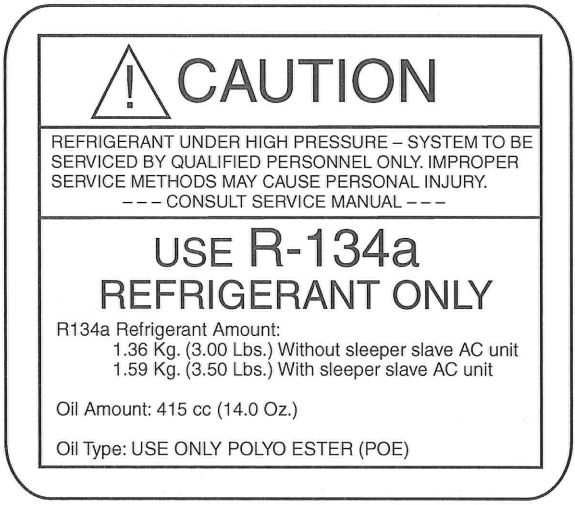


000778b

For detailed instructions on transmission and PTO shift sequences, refer to the *OPERATION* section of this handbook beginning on "POWER TAKE-OFF (PTO) OPERATION" on page 186.

R-134a Refrigerant Label

The servicing caution label is located under the hood attached to the receiver dryer bracket.



CH CHASSIS WITH C.C.I. COMPRESSOR



CH CHASSIS WITH SANDEN COMPRESSOR

600082d

Eaton Controlled Traction Differential Label



403416a

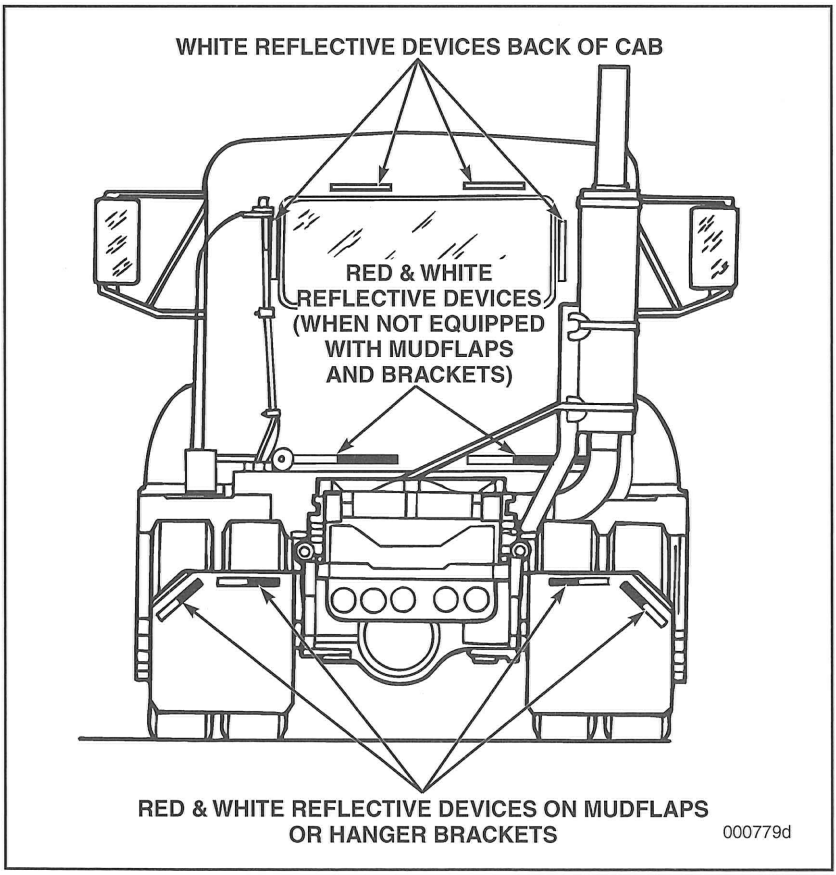
Engine KBi System Starting Aid Label (If Equipped)



268396a

TRUCK-TRACTOR CONSPICUITY

To make the vehicle more conspicuous when approached from the rear (in times when visibility is reduced), all truck/tractors built on or after July 1, 1997 have reflective devices applied on the rear of the cab and on the mudflaps or mudflap hanger brackets if mudflaps or mudflap hanger brackets are supplied from the factory. If mudflaps or mudflap hanger brackets are not supplied from the factory, reflective devices will be applied on the rear, lower portion of the cab. Refer to the illustration. Locations of these reflective devices may vary from this illustration, depending on the cab model and/or equipment added to the rear of the cab.



NOTE

The truck-tractor conspicuity standard is intended to make the tractor as visible as the trailer when the truck tractor is being operated in a bobtail condition.

CAB ENTRY/EXIT

Three-Limb Contact

⚠ WARNING

When entering or exiting a cab, the driver and/or passenger must have at least three limbs in contact with the vehicle or ground at all times. This means that a minimum of two hands and one foot, or one hand and two feet must be in FIRM contact with the vehicle or ground.

⚠ WARNING

When entering or exiting the cab, be aware of the condition of the steps and handrails. Clean any fuel, oil or grease off of the steps before entering the cab. During cold weather operation, ice and snow may accumulate and should be cleaned off to prevent slipping.

During cold, wet conditions when ice, slush, or snow may accumulate on the cab doorstep and other external surfaces, extra caution must be observed when entering or exiting the cab.

⚠ WARNING

GUIDELINES FOR ENTERING AND EXITING TO AVOID SERIOUS INJURY

- **Face the cab when entering AND exiting.**
- **Place papers, coats, etc., in cab BEFORE entering. Take out AFTER exiting. Keep hands free to grip handholds.**
- **Keep hands and shoes clean. Check hands and shoes for grease, mud, etc., BEFORE entering or exiting.**
- **Keep 3 limbs (2 hands and 1 foot or 1 hand and 2 feet) in FIRM contact with steps and handholds at ALL times.**
- **Be sure of where you step and grab the handholds. Keep the areas clean.**
- **Be EXTRA careful in rainy, snowy, etc., weather.**
- **Do NOT jump from vehicle.**

NOTE

The illustrations on the following pages are typical for purposes of emphasizing a safe method for hand/foot placement and movement during cab entry/exit. Your vehicle may not look exactly like the one pictured.

NOTE

The arrows in the illustrations are intended to show movement. Notice that three-limb contact is maintained even when one foot, or one hand, is moving.

Driver Side

The following cab entry and exit procedures, along with the safety guidelines outlined in Three-Limb Contact earlier in this section, should be used with this MACK vehicle.

Entry

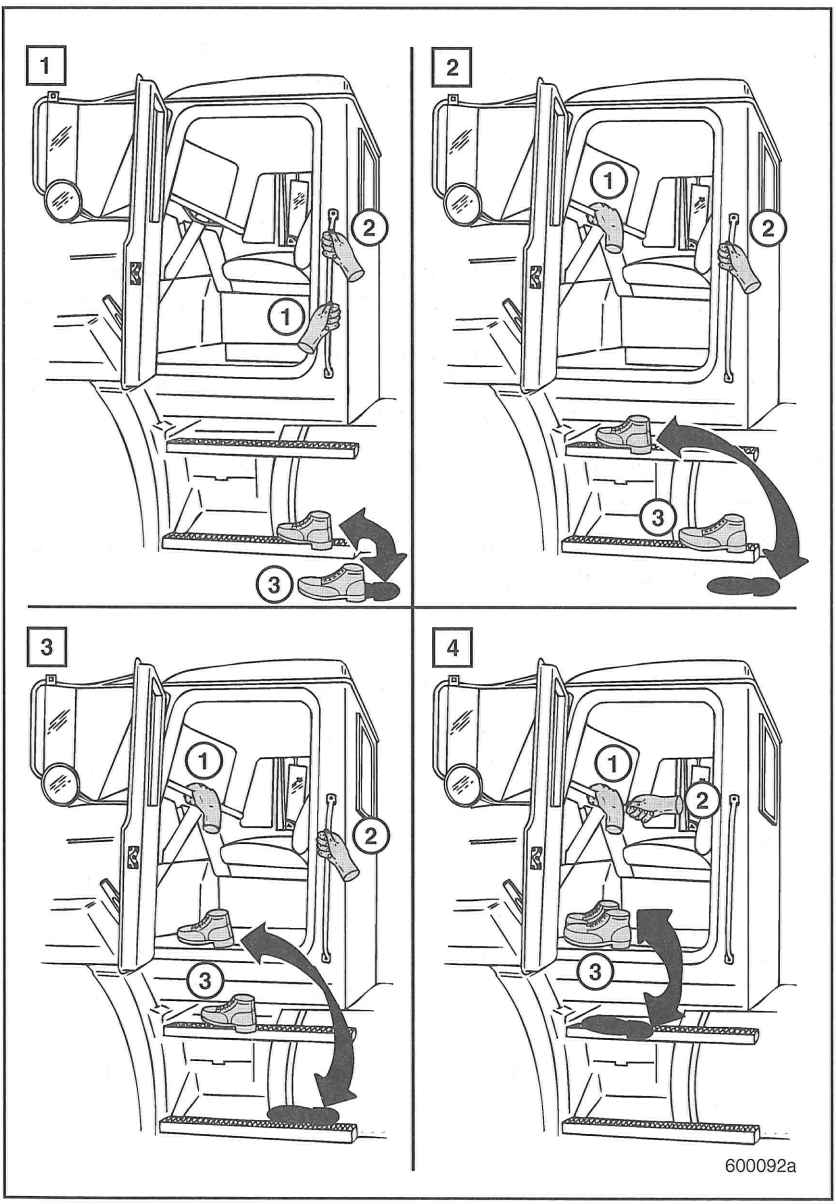
These entry procedures are illustrated on the following page:

1. With both feet firmly on the ground, grab the outside handhold with both hands or grab the outside handhold with one hand and grab the steering wheel with the other hand. Then raise one foot to the bottom step. (See figure 1.)
2. Maintain a firm grip on the handhold and/or steering wheel and raise your other foot to the top step. (See figure 2.)
3. While still gripping the handhold and/or steering wheel, raise one foot to the cab floor. (See figure 3.)
4. Move one hand at a time to the steering wheel or cab interior. Bring the other foot inside the cab and sit down. (See figure 4.)

Exit

To exit, follow the illustrations in reverse order:

1. With both hands gripping the steering wheel or cab interior, stand up and face the inside of the cab. Move one foot to the top step. (See figure 4.)
2. Move one hand to the outside handhold and grip the steering wheel or cab interior with the other hand. With one foot firmly on the top step, lower the other foot to the bottom step. (See figure 3.)
3. Maintain a firm grip on the handhold and/or steering wheel, and keep one foot firmly on the bottom step. Then lower the other foot to the ground. (See figure 2.)
4. With both hands firmly gripping the outside handhold, lower the other foot to the ground. (See figure 1.)


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Passenger Side

The following cab entry and exit procedures, along with the safety guidelines outlined in the Three-Limb Contact section, should be used with this MACK vehicle.

Entry

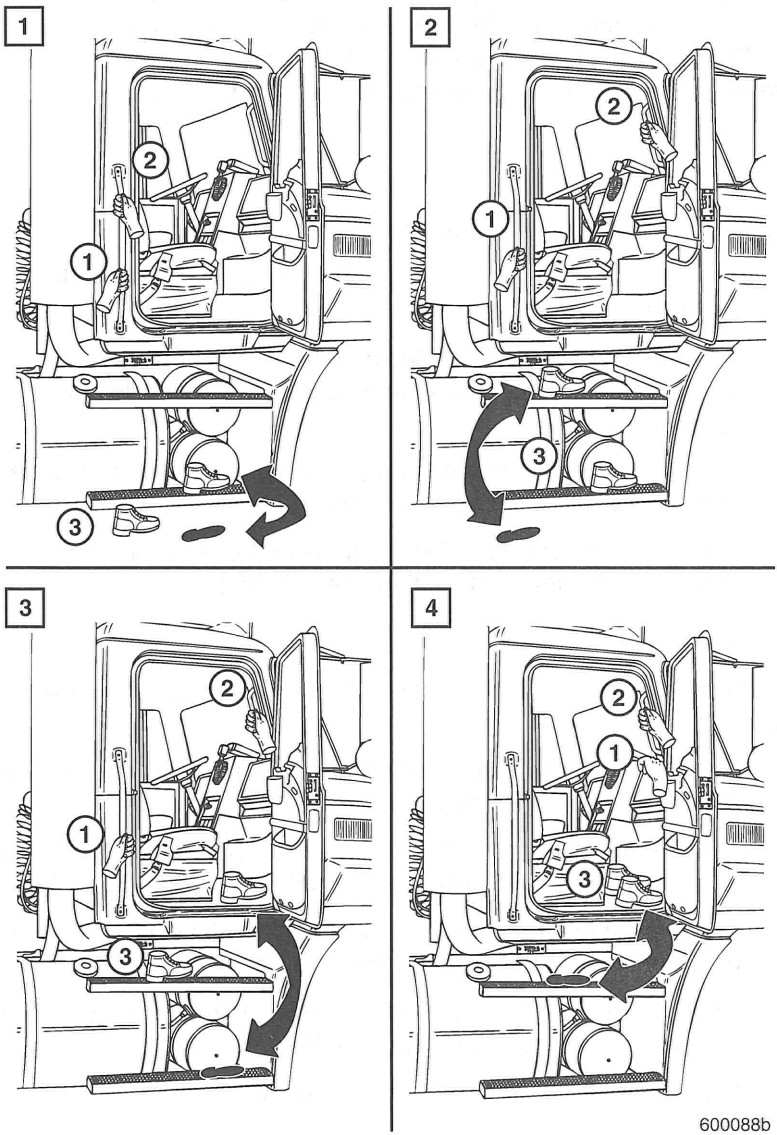
These entry procedures are illustrated on the following page:

1. With both feet firmly on the ground, grab the outside handhold with both hands. Then raise one foot to the bottom step. (See figure 1.)
2. Maintain a firm grip on the outside handhold with your left hand and grab the inside handhold with your right hand. Then raise your other foot to the top step. (See figure 2.)
3. While still gripping the handholds, raise one foot to the cab floor. (See figure 3.)
4. Move your left hand to the cab interior. Bring the other foot inside the cab and sit down. (See figure 4.)

Exit

To exit, follow the illustrations in reverse order:

1. With your right hand gripping the inside handhold and your left hand gripping the cab interior, stand up and face the inside of the cab. Move one foot to the top step. (See figure 4.)
2. While maintaining a firm grip on the inside handhold with your right hand, move your left hand to the outside handhold. Then, lower the other foot to the bottom step. (See figure 3.)
3. With a firm grip on both handholds and your foot planted securely on the bottom step, lower the other foot to the ground. (See figure 2.)
4. Move your right hand to the outside handhold and lower the other foot to the ground. (See figure 1.)


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Deck Plate Access

There may be a time when you will need to climb up behind the cab. If your vehicle is equipped with a deck access package, steps and a handhold are provided so you can get to this area safely. Review the rules in the Three-Limb Contact section before climbing behind the cab.

Climbing Up

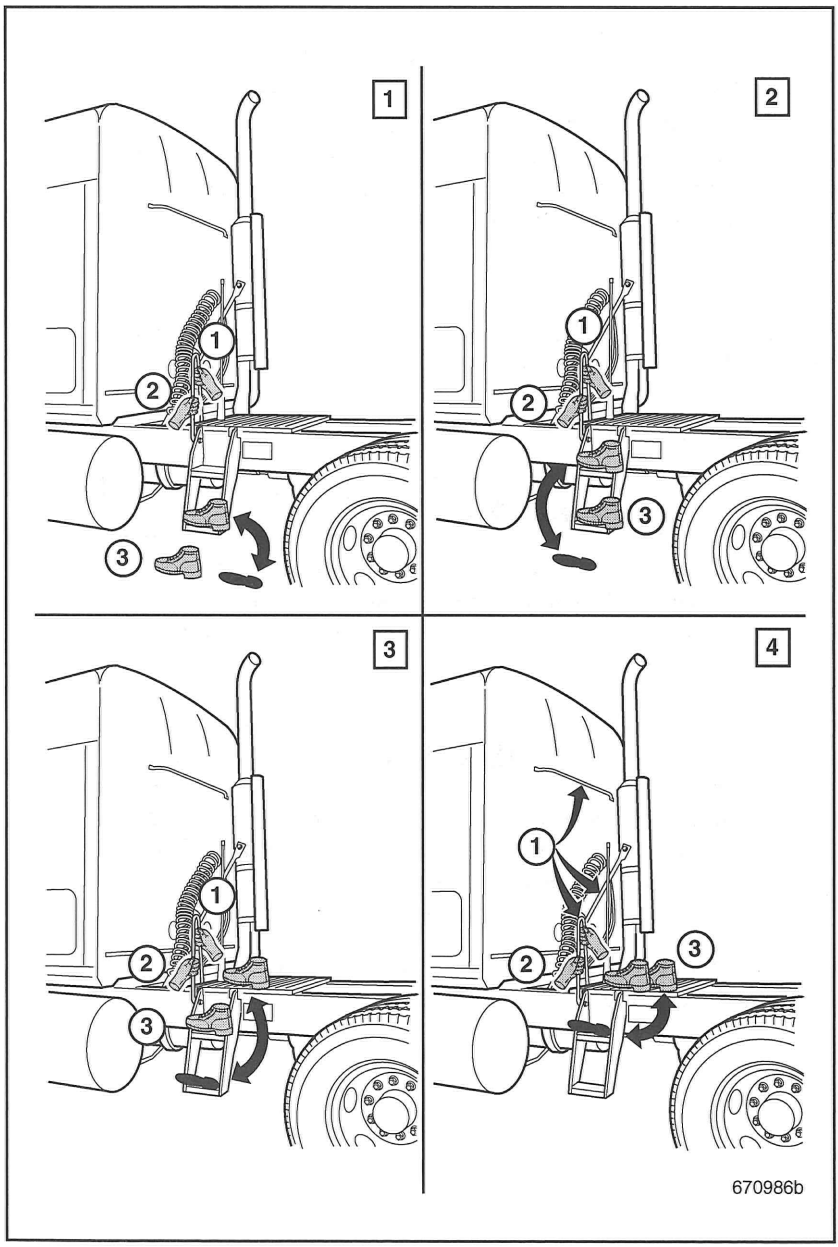
These procedures are illustrated on the following page:

1. Grab the handhold with both hands. Then move one foot to the bottom step. (See figure 1.)
2. While still gripping the handhold, and with one foot planted firmly on the bottom step, move your other foot to the middle step. (See figure 2.)
3. Then with one foot planted firmly on the middle step, move the other foot to the top step. (See figure 3.)
4. Finally, move your other foot from the middle step onto the deck plate and grab the next available handhold. (See figure 4.)

Climbing Down

To climb down from behind the cab, follow the illustrations in reverse order:

1. Grab the available handholds with both hands and move one foot to the top step. (See figure 4.)
2. While firmly gripping the handhold, and with one foot on the top step, move your other foot to the middle step. (See figure 4.)
3. Then with one foot planted firmly on the middle step, place the other foot on the bottom step. (See figure 3.)
4. With both hands still gripping the handhold, move your other foot from the middle step to the ground. (See figure 2.)
5. Finally, move foot from bottom step to the ground. (See figure 1.)


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DOOR LOCKS

⚠ WARNING

Always lock the doors while driving. This will lessen the chance of personal injury. Locking the doors helps prevent the occupants from being ejected from the vehicle in the event of an accident.

For additional information on the operation of doors and locks, refer to the *OPERATION* section of this handbook.

SEAT ADJUSTMENT AND RECLINE (IF EQUIPPED)

⚠ WARNING

Do not adjust the driver's seat while the vehicle is moving. After adjusting the seat and before driving off, ensure that the seat is firmly latched in position.

⚠ WARNING

Do not drive or ride with the seat reclined. In case of a sudden stop, a person in a reclined position may slide under the seatbelt.

For additional information on seat adjustment, refer to the *OPERATION* section of this handbook.

SEAT BELTS

⚠ DANGER

Seat belts should always be secured BEFORE the vehicle is set in motion. Failure to use seat belts can result in SEVERE bodily injury or death. Unbelted riders could be thrown into the windshield or other parts of the cab, or thrown out of the cab entirely.

Seat Belt Operation

MACK vehicles manufactured on or after September 1, 1990 must have locking retractable seat belts.

For all seating positions in your MACK vehicle, this type of seat belt is a combination lap and shoulder belt.

This type of belt is designed to lock (prevent belt travel out of the retractor) only during sudden stops or impacts. This feature allows the operator to move freely under normal conditions. Seat belts cannot be locked by jerking on the belt, except during sudden stops or harsh bumps.

Fastening Seat Belt

1. Pull clip so the belt crosses your shoulder and lap and insert it into the buckle until an audible snap is heard.

⚠ DANGER

Use the shoulder belt only on the shoulder that is closest to the vehicle door. Never wear the shoulder portion of the belt under your arm or behind your back. Improper use will increase your chances of injury during a collision.

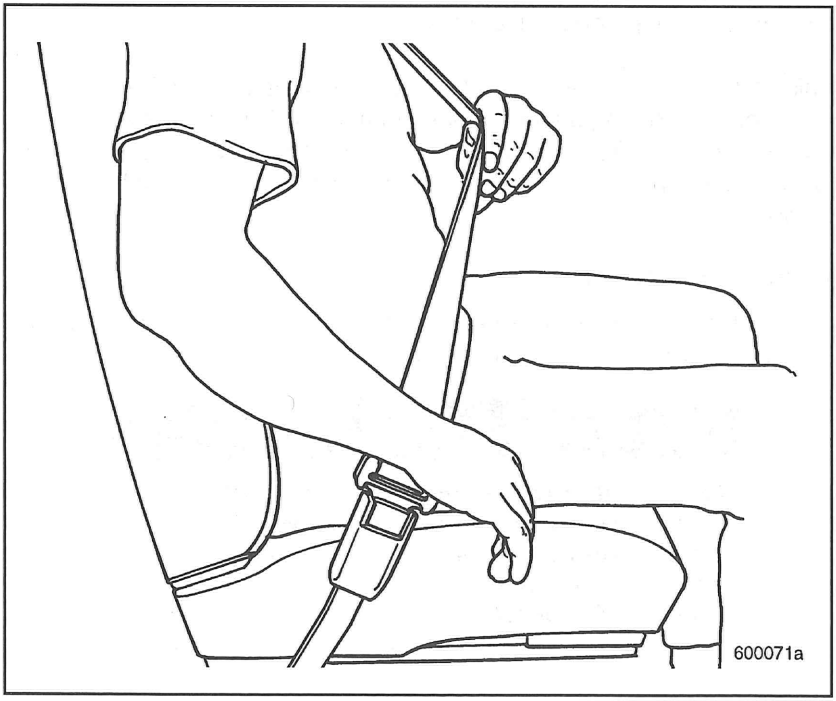
⚠ DANGER

To prevent possible injury the belt must be positioned low over the pelvis, below the abdomen. If the belt is buckled too high, it will apply force to the abdomen, not the pelvic region, and could cause serious internal injuries during a sudden stop.

⚠ DANGER

Do NOT wear seat belt loosely. Do NOT use one belt for more than one person.

2. Make sure the clip is securely fastened into the buckle.

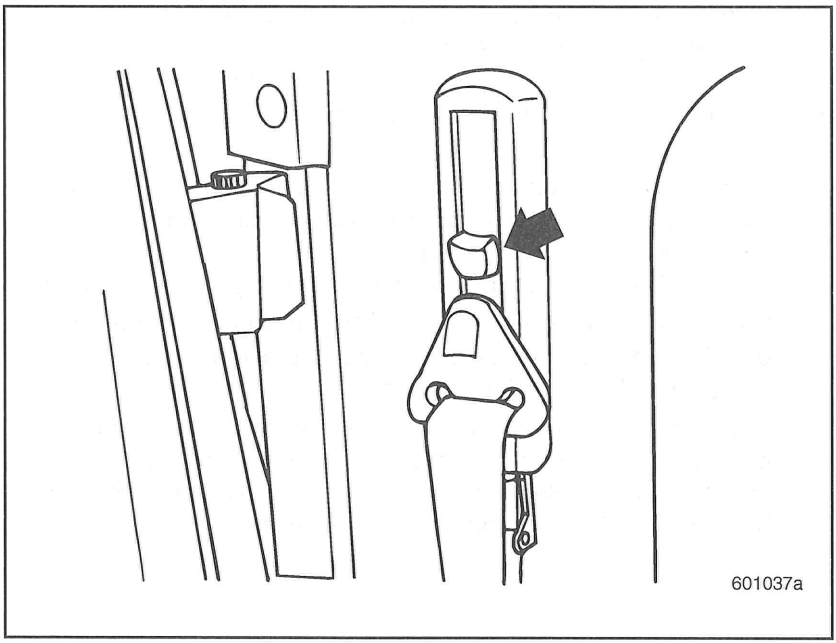


3. To tighten the lap portion of the combination belt, pull upward on the shoulder portion until the lap portion fits snugly. The belt should rest as low on your hips as possible.

Unfastening Seat Belt

Push down on the button to release the belt.

Adjustable D-Ring Shoulder Belts (if equipped)



The shoulder belt portion of the three-point belt is adjustable so that the belt can be adjusted to lay properly and comfortably across the shoulder. To adjust the belt, squeeze the release lock and move the belt to the desired position. The belt locks into place when the lock is released.

Seat Belt Maintenance

- Keep belt clean and dry.
- Clean with mild soap solution and lukewarm water.

⚠ DANGER

Do NOT bleach or dye belt, as this may cause severe loss of strength. Do NOT install belt in a truck with a weakened floor until the floor has been replaced or reinforced.

- Periodically inspect the following areas and replace any inadequate parts:

  Buckle and Latchplate — The buckle and latchplate should mate easily with a solid click and release easily and quickly with moderate pressure on the release button. All metal seat belt components should be free of signs of damage, corrosion or rust.

  Webbing — The webbing should show no signs of wear, fraying or holes, and it should be reasonably free of dirt which could find its way into the retracting mechanism.

  Retractors — The retractors should function smoothly and maintain an appropriate amount of tension. Loose webbing is an indicator that maintenance is needed; it's likely that a too-loose belt will fail to tighten properly when necessary.

Seat Belt Mounting Components — The tethering should be free of wear and debris; the webbing should show no signs of wear, fraying or holes; and the metal components should be free of signs of damage, corrosion or rust.

⚠ DANGER

Seat belt assemblies must be replaced after an accident if they have been subjected to loading by occupants (even if no damage is obvious), or if they have been damaged by an accident (bent retractor, torn webbing, etc.). If there is any question regarding belt or retractor condition, replace the appropriate part.

D-Rings (If Equipped) — The height adjustors installed on pillars should function smoothly without binding or signs of looseness.

Komfort® Latch System

Seat Belt Assembly

The Track III three-point seat belts installed in this chassis are designed to provide the highest degree of operator safety, comfort and convenience. Additional comfort is provided by the Komfort Latch mechanism, which is incorporated into the seat belt assembly, and may be used to relieve any discomfort caused by the constant pressure of engaged seat belts.

Seat Belt Operation

To buckle the seat belt, grasp the latch portion of the buckle, bring it across your lap (from outboard to inboard) and insert it into the fixed buckle which is mounted to the floor or seat (depending on seat type). With the belt properly latched, the pelvic and upper torso restraints will be in place and automatically adjusted to provide a snug fit.

Komfort Latch Feature

If the constant tension of the buckled seat belt causes any discomfort, engage the Komfort Latch as follows:

⚠ DANGER

Do NOT attempt to engage the Komfort Latch feature while the truck is in motion.

Engagement — Pull the webbing of the shoulder belt away from the upper torso, pulling only as much slack as needed while still allowing the belt to exert slight pressure against your chest and shoulder. (Maximum amount of slack should not exceed one inch when measured from the chest to the belt.) While holding the slack, lift the lever located on top of the Komfort Latch mechanism upward to clamp the webbing in place.

Normal Release — To unfasten the seat belt, simply release the buckle and give the shoulder belt a quick tug to release the Komfort Latch mechanism. Allow the belt to retract into the retractor.

Emergency Release — In the event of an emergency, release the seat belt buckle. It is not necessary to release the Komfort Latch in an emergency situation.

NOTE

If forward movement is required while the Komfort Latch mechanism is latched, the latch automatically releases when you lean against the shoulder portion of the belt. Repeat the above steps to reset the Komfort Latch, if desired, after forward movement is no longer required.

⚠ DANGER

Excessive slack will reduce effectiveness of the seat belt, which could result in personal injury and death. CAREFULLY follow the instructions for adjusting the tension-relieving device.

SLEEPER BUNK RESTRAINT

A sleeper bunk restraint is provided as a means of preventing ejection of an occupant from the sleeper bunk during deceleration of the vehicle.

⚠ DANGER

To avoid personal injury, DO NOT occupy the sleeper bunk unless the restraint is completely attached.

Upper Bunk (Optional)

The optional upper bunk is not intended to be used as a sleeping area or storage area while the vehicle is moving and, therefore, is not equipped with a bunk restraint.

⚠ DANGER

To avoid personal injury, DO NOT occupy the upper bunk or use it for storage while the vehicle is moving.

⚠ DANGER

To avoid personal injury, use the bunk restraining strap to hold the upper bunk in place when it is in the upright (stored) position.

Bunk Restraint Operation

Your vehicle is equipped with either a two-belt restraint system or a net restraint system.

Two-Belt Restraint

- Pull each belt across the body and insert the tongue into the buckle until it latches.
- Make sure that the tongue is securely fastened into the buckle.
- To release the belt, push down on the button.

To Attach Net Restraint

- Facing the mattress, arrange the webbing of the restraint on top of the mattress so that the side with the two buckles (female ends) faces the rear of the sleeper, and the side with the single buckle faces the passenger's side of the vehicle.
- Fasten the two buckles to the two corresponding tongues (male ends) attached to the rear wall of the sleeper.
- Fasten the buckle on the left side of the restraint to the corresponding tongue attached to the passenger side wall of the sleeper.
- Fasten the tongue on the right side of the restraint to the corresponding buckle attached to the driver's side wall of the sleeper.
- Fasten the three tongues along the nearside of the webbing to the corresponding buckles attached to the front of the mattress area.

Bunk Restraint Maintenance

- Visually inspect the buckle and tongue for any damage which would impair latching or unlatching.
- Check all hardware for breakage, distortion, or excessive corrosion.
- Ensure that fasteners are securely tightened in accordance with specifications.

SAFETY TIPS FOR COLD WEATHER OPERATION

Driver Visibility

Poor driver visibility is not only annoying, but extremely unsafe under any circumstance. Without proper maintenance of visibility-related components, adverse weather conditions such as rain, snow and frost can seriously reduce visibility. Take time before winter arrives to check the following:

- Windshield Wipers
  - — Check windshield wiper operation and speeds.
  - — Inspect condition and travel of blades. Install new refills for any blades that are cracked, brittle, torn, or coated with road oil along the wiping edge.
- Windshield Washers
  - — Check operation of windshield washer.
  - — Inspect system hoses and replace if brittle or worn.
  - — Inspect washer reservoir. Drain and flush if dirt particles are evident in washer solution.
  - — Fill reservoir with commercially available non-freezing type washer fluid.

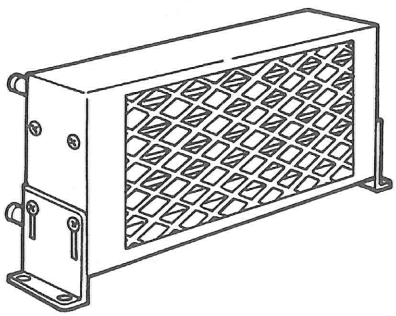
⚠ CAUTION

Do NOT fill reservoir with water only. Even though non-freezing type washer fluid is recommended, do not attempt to clear the windshield of ice by activating the windshield washer and wipers. Ice accumulations should be removed manually by using a scraper.

- Heater/Defroster
  - — Check operation and blowers for speed control, noise and temperature.
  - — Inspect heater core for signs of corrosion and/or leakage.
  - — Check that the defroster blend door is operating correctly and that all ducting is connected properly.
  - — Be sure that vents are not obstructed by debris or other objects.

Auxiliary Cab Heater

To ensure maximum in-cab comfort (even under severe cold weather conditions) contact a MACK subsidiary or distributor for details concerning auxiliary in-cab heaters (see figure below).



600266a

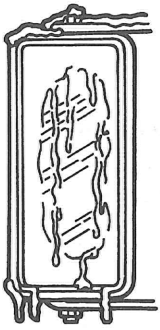
Cab Door Seals and Key Locks

Hollow-core rubber weather seals around some cab doors may lose their resilience in extremely cold temperatures (i.e., –40°F/–40°C and below). Under these conditions, it may be necessary to drill holes to penetrate the hollow core. This allows entrapped air to escape, thereby easing the opening/closing of cab door(s).

Be sure to keep the key locks clean and dry to prevent occasional winter freeze-up. Use of antifreeze lubricants is neither required nor recommended.

Outside Mirror Heater

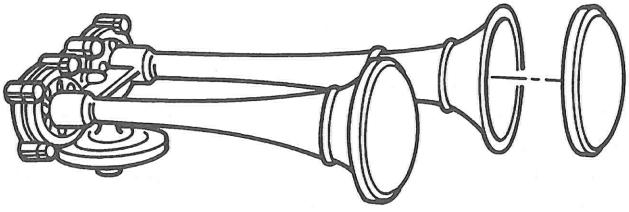
In areas of frequent snowfall and ice, it may be beneficial to install heated mirrors which will defrost and de-ice cab mirrors. Heated mirrors eliminate the need to pull off the highway and stand on the roadside to scrape ice and snow from the mirrors during winter driving conditions.



600267a

Air Horn Snow Shield

Installation of an air horn snow shield is recommended to prevent snow from clogging the air horn bell (maintaining maximum sound output).



600268a

Emergency Reflector Kit (If Equipped)

Your chassis may be equipped with an emergency reflector kit.

Your kit includes red reflector triangles and can be stored in one of the following locations:

- Inboard side of rider seat
- Left-hand luggage compartment of sleeper box
- Between rider seat and rider side door
- Between the driver and rider seats against back of cab

Fire Extinguisher (Optional)

Your vehicle may be equipped with a fire extinguisher which is located inside your cab. Check your fire extinguisher regularly to make sure it is fully charged.

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CAB INTERIOR 64

INSTRUMENT PANEL 65

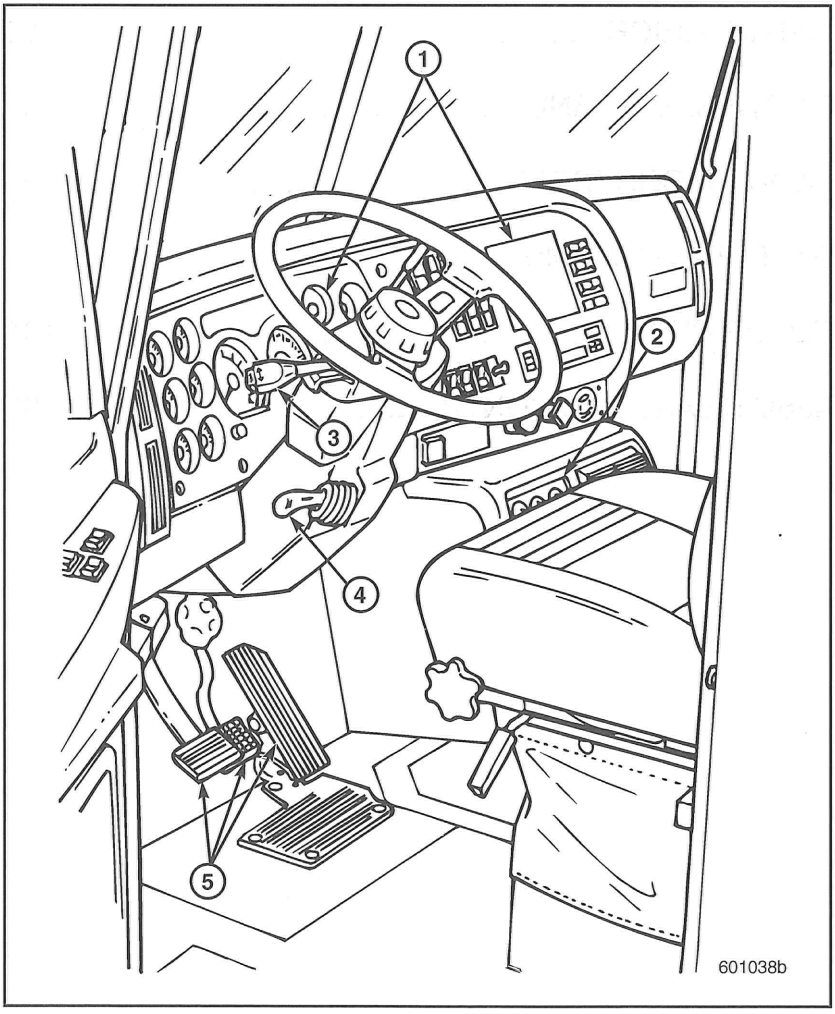
CLIMATE CONTROLS 93

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CAB INTERIOR



1. Instrument Panels 2. Cab Climate Control Panel 3. Turn Signal, Hazard Lights, HI/LO Beam, Courtesy Flash and Flash to Pass Combination Switch	4. Steering Column Tilt Control and Telescopic Lever (If Equipped) 5. Foot Pedals

INSTRUMENT PANEL

Tell-Tales

A tell-tale is a display that indicates the actuation of a device, a correct or defective condition, or a failure to function.

The operator should become familiar with these symbols in order to recognize and react (if necessary) to the indicated condition. Tell-tale symbols are shown in the instrument panel illustrations on the following pages.

Colors

To promote visual recognition internationally, specific colors for tell-tales have been established. Unless governmental regulations (in the area where the vehicle is to be used) or engineering directives specify otherwise, the standard colors are:

- **Blue** — high-beam headlights/engine maintenance
- **Flashing Green** — turn signals
- **Flashing Red** — hazard condition involving the safety of personnel
- **Steady Green** — system in operation
- **Steady Red** — warning, immediate action required
- **Amber** — early warning, such as low fuel or Anti-Lock Brake System (ABS) malfunction

Panel Arrangement

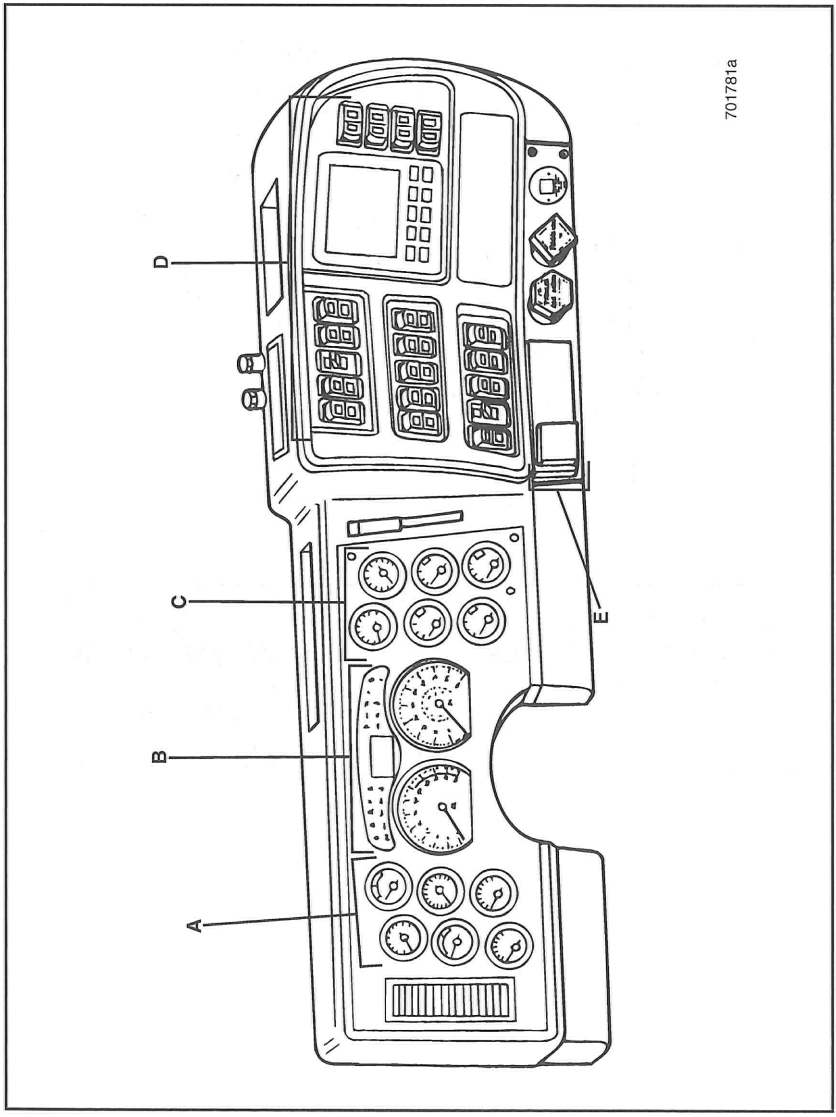
Your view from the driver seat should look something like the illustrations shown. The layout is designed to provide the operator with a good view of the gauges and controls (which are placed so they are within easy reach). The instrument panel, as shown in the following drawing, is broken down into several main sections. For easy identification we refer to them, from left to right, as Panels A, B, C, D, E and F (where necessary).

NOTE

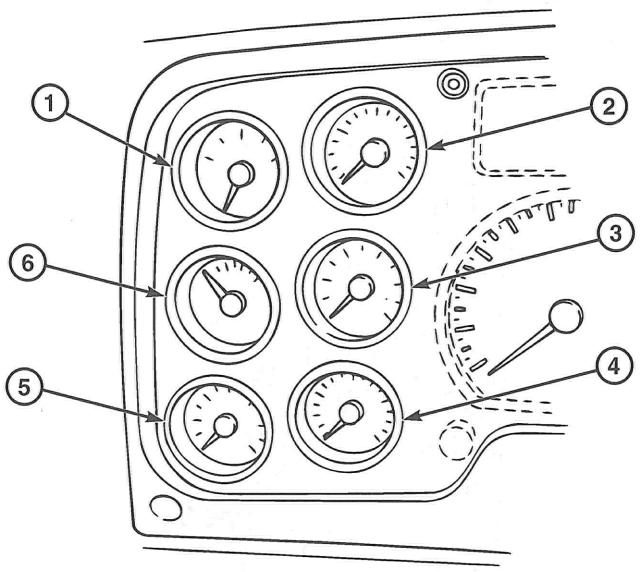
This section shows the instruments and controls available for this vehicle at the time of publication. However, depending on options, your vehicle may not have all the instruments and controls shown here, and they may not be in the same position.

INSTRUMENT PANEL GAUGE LAYOUT

The instrument panel features a wrap-around dash with electronically controlled “race type” gauges, meaning their needles point up when the truck is running properly.

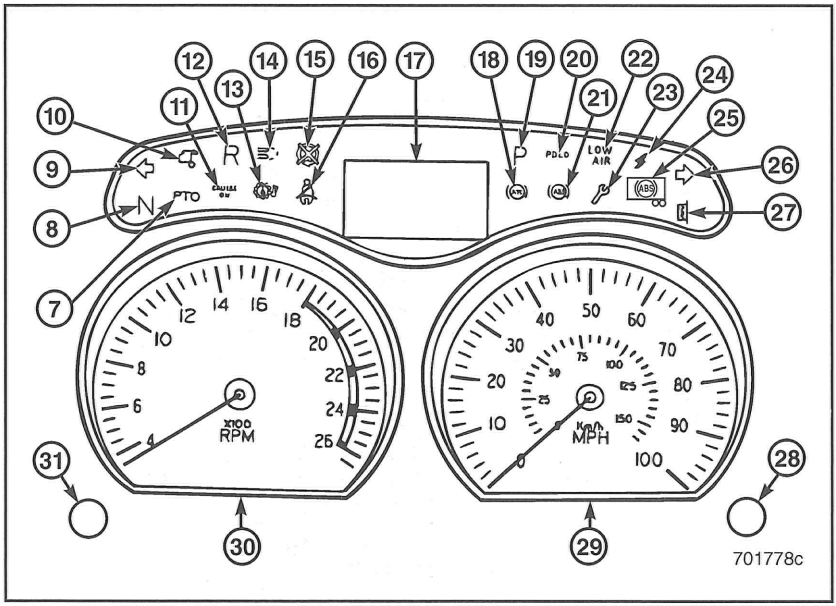


Panel A



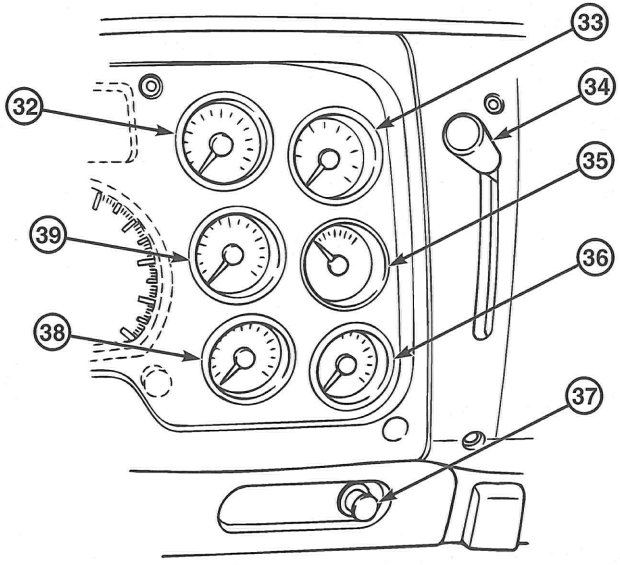
1. Manifold Pressure Gauge 2. Coolant Temperature Gauge 3. Oil Pressure Gauge	4. Engine Oil Temperature Gauge (Only with MACK Engine) 5. Exhaust Pyrometer 6. Voltmeter

Panel B



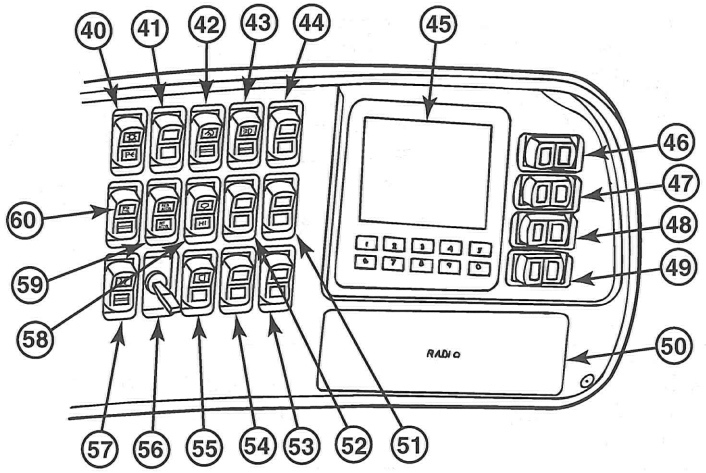
7. Power Take-Off Operating Indicator (Green)	20. Inter-Axle Power Divider Lockout Indicator (Amber)
8. Neutral Indicator (Amber)	21. Anti-Lock Brake System (ABS) Indicator (Amber)
9. Left Turn Signal Indicator	22. Low Air Pressure Warning Indicator (Red)
10. Hook-Up Indicator (Amber)	23. Maintenance Due Indicator (Blue)
11. Cruise Control Indicator	24. Electronic Malfunction Indicator (Amber)
12. Reverse Indicator (Amber)	25. Trailer ABS Indicator (Amber)
13. Check Transmission Indicator (Amber)	26. Right Turn Signal Indicator
14. High Beam Indicator (Blue)	27. Heated Mirror Indicator (Amber)
15. Engine Shutdown Indicator (Red)	28. Mode Button
16. Fasten Seat Belt Warning Indicator (If Equipped)	29. Speedometer
17. Odometer/Hour Meter/Fault Code Indicator	30. Tachometer
18. Automatic Traction Control (ATC) Indicator (Amber)	31. Reset Button
19. Parking Brake Indicator (Red)	

Panel C



32. Air Pressure Gauge 33. Air Application or Air Suspension Gauge 34. Hand-Control Brake Lever 35. Fuel Gauge 36. Transmission Oil Temperature Gauge	37. Cigar Lighter 38. Rear Rear Axle Oil Temperature Gauge 39. Front Rear Axle Oil Temperature Gauge

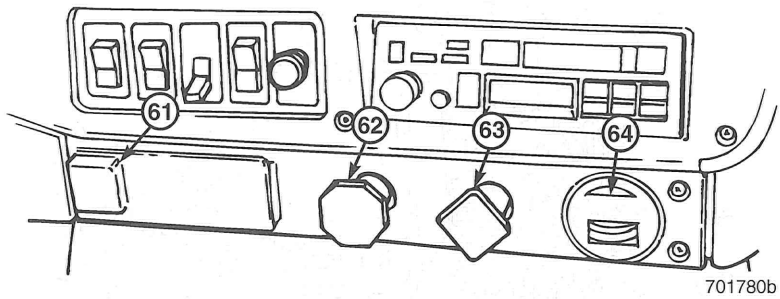
Panel D



40. Master Lighting Switch	51. *Optional Switch
41. Panel Dimmer Switch	52. *Optional Switch
42. Hook-Up Light Switch (Optional Day Cab Only)	53. *Optional Switch
43. *Optional Switch	54. *Optional Switch
44. *Optional Switch	55. *Optional Switch
45. Co-Pilot® Display (If Equipped)	56. Wiper Speed/Delay/Wash Master Switch
46. *Optional Switch	57. Engine Shutdown Override Switch
47. *Optional Switch	58. *Optional Switch
48. *Optional Switch	59. Resume/Set Switch
49. *Optional Switch	60. Speed Control Switch
50. Radio	

* The switches shown in parentheses are listed in their likely position on the panel; however, they may be at other switch locations depending on the customer's requirements. See "Function of Optional Switches" on page 88 for a description of the optional switches, listed in alphabetical order.

Panel E



61. Ash Tray 62. Trailer Air Supply Valve 63. Parking Brake Valve	64. Air Filter Restriction Indicator (If Equipped)

1. **Manifold Pressure Gauge** — Measures the charge air boost pressure in the intake manifold.

2. **Coolant Temperature Gauge** — Indicates the temperature of the engine coolant. The normal operating temperature for MACK ASET™ engines is between 170°F and 225°F (77°C and 107°C). The driver will receive a warning if coolant temperature reaches 223°F and engine shutdown will occur at 227°F if the engine coolant temperature shut down option is enabled.

⚠ CAUTION

Coolant temperature must NOT exceed 225°F (107°C).

3. **Oil Pressure Gauge** — Indicates engine oil pressure. The normal operating oil pressure for a MACK ASET™ engine (at governed speed) is between 30 and 84 psi (207 and 579 kPa). At idling speed, the oil pressure should be between 10 and 35 psi (69 and 241 kPa).

4. **Engine Oil Temperature Gauge (Only with MACK Engine)** — Indicates the temperature of the engine oil.

NOTE

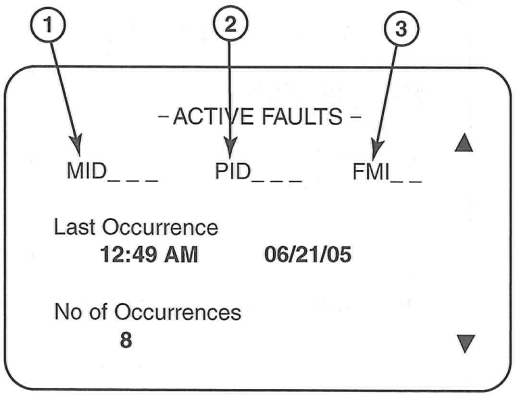
At full-load operation, engine oil temperature can be approximately 250°F on a sustained basis, and can intermittently reach temperatures between 250°F to 270°F. Sustained temperatures of 250°F and intermittent temperatures up to 270°F are acceptable. However, if engine oil operation temperatures exceed 250°F more than 20% of the total engine operating time, and the oil has a minimum of 300 hours of service, the oil must be changed. Otherwise, the normal mileage/time oil change interval may be used. For the MACK recommended oil change intervals, refer to the *Maintenance and Lubrication Manual (TS494)*.

5. **Exhaust Pyrometer** — Indicates the temperature of exhaust gases (about 12 to 16 inches from the turbocharger exhaust connections). This helps the operator select the proper gear for load and grade conditions, thereby avoiding excessive exhaust temperatures.

> **⚠ CAUTION**
>
> *Do NOT exceed the maximum exhaust temperature indicated by the red line on the gauge. To reduce exhaust temperature, downshift or reduce engine power. If operating in cold climates with a winterfront, open the winterfront.*

6. **Voltmeter** — Indicates the surface charge of the battery with the engine NOT running (and the ignition ON). Indicates the condition of charging system with the engine running.
7. **Power Take-Off Operating Indicator (Green)** — Indicates PTO operation.
8. **Neutral Indicator (Amber)** — Indicates that the transmission is in Neutral.
9. **Left Turn Signal Indicator** — Flashes green when the left turn signal is activated.
10. **Hook-Up Indicator (Amber)**
11. **Cruise Control Indicator** — Indicates that cruise control is engaged.
12. **Reverse Indicator (Amber)** — Indicates that the transmission is in Reverse.
13. **Check Transmission Indicator (Amber)** — Indicates that the transmission oil temperature is above the warning limit.
14. **High Beam Indicator (Blue)** — Indicates that high beams are on.

15. **Engine Shutdown Indicator (Red)** — Indicates the occurrence of a condition which requires that the engine be shut down (i.e., low water level, low oil pressure or high water temperature). If the engine shutdown feature is enabled, the operator has about 15 seconds after the light goes on to pull to the side of the road before the engine shuts off. If the engine shutdown feature is disabled, the indicator will function as a warning light but the engine will not shut down.
16. **Fasten Seat Belt Warning Indicator (If Equipped)**
17. **Odometer/Hour Meter/Fault Code Indicator** — Diagnostic fault codes are used for isolating and troubleshooting any active faults in the V-MAC IV system. Both active and inactive codes can be quickly viewed on the electronic dash display (Co-Pilot) in the following format:



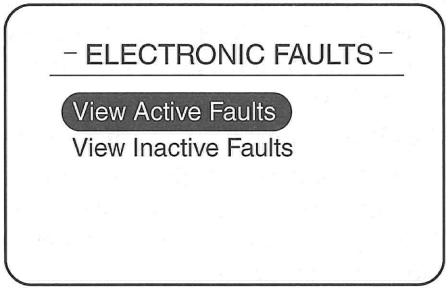
Fault Code Indicator

703769a

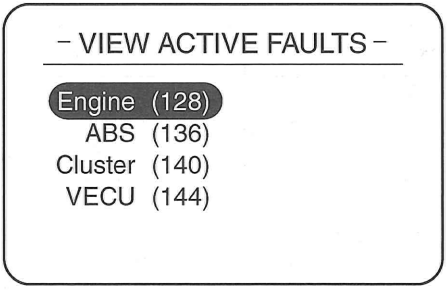
Fault Code Indicator

1. MID — Message Identifier Code 2. PID or SID — Parameter Identifier or Subsystem Identifier Code	3. FMI — Failure Mode Identifier

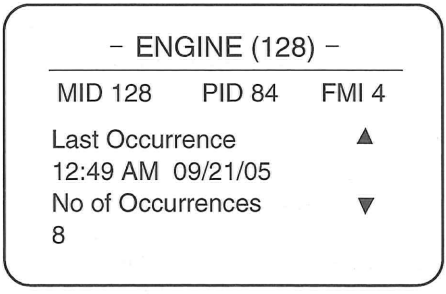
The screens in the figure below indicate that there is an active PID 84 fault from transmitter 128 with an FMI of 4.



Select View Active Faults Screen



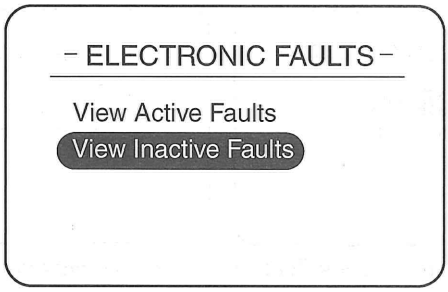
Select Engine Active Faults Screen



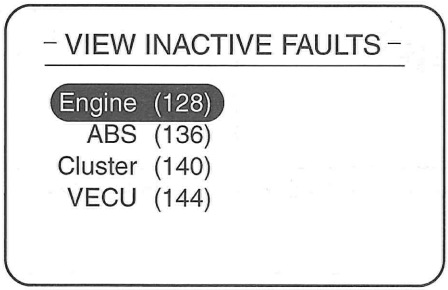
Active Faults for Engine Screen

703770a

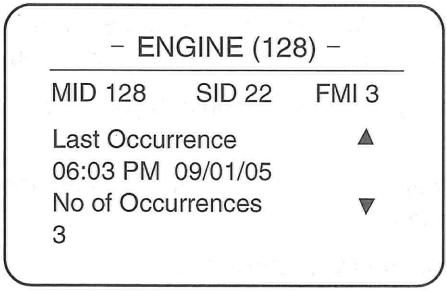
The screens in the figure below indicate that there is an inactive SID 22 fault from transmitter MID 128 with an FMI of 3.



Select View Inactive Faults Screen



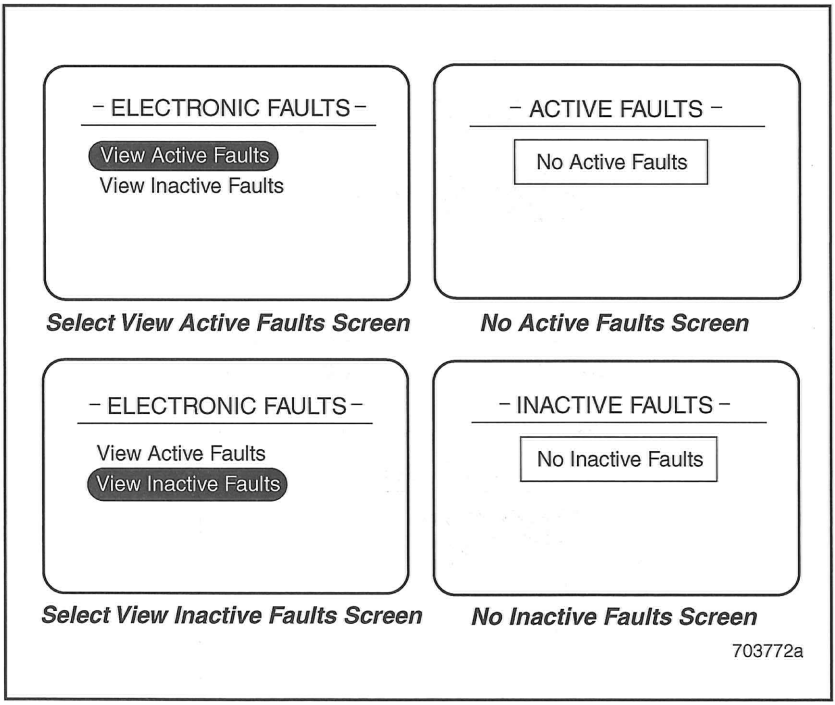
Select Engine Inactive Faults Screen



Inactive Faults for Engine Screen

703771a

The screen in the figure below indicates there are currently no active or inactive fault codes.



To view fault codes, turn the ignition key to the ON position and do the following:

1. Press the ***Enter*** (↵) button on the Stalk Switch (available only with Co-Pilot). The Co-Pilot main menu will appear.
2. Use the ***Up & Down*** button to highlight the Diagnostics menu.
    a. Press the ***Enter*** (↵) button to enter the Diagnostics menu.
    b. Use the ***Up & Down*** button to highlight Electronic Faults.
    c. Press the ***Enter*** (↵) button to enter the Electronic Faults menu.

3. You can view both active and inactive fault codes.
   a. To view active fault codes, use the ***Up & Down*** button to highlight Active Faults and then press the ***Enter*** (↵) button to select.
   b. To view inactive fault codes, use the ***Up & Down*** button to highlight Inactive Faults and then press the ***Enter*** (↵) button to select.
   c. To clear inactive fault codes, press the ***Enter*** (↵) button.
4. To exit the Co-Pilot, press the ***Enter*** (↵) button and then press the ***ESC*** button twice to return to the main menu.

18. **Automatic Traction Control (ATC) Indicator (Amber)** — Indicates that ATC is operating and will flash when in deep mud and snow mode.
19. **Parking Brake Indicator (Red)** — Indicates that the parking brake is engaged.
20. **Inter-Axle Power Divider Lockout Indicator (Amber)** — Indicates the Inter-Axle Power Divider Lockout is engaged.
21. **Anti-Lock Brake System (ABS) Indicator (Amber)** — Indicates an ABS malfunction. Also illuminates momentarily as a bulb check when the ignition is turned on. If the light turns on and stays on, a malfunction is indicated. If the light does not turn on when the ignition is turned on, the bulb and the power source may be defective. For additional information on operating an ABS-equipped vehicle, refer to "Anti-Lock Brake System (ABS)" on page 154, of the *OPERATION* section.

NOTE

When an ABS malfunction is detected, anti-lock braking in the affected wheel will be disabled and normal braking will return; the other wheels will retain anti-lock braking.

22. **Low Air Pressure Warning Indicator (Red)** — Indicates low air pressure in the air brake system(s). This feature may also come with a buzzer.

23. **Maintenance Due Indicator (Blue)** — Indicates that a maintenance alert has been issued (maintenance is due).

    When a maintenance item becomes due, this light flashes three times. Thereafter, the light will flash three times at every startup until the maintenance condition is cleared.

24. **Electronic Malfunction Indicator (Amber)** — Illuminates when V-MAC® detects an electronic malfunction. Refer to the applicable *V-MAC® Operator's Guide*.

    The Electronic Malfunction lamp may turn on after starting the engine if:

    NOTE

    The Variable Turbine Geometry Turbocharger (VGT) requires 95 psi to operate at engine start up. The electronic malfunction lamp will illuminate under the following conditions:

    - Air system pressure is low
    - Air system pressure is low and engine speed is raised in an attempt to build air pressure
    - Air system pressure does not reach 95 psi within 2 minutes

    The system is normal if the electronic malfunction light goes out when air pressure reaches approximately 95 psi.

    The electronic malfunction lamp may turn on when operating the vehicle in a bob-tail mode with the engine brake turned on and cruise control active. Cruise control will become inoperative but can be reset by shutting off, then restarting the engine. This condition can be corrected by resetting the "Service Brake Fault Threshold with Engine Brake" function. Refer to V-MAC® IV Customer Data Programming.

25. **Trailer ABS Indicator (Amber)** — If trailer is PLC ABS equipped, the ABS lamp illuminates for several seconds at start-up during an initial function check. It will illuminate when a trailer ABS fault occurs. It will blink three times if there is a loss of communication between the tractor and trailer.

26. **Right Turn Signal Indicator** — Flashes green when turn signal is activated.

27. **Heated Mirror Indicator (Amber)** — Indicates that the outside mirror heater is in operation.

28. **Mode Button** — Serves several functions:

    - Depress the Mode button (with the ignition OFF) to activate the Odometer/Hour Meter for 10 seconds. Depress the Mode button again to toggle between the current trip and total accumulated mileage/hours.
    - Depress and hold the Mode button for longer than 2 seconds (with the ignition ON and the engine NOT running) to initiate a self-diagnostic routine. The routine includes positioning all gauges (with the exception of the air pressure gauge) to the 12 o'clock position, activating all indicator lights and LCD segments for 5 seconds and activating an audible alarm for 2.5 seconds.
    - Depress the Mode and Reset buttons simultaneously (with the vehicle stationary and the ignition ON) to activate the fault code display.

    NOTE

    Displays active codes only. A complete fault history can be retrieved through the 1587 serial line using Mack Trucks, Inc. recommended diagnostic PC and associated service support software.

29. **Speedometer** — Indicates road speed in miles and/or kilometers per hour.

30. **Tachometer** — Indicates engine speed in revolutions per minute (RPM). Tachometer readings should be used as a guide for shifting, as well as to prevent engine damage due to overspeed. The blue band indicates the optimum range for engine brake operation.

31. **Reset Button** — Resets the trip miles/hours to 0.

32. **Air Pressure Gauge** — Indicates the air pressure in the air brake system(s). The normal operating air pressure is between 110 psi (759 kPa) and 130 psi (897 kPa) in both air brake systems. If pressure drops below 75 psi (± 5 psi) in either system, the warning buzzer and warning light will go on. Determine the cause of failure before proceeding. Primary air pressure is supplied to the rear brakes and is indicated by the green pointer on the gauge. Secondary air pressure is supplied to the steering axle brakes and indicated by the orange pointer.

33. **Air Application Gauge** — Indicates the air pressure being delivered to the service brake chambers in the tractor (and trailer, if equipped); OR

    Air Suspension Gauge — Indicates the air pressure being delivered to the air suspension system (100 psi range).

34. **Hand-Control Brake Lever** — Pull down to activate the trailer brakes, or the rear axle brakes in the case of a platform truck.

⚠ WARNING

The hand-control brake system must NOT be used for parking. Do NOT use to apply service brakes while vehicle is in motion. Do not leave the vehicle while hand-control brake is applied.

35. **Fuel Gauge** — Registers the fuel level in the supply tank(s).

36. **Transmission Oil Temperature Gauge** — Indicates transmission oil temperature.

> **⚠ CAUTION**
>
> *The maximum safe oil temperature for MACK transmissions is 250°F (121°C) for mineral-based oil, or 300°F (148°C) for synthetic oil. Continued operation with oil above this temperature will cause rapid deterioration of the oil's lubricating properties and is NOT recommended. Consult the vendor manual for non-MACK components.*

37. **Cigar Lighter** — Press in the lighter; it will pop out when element is hot.

> **⚠ CAUTION**
>
> *Maximum amperage for the in-dash cigar lighter is 10 amps. DO NOT use the cigar lighter receptacle to power accessories rated higher than 10 amps.*

38. and **39. Rear Axle Oil Temperature Gauges** — Indicate rear axle oil temperature.

> **⚠ CAUTION**
>
> *The maximum safe oil temperature for MACK rear axles is 250°F (121°C). Continued operation with oil above this temperature will cause rapid deterioration of the oil's lubricating properties and is NOT recommended. Consult the vendor manual for non-MACK components.*

40. **Master Lighting Switch** — Allows the operator to choose between parking lights (middle position), headlights (push top in) or OFF (push bottom in). Clearance lamps on the tractor and the trailer are activated in the middle position. Chassis may be equipped with daytime running lights.
41. **Panel Dimmer Switch** — Adjusts panel light intensity.
42. **Hook-Up Light Switch (Optional — Day Cab Only)** — Push the top to activate the hook-up lights. Push the bottom to turn them off.
43. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.
44. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.
45. **Co-Pilot® Display (If Equipped)** — Co-Pilot® displays a variety of vehicle information.

> **NOTE**
>
> For operating instructions, refer to the *V-MAC® IV Operator's Guide, (TS898).*

46. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.
47. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.
48. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.
49. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.
50. **Radio**
51. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.
52. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.

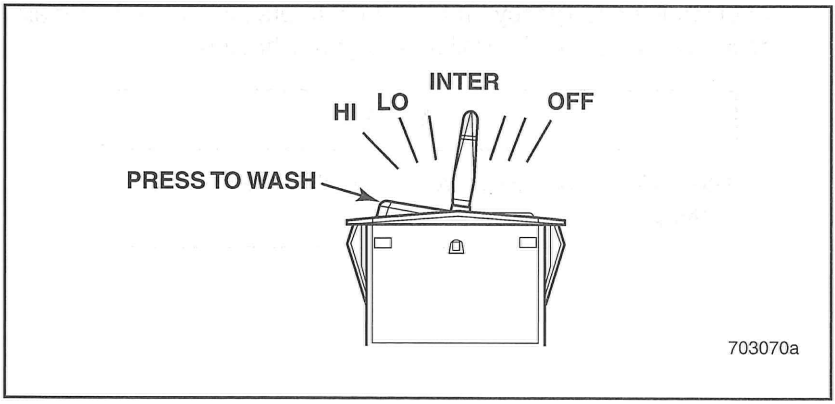
53. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.

54. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.

55. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.

56. **Wiper Speed/Delay/Wash Master Switch**

- Depress top of the rocker switch to activate windshield washer
- Toggle switch in top position turns wipers on HIGH
- Toggle switch in second position from top turns wipers on LOW
- Toggle switch in the center position activates intermittent wipers. Pressing the switch down slows the speed of the wipers
- Toggle switch in the lowest position turns wipers OFF



Wiper Speed/Delay/Wash Master Switch

57. **Engine Shutdown Override Switch** — Pressing this switch shortly after the engine shutdown alarms, allows 30 additional seconds of operation. This process can be repeated several times to safely park the vehicle.

> **⚠ CAUTION**
>
> *Continuously overriding the shutdown system may result in severe engine damage.*

58. **Optional Switch** — Refer to "Function of Optional Switches" on page 88.

59. **Resume/Set Switch** — This is a V-MAC® switch; refer to the applicable *V-MAC® Operator's Guide* for more information.

60. **Speed Control Switch** — This is a V-MAC® switch; refer to the applicable *V-MAC® Operator's Guide* for more information.

61. **Ash Tray**

62. **Trailer Air Supply Valve** — Red octagonally-shaped knob. Pull to apply trailer emergency brakes. Push to pressurize the trailer air reservoir, releasing the trailer emergency brakes.

> **NOTE**
>
> The trailer air supply valve should NOT be used for parking.

63. **Parking Brake Valve** — Yellow diamond-shaped knob. Pull to apply. Push to release. Applies tractor parking brakes and trailer brakes, if equipped.

NOTE

To park tractor only, after applying parking brake, push IN red knob (Trailer Air Supply Valve).

⚠ WARNING

This procedure should not be used to park a combination tractor and trailer permanently. The driver should not leave the driver's seat.

64. **Air Filter Restriction Indicator (If Equipped)** — Indicates that the element needs servicing or replacement. When the red flag locks into position, service as soon as possible to prevent engine damage; then reset the indicator after the filter change. Check the air filter restriction indicator daily.

Function of Optional Switches

The following optional switches, listed in alphabetical order, may appear on *Panel D*, shown on "Panel D" on page 71.

- **Air Suspension Control Switch** — This switch exhausts the air from the air bags of the suspension. It may be used when coupling or uncoupling trailers.

⚠ CAUTION

When preparing to connect a tractor to a trailer, make sure that the height of the 5th wheel matches the height of the underside of the trailer. Failure to do so will result in the trailer being improperly connected. After the trailer has been coupled and the trailer landing gear has been raised, make sure that the 5th wheel jaws have properly engaged the trailer king pin, and there is no gap between the 5th wheel plate and the bottom of the trailer.

⚠ CAUTION

DUMP BODY: Always exhaust the air from the bags before raising the dump body to protect the air bags and improve chassis stability while dumping. If the dump body is raised while the air suspension is pressurized, damage to the air bags may result.

⚠ CAUTION

Do not drive the vehicle with the air bags exhausted. Repressurize the air bags before driving the vehicle.

NOTE

On chassis equipped with the MAXLITE™ 20/40 air suspension, the Meritor WABCO leveling valve can take up to 7 minutes to completely stabilize the chassis after any load is applied or removed. (During that 7 minute period, the valve may appear or sound like it is leaking.)

NOTE

Engine speed and road speed will automatically be limited if the vehicle is moved with the air bags exhausted.

For information concerning trailer coupling and uncoupling, refer to the *OPERATION* section of this manual.

- **Accessory Switch (Battery Power)** — This switch may be used to power optional accessory equipment that requires battery voltage, with the key switch turned OFF.
- **Accessory Switch (Ignition Power)** — This switch may be used to power optional accessory equipment that requires ignition voltage, with the key switch turned ON.

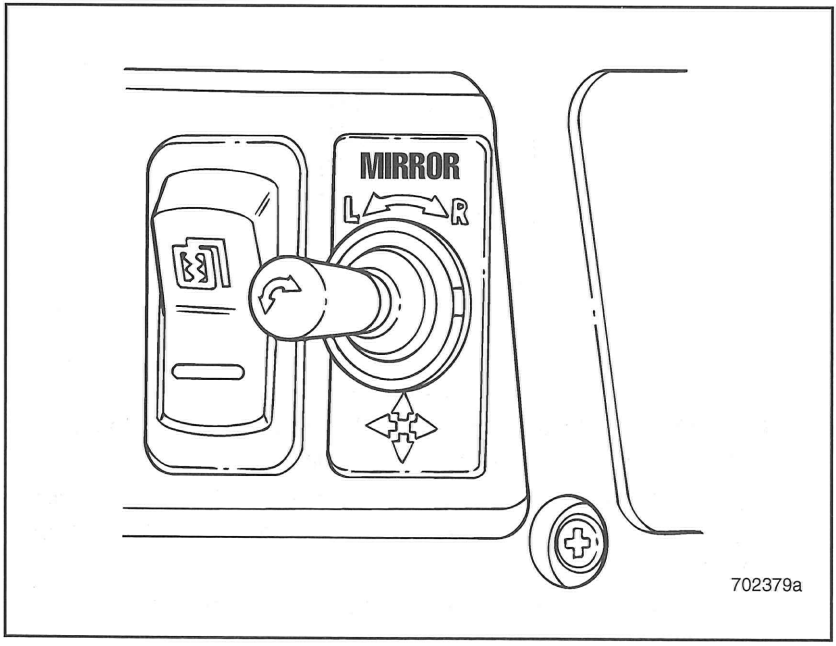
- **Automatic Traction Control Switch/Heavy Mud/Snow** — Activate for increased traction control in heavy mud or snow. (See "Automatic Traction Control (ATC) (If Equipped)" on page 157 in the *OPERATION* section of this manual for more details.) When the operator presses the top of the rocker switch, the heavy mud/snow function ATC indicator lamp blinks continuously. The ATC lamp stops blinking when the ATC mode switch is pressed again or ignition key cycled.

⚠ CAUTION

Be sure to deactivate the heavy mud/snow function when no longer needed. Continued operation with the heavy mud/snow function active will result in vehicle damage. If after a reasonable amount of time (no more than five minutes) the vehicle is still not moving, deactivate the ATC and put on chains.

- **Cold Start Switch** — Press at the top to activate the solenoid for the cold start system.
- **Engine Brake Switch** — Used to activate the engine brake. Refer to the *OPERATION* section in this handbook for more information.
- **Fan Control Manual Override Switch** — Allows the operator to manually control the engine cooling fan.
- **5th Wheel Kingpin Unlock Switch** — Press the top of this switch to unlock the Kingpin before disengaging the trailer. See Step #7 of the *UNCOUPLING* instructions in the *OPERATION* section.
- **5th Wheel Slide Switch** — Locks and releases a sliding 5th wheel using air pressure; this allows the 5th wheel to be properly positioned. The indicator lamp will illuminate when the 5th wheel is unlocked. Prior to model year 2001, it was necessary to use the trailer Hand Brake Control Lever to activate the 5th wheel slide function. This feature has been changed to make the air slide switch independent of the hand brake control, thereby preventing unexpected 5th wheel slide.

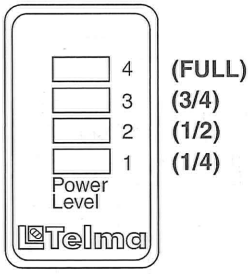
- **Fog Lamps Switch** — Push the top to activate the fog lights. Push the bottom to turn them off. The master lighting switch must be in Parking Lights position to activate fog lights.
- **Heated Mirrors Switch** — Activates the outside heated mirrors (for use in icy conditions).
- **Inside/Outside Air Switch** — Allows the operator to choose whether outside air or "under the hood" air is fed into the air cleaner.
- **Mirror Control Switch** — Push the top in to turn the mirror to the left. Push the bottom in to turn the mirror to the right.
- **Mirror Defrost** — Push the top in to activate mirror defrost.
- **Motorized-Mirror Joy Stick** — This control is designed like a "joy stick." ROTATE the stick to the right to control the right mirror. ROTATE the stick to the left to control the left mirror. PUSH the stick up, down, left or right, as indicated, to correctly position the selected mirror.



- **Neutral Control Switch** — Shifts the rear compound to neutral on certain transmissions for rear case power take-off operation.
- **Inter-Axle Power Divider Lockout Switch** — See Inter-Axle Power Divider Lockout in the *OPERATION* section of this handbook, "Inter-Axle Power Divider Lockout (If Equipped)" on page 244.
- **Telma Rear Axle Mounted Retarder Indicator Lamp (If Equipped)** — The Telma does not have a disable switch. It is always on and will operate at four levels depending on application of service brake. The indicator will show you the level you are retarding the vehicle: 1/4, 1/2, 3/4 or full.

NOTE

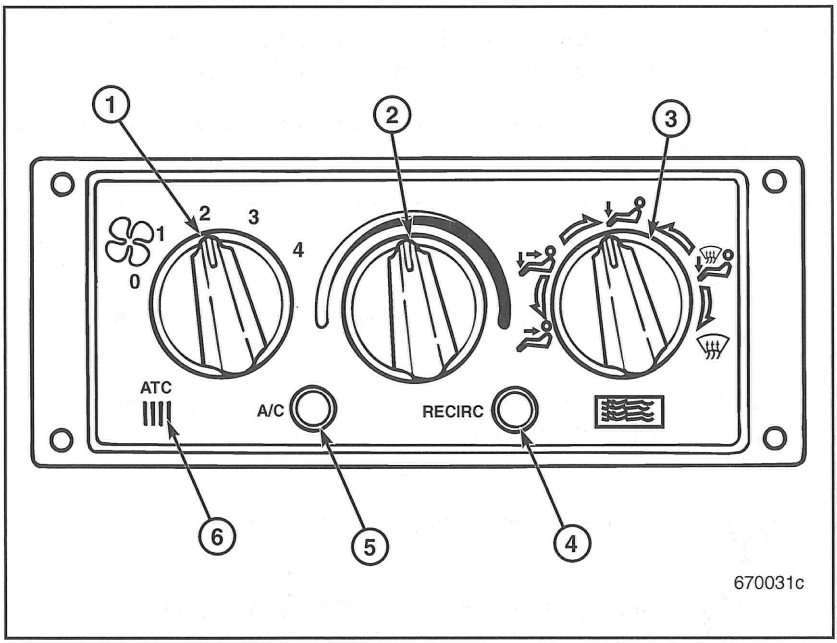
The Telma retarder is disabled if there is an ABS event.



Telma Retarder

- **Power Take-Off Switch (Optional)** — Push the top in to turn the PTO on. Push the bottom in to turn it off.
- **QUAL COMM Panic Button** — If your vehicle is equipped with this option, refer to the QUAL COMM literature provided with the vehicle.
- **Right-Hand Only Door Lock** — Push the top in to lock the right-hand door.

CLIMATE CONTROLS



1. Blower Control Knob	4. Fresh/Recirculation Button
2. Temperature Control Knob	5. A/C ON/OFF Button
3. Mode Knob	6. ATC Air Grid

1. **Blower Control Knob** — This knob controls fan speed from 0 (OFF) to 4 (highest speed).
2. **Temperature Control Knob** — Controls the temperature of the air in the cab from COOL (far left) to HOT (far right).
3. **Mode Selection Knob** — Controls the direction of air flow around the cab as follows:



Directs airflow through the dash panel air vents only.



Directs airflow through both the dash panel and floor air vents (bi-level).



Directs airflow through the floor vents only.



Directs airflow through the floor vents and the windshield for defrosting and/or defogging.



Directs airflow only to the windshield for defrosting and/or defogging.

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NOTE

The Mode Selection knob can be rotated to any position (see above). This allows the operator to select the desired amount of blend between the positions.

4. **Fresh/Recirculation Switch or Button** — Selects the cab intake air between fresh air (from outside the cab) and recirculated air (inside the cab).

   NOTE

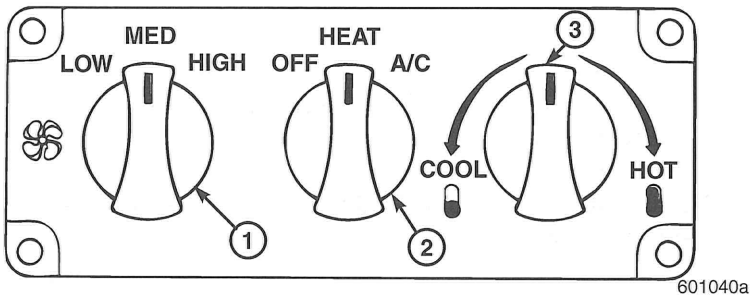
   For maximum air conditioner performance, select recirculated air.

5. **Air Conditioner ON/OFF Switch or Button** — Activates the air conditioning system.

   NOTE

   When using the sleeper air conditioner, this switch must be turned ON.

SLEEPER CLIMATE CONTROL



1. Fan Control Knob 2. Mode Selection Knob	3. Temperature Control Knob

1. **Fan Control Knob** — This is a three position knob to control the amount of air delivered through the sleeper box air vents.
2. **Mode Selection Knob** — Allows the operator to choose between OFF, HEAT or A/C.
3. **Temperature Control Knob** — Controls the temperature of the air in the sleeper from COOL (far left) to HOT (far right).

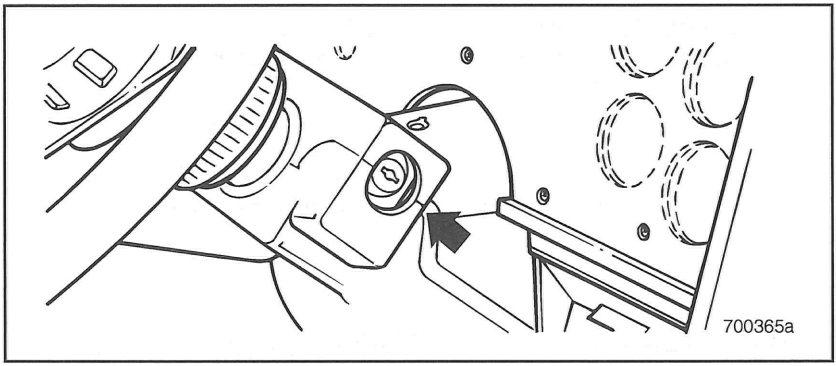
NOTE

When the sleeper mode selection knob is in the OFF position, warm air flows out the sleeper box air vents. As a result, the sleeper may become quite warm and uncomfortable on hot summer days.

To use the sleeper box air conditioner, make sure that the Cab air conditioning unit is activated and the cab fan control switch must be ON (any speed). Then, on the sleeper climate control panel, move the mode selection knob to the A/C position and turn the temperature control knob to COOL.

STEERING COLUMN

Combination Starter and Electrical Switch



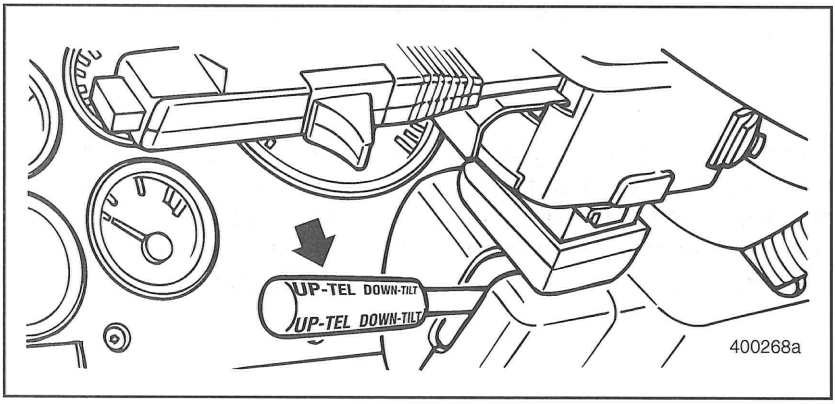
This switch starts the engine (turn the switch clockwise) and activates the accessory relay (turn the switch counterclockwise). When the switch is turned ON (in either direction), a warning buzzer sounds if air system pressure is below 65 ± 5 psi (448 ± 34 kPa) or if there is low oil pressure. The buzzer shuts off as soon as sufficient air/oil pressure is restored.

Steering Wheel Adjustment

⚠ WARNING

Adjust the steering wheel position BEFORE attempting to move the vehicle to avoid losing control of the vehicle.

The steering column adjusts by telescoping (if equipped) and tilting. There is a lever which controls these functions (see illustration).



Tilting

Push down on the lever located on the left side of the steering column to tilt the wheel to any position between fully tilted up to fully tilted down. Note that you must continue to hold the lever down while adjusting. When the adjustment is complete, release the lever.

Telescoping (If Equipped)

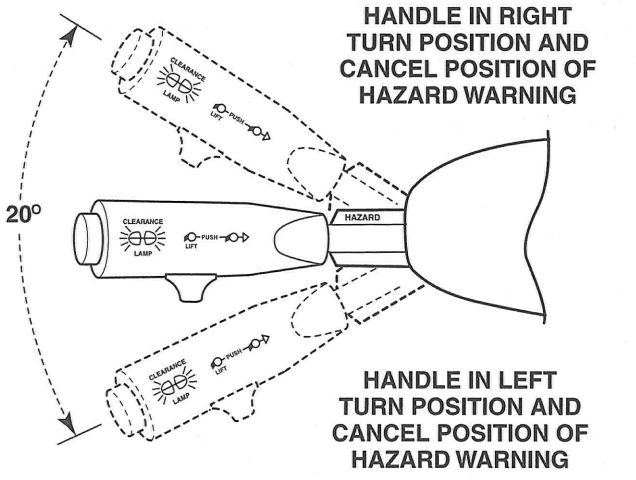
Pull up on the lever located on the left side of the steering column and the steering column telescopes to any position between fully retracted to fully extended.

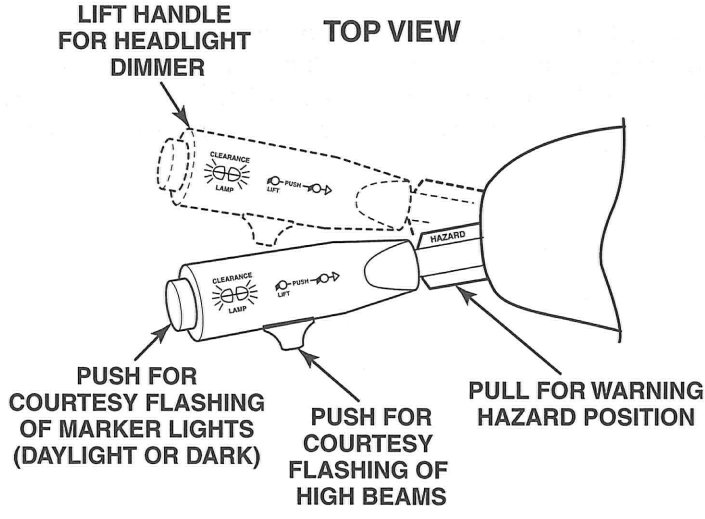
Turn Signal Lever

NOTE

The turn signals are not self-cancelling and must be returned to the middle position manually.

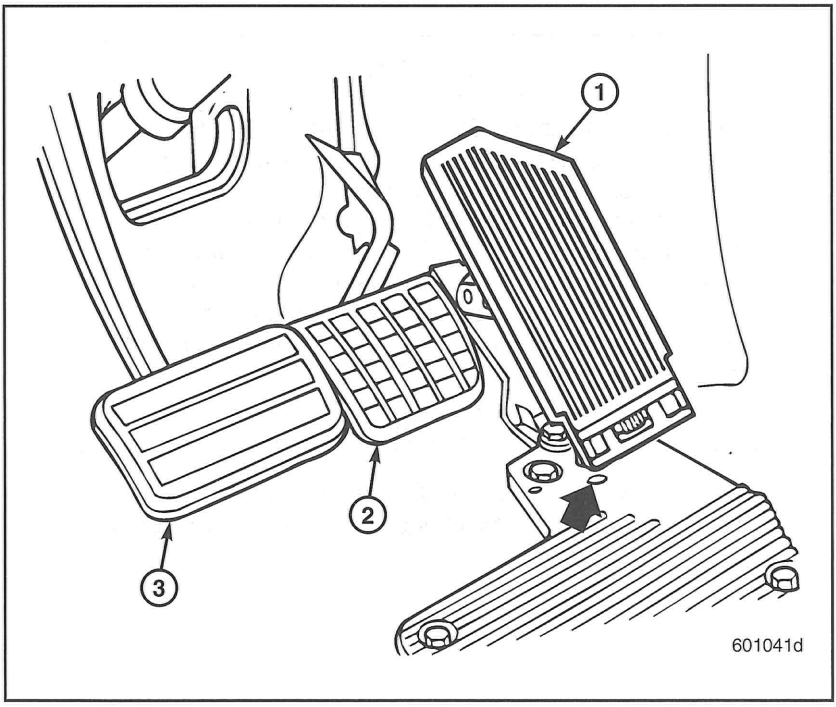
The turn signal lever is located on the steering column. It performs a number of functions, including activating the high and low beams, signal switch and the hazard switch. The signal switch can be used for courtesy flashing of marker lights and for the flashing of high beams.


HANDLE IN RIGHT TURN POSITION AND CANCEL POSITION OF HAZARD WARNING
20°
CLEARANCE LAMP
PUSH LIFT
HAZARD
HANDLE IN LEFT TURN POSITION AND CANCEL POSITION OF HAZARD WARNING


LIFT HANDLE FOR HEADLIGHT DIMMER
TOP VIEW
CLEARANCE LAMP
PUSH LIFT
HAZARD
PUSH FOR COURTESY FLASHING OF MARKER LIGHTS (DAYLIGHT OR DARK)
PUSH FOR COURTESY FLASHING OF HIGH BEAMS
PULL FOR WARNING HAZARD POSITION
SIDE VIEW

700366e

FLOOR PEDALS



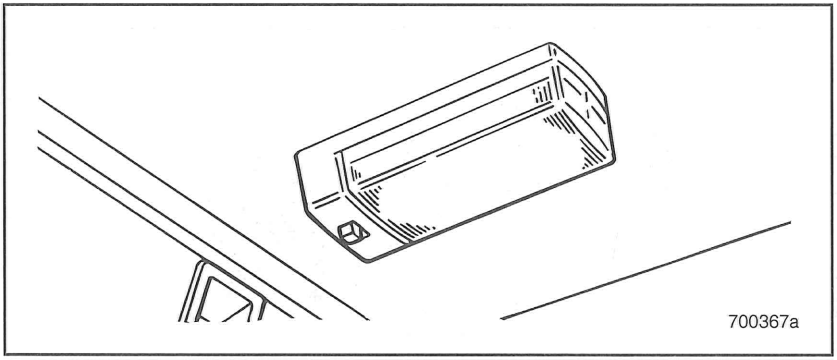
1. **Accelerator Pedal** — Depress to increase engine/vehicle speed; release to decrease engine/vehicle speed.

> **NOTE**
>
> To provide maximum driving comfort for a variety of drivers, the accelerator pedal assembly mounting is adjustable. The heel plate to which the pedal assembly is mounted has two sets of mounting holes. From the factory, the pedal assembly is mounted in the forward set of holes to accommodate medium to long-legged drivers. For shorter-legged drivers, the pedal assembly can be moved to the rearward set of holes (see arrow in illustration).

2. **Brake Treadle Valve** — Depress to activate the service brakes.
3. **Clutch Pedal** — Depress to disengage the clutch. The clutch pedal is only found on trucks equipped with manual transmissions.

MISCELLANEOUS CONTROLS

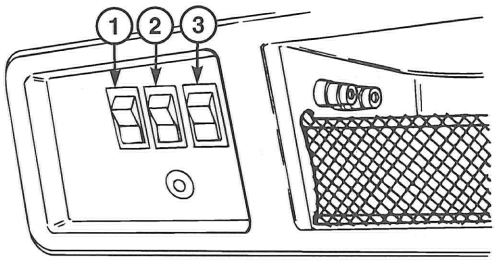
Dome Light (Day Cab)



With the switch in the left position, the dome light will come on when the cab door is opened and go off when it is closed. Push the switch to the right to turn on the dome light when the doors are closed.

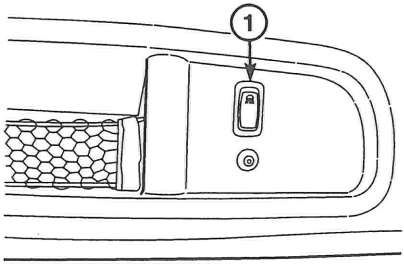
Interior Cab Lights (Sleeper Cab)

Various interior cab lights are activated using the rocker switches located in the headliner.



DRIVER SIDE 601042b

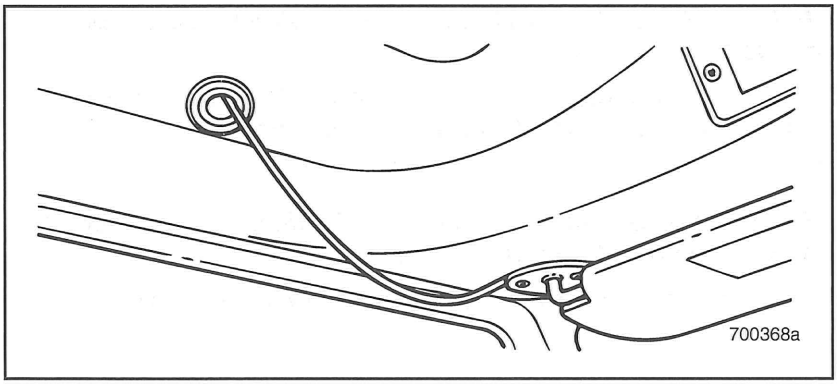
1. Map Light Switch Activates the map lights (which are located in the headliner, to the left of sun visor).	2. Dome Light Switch Activates the dome lights. 3. Sleeper Light Switch Activates the sleeper ceiling lights.



PASSENGER SIDE 670987a

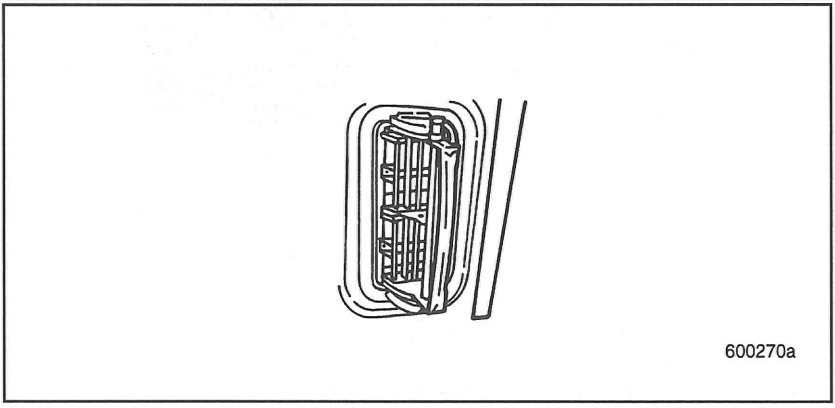
1. Dome Light Switch Activates the dome lights.

Air Horn



The air horn(s), if equipped, is activated by pulling down on the cord that is located above the left-side window.

Fresh Air Vent



An air vent is provided to circulate outside air to the cab interior. Move the vent lever forward or rearward to open the vent. Move the lever to the center to close the vent.

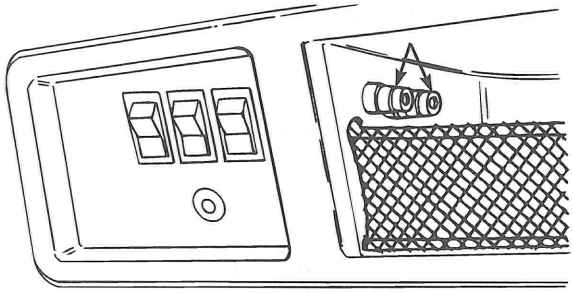
CB Connector

CB Radio Power Jack (+) Located in Headliner on Sleeper Cab; on Dashboard in Day Cab (Red)

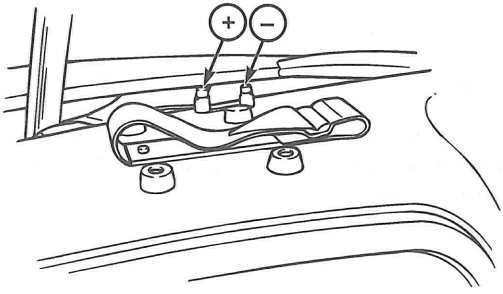
This is a 12-volt, switched battery connection. It is used to power the vehicle's CB radio. It is protected by a 15-amp circuit breaker and supplies power only when the key is turned ON.

CB Radio Power Jack (–) Located in Headliner on Sleeper Cab; on Dashboard in Day Cab (Black)

This is a ground connection. It is used as a power return (–) connection for the vehicle's CB radio.



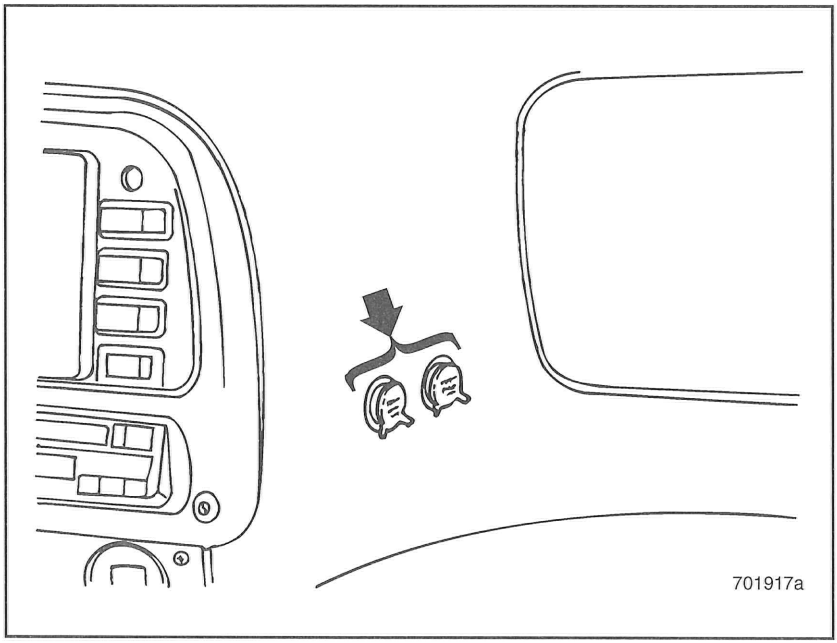
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Accessory Power Outlets

Additional 12-volt accessory power outlets are located on the dashboard, directly in front of the passenger seat. These cigar lighter-type outlets supply 12 volts of fused (25A) power when the ignition switch is turned to the ignition or accessory position.



⚠ CAUTION

Maximum amperage for all power receptacles in cab and sleeper is 20 amps. Do NOT exceed maximum amperage as equipment damage may result.

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BEFORE OPERATING THE VEHICLE

Driver's Daily Walk-Around Inspection

With the proper care, your CHN will give you years of efficient performance.

Before each shift, the driver should perform the following inspections:

⚠ WARNING

To avoid serious injury, do NOT step on fuel tank, battery box, frame, etc., unless adequate slip-resistant surfaces and handholds are provided.

Fluids

- ❑ Engine oil
- ❑ Engine coolant
- ❑ Fuel
- ❑ Power steering fluid
- ❑ Windshield washer fluid

Leaks

- ❑ Air, coolant, oil, fuel, power steering fluid

Wheels and Tires

- ❑ Tire air pressure
- ❑ Tire/wheel condition
- ❑ Wheel stud nuts
- ❑ Front wheel bearings (oil)

Fasteners

- ❑ Steering linkage
- ❑ Seat belts

- ❑ Doors and windows
- ❑ Battery box covers
- ❑ Fuel tank straps
- ❑ Hood or engine compartment covers

Air Reservoir

- ❑ Drain to remove moisture

Lights/Reflectors

- ❑ Replace defective and burned-out bulbs
- ❑ Replace broken lenses and reflectors

Gauges and Instruments

- ❑ Air pressure gauge
- ❑ Oil pressure gauge
- ❑ Temperature gauge
- ❑ Voltmeter

Component Operation

- ❑ Brakes (service and parking)
- ❑ Horn
- ❑ Heater and defroster
- ❑ Signaling devices
- ❑ Windshield wipers/washers
- ❑ Foot pedals
- ❑ Back-up alarms (if equipped)

Component Adjustment

- ❑ Sideview mirrors
- ❑ Seats

New Vehicle Break-In

To ensure many years of reliable, trouble-free operation, the following break-in procedures are recommended:

NOTE

Oil change, filter change and chassis lubrication are no longer required at the 3,000-mile vehicle break-in interval.

Refer to the preventive maintenance schedules outlined in the *Maintenance and Lubrication Manual (TS494)* for recommended lubrication change intervals for the following items:

- Gear oils (transmission, rear axle carrier[s], front drive axle carrier, transfer case, flywheel PTO)
- Engine oil
- Oil filters
- Fuel filters
- Coolant conditioner

NOTE

It is important that components be filled with lubricants meeting the specifications as given in the *Maintenance and Lubrication Manual (TS494).*

NOTE

When checking oil levels, the vehicle must be parked on level ground, and the units at normal operating temperature. Components must be filled to the correct level. DO NOT OVERFILL.

NOTE

Oil and filter change intervals in this manual pertain to components built by Mack Trucks, Inc. For information concerning oil and oil filter change intervals for vendor components, refer to the specific vendor component service literature.

During the First 3000 Miles (5000 Kilometers)

- After the first 125 miles (200 km), retorque the wheel nuts using an accurately calibrated torque wrench. Recheck this torque again after 500 miles (800 km).
- Check oil and coolant levels frequently.
- Check brake and clutch adjustments per recommended maintenance schedule, and adjust as needed.
- Observe the instruments often, and shut down the engine at the first sign of any abnormal readings.
- Report all leaks, loose fasteners, unusual noises, etc., to the service representative at the nearest Mack dealership so they can be checked and corrected.
- Check the spring clip torque (U-bolts). (On REYCO suspensions, also check equalizer nut torque.)
- Check the U-bolt torque on the MACK air suspension at the end of the first 1000 miles (1600 km).

After the First 3000 Miles (5000 Kilometers) or Before 4000 Miles (6400 Kilometers) or Before 3 to 4 Months

- Retorque the spring clip (U-bolts). (On REYCO suspensions, also retorque the equalizer nut.)

At the First A Inspection Interval

- Check front and rear axle alignment and adjust if the alignment is out of specifications.
- Check steering knuckle to axle beam clearance.

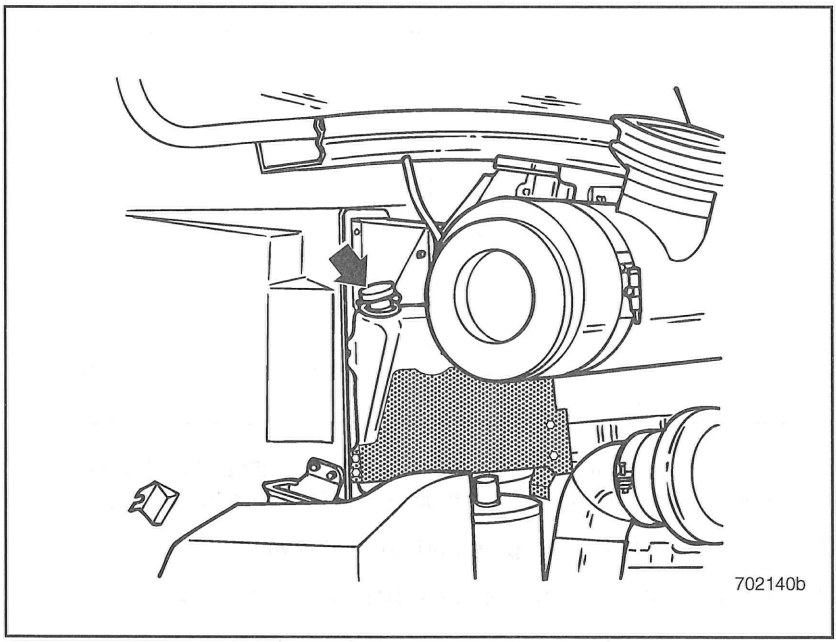
Although this quality-built vehicle has been inspected, lubricated and adjusted at the MACK Trucks Assembly Plant, an occasional air, oil or coolant leak may develop. Quick action to correct these minor items will prevent a major repair later. Take the vehicle to the nearest MACK service center as soon as any abnormal condition becomes evident.

Initial Valve Adjustment Intervals

Refer to the *Maintenance and Lubrication Manual (TS494)* for detailed information concerning the Initial Valve Adjustment Interval.

WINDSHIELD WASHER RESERVOIR

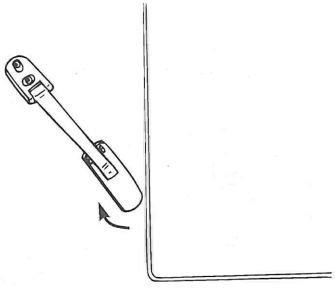
As shown in the drawing below, the windshield washer reservoir is located under the hood, against the rider-side cab bulkhead.



HOOD OPERATION

Opening the Hood

To open the hood, release the locking tabs on each side of the hood.

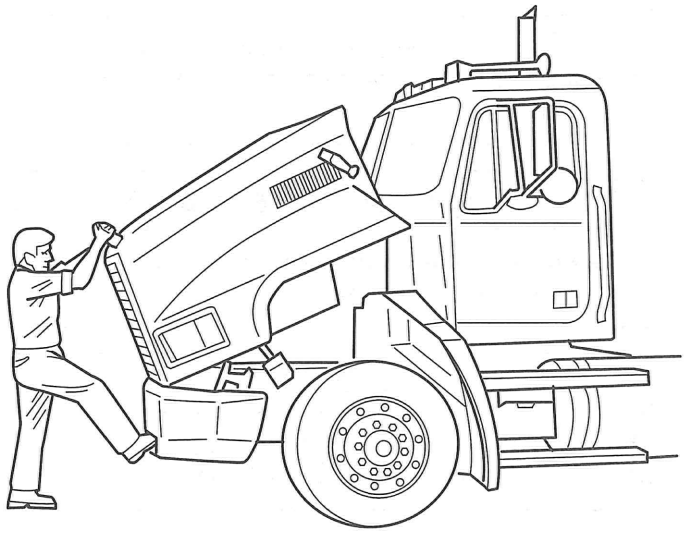


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1. With the hood in the locked position, pull outward on the plastic handle and disengage the locking tab from the hood latch.
2. Swing the rubber strap up and out of the way.
3. Repeat this procedure on the other side of the hood.

NOTE

When the hood is opened, the safety latch will drop down into the locked position.



600030b

4. Using the Bulldog as a handle, pull on the hood to raise it over the engine. You may put one foot on the bumper if necessary.
5. Pull steadily on the hood until it comes over the center and stops fully open.

⚠ WARNING

NEVER take both feet off the ground to tilt the hood. Keep at least one foot on the ground to avoid a slip or fall. If it is difficult for you to raise the hood, get the help of someone who can lift from the rear of the hood.

Closing the Hood

NOTE

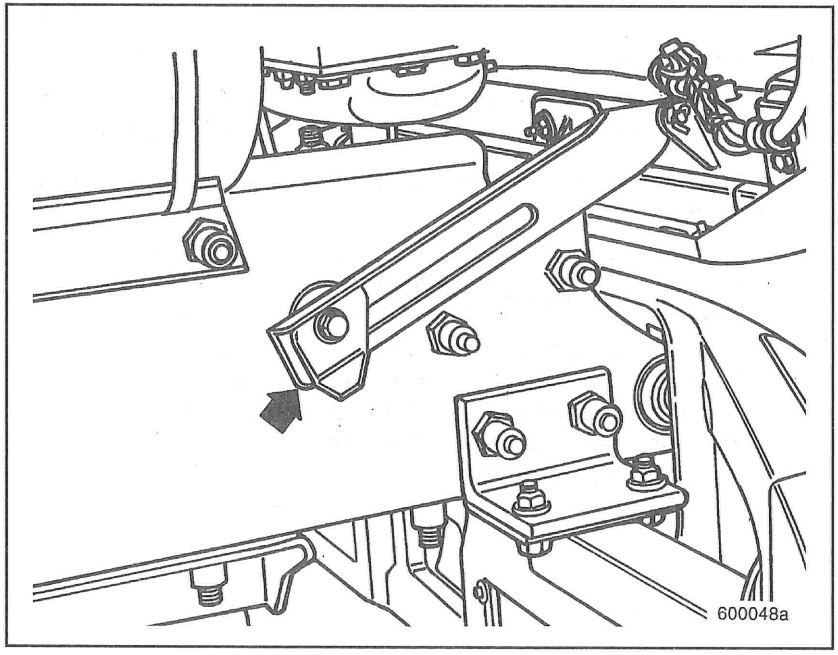
Remember to remove all tools, rags and test equipment from the engine compartment before closing the hood.

⚠ WARNING

Before closing the hood, be sure no one is in the way of the hood's descent.

NOTE

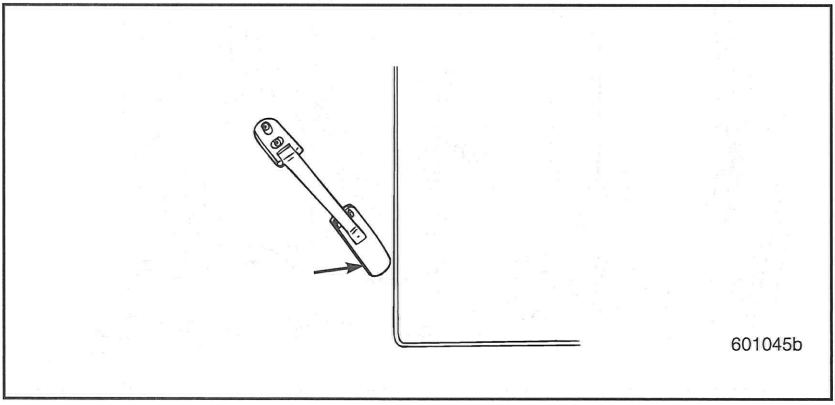
The safety latch must be released (reset) before the hood will close. (See arrow in illustration.)



Locking the Hood

To lock the hood, secure the rubber hold-down straps on each side of the hood.

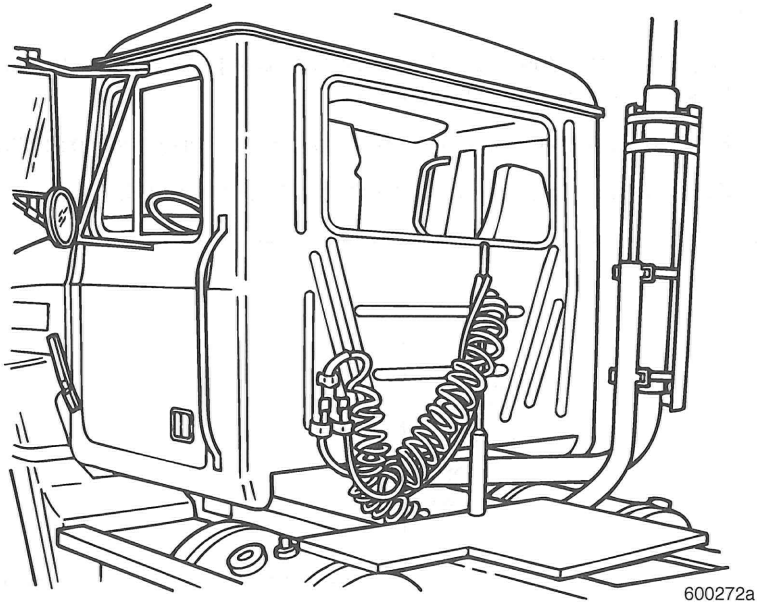
1. With the hood down, set the rubber strap in position and force the locking discs into the hood latch.
2. Push inward on the plastic handle to lock the rubber strap in place.
3. Repeat this procedure on the other side of the hood.



⚠ CAUTION

Be sure the hood is latched securely. If the latch is not completely engaged, the hood could open during operation and cause vehicle damage.

HOSE TENDERS

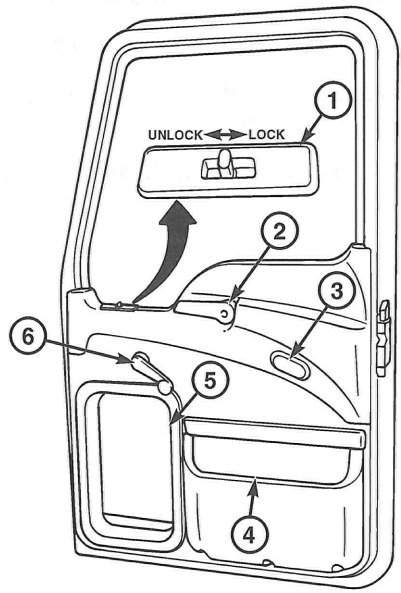


⚠ CAUTION

Avoid loose hoses. Air lines and tractor-to-trailer electrical connections must be secured to the tractor hose tenders (hose hanger, towel bar, pogo stick, etc.) to prevent them from tangling in the driveline.

DOORS

Standard Door Panel

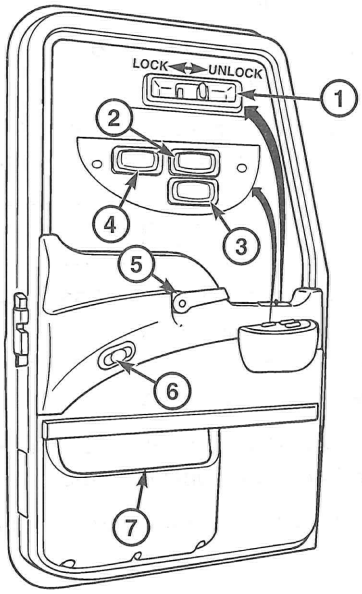


Manual Locks and Windows — Passenger Side (Right) Shown

1. Manual Door Lock 2. Door Handle 3. Door Light 4. Storage Pouch	5. Lower View Window (Passenger Side Only) 6. Window Crank

1. **Manual Door Lock** — Push backward to lock. Push forward to unlock. The lock opening appears red when unlocked.
2. **Door Handle** — Lift handle to open.
3. **Door Light** — The door light automatically comes on when the door is opened and goes out when the door is closed.
4. **Storage Pouch** — Large, rigid storage pouch.
5. **Lower View Window** — Provides safe viewing of low lying obstacles on construction sites.
6. **Window Crank** — Turn counterclockwise to open, clockwise to close.

Power Door Panel (Optional)



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Power Locks and Windows — Driver Side (Left) Shown

1. Manual Door Lock 2. Left Side Power Window Control 3. Right Side Power Window Control	4. Power Door Lock 5. Door Handle 6. Door Light 7. Storage Pouch

1. **Manual Door Lock** — Push backward to lock. Push forward to unlock. The lock opening appears red when unlocked.
2. **Left Side Power Window Control** — Push back of button for DOWN, front of button for UP.
3. **Right Side Power Window Control** — Push back of button for DOWN, front of button for UP.
4. **Power Door Lock** — Push back of button to lock, front of button to unlock. The power lock controls both doors.

> **NOTE**
>
> The right side (passenger) door has a power control for the right side window only.

5. **Door Handle** — Lift handle to open.
6. **Door Light** — The door light automatically comes on when the door is opened and goes out when the door is closed.
7. **Storage Pouch** — Large, rigid storage pouch.

Opening the Cab Door

To open the door, grasp the front of the door handle and pull upward.

Locking the Cab Door

The doors can be locked using the manual door lock (item 1 in the illustration) or a power door lock switch (item 4 in the illustration).

Power door lock switches (on both sides of the cab) lock and unlock both cab doors at the same time. To lock the doors, push the rear of the rocker switch. To unlock the doors, push the front of the rocker switch.

To lock with the door open, push the lock lever forward and release. The lock lever will return to the home position and the door will be locked when closed. To unlock, pull the paddle and open the door.

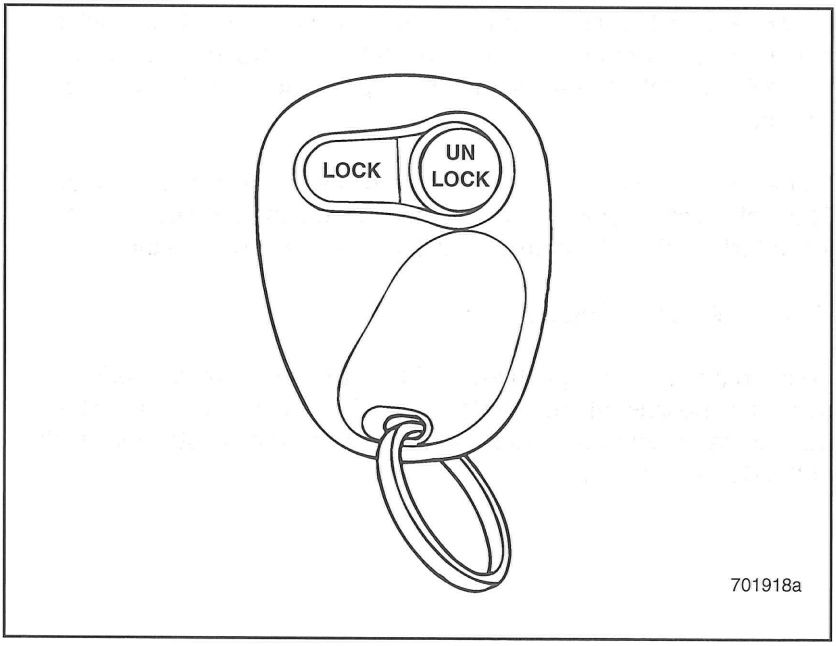
Power Window Regulators

To open the windows, push and hold the rear of the rocker switch (item 3 in the illustration). To close the windows, push and hold the front of the rocker switch. Release the rocker switch to stop the window at the desired position.

REMOTE KEYLESS ENTRY — (OPTIONAL)

This vehicle is equipped with a Remote Keyless Entry system. This system operates by means of a hand-held remote control that locks and unlocks the cab doors.

The remote control door lock transmitters are supplied in pairs; each one is attached to a key ring.



Each transmitter is powered by a 3-volt battery and is water resistant. Information concerning battery replacement, troubleshooting, resynchronization and reprogramming the transmitters is provided in this section.

The receiver in the vehicle is capable of recognizing four transmitters. Replacement transmitters are available; however, they must be programmed to match the specific receiver (refer to the "Reprogramming the Transmitter" section).

Locking and Unlocking the Doors

The door lock/unlock transmitter has two buttons (labeled LOCK and UNLOCK) to control operation of the system. When any one of the buttons is pressed, a coded Ultra-high frequency (UHF) radio signal is transmitted to the receiver in the vehicle.

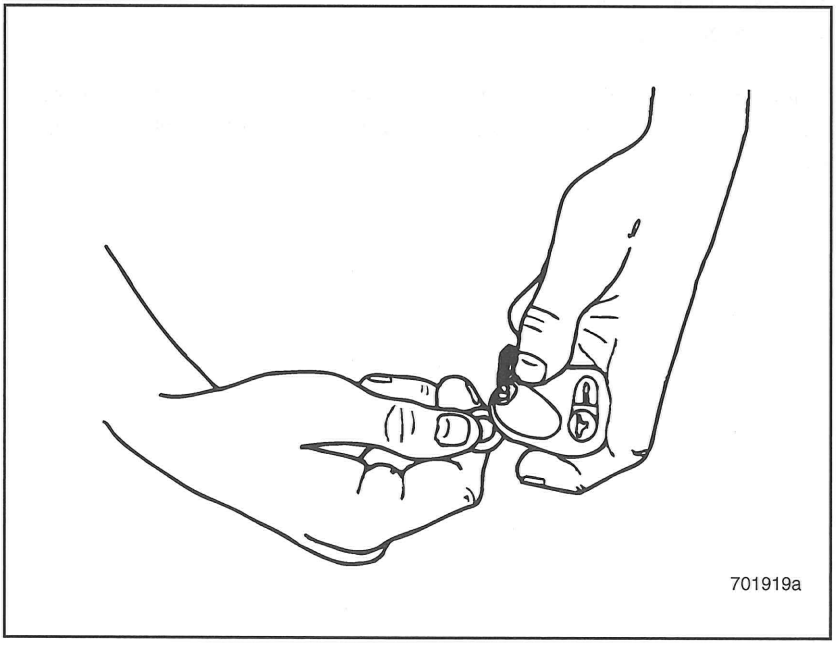
The transmitter must be within approximately 33 feet (10 meters) of the vehicle for the receiver to detect the coded signal. The Remote Keyless Entry system has no effect on the normal operation of the power door locks.

When the UNLOCK button is pressed, all of the vehicle doors will be unlocked. When the LOCK button is pressed, all of the vehicle doors lock at once.

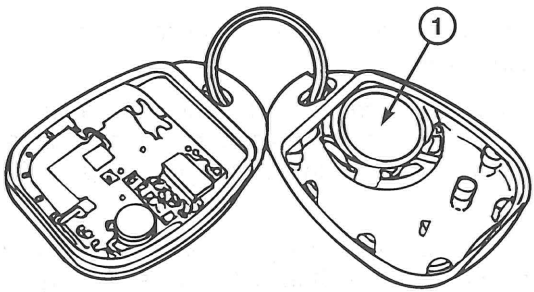
Battery Replacement

Under normal use, the transmitter battery should last approximately two years. When battery replacement becomes necessary, use a Panasonic® 3 volt, type CR2032, or equivalent. Replace the battery as follows:

1. Open the transmitter by inserting a dime between the two halves of the transmitter case (near the key ring hole) and twisting.



2. Remove the battery.
3. Install a new battery with the positive (+) side down.



1. Battery, positive (+) side down

4. Align the transmitter case halves, then snap the case together.
5. Check the operation of the transmitter.

Troubleshooting

The following checks may be used to diagnose any problems which may arise with Remote Keyless Entry system operation. Remember to check all transmitters.

1. Before attempting any other steps, resynchronize the transmitters to the receiver in the vehicle. Refer to the "Resynchronization" section.

NOTE

The Remote Keyless Entry system will not operate if there are any metal objects between the transmitter and the vehicle. While performing these checks, park the vehicle outdoors and as far away as possible from any metal objects.

2. Lower the windows, turn the ignition key to the OFF position and close the doors.

3. Stand near the driver's side door, aim the transmitter at the vehicle and operate both functions of the transmitter. Repeat for all transmitters, if applicable.
   - If a single function on one transmitter is inoperative, replace the transmitter.
   - If both functions on any of the transmitters are inoperative, reprogram all transmitters and repeat the troubleshooting procedures. Refer to the "Reprogramming the Transmitter" section.
   - If one transmitter cannot be programmed, replace the battery in the transmitter. Refer to the "Battery Replacement" section.
4. If all functions on all transmitters operate, stand approximately five feet from the vehicle (at several points around the vehicle), and check the operation of all transmitters at each point.
   - If one transmitter does not operate at some point where another transmitter does operate, replace the battery in the transmitter that does not operate.
   - If all transmitters operate approximately five feet from the vehicle, the system is operating properly and no repairs should be attempted.

Resynchronization

The Remote Keyless Entry system employs a security method that continually modifies the frequency of the transmitter signal; this prevents the possibility of recording and playing back the signal from the transmitter. Because the transmitter does not send the same signal twice, and the receiver will not respond to a signal it has been sent previously, resynchronization of the transmitters may be necessary.

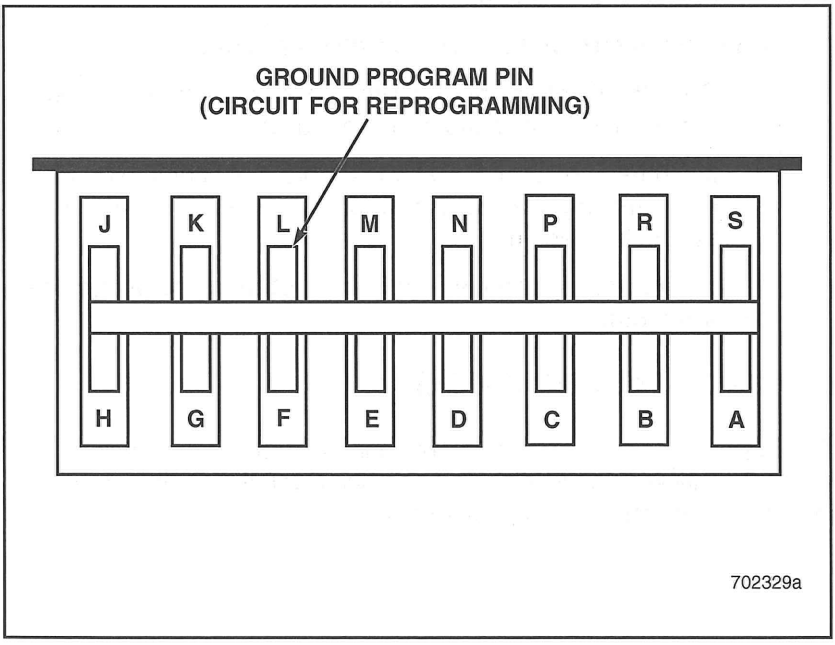
Resynchronization will be necessary if:

1. The transmitter battery is changed.
2. The vehicle battery is disconnected.
3. The transmitter buttons have been pressed 250 times with the transmitter out of range of the receiver.

To resynchronize the transmitter with the receiver, stand close to the vehicle and simultaneously press and hold the LOCK and UNLOCK buttons for five seconds. The door locks should cycle to confirm resynchronization. Resynchronization only works if the transmitter is already programmed.

Reprogramming the Transmitter

1. Turn the ignition switch to the OFF position.
2. Install a jumper between pin "L" of the keyless entry module connector and a good ground (see the following figure). The module and connector are located inside the cab, behind the kick panel on the passenger side of the vehicle. Within one second, the door locks will lock and unlock to indicate that the module is ready to be reprogrammed.



3. Cycle the ignition (turn the key ON and then OFF once).

4. Press and hold the LOCK and UNLOCK buttons on the key chain transmitter for 10 seconds. The door locks will cycle one time (lock and unlock) to indicate that the transmitter has been successfully programmed.
5. Repeat Step 4 to reprogram the remaining transmitters.
6. When finished, remove the jumper wire from the keyless entry module connector and the ground.

Common Programming Mistakes

1. **Transmitter buttons are not depressed properly.**
   - — LOCK and UNLOCK buttons must be depressed firmly for the full 10-second duration.
   - — If, after approximately 14 seconds, there is no response, try depressing the buttons again.
2. **All transmitters must be programmed together.**
   - — Once the first transmitter is programmed, all other previously programmed transmitters will be erased.
   - — If you remove ground from the program pin before you finish programming other transmitters, you must reprogram all transmitters again.
3. **Make sure other people in range are not trying to program at the same time.**

HEATED SEAT (OPTIONAL)

If the vehicle is equipped with the optional heated seat which is available only with the MACK Performance Seat, the controls are located on the inboard side of the seat.

SWIVEL SEAT (OPTIONAL)

Both the driver-side and passenger-side seats can be swiveled 180° inboard. (See drawing and instructions that follow.)

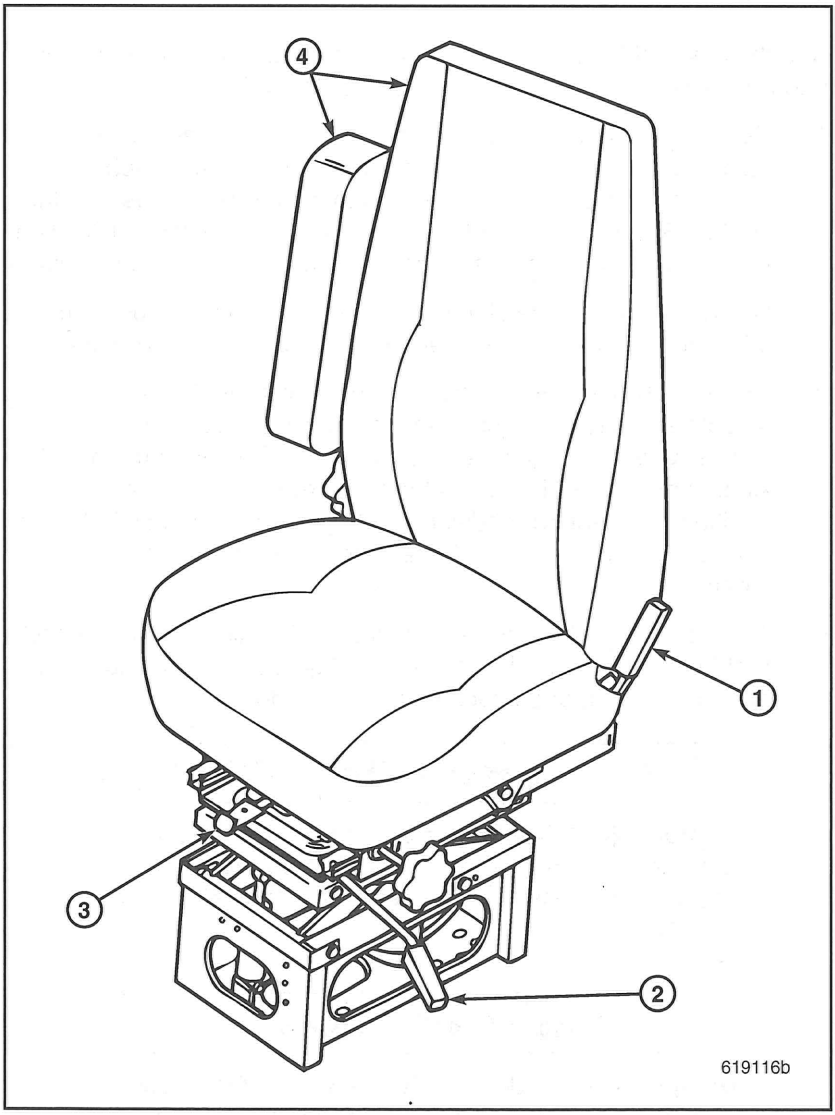
1. **Recliner Handle** — Before attempting to swivel, adjust the seat back to near-vertical position using the lever or turn knob provided. After the seat is swiveled into the desired position, the seat back may be reclined to a more comfortable angle. (Position driver's seat away from steering wheel to allow maximum recline.)
2. **Swivel Latch** — Unlatch by moving handle. Swivel inboard up to 120°. Handle may be released after the seat begins to swivel.
3. **Fore/Aft Adjustment Lever** — Fore (forward)/aft (backward) adjustment may be required to provide clearance for the seat to swivel. Move the adjustment knob to slide the seat fore and aft. After seat back and arm rest have cleared B-pillar, seat fore/aft position may require readjustment to provide clearance between knees and gearshift or dashboard and between seat back and steering wheel.
4. **Arm and Back Clearance** — As the seat begins to swivel, check that the seat back and armrest do not get hung up on the curtain or shoulder belt, or contact the B-pillar or door.

⚠ WARNING

Do not adjust the driver's seat while the vehicle is moving. After adjusting the seat and before driving off, ensure that the seat is firmly latched in position.

⚠ WARNING

Do not drive or ride with the seat reclined. In case of a sudden stop, a person in a reclined position may slide under the seatbelt.



Left Driver Seat Shown

1. Recliner Handle	3. Fore/Aft Adjustment Lever
2. Swivel Latch	4. Arm and Back Clearance

MACK ENGINE INFORMATION

For engine starting procedures, refer to "STARTING THE VEHICLE" on page 161.

Precautions and Warnings

⚠ CAUTION

If a winterfront is required, use only a MACK-approved winterfront that was designed for this specific chassis.

⚠ CAUTION

Be sure to avoid high intake/exhaust temperatures when using winterfronts or shutters under normal operating conditions (above freezing). The restriction of airflow can cause higher exhaust temperatures, power loss, excessive fan usage and reduced fuel economy.

⚠ CAUTION

When using a winterfront, a MACK-approved exhaust pyrometer must be installed and closely monitored while the engine is in operation. Do NOT exceed the maximum temperature indicated by the red line on the gauge. To reduce exhaust temperature, downshift or reduce engine power and open the winterfront.

⚠ CAUTION

Do not permit a heavy load to drive the engine above the governed speed. Operate in a gear low enough to allow the engine to accelerate to (or maintain) governed speed when applying the throttle.

⚠ WARNING

Misuse or modification of a turbocharger can result in serious injury and property damage. In addition, extreme care must be taken to avoid foreign material induction, excessive exhaust temperatures and lack of lubrication.

Engine Model Designations

The MACK engine model designation system uses letters and numbers to provide a complete unit description.

Prefix Letters and Numbers:

- ASET™ = Application Specific Engine Technology
- AI = MACK Turbocharged Diesel Engine — Internal Exhaust Gas Recirculation
- AMI = MACK Turbocharged Diesel Engine — Maxidyne Internal Exhaust Gas Recirculation (high torque rise)
- AC = MACK Turbocharged Diesel Engine — Cooled Exhaust Gas Recirculation
- Digits = Rated Gross Horsepower (BHP)

Engine Operating Range

Please refer to the Operating Instructions Label on your vehicle's sun visor.

MACK POWERLEASH™ ENGINE BRAKE (IF EQUIPPED)

NOTE

If your vehicle is equipped with a Jacob's engine brake, please refer to the Jacobs Engine Brake Manual supplied with the vehicle for complete operating instructions.

Engines may be equipped to be PowerLeash™ upgradeable. These engines will be equipped with PowerLeash™ camshaft. These engines are identified on the engine information sticker.

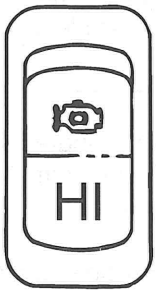
If your vehicle is equipped with the MACK PowerLeash™ Engine Brake, it is important that you take the time to become familiar with your engine brake before putting it into operation.

⚠ WARNING

Operation of any vehicle on wet or slippery roads requires extreme caution. Because the engine brake converts the engine to a retarding device, it should NOT be used on wet or slippery roads if the vehicle has a single driving axle or if it has tandem driving axles that are lightly loaded. Use of an engine brake under these conditions can cause the vehicle to skid or a combination vehicle to jackknife.

Engine Brake Switch

The Engine Brake switch is located on the dashboard. The Engine Brake switch is a three-position switch located on the instrument panel.



Engine Brake Switch

HI	Full Engine Braking Power
LO	Half Engine Braking Power
OFF	No Engine Braking Power

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To operate the vehicle without the engine brake active, leave the dash-mounted switch in the OFF position.

⚠ CAUTION

Engine Stalling and potential engine damage can result from operation of the engine brake at cold oil temperatures. Vehicles equipped with an Engine Brake have also been equipped with a V-MAC® control feature that will prevent engine brake activation until the engine coolant reaches a temperature of at least 125°F (52°C). The driver should be alert to the fact that the engine brake will not function until sufficient warm-up time has elapsed, regardless of the dash switch setting.

How the Engine Brake is Activated

When the engine brake is "enabled" (switch in either LOW or HIGH position), your engine V-MAC® electronic control system commands engine brake power (engine brake "active") only when the following conditions are true:

- The foot-operated engine accelerator pedal is not depressed.
- The clutch pedal is not depressed (manual shift transmissions only).
- The engine speed is at least 900 rpm.

If the engine brake is active, the engine brake will automatically be deactivated by depressing either the accelerator or the clutch, or if the engine speed drops below 900 rpm. As soon as all of the engine brake "active" conditions are again true (taking your foot off the accelerator, for example), the engine brake will again be activated. In order to disable the engine brake, simply return the dash-mounted control switch to the OFF position.

⚠ DANGER

The engine brake should never be considered a substitute for the vehicle service brakes. The service brakes should always be maintained in good working order, and should always be viewed as the primary vehicle slowing system. Service brakes are always used to bring the vehicle to a complete stop.

Cruise Control with the MACK PowerLeash™ Engine Brake

When the MACK PowerLeash™ Engine Brake is enabled at the same time your V-MAC® cruise control is in use, the engine brake automatically activates when necessary to slow the vehicle to the cruise set point speed. You can select one of two possible options:

- The engine brake is activated 2 mph above the cruise set point.
- The engine brake is activated as soon as cruise control commands fueling to zero (vehicle has just reached cruise set point and fuel has been turned off).

The first option is the more popular choice for highway use and is the default mode. Consult your V-MAC® IV Operator's Manual for more information about this option. Your local MACK dealer can change the current selection.

The engine brake's ability to control maximum vehicle speed is limited to the selected retarding power of the engine brake. If the engine brake dash-mounted control switch is set to the LOW position, only half of the available braking power is used. If the dash-mounted control switch is set to the HIGH position, the cruise control invokes full engine brake power.

NOTE

Deactivating the cruise control function does not disable the engine brake.

The MACK PowerLeash™ Engine Brake may be activated or deactivated by other vehicle systems such as ABS and Headway control systems. Refer to the literature concerning these systems for additional information.

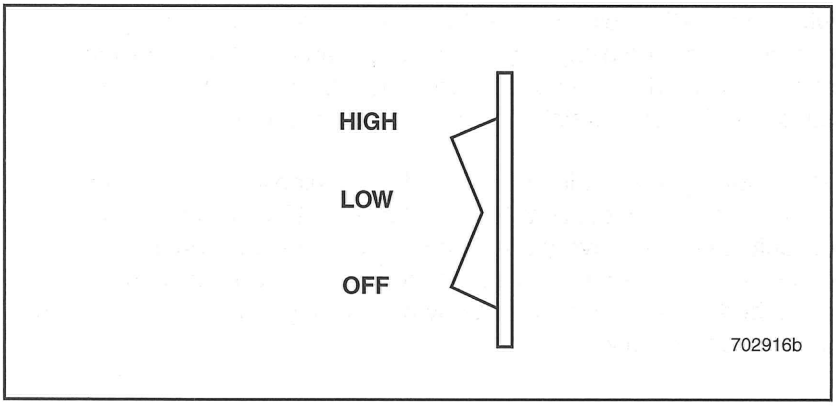
ON THE ROAD WITH THE MACK POWERLEASH™ ENGINE BRAKE

If you are not familiar with the use and operation of a heavy-duty diesel engine brake, it is essential that you read the following section carefully. It is very important that you take the time to gain experience with your MACK PowerLeash™ Engine Brake in good driving conditions, before using it in difficult or hazardous driving conditions, such as steep descents or slippery roads. Of course, there is no substitute for driver training by a qualified specialist.

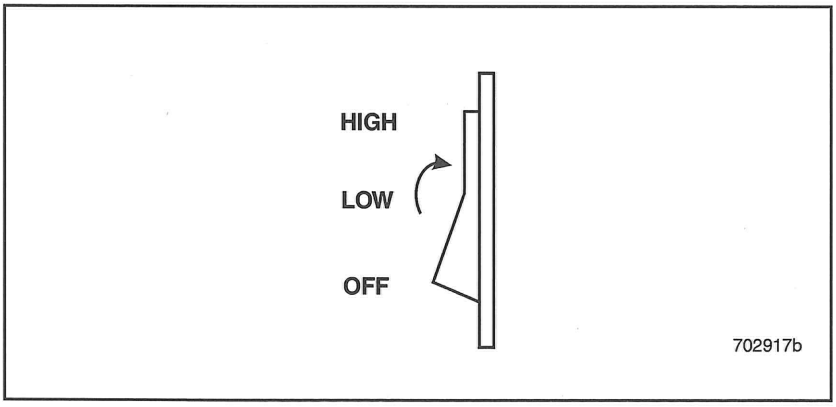
The following information is intended as a guideline to safe and appropriate use of the MACK PowerLeash™ Engine Brake. It is difficult to describe every possible driving condition. Certain circumstances may require a more conservative approach than will be described. When encountering any new driving route or situation, err on the side of caution.

Over Flat Terrain

The LOW power position is likely adequate to control vehicle speed in situations where the roadway is relatively flat or has modestly graded rolling hills, and if total vehicle weight is light.



As grades and vehicle weight increase, it will be necessary to use the HIGH position.



Descending a Grade

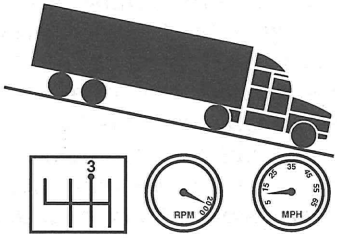
⚠ DANGER

The MACK PowerLeash™ Engine Brake assists you in establishing faster downhill descent speeds than in a similarly configured and loaded vehicle without an engine brake; nevertheless, even with an engine brake, there are limits to the maximum vehicle speed at which you can travel on downhill grades and still keep your vehicle safely under control. Always approach these situations with caution, and gain the experience necessary for each grade and driving condition to determine the appropriate downhill descent speed.

For a certain vehicle and load condition, a "control speed" may be established for a given descent. The control speed is the vehicle speed at which the retarding forces of air drag, rolling resistance and engine brake power are equally balanced by the natural force of gravity that causes the vehicle to accelerate down the hill, resulting in a steady, controlled vehicle speed. The additional vehicle slowing power offered by the MACK PowerLeash™ Engine Brake allows the driver to descend the hill in a higher gear than normal (at a faster control speed), without overspeeding the engine.

For example, consider that you are descending a grade with a specific vehicle and an assumed total vehicle weight. You will find that without an engine brake, you must descend this grade in third gear to maintain a steady 10 mph at 2,000 engine rpm, without the need to apply the service brakes.

DESCENT SPEED WITHOUT MACK ENGINE BRAKE



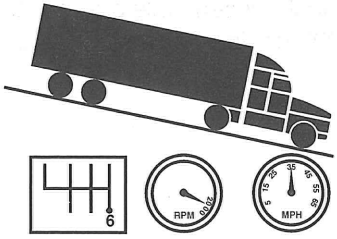
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Switch the MACK PowerLeash™ Engine Brake to the HIGH position, and now it is possible to descend the same grade in sixth gear to maintain a steady 35 mph at 2,000 engine rpm.

⚠ CAUTION

The maximum allowable engine speed is listed on the Warning label on the sun visor. Do NOT exceed the maximum allowable engine speed.

DESCENT SPEED WITH MACK ENGINE BRAKE



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In any gear selection higher than sixth gear (in this example), it would be necessary to occasionally apply the service brakes to maintain a safe vehicle speed and to avoid overspeeding the engine.

⚠ DANGER

As with any vehicle, regular and excessive application of the service brakes during a downhill descent can lead to a brake lining overheat condition, resulting in a very dangerous loss of service brake retarding capability.

NOTE

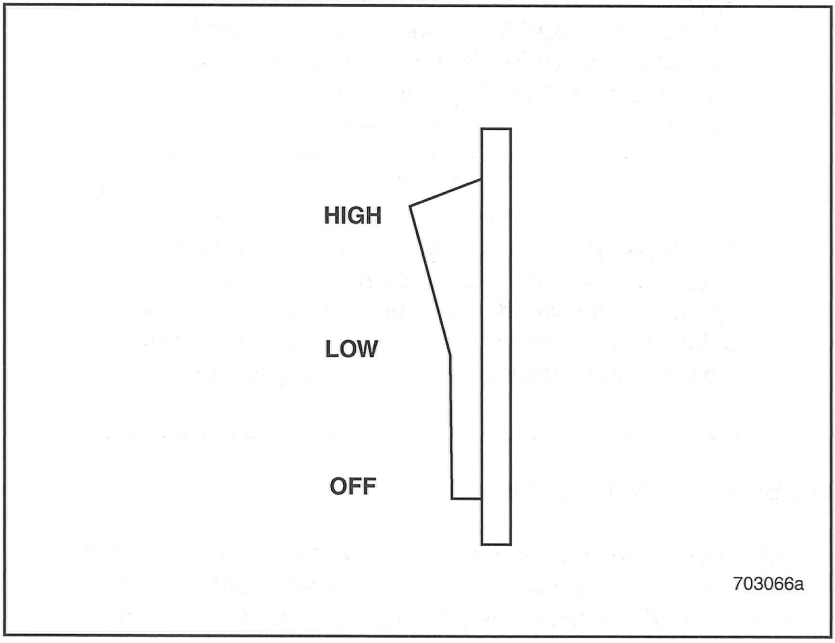
The previous figures apply only to this hypothetical example. Specific vehicle control speeds and engine speeds for a given descent are dependent upon the actual vehicle and engine configurations, the gross weight of the vehicle, and the percent grade of the road.

On Slippery Road Surfaces

As with many aspects of operating a heavy-duty vehicle, special care should be taken when using the MACK PowerLeash™ Engine Brake on slippery road surfaces. The potential for unpredictable loss of vehicle traction is a serious concern; in some situations the engine should not be used at all.

As always, approach untested driving conditions with caution. Avoid use of the MACK PowerLeash™ Engine Brake in these situations until you have gained some experience under normal driving conditions.

As a rule, make sure that the vehicle is demonstrating good tractability with the engine brake off before checking for tractability with the engine brake enabled. Then, provided traffic conditions are safe for "testing" tractability, switch the MACK PowerLeash™ Engine Brake to the LOW position. If the vehicle shows any signs of loss of control (ABS activation or vehicle swerving, for example), immediately switch the engine brake back to the OFF position.



Only if the vehicle demonstrates good control in the LOW position (again, only in safe driving conditions) should you test in the HIGH position, if desired. Return to the LOW position and proceed with caution if there is any sign of loss vehicle control.

NOTE

Always monitor vehicle tractability in slippery road conditions, and make adjustments to engine brake switch position and vehicle speed as necessary. Always test the LOW power position setting before moving to the HIGH position.

Your MACK PowerLeash™ Engine Brake and ABS control systems are designed to work together for optimized vehicle control. The engine brake function may be modified or interrupted briefly in the event of pending wheel lock.

⚠ CAUTION

Do not enable the MACK PowerLeash™ Engine Brake during bobtail operations, or when operating on slippery roads with an empty or lightly loaded trailer.

CRUISE CONTROL OPERATION

Speed Control Switches

Resume/Set Switch — Allows the driver to set and resume cruise control.

> **NOTE**
>
> In most cases, the Speed Control switch must be in the ON position in order to use the Resume/Set switch. However, when the Initial Set Using Resume Switch feature is enabled, cruise control can be activated using the Resume/Set switch.

The Resume/Set switch also functions as the Accel/Decel switch. Usually the Resume position (press the top) corresponds to an increase in engine speed (Accel) and the Set position (press the bottom) corresponds to a decrease in engine speed (Decel). However, V-MAC can be programmed so that the reverse is true.

> **NOTE**
>
> Under specific circumstances this switch can also be used to activate cruise control. For details concerning the Initial Set Using Resume Switch feature, refer to the *V-MAC Support Software User's Guide*.

Speed Control Switch — Activates the cruise control system.

Setting Cruise Control

1. Engage the clutch (if equipped).
2. Move the Speed Control switch to the ON position.
3. Increase engine speed using the accelerator pedal.
4. At the desired speed, press and release the Resume/Set switch. This speed is now programmed and will be automatically maintained.

NOTE

To increase the engine speed, press and hold the Accel switch until the desired speed is attained, or press the accelerator pedal until the desired speed is attained and then press and release the Set switch.

Disengaging Cruise Control

To turn off the cruise control system, move the Speed Control switch to the OFF position.

NOTE

If the Speed Control switch is moved to the OFF position, the process of setting cruise control must be repeated in order to re-activate cruise control (unless the Initial Set Using Resume Switch feature is enabled).

To temporarily disengage cruise control, disengage the clutch or apply the service brakes.

NOTE

If cruise control is temporarily disengaged using the clutch or service brakes, press the Resume switch to resume the previously programmed speed.

BRAKE OPERATION

Air Brake System

This chassis features a dual braking system which has two complete air circuits: a primary circuit for rear brakes and a secondary circuit for front brakes. Each circuit receives air from separate reservoirs. Although there are two air circuits, they operate as one brake system through the dual-circuit treadle valve. This provides the driver with easy, graduated control when applying and releasing the brakes.

The air pressure in the two circuits is monitored by gauges on the instrument panel. When air pressure drops below 75 ± 5 psi (517 ± 34 kPa) in either system at any time other than vehicle startup, pull to the side of the road and determine the problem. If air pressure continues to drop below 40 ± 5 psi in BOTH systems, spring brakes will automatically apply. The Low Air Pressure Warning indicator and buzzer will be activated if low air pressure occurs in either circuit.

In tractor applications, the Trailer Supply Valve (red octagonal knob) will automatically pop out and the trailer spring brakes will apply when system pressure reaches approximately 70 psi, in the event of a trailer breakaway, sudden trailer air line failure or a slow leak in the trailer air system. This protects the tractor air system from further pressure loss.

If the Trailer Supply Valve is held in, in an attempt to override application of the trailer spring brakes, the Park Brake Valve (yellow diamond knob) will automatically pop out and apply the parking brakes when system pressure drops to approximately 20–30 psi.

The air brake system consists of three main elements:

- The compressor, governor and reservoirs supply and store the air pressure.
- The brake application valve controls the brake application pressures.
- The brake chambers control the brake mechanism.

Air Brake Operation

⚠ CAUTION

Avoid sudden stops. Constant, sudden stops may negatively affect the performance of braking and driving parts.

When slowing for a stop, leave the clutch engaged for as long as possible to use the braking effect of the engine. When forward speed has dropped to a little above idling speed, push clutch pedal in and brake to a complete stop.

Automatic Slack Adjusters

Automatic slack adjusters are designed to automatically maintain proper brake chamber pushrod travel and compensate for brake lining wear during normal use. Manual adjustment of an automatic slack adjuster should never be performed except when performing brake or wheel service (such as backing off the brake shoes for wheel removal, brake shoe relining/replacement, brake drum reconditioning, etc.).

When pushrod travel exceeds specifications (as given in the "BRAKE ADJUSTMENT" section of the *Maintenance and Lubrication Manual*, TS494) on a vehicle equipped with automatic slack adjusters, a mechanical problem with the slack adjuster, brake components or improper installation of the slack adjuster is indicated. If brakes are found to be out of adjustment, the vehicle must be taken to the nearest repair facility as soon as possible to have the problem investigated and corrected.

⚠ CAUTION

Automatic slack adjusters should not be manually adjusted in an effort to correct excessive pushrod stroke, because this condition indicates that a problem exists with the automatic adjuster, with the installation of the adjuster, or with related foundation brake components, which manual adjustment will not fix. Manual adjustment of automatic slack adjusters is a dangerous practice that could have serious consequences, because it gives the operator a false sense of security about the effectiveness of the brakes, which are likely to go out of adjustment again soon.

Parking Brake System

Spring-type parking brakes are standard on all single and tandem rear axles.

The spring brake system consists of an air cylinder with heavy springs, which is integrated with the spring brake air chamber. When there is no pressure in the air chamber, the springs expand (causing a brake application). When air pressure is applied to the air chamber, the springs are compressed (releasing the brakes).

Parking Brake Operation

The parking brakes can be applied and released from the cab, using the hand-operated push/pull control valve with the yellow diamond knob.

In the event of a significant air pressure loss in both the air brake systems, the spring brake air chambers will be automatically exhausted (applying the brakes). The parking brakes will remain applied until enough pressure is available to recompress the springs.

⚠ WARNING

- **NEVER use the trailer parking brake system alone.**
- **NEVER use the tractor parking brake system alone.**
- **ALWAYS use the tractor and trailer parking brake systems together.**
- **NEVER use the rear service brakes for parking.**
- **ALWAYS apply the parking brakes when parking and make sure the parking brakes are holding the vehicle from moving before leaving the driver's seat.**
- **When parking on a grade, use wheel chocks under the rear wheels or turn the front wheels to the curb. Do not leave diesel engine vehicles in gear; if the vehicle should move, the engine may start by heat of compression.**
- **Check brake adjustment frequently to be sure that the brakes will lock and hold the vehicle when parked.**
- **Do not use the parking brake to slow or stop the vehicle when in motion, except in an emergency.**
- **Do not use hand control valve for parking.**

Anti-Lock Brake System (ABS)

NOTE

Anti-lock brake systems became mandatory in the U.S.A. on all tractors beginning March 1, 1997; all trucks beginning March 1, 1998, and all trailers beginning March 1, 2001. Federal regulations require that any tractor/truck with a trailer air connection built beginning March 1, 2001 must have a data communications link with the trailer ABS and an indicator lamp located in the cab to alert the driver if there is a trailer ABS malfunction.

ABS Operation

When operating an ABS-equipped vehicle, the following guidelines should be used.

- Apply the brakes as normal. If the anti-lock brake system begins to function, maintain brake pressure. Do NOT release the brakes.
- Avoid rapidly pumping the brakes. The anti-lock brake system automatically applies and releases the brakes up to five times per second.
- When towing a trailer, watch the trailer through the mirrors. Adjust brake application as necessary to keep the combination in a straight line. Make sure the trailer follows the tractor properly.
- An amber trailer ABS lamp on the instrument panel will illuminate for several seconds at start-up during an initial function check. When a trailer ABS fault occurs, the lamp will remain illuminated until the fault is cleared. If there is a loss of communication between the tractor and trailer, the lamp will blink three times.

Rollover Stability Control (If Equipped)

⚠ CAUTION

Aftermarket steering wheels must not be used on vehicles equipped with the Bendix ESP system. Only OEM-supplied replacement steering wheels should be used. During any service procedure that involves reinstallation or replacement of the OEM steering wheel, use care not to crush or damage the ESP steering angle sensor.

Rollover Stability Control is an optional device that is wired into the existing ABS system and, in the event of sensing a rollover situation, applies and releases the rear and trailer axle brakes to reduce the possibility of rollover. Please refer to the applicable vendor manual for more information.

Enhanced Stability Program

Enhanced Stability Program (ESP) is an optional system that uses existing ABS and ATC components with the addition of electronic sensors and brake valves. The system will automatically apply and release individual brakes to improve vehicle control when extreme conditions are detected. In the event a pending rollover situation is sensed, the system applies all brakes to reduce vehicle speed to lessen the possibility of rollover. Please refer to the applicable vendor manual for more information.

Precautions When Installing Electrical Equipment

Connecting electrically powered or electrically controlled equipment to the vehicle may cause interference with other vehicle components (e.g., the ABS system). The amount of interference will depend on the operating frequency of any new signals and the degree to which transient signals are coupled into the vehicle system.

NOTE

Whenever new electrical equipment is installed, it is the obligation of the installer to ensure that the new equipment does not interfere with the proper operation of all other electrical systems on the vehicle.

If new electrical equipment is installed, a vehicle checkout procedure should be performed.

1. Perform the checkout procedure under the following conditions:
   - Engine running
   - Brake system air pressure in operating range
   - Vehicle stationary
   - Brake pedal fully depressed
2. Operate the new equipment under all starting, running and shutdown conditions.
3. Listen for signs of air exhausting from ABS modulator valves (which is an indication of an interference condition).
4. Correct all interference conditions before operating the vehicle.

NOTE

The center pin of the standard seven-pin trailer electrical connector has been standardized as the dedicated connection for uninterrupted power for trailer ABS. This pin is always hot when the tractor ignition is turned on.

⚠ DANGER

Some trailers manufactured prior to the trailer ABS regulations may use the center pin to power certain trailer auxiliary equipment. The possibility exists that this auxiliary equipment may be unexpectedly activated by the truck or tractor electrical system, resulting in personal injury or damage to equipment. Caution must be used when connecting the trailer electrical connector to ensure that power to the center pin will not unintentionally activate any trailer auxiliary equipment.

Automatic Traction Control (ATC) (If Equipped)

Automatic Traction Control (ATC) provides improved traction on slippery surfaces by reducing wheel spin. The system operates automatically as follows:

- If a drive wheel starts to spin, ATC applies air pressure to the brake of the spinning wheel. Doing this transfers engine torque to the wheels that have better traction.
- If all drive wheels are spinning, ATC limits engine torque which, in turn, reduces wheel spin to provide improved traction.

When ATC automatically becomes active, the ATC indicator lamp turns on to alert the operator. The lamp turns off when the wheel(s) stops spinning.

Heavy Mud/Snow Function (If Equipped)

ATC may also include a heavy mud/snow function which allows the operator to activate ATC when additional traction is needed. This function is activated with the ATC mode switch which is located on the dashboard. The heavy mud/snow function increases available traction by increasing permissible wheel spin.

When the operator selects the heavy mud/snow function, the ATC indicator lamp blinks continuously. The ATC lamp stops blinking when the ATC mode switch is turned off.

⚠ CAUTION

Be sure to deactivate the heavy mud/snow function when no longer needed. Continued operation with the heavy mud/snow function active will result in vehicle damage. If after a reasonable amount of time (no more than five minutes) the vehicle is still not moving, deactivate the ATC and put on chains.

GOOD DRIVING HABITS

Weight Ratings

Do not overload the vehicle. The gross vehicle weight rating (GVWR) and gross axle weight ratings (GAWR's) for a given model may vary due to the tires, wheels/rims, suspensions, axles and/or frame of a specific vehicle. For safety and durability reasons, do not exceed the GVWR and GAWR's listed on your vehicle's Safety Certification Label.

Instruments

Glance at the instruments frequently. When problems develop, take prompt steps to correct them.

Shutting Down the Engine

After a hard run, allow the engine to idle three minutes before shutdown to stabilize the temperature of all engine parts. Quick shutdowns can cause engine damage and prevent the turbocharger from being properly lubricated. For additional options, see "Shutting Down the Engine" on page 169.

Parking

⚠ WARNING

WHEN PARKING A VEHICLE:

- **NEVER use the trailer parking brake system alone.**
- **NEVER use the tractor parking brake system alone.**
- **ALWAYS use the tractor and trailer parking brake systems together.**
- **NEVER use the rear service brakes for parking.**
- **ALWAYS apply the parking brakes when parking and make sure the parking brakes are holding the vehicle from moving before leaving the driver's seat.**
- **When parking on a grade, use wheel chocks under the rear wheels or turn the front wheels to the curb. Do not leave diesel engine vehicles in gear; if the vehicle should move, the engine may start by heat of compression.**
- **Check brake adjustment frequently to be sure that the brakes will lock and hold the vehicle when parked.**
- **Do not use the parking brake to slow or stop the vehicle when in motion, except in an emergency.**
- **Do not use the hand control valve for parking.**

General Observation

Make it a habit at stops to walk around your truck and look for fuel, oil and coolant leaks. Also check the condition of tires, wheel nuts, springs and lights. Stop trouble before it stops you!

STARTING THE VEHICLE

NOTE

Consult the appropriate vendor engine manual if your vehicle is not equipped with a MACK engine.

General Information

Before putting the key in the ignition switch, set the parking (spring) brake, disengage the clutch (if equipped) and put the transmission in NEUTRAL.

⚠ CAUTION

Do not engage the starting motor too soon after an incomplete start of the engine, or the starter may be damaged. Wait at least five seconds before attempting to restart the engine.

⚠ CAUTION

Do not rev the engine at start-up. Turbocharger damage may result because lubricants need time to establish a film between moving parts.

⚠ CAUTION

If the engine does not start immediately, limit cranking periods to 30 seconds to avoid overheating and damaging the starter.

Push Button Starters

Put the key in the ignition switch. Turn the key clockwise to the first "click" (about two o'clock position) to activate the instruments. Depress the starter button and release as soon as the engine starts. Keep the clutch (if equipped) disengaged until the engine runs smoothly.

Air Starters

On chassis equipped with an air starter, make sure that the air pressure gauge reads a maximum of 120 psi before shutting down and parking for the night. This will ensure sufficient air pressure for restarting the engine.

⚠ WARNING

Make sure clutch is depressed and transmission is in neutral before engaging the starter! Failure to do so could cause the vehicle to jerk forward unexpectedly causing serious damage or bodily harm.

Starting ASET™ Engines

Use the following procedure:

1. Crank the engine until it starts.

NOTE

Throttle pedal position is not important during cranking.

⚠ CAUTION

DO NOT engage the starting motor too soon after an incomplete start of the engine, or the starter may be damaged. Wait at least five seconds before attempting to restart the engine.

If the engine does not start immediately, limit cranking periods to 30 seconds to avoid overheating and damaging the starter.

DO NOT rev the engine at start-up. Turbocharger damage may result. Lubricants need time to establish a film between moving parts.

2. After the engine has started, warm the engine until the coolant temperature reaches normal operating range (170°F to 225°F; 77°C to 107°C). Once the engine reaches this temperature, it can be operated in a normal fashion.

NOTE

Warm-up time can be reduced by increasing engine idle speed between 1000 and 1200 rpm by either applying the throttle pedal or by using the Electronic Hand Throttle feature (if equipped).

NOTE

For bobtail or unloaded applications, the engine may be warmed up by moving the vehicle with "light" throttle application after only one minute of idle.

Priming the MACK ASET™ Fuel System

⚠ CAUTION

The only acceptable method of priming the fuel system is the hand-primer pump. The application of air pressure to the fuel tank or the use of an auxiliary pump to prime the fuel system is PROHIBITED. These priming techniques may result in severe engine damage caused by leakage of fuel past the supply pump seal and into the crankcase.

Priming the fuel system is usually only necessary when the fuel system has run dry or when changing fuel filters. If the hand-priming pump is needed, use the following procedure:

FIRST — PRIME THE FUEL FILTER(S)

1. Remove, fill and reinstall the primary and secondary (if applicable) fuel filters.
2. Disconnect the inlet hose at the secondary fuel filter.
3. Hand-prime until fuel is seen at the inlet hose fitting. This should take approximately 50 hand pumps.

NOTE

Excessive hand priming after fuel is seen at the fitting may make the engine difficult to start.

4. Reconnect the inlet hose to the secondary fuel filter and crank the engine.

SERVICE HINT

If the engine does not start, refill both filters and repeat priming procedure outlined in Steps 2, 3 and 4.

NOTE

Do not crank the engine continuously for more than 30 seconds without allowing the starter to cool for two minutes between cranks.

SECOND — BLEED THE FUEL SYSTEM (IF NECESSARY)

SERVICE HINT

If the engine still does not start, it will be necessary to bleed the system by loosening the high-pressure injection line clamp nuts. To do this, it is necessary to loosen the clamp nuts at the unit pumps, not at the cylinder head. Proceed as follows:

a. Remove the unit pump outer heat shields.

b. Loosen the high-pressure fuel line nut (only slightly) at the unit pump No. 1.

c. Operate the hand primer pump and observe that air and a small amount of fuel is purged from the fuel line-to-unit pump connection.

d. When the air has been bled, tighten the fuel line nut to 30 lb-ft (41 N•m).

e. Repeat steps b, c and d for the remaining fuel lines, one line nut at a time, until all six lines have been bled.

f. Clean any spilled fuel from the unit pump and the engine.

g. Start the engine. The engine should start easily, but may run rough for a short period of time until any remaining air is completely bled from the system.

NOTE

If the engine does not start after a reasonable period of time (one or two 30-second cranking periods), or it starts but immediately stalls, repeat steps b through g.

h. Run the engine until reaching normal operation temperature, and then check the fuel system for leaks.

i. Perform a short road test, and again, check for leaks.

j. Shut the engine off and reinstall the unit pump outer heat shields.

Engine Warm-Up

⚠ CAUTION

Idling the engine unnecessarily for long periods of time wastes fuel and fouls injection nozzles. Unburned fuel causes carbon formation and oil dilution. NEVER race an engine during warm-up.

Engine damage can occur if the engine is not warmed up to a minimum operating temperature of 170°F (77°C) before putting the vehicle into full operation.

NOTE

Consult the appropriate vendor engine manual if your vehicle is not equipped with a MACK engine.

Heavy-duty diesel engines are designed to operate at optimum efficiency when they are running loaded at (or very near) normal operating temperature, where efficient combustion takes place. When the engine is operated unloaded, lightly loaded (i.e., stop-and-go operations, PTO operations, or periods of extended engine idling) or in cold weather conditions, normal operating temperature may not be achieved or maintained. As a result, carbon and/or varnish build-up will occur and lubricating oil will become contaminated with combustion by-products.

Cold weather operations place added demands on a diesel engine. When operating in cold climates (particularly in stop-and-go operations, PTO operations or periods of extended engine idling), minimum operating temperature must be maintained to prevent engine damage resulting from valve varnishing and carbon build-up.

NOTE

Many accessories are available for cold weather operations. Refer to the *Maintenance and Lubrication Manual (TS494)* for additional information concerning cold weather accessories.

Engine Idling

Idling the engine unnecessarily for long periods of time wastes fuel, fouls injector nozzles and can lead to valve carbon and varnish deposits. Unburned fuel causes carbon formation and oil dilution. Shut the engine down when prolonged loading or unloading of cargo is required.

When starting a cold engine, or if the vehicle has been parked and the engine coolant has fallen well below normal operating temperature, a fast idle speed of approximately 1200 rpm should be maintained to help the engine warm up more quickly.

Shutting Down the Engine

NOTE

Consult the appropriate vendor engine manual if your vehicle is not equipped with a MACK engine.

Standard Shutdown

After a hard run, allow the engine to idle three minutes before shutdown in order to stabilize the temperature of all engine parts. Quick shutdowns can cause engine damage and prevent the turbocharger from being properly lubricated.

⚠ CAUTION

Operating the engine below normal operating temperature for extended periods of time will allow varnish/carbon deposits to build up on the valve stems and guides. This will cause the valves to stick in the guides after the engine has been shut down and could result in push rod damage when the engine is restarted. If the engine has been operated below normal operating temperature for an extended period of time (and the odor of raw diesel fuel is detected or unburned fuel can be seen at the exhaust stack), the engine should be operated under "load" until normal operating temperature is achieved BEFORE shutting down the engine.

On chassis equipped with an air starter, make sure that the air pressure gauge reads a maximum of 120 psi before shutting down and parking for the night. This will ensure sufficient air pressure for restarting the engine.

V-MAC IV Shutdown Option: Idle Cooldown

From the factory the IDLE COOLDOWN is set to the OFF (disabled) position, requiring the standard shutdown procedure.

IDLE COOLDOWN may be set to the ON (enabled) position using the V-MAC IV Customer Data Programming Software. If the IDLE COOLDOWN option is ON, the engine may NOT shut down immediately when (1) the vehicle stops, (2) the parking brake is set, and (3) the key is turned off.

This feature allows the driver to lock the truck and walk away, while still allowing adequate cooldown if the system senses that the turbocharger is still hot. All switched accessories will then turn off once the engine has stopped. If this option is enabled, the engine can still be shut down immediately by cycling the key on and off again or by pressing the shutdown override switch.

Engine Shutdown System (If Enabled)

The engine is protected by a system that prevents engine damage by shutting down the engine whenever a potentially damaging condition (such as loss of oil pressure, loss of coolant or engine overheating) is detected. If the system detects such a condition, a warning indicator light and an alarm will alert the driver before the engine actually shuts down. Pressing the *Engine Shutdown Override Switch* on the instrument panel shortly after the engine shutdown alarm, allows 30 additional seconds of operation. This process can be repeated several times to safely park the vehicle.

⚠ CAUTION

Continuously overriding the shutdown system may result in severe engine damage.

Engine Shutdown Indicator — During normal operating conditions, this indicator should illuminate as soon as the key switch is turned on. After the engine is started, it will remain illuminated until engine oil pressure reaches normal idling range. During shutdown, if the system detects a condition that could lead to engine failure, the Engine Shutdown indicator will illuminate prior to engine shutdown.

NOTE

Consult the appropriate vendor engine manual if your vehicle is not equipped with a MACK engine.

COLD WEATHER OPERATION

NOTE

Consult the appropriate vendor engine manual if your vehicle is not equipped with a MACK engine.

Cold Weather Starting Tips

- Save the batteries. Do not overtax the batteries by cranking the starter for more than 30 seconds without interruption. Allow about two minutes between attempts at starting the vehicle; this allows the starter to cool and the batteries to re-energize.

NOTE

Always make sure that the battery is fully charged in cold weather.

- Use the correct grade of oil for the prevailing winter temperature.

- Drain the fuel tanks and filters regularly to prevent water accumulation in the fuel system. This accumulation can freeze in fuel tanks, fuel lines and filters.

⚠ WARNING

Do NOT — under any circumstances — add gasoline, alcohol, used oil or additives with metallic particles to the fuel.

- If the fuel gels and starts clogging filters and small passages, mix a small percentage of No. 1D fuel (kerosene) with No. 2D (diesel) fuel.

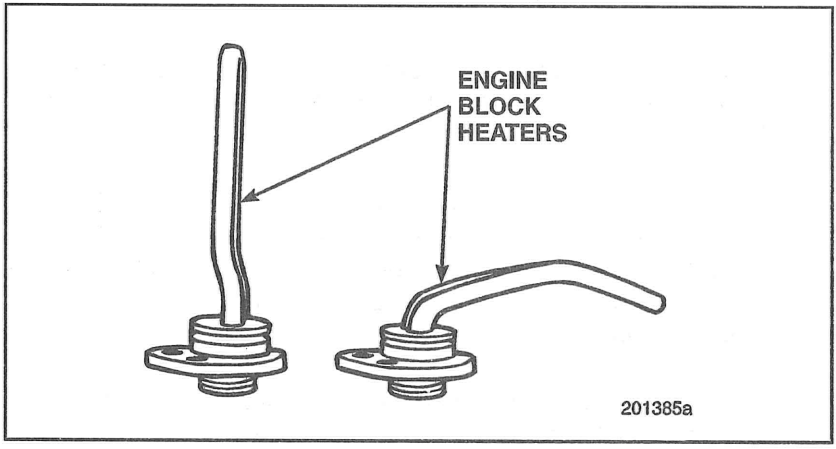
NOTE

Adding kerosene is NOT recommended for general use because both performance and fuel economy will be reduced.

- Refer to the *Maintenance and Lubrication Manual (TS494)* for additional cold weather operating information.

Engine Block Heaters

An engine block heater works by heating the coolant surrounding the combustion chambers. Engine heaters are recommended to help combat the extreme demands of cold weather operating conditions. When the temperature drops, the engine heater can be plugged in overnight. The location of the engine heater power receptacle varies according to vehicle design.



Engine Heater Benefits

- Eliminates cold weather starting problems.
- Increases engine life significantly by keeping the engine warm and avoiding costly, excessive idling.
- Prevents external water leaks caused by excessive cold.
- Allows the cab to heat more quickly.
- Reduces the temperature at which ether is required.
- Allows the engine heaters to be activated as soon as the engine is stopped.

COUPLING A TRAILER

1. Position the tractor directly in front of the trailer.
2. Back the trailer slowly until the fifth wheel just contacts the trailer plate.
3. Place the transmission in neutral and apply the parking brakes.
4. Connect the trailer glad hands and electrical connector.

> **⚠ CAUTION**
>
> *Make sure the trailer air lines and the trailer electrical cord are properly supported so they will not be pinched or caught while the tractor is being backed under the trailer.*

5. Check that the fifth wheel height matches the height of the underside of the trailer. If the trailer is too high, use the landing gear to lower the trailer until fifth wheel and trailer height match. If the vehicle is equipped with an air suspension and the trailer is too low, use the air suspension control switch to exhaust air from the suspension air bags until fifth wheel and trailer height match.

> **⚠ CAUTION**
>
> *Failure to match fifth wheel height with trailer height will result in the trailer being improperly connected.*

6. Back under the trailer slowly until the trailer king pin engages. Back slowly to avoid hitting the king pin too hard, and stop as soon as the king pin is locked into the fifth wheel.
7. If equipped with an air suspension, use the air suspension control switch to reinflate the suspension air bags.
8. Raise the trailer landing gear slightly off the ground.
9. With the trailer parking brakes applied, pull the tractor ahead slightly to ensure that the trailer is locked onto the tractor.

10. Push the trailer air supply valve (red octagonal knob) in to supply the trailer system with air pressure. With the air system at normal operating pressure, check the trailer air brake system for excessive leakage and proper operation.
11. Inspect the coupling to ensure the trailer is properly connected. Make sure there is no space between the fifth wheel and the trailer plate and that the fifth wheel jaws have closed around the shank of the king pin. Check that the locking lever is in the "lock" position and make sure the safety latch is in position over the locking lever.
12. After ensuring that the trailer is properly connected, raise the landing gear to its maximum height.
13. If wheel chocks were placed at the trailer wheels, remove the chocks and store.

⚠ CAUTION

If equipped with an air suspension, do NOT operate the vehicle with the suspension air bags deflated. Always reinflate the suspension air bags after coupling or uncoupling a trailer.

UNCOUPLING A TRAILER

1. Park the tractor/trailer combination on a level surface. Make sure the parking surface will support the weight of the trailer, and make sure that the tractor is lined up straight with the trailer. Pulling out from under a trailer at an angle may damage the landing gear.
2. Pull the trailer air supply valve (red octagonal knob) out to apply the trailer parking brakes.
3. Back the tractor slightly to ease pressure on the fifth wheel jaws. Apply the tractor parking brakes while still backing against the king pin so the combination will be held with pressure off the fifth wheel jaws.
4. Block the trailer wheels to prevent the trailer from moving.
5. Lower the trailer landing gear until the gear makes firm contact with the ground.
6. Disconnect the glad hands and the trailer electrical connector. Connect the glad hands to the dummy couplers at the back of the tractor and install the trailer electrical connector into the receptacle provided at the back of the cab.

⚠ CAUTION

Make sure the trailer air lines and electrical cord are properly suspended so they will not become tangled or damaged while the tractor is being driven.

⚠ WARNING

Keep legs and feet clear of the tractor rear wheels to avoid serious injury should the vehicle move when the fifth wheel is unlocked.

7. Unlock the fifth wheel.

8. Pull the tractor ahead slightly (approximately twelve inches) so that the king pin disengages the fifth wheel jaws.
9. If equipped with an air suspension, use the air control switch to exhaust the air from the suspension air bags.
10. Pull the tractor ahead until the fifth wheel is out from under the trailer. Stop the tractor with frame under the trailer. This prevents the trailer from falling should the landing gear collapse or sink into the ground.
11. Place the transmission in neutral and apply the parking brakes.
12. Inspect the parked trailer to make sure the ground is supporting the trailer and the landing gear is not damaged.
13. If equipped with an air suspension, use the air suspension control switch to reinflate the suspension air bags.
14. Release the parking brakes and drive the tractor forward until the tractor is clear of the trailer.

⚠ CAUTION

If equipped with an air suspension, do NOT operate the vehicle with the suspension air bags deflated. Always reinflate the suspension air bags after coupling or uncoupling a trailer.

MOVING THE VEHICLE — GENERAL INFORMATION

Braking

Avoid sudden stops. Constant sudden stops may negatively affect braking performance and driving parts. When slowing, leave the clutch (if equipped) engaged as long as possible to use the braking effect of the engine.

⚠ CAUTION

When using the braking effect of the engine, final gear selection is critical. If gear selection is too high, the vehicle will buck which could cause loss of control.

Shifting

Operate in a gear low enough to allow the engine to accelerate to (or maintain) governed engine speed when applying full throttle. Allowing the engine to lug causes excessive strain on the engine, which could damage pistons, rings, cylinder walls, or bearings. However, be sure not to overspeed the engine.

⚠ DANGER

Always select the proper gear ratio BEFORE descending a grade (to avoid a runaway vehicle and to stay within safe and legal speed limits). Do NOT coast down hills. Gear ratios should be selected to allow the engine to operate between peak torque and rated speed.

⚠ DANGER

If your vehicle is equipped with an Eaton® Fuller® Autoshift™ transmission, selecting "D" on downhill grades will cause automatic upshifts. To prevent unwanted upshifts, preselect "Manual" or "H". Engine must be kept below 2100 rpm to allow commanded upshifts. See the Eaton Driver Instructions manual for more details.

⚠ CAUTION

Do not permit a load to drive the engine above governed speed. When descending steep grades, use lower gears and watch the tachometer. Overspeeding will cause severe drivetrain damage and eventually destroy the engine.

⚠ CAUTION

Running the engine at a speed that is too low for the load (or grade of the road) can cause damage to the drivetrain.

Shifting at the proper time will result in increased fuel efficiency, as well as a decrease in costly repairs. Remember that once the engine falls below peak torque, both torque and horsepower will drop off very rapidly. Before this happens, downshift to the next lower gear.

For vehicles with transmissions that have extreme reduction gearing coupled with high rear-axle loads, a torque-limiting device should be used. This device limits the amount of fuel that can be delivered to the engine and prevents overloading of drivetrain components while in extreme reduction gears.

Always use the same gear going downhill as uphill. This will reduce brake wear and prevent damage to the engine from overspeeding.

Engine Temperature

Before entering high-speed traffic conditions, allow the engine to reach normal operating temperature. A normal operating range is between 170°F and 225°F (77°C and 107°C) for stationary vehicles.

Clutch (If Equipped)

To avoid shock damage, release the clutch pedal smoothly, without shock-loading the driveline (especially on grades while carrying heavy loads). Do not ride the clutch pedal. Premature wear of the clutch facing and release bearing may result.

⚠ CAUTION

Always use the lowest drive gear combination to start the vehicle moving to avoid premature clutch failure.

1. To move the vehicle, start the engine and wait until it reaches operating temperature.
2. Disengage the clutch by pushing the pedal to the floor.
3. Shift the transmission into first or LO gear (see "Transmission Shifting Instructions" for specific procedures).
4. Release the parking brake.

⚠ CAUTION

If the Parking Brake indicator is on, do NOT attempt to move the vehicle because driveline damage may result.

5. Engage the clutch smoothly by allowing the clutch pedal to come up slowly. For comfortable starts, do not apply the accelerator until the clutch begins to engage.

⚠ CAUTION

Never allow your foot to ride the clutch pedal when the clutch is engaged. This will cause premature failure and increased clutch wear.

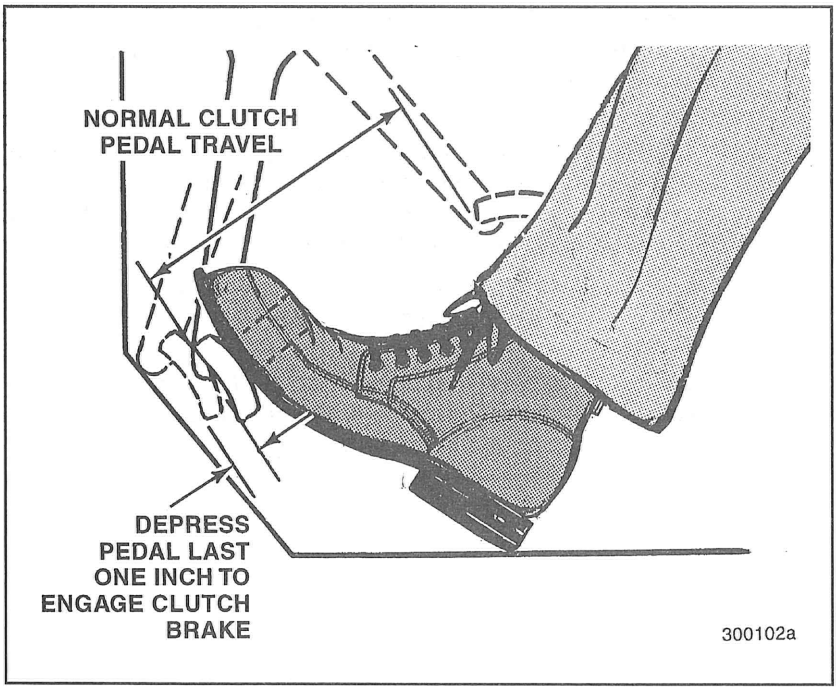
6. As the vehicle gains speed, continue shifting until the transmission is in the highest gear possible (with engine in operating range).

NOTE

When the vehicle is equipped with a torque-limiting device, the engine must be warmed up to operating temperature before attempting to move in either REVERSE or LO-LO range.

Clutch Brake Operation

The clutch brake is designed to stop the rotation of the transmissions input shaft while the truck is standing still. This makes shifting into first or reverse gears easier. Inadvertent use of the clutch brake will make shifting from a gear difficult (i.e., shifting from reverse with the clutch brake applied and the vehicle is stationary).



1. With the vehicle standing still, apply the clutch brake by pushing the clutch pedal all the way to the floor; the clutch brake is applied when the clutch pedal is fully depressed (the last one inch of travel past normal pedal travel).

NOTE

When the clutch is disengaged, a slight but definite resistance to clutch pedal downward travel will be felt in the last one inch.

2. Shift the transmission into first or reverse gear, engage the clutch and accelerate. The clutch brake is only to be used when the vehicle is stopped and is shifted into first or reverse gears. It is not designed to be used as an upshifting aid.

⚠ CAUTION

Clutch brake damage may result if used while the vehicle is in motion. The clutch brake must NOT be used when making a downshift or an upshift.

Double-Clutching

Double-clutching is a way to bring the speed of the transmission gears into synchronization so that the shift can be made without a clash. The engine is used to speed up the countershaft for a downshift and to slow it down for an upshift.

NOTE

For all nonsynchronized transmissions, double-clutching is necessary on downshifts and upshifts. It is advisable to use the torque-limiting clutch brake to engage first and REVERSE gears and to double-clutch for gear ratio changes.

1. Depress the clutch pedal and shift to NEUTRAL.
2. Release the clutch pedal and increase (downshift) or decrease (upshift) engine speed until it roughly corresponds to the road speed of the desired gear.
3. Depress the clutch pedal and complete the shift. Then release the clutch pedal.

POWER TAKE-OFF (PTO) OPERATION

If the vehicle is equipped with a Power Take-Off (PTO) unit, be sure to read the following section.

PTO Precautions

⚠ DANGER

Power Take-Off (PTO) units and related equipment can be very dangerous. Any PTO installation, repair or replacement should include a warning indicator light which indicates PTO engagement. The light must be located close to the PTO control and clearly visible to the operator.

⚠ DANGER

PTO units are driven by engine or drivetrain components (flywheel, crankshaft, transmission). Do not attempt to service the PTO and related units unless the engine is shut down.

⚠ DANGER

Always keep body parts and loose-fitting clothing out of the range of drivetrain components, or personal injury may result.

⚠ DANGER

Always be aware of the current PTO status (engaged or disengaged) and the position of the vehicle body (dump body controlled by PTO, etc.). Be sure to disengage the PTO when not in use.

PTO Classification

Rear-mounted PTO units, for MACK transmissions, are categorized according to operation.

Intermittent Service — The PTO unit is operated, under load, for less than seven minutes and then allowed to cool before it is operated again.

NOTE

If a PTO unit is operated for less than seven minutes but is "not" allowed to cool down before operating again, it is considered in Continuous Service.

Continuous Service — The PTO unit is operated, under load, for seven minutes or more.

NOTE

Rear-mounted PTO units operating under the Continuous Service guideline must not be run at more than 70% of the PTO output-rated torque/horsepower.

Side-Mounted PTO Locations

The first choice location for Side-Mounted PTOs is either of the PTO openings on the main box.

The second choice, which is the compound PTO opening, is restricted to those applications specifically requiring multi-speed PTOs with reverse capability, such as some mechanical winches or unique speed or multiple PTO requirements. However, a word of caution is in order when using these locations. Operators should be trained to understand and follow the proper operating procedures as described in the cab instructions, and avoid using the neutralizing feature as a power disconnect for vehicle propulsion.

PTO Operating Procedures

Specific PTO operating procedures are described at the end of applicable transmissions in the following section.

TRANSMISSION SHIFTING INSTRUCTIONS

⚠ CAUTION

The maximum safe operating oil temperature for MACK transmissions is 250°F (121°C) for mineral-based oil, and 300°F (148°C) for synthetic-based oil. Continued operation with oil above this temperature will result in rapid deterioration of the oil's lubricating properties and is NOT recommended.

⚠ CAUTION

To avoid transmission damage, the vehicle must be completely stopped before being shifted from REVERSE to any forward speed (and vice versa).

⚠ CAUTION

Never coast with the transmission in neutral. Never coast with the clutch depressed.

Shifting Instructions for Allison Automatic Transmissions

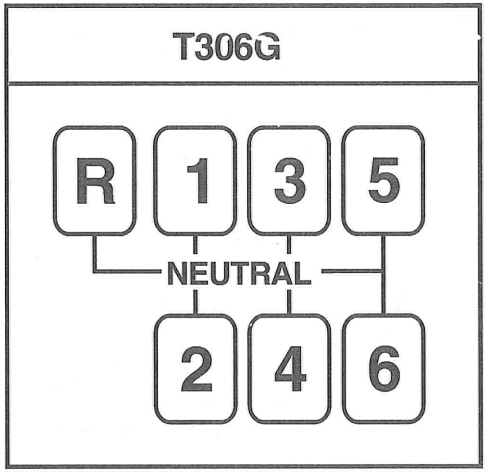
Please refer to the applicable Allison automatic transmission operator's manual provided with your vehicle for complete shifting and operating instructions.

MACK T306G Shifting Instructions

The T306G is a six speed overgear, nonsynchronized transmission designed for general highway use. Shifting is accomplished through a single shift lever using the traditional H pattern.

Upshift — Start out in first gear and shift up to second, third, fourth, fifth and sixth gears, double-clutching from one gear to the next.

Downshift — Downshift in reverse order (sixth through first), double-clutching through each gear.



T306G TRANSMISSION RATIOS

Gear	Ratio
1	7.50
2	4.08
3	2.41
4	1.50
5	1.00
6	0.71
Reverse	8.84

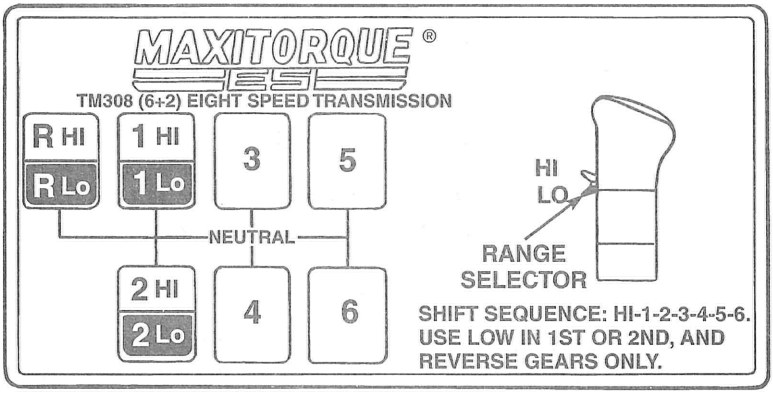
MACK TM308 Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is warmed before shifting the transmission. To avoid transmission damage, do NOT change range while moving in REVERSE. Use of the clutch brake is for shifting into first and reverse gears only. Do not use the clutch brake to shift out of gear. Be careful not to overspeed the engine during downshifting. Damage to powertrain components can result.

The TM308 is a non-synchronized transmission having a total of eight speeds (6+2) with a non-synchronized air shifted compound section. This LO and HI auxiliary compound section is controlled by an air-shift range selector valve located on the shift lever. The LO range has two low gear ratios. In HI range there are six forward gears which can be shifted in the normal manner, but remember to double-clutch whether moving up or down through the gears. For normal highway use, start in HI range, first gear and shift through second, third, fourth, fifth and sixth. The ratio step between fifth and sixth is smaller than all the other ratio steps. The two gears in LO range are designed for off-highway use and in slow-moving operations (curb pouring, material spreading, heavy load, steep grade).

Reverse — Reverse can be used in LO or HI range. To make a range shift in reverse, bring the truck to a complete stop. Flip the range selector lever to range desired.



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TM308 TRANSMISSION RATIOS

Gear (Main Box)	Ratios	
	LO Range	HI Range
First Lo	17.77	
Second Lo	10.94	
First Hi		6.57
Second Hi		4.05
Third Hi		2.54
Fourth Hi		1.57
Fifth Hi		1.00
Sixth Hi		0.71
Reverse Lo	18.36	
Reverse Hi		6.79

MACK TM308M Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is warmed before shifting the transmission. Use of the clutch brake is for shifting into first and reverse gears only. Do not use the clutch brake to shift out of gear. Be careful not to overspeed the engine during downshifting. Damage to powertrain components can result.

The TM308M is a non-synchronized transmission having a total of eight speeds (6+2) with a non-synchronized air shifted compound section. This LO and HI auxiliary compound section is controlled by an air-shift range selector valve located on the shift lever. The LO range has two low gear ratios. In HI range there are six forward gears which can be shifted in the normal manner, but remember to double-clutch whether moving up or down through the gears.

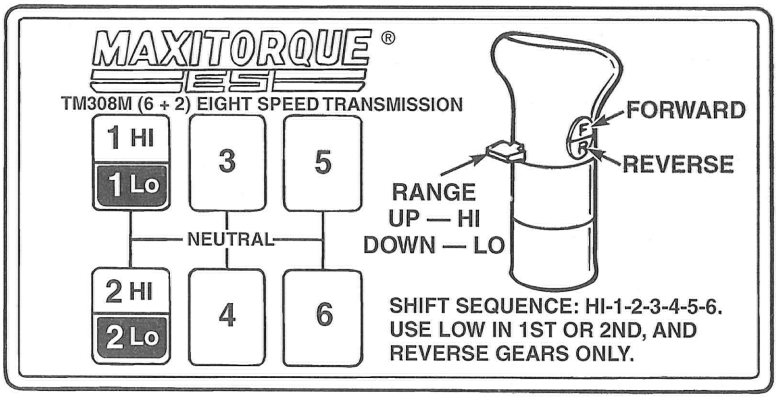
For normal highway use, start in HI range, first gear and shift through second, third, fourth, fifth and sixth. The ratio step between fifth and sixth is smaller than all the other ratio steps. The two gears in LO range are designed for off-highway use and in slow-moving operations (curb pouring, material spreading, heavy load, steep grade).

Reverse is used in LO range only. To avoid transmission damage when shifting Forward to Reverse or Reverse to Forward:

- Bring vehicle to a stop.
- Move lever to NEUTRAL.
- Select low range.
- Select F or R as desired.
- Select lowest lever gear position.
- Release and depress clutch pedal.
- Select desired gear.

⚠ CAUTION

Vehicle operators must use extreme caution if operating a truck in the higher reverse gears. Higher reverse gears will produce high reverse speeds which may be difficult for drivers to control dependent on terrain or obstacles.



TM308M TRANSMISSION RATIOS

Gear (Main Box)	Ratios		
	LO Range	Direct Range	Reverse
First Lo	17.77		15.59
Second Lo	10.94		9.60
Third Lo			6.02
Fourth Lo			3.73
Fifth Lo			2.37
Sixth Lo			1.69
First Hi		6.57	
Second Hi		4.05	
Third Hi		2.54	
Fourth Hi		1.57	
Fifth Hi		1.00	
Sixth Hi		0.71	

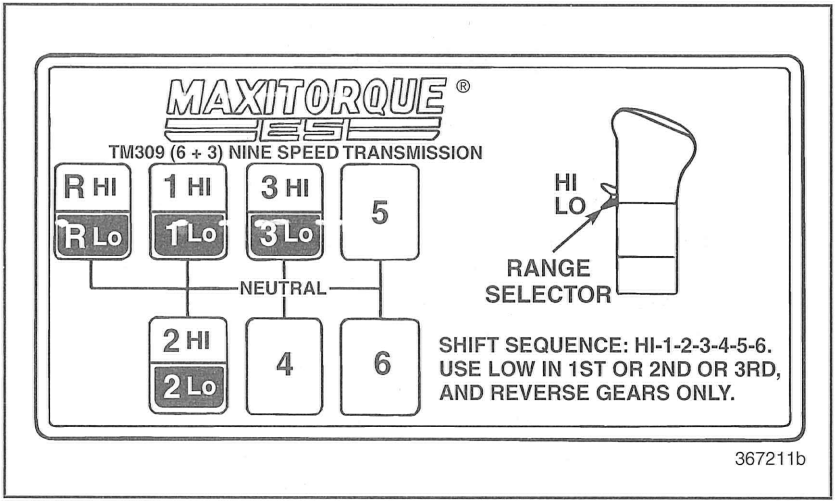
MACK TM309 Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is warmed before shifting the transmission. To avoid transmission damage, do NOT change range while moving in REVERSE. Use of the clutch brake is for shifting into first and reverse gears only. Do not use the clutch brake to shift out of gear. Be careful not to overspeed the engine during downshifting. Damage to powertrain components can result.

The TM309 is a non-synchronized transmission having a total of nine speeds (6+3) with an air shifted non-synchronized compound section. This LO and HI auxiliary compound section is controlled by an air-shift range selector valve located on the shift lever. The LO range has three low gear ratios. In HI range there are six forward gears which can be shifted in the normal manner, but remember to double-clutch whether moving up or down through the gears. For normal highway use, start in HI range, first gear and shift through second, third, fourth, fifth and sixth. The ratio step between fifth and sixth is smaller than all the other ratio steps. The three gears in LO range are designed for off-highway use and in slow-moving operations (curb pouring, material spreading, heavy load, steep grade). Only start in the lowest gear necessary to move the vehicle. The extreme LO gear (1st low) is intended for vehicular speed control and not for torque multiplication.

Reverse — Reverse can be used in LO or HI range. To make a range shift in reverse, bring the truck to a complete stop. Flip the range selector lever to range desired (preselect). Move the shift lever out of reverse through NEUTRAL and then back into reverse again. As the lever moves through NEUTRAL, the range shift will be completed.



TM309 TRANSMISSION RATIOS

Gear (Main Box)	Ratios	
	LO Range	HI Range
First Lo	25.21	
Second Lo	15.52	
Third Lo	9.73	
First Hi		6.57
Second Hi		4.05
Third Hi		2.54
Fourth Hi		1.57
Fifth Hi		1.00
Sixth Hi		0.71
Reverse Lo	25.67	
Reverse Hi		6.79

MACK TM309M Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is warmed before shifting the transmission. Use of the clutch brake is for shifting into first and reverse gears only. Do not use the clutch brake to shift out of gear. Be careful not to overspeed the engine during downshifting. Damage to powertrain components can result.

The TM309M is a non-synchronized transmission having a total of nine speeds (6+3) with an air shifted non-synchronized compound section. This LO and HI auxiliary compound section is controlled by an air-shift range selector valve located on the shift lever. The LO range has three low gear ratios. In HI range there are six forward gears which can be shifted in the normal manner, but remember to double-clutch whether moving up or down through the gears.

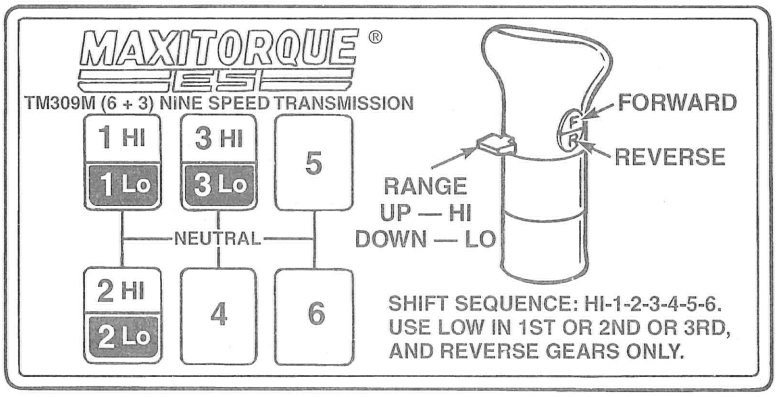
For normal highway use, start in HI range, first gear and shift through second, third, fourth, fifth and sixth. The ratio step between fifth and sixth is smaller than all the other ratio steps. The three gears in LO range are designed for off-highway use and in slow-moving operations (curb pouring, material spreading, heavy load, steep grade). Only start in the lowest gear necessary to move the vehicle. The extreme LO gear (1st low) is intended for vehicular speed control and not for torque multiplication.

Reverse is used in LO range only. To avoid transmission damage when shifting Forward to Reverse or Reverse to Forward:

- Bring vehicle to a stop.
- Move lever to NEUTRAL.
- Select low range.
- Select F or R as desired.
- Select lowest lever gear position.
- Release and depress clutch pedal.
- Select desired gear.

⚠ CAUTION

Vehicle operators must use extreme caution if operating a truck in the higher reverse gears. Higher reverse gears will produce high reverse speeds which may be difficult for drivers to control dependent on terrain or obstacles.



TM309M TRANSMISSION RATIOS

Gear (Main Box)	Ratios		
	LO Range	Direct Range	Reverse
First Lo	25.21		22.12
Second Lo	15.52		13.62
Third Lo	9.73		8.54
Fourth Lo			5.30
Fifth Lo			3.37
Sixth Lo			2.40
First Hi		6.57	
Second Hi		4.05	
Third Hi		2.54	
Fourth Hi		1.57	
Fifth Hi		1.00	
Sixth Hi		0.71	

MACK T309, T309L and T309LR Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is at operating temperature before making range shifts. Always start in LO range. This also applies to dynamometer testing. When the truck is stationary, do NOT shift into HI range and then start moving the truck. Otherwise, damage to the synchronizer may result.

The T309 unit is a range-shifted transmission which has eight forward highway speeds plus an extra LO speed gear in the LO range. This transmission features a LO and HI auxiliary compound section controlled by an air-shift range selector located on the shift lever. The compound section is equipped with a synchronizer to facilitate LO-HI range shifting.

The LO range provides five low ratios. Never attempt to move the vehicle from a stopped position in any gear higher than second gear. Depending on the load, grade or road conditions, it may be necessary to start in LO speed gear or first-second gears. Note that LO speed gear was designed for off-highway use such as paving, material spreading or heavy load/steep grade conditions.

The HI range has four forward gears that can be shifted in the standard manner. Remember, however, to double-clutch when moving up or down through these gears.

REVERSE can be used in LO range only.

Upshift — Under normal highway conditions, with shift lever in NEUTRAL, flip air-shift range selector to LO range, then shift the transmission into first gear (see shift pattern). Shift through second, third and fourth, double-clutching between gears. When maximum RPM is reached in fourth gear, flip air-shift range selector to HI range (preselect) and then move shift lever through NEUTRAL to fifth gear. As the shift lever passes through NEUTRAL, it will put the transmission in HI range. Now continue double-clutching through sixth, seventh and eighth gears.

⚠ CAUTION

Do NOT move the air-shift range selector while moving in REVERSE. Also, when the truck is stationary, do NOT shift into HI range and then start moving the truck. Damage to the synchronizer may result.

Downshift — To downshift the T309, shift from eighth to seventh, sixth and fifth (HI range), double-clutching between gears. While still in fifth gear, flip the air-shift range selector to LO range (preselect), then shift through NEUTRAL to fourth gear. As you shift through NEUTRAL, the range shift to LO will be completed. Move the shift lever to third, second and first, double-clutching between gears.

T309 and T309L Reverse — Reverse can be used in LO range only.

T309LR Reverse — Reverse can be used in LO and HI range.

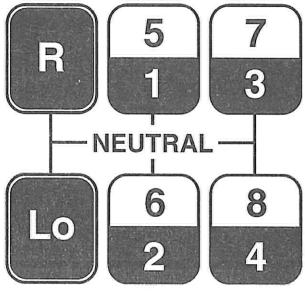
To make a range shift in reverse, bring the truck to a complete stop. Flip the range selector to the range desired (preselect). Move the shift lever out of reverse through NEUTRAL, and then back into reverse again. As the lever moves through NEUTRAL, the range shift will be completed.

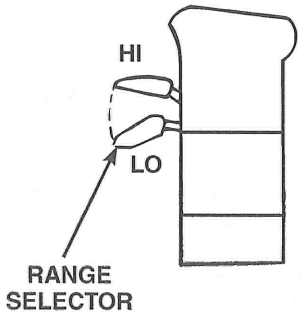
⚠ CAUTION

To avoid transmission damage, do NOT change range while moving in REVERSE.

T309, T309L AND T309LR

SHIFT PATTERN	RANGE SELECTOR





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T309 TRANSMISSION RATIOS

Gear (Main Box)	LO Range	HI Range
LO	11.24	
1/5	7.35	1.94
2/6	5.25	1.39
3/7	3.78	1.00
4/8	2.69	0.71
R	13.31	3.52

T309L TRANSMISSION RATIOS

Gear (Main Box)	LO Range	HI Range
LO	13.74	
1/5	7.35	1.94
2/6	5.25	1.39
3/7	3.78	1.00
4/8	2.69	0.71
R	13.31	3.52

T309LR TRANSMISSION RATIOS

Gear (Main Box)	LO Range	HI Range
LO	13.74	
1/5	7.35	1.94
2/6	5.25	1.39
3/7	3.78	1.00
4/8	2.69	0.71
R	24.24	6.41

Preferred Methods for Engaging T309 "Eighth" Gear (or any Hi-Range Gear) for Output Shaft Driven Power Take-Off (PTO) Operation

NOTE

OPTIONAL RANGE ENGAGEMENT INDICATOR LAMP — If the vehicle is so equipped, an indicator lamp, located in the cab, will illuminate to indicate that the range shift has occurred.

Method #1 — PTO Operation with Wheels OFF the Ground

1. Position the vehicle for power take-off operation.
2. Stop the vehicle and apply the spring brakes.
3. Raise the vehicle wheels off the ground.
4. Shift the transmission to NEUTRAL.
5. Turn on PTO.
6. Place the range selector to HIGH.
7. Fully depress the clutch pedal and shift the transmission to REVERSE.
8. Slowly release the clutch pedal until the transmission range clutch engagement is heard; or, if so equipped, until the range engagement indicator lamp is lit.
9. Fully depress the clutch pedal.
10. Shift the transmission to EIGHTH gear.
11. Release the clutch pedal to begin PTO operation.

Method #2 — PTO Operation with Wheels ON the Ground

1. Position the vehicle for power take-off operation.
2. Stop the vehicle and apply the spring brakes.
3. Keep the vehicle wheels on the ground.
4. Shift the transmission to NEUTRAL.
5. Place the range selector to HIGH.
6. Fully depress the clutch pedal and shift the transmission to REVERSE.
7. Slowly release the clutch pedal until the transmission range clutch engagement is heard; or, if so equipped, until the range engagement indicator lamp is lit.
8. Fully depress the clutch pedal.
9. Turn on PTO.
10. Shift the transmission to EIGHTH gear.
11. Release the clutch pedal to begin PTO operation.

MACK T310 Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is warmed before making range shifts. Always start in LO range. This also applies to dynamometer testing. When the truck is stationary, do NOT shift into HI range and then start moving the truck. Otherwise, damage to the synchronizer may result.

The T310 unit is a range-shifted transmission which has 10 forward "highway" speeds. This transmission features a LO and HI auxiliary compound section controlled by an air shift range selector located on the shift lever. The compound section is equipped with a synchronizer to facilitate LO-/HI- range shifting.

The LO range provides five low ratios. Never attempt to move the vehicle from a stopped position in any gear higher than fourth speed gear. Depending on load, grade, or road conditions, it may be necessary to start in first, second, third or fourth speed gears. In HI range there are five forward gears that can be shifted in the standard manner. Always remember, however, to double clutch whether moving up or down through these gears. Reverse gear can be used in LO range only.

Upshift — With the shift lever in NEUTRAL, flip the air shift range selector down to LO range. Then shift the transmission into first gear. Shift up to second, third, fourth and fifth speed gears, double clutching between the gears. When maximum engine RPM has been reached in fifth gear, flip the air shift range selector up to HI range (preselect). Then move the shift lever through NEUTRAL to sixth gear. As the shift lever passes through NEUTRAL, the transmission is placed into Hi range. Continue following the normal sequence (7-8-9-10), being sure to double clutch from one gear to the next.

Downshift — Shift from 10th speed gear down through the HI range (9-8-7-6), double clutching through each gear. While still in sixth speed gear, flip the air shift range selector down to LO range (preselect). Then move the shift lever through NEUTRAL to fifth speed gear. As the shift lever passes through NEUTRAL, the transmission is placed into LO range. Then, shift down to fourth, third, second and first speed gears, double clutching between all gears.

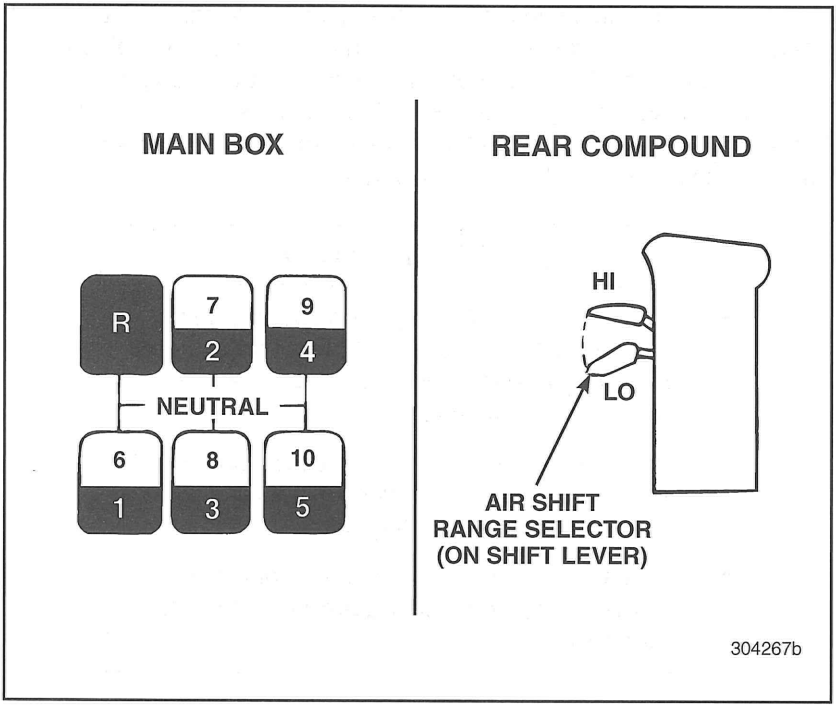
⚠ CAUTION

- *Always start in LO range according to shift marker plate instructions. Never start in a gear higher than fourth speed gear, even when dynamometer testing.*
- *When the truck is stationary, do not shift into HI range and then start moving the truck. Damage to the synchronizer can result.*
- *Be careful not to overspeed the engine during downshifting. Damage to powertrain components may result.*

Reverse — Reverse can be used in LO only. To make a range shift in reverse, bring the truck to a complete stop. Flip the range selector lever to range desired (preselect). Move the shift lever out of reverse through NEUTRAL and then back into reverse again. As the lever moves through NEUTRAL, the range shift will be completed.

⚠ CAUTION

To avoid transmission damage, do NOT change range while moving in REVERSE.



T310 TRANSMISSION RATIOS

Gear (Main Box)	Ratios	
	LO	HI
1/6	13.81	2.67
2/7	10.05	1.94
3/8	7.18	1.39
4/9	5.17	1.00
5/10	3.75	0.73
R/R	14.73	2.85

MACK T310M, T310ME and T310MLR Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is at operating temperature before making range shifts. Always start in LO range. This also applies to dynamometer testing. When the truck is stationary, do NOT shift into HI range and then start moving the truck. Otherwise, damage to the synchronizer may result.

The T310M is a range-shifted transmission which has 10 forward speeds. There is a LO and HI auxiliary compound section controlled by an air-shift selector on the shifter. This compound section is equipped with a synchronizer to facilitate LO-HI range shifting. The T310M transmission also provides a multi-speed reverse feature by means of reverse gearing in the compound case which works in conjunction with LO-LO, first and second speed gears in the main box. The air-shift selector must be moved to the R (REVERSE) position in order to utilize the multi-speed reverse feature.

LO range provides six low ratios for six forward gears in the T310M. HI range provides four additional forward gears which can be shifted in the standard manner. Remember, however, to double-clutch when moving up or down through the gears. For normal highway use, start in LO range, first gear and shift through second, third and fourth. The LO-LO and LO positions in LO range for this transmission are designed for use in off-highway and slow-moving operations such as curb pouring, material spreading, heavy load/steep grade. REVERSE is used in LO range for four reverse speeds.

Upshift — Begin in first gear (shown as 1/5 on shift pattern diagram) with air-shift selector in LO range. Upshift to second gear (2/6 on shift pattern diagram) LO range in the normal manner (double-clutching). When ready to upshift again, depress the clutch pedal and release the accelerator pedal in the normal manner. Repeat this shifting pattern through the remaining gears up to fourth speed (4/8 on shift pattern diagram). When maximum engine RPM has been reached in fourth gear, flip the air-shift selector to HI range (preselect), then double-clutch and shift to fifth gear. As the shift lever passes through NEUTRAL, it will put the transmission in HI range. Continue to upshift through normal sixth, seventh and eighth gears, while double-clutching.

Downshift — Downshift as normal from eighth to seventh, sixth and fifth in HI range (double-clutching between all gears). The next lower shift will be to fourth gear LO range. While still in fifth gear, flip the air-shift selector to LO range (preselect), then double-clutch and move the shift lever through NEUTRAL to fourth gear. The move through NEUTRAL activates the air-shift mechanism, this time to LO range. The next lower gear is third gear LO range. Double-clutch down through the remaining gears to first gear LO range as needed.

⚠ CAUTION

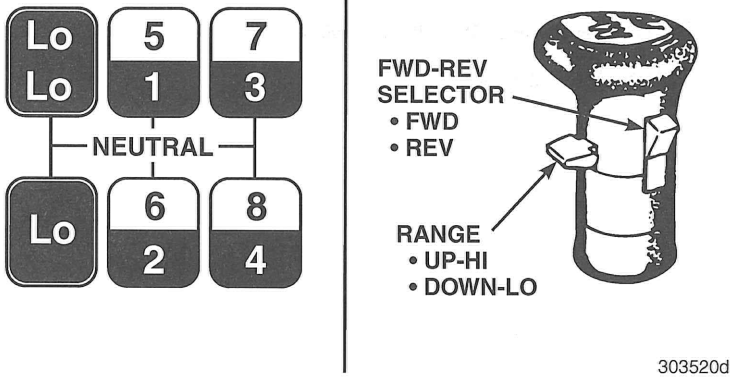
When the truck is stationary, do NOT shift into HI range and then start moving the truck. Damage to the synchronizer may result.

Reverse is used in LO range only. To avoid transmission damage when shifting Forward to Reverse or Reverse to Forward:

- Bring vehicle to a stop.
- Move lever to NEUTRAL.
- Select low range.
- Select F or R as desired.
- Select lowest lever gear position.
- Release and depress clutch pedal.
- Select desired gear.

T310M, T310ME AND T310MLR

SHIFT PATTERN	RANGE SELECTOR



T310M AND T310ME TRANSMISSION RATIOS

Gear (Main Box)	LO Range	HI Range	Reverse
LO-LO	17.35		15.22
LO	11.40		10.00
1/5	7.45	1.94	6.54
2/6	5.33	1.39	4.67
3/7	3.83	1.00	3.37
4/8	2.78	0.73	2.44

T310MLR TRANSMISSION RATIOS

Gear (Main Box)	LO Range	HI Range	Reverse
LO-LO	27.30		23.96
LO	13.90		12.22
1/5	7.45	1.94	6.54
2/6	5.33	1.39	4.67
3/7	3.83	1.00	3.37
4/8	2.73	0.71	2.40

Preferred Method for Engaging T310M or T310MLR High Range Gear for Output Shaft Driven Power Take-Off Operation

After positioning the vehicle for power take-off operation:

1. Shift the transmission to NEUTRAL.
2. Engage power take-off drive.
3. Move range selector to HI range.
4. Disengage engine clutch.
5. Select "tenth" gear (8 on the shift marker plate) for T310M or T310MLR.
6. Engage clutch when power take-off operation is desired.

⚠ CAUTION

When the truck is stationary, do NOT shift into HI range and then start moving the truck. Damage to the synchronizer may result.

MACK T313-T313L-T313LR Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is at operating temperature before making range shifts. Always start in LO range. This also applies to dynamometer testing. When the truck is stationary, do NOT shift into HI range and then start moving the truck. Otherwise, damage to the synchronizer may result.

The T313(L)(LR) is a range-shifted transmission with 12 forward highway speeds and an extra LO gear in the LO range. LO and HI ranges are controlled by an air-shift range selector.

NOTE

When making a SPLIT SHIFT from gear to gear, the splitter switch must not be actuated, either up or down, until the main box is in NEUTRAL. When making a SPLIT SHIFT in the same gear to a preselected gear, especially under a heavy load, the splitter will not shift until the driveline torque is relieved. This can be done by depressing the clutch pedal and releasing it, or by backing off the throttle and reapplying it. When making a RANGE SHIFT, it is important to preselect the range shift. This means that the range selector must be moved to its next position (up or down) BEFORE the gearshift lever is moved. Then move the gearshift lever through NEUTRAL to the next desired gear position. As the lever passes through NEUTRAL, the range shift will be completed.

⚠ CAUTION

Do not "play" with the splitter and range selector tabs at a stop light, flipping from high to low range or HI-LO split. These controls are not intended for entertainment. Such activity can adversely impact the life of the transmission.

Upshift — For purposes of explaining the shifting procedures through ALL gears, assume that the vehicle has a full load and will climb a slight grade.

Before moving the vehicle, the range selector must be in LO range and the splitter switch in LO-split. With the shift lever in NEUTRAL, move the splitter to LO-split (if needed), then the range to LO range (if needed).

Refer to the shift pattern and move the shift lever to LO speed gear (LO range, LO-split). Apply accelerator, engage the clutch, and accelerate to governed speed. Shift up through first, second, third and fourth speed gears, double-clutching between the gears.

To continue while in fourth gear (LO-split), flip the range selector up to HI range (preselect), then move the shift lever through NEUTRAL to fifth gear. As the lever moves through NEUTRAL, the range shift to HI will be completed. You are now in fifth gear LO-split (HI range). Use a combination of the splitter and shift lever to continue shifting to fifth HI-split, sixth LO-split, sixth HI-split and so on, until you reach eighth HI-split. Remember to double-clutch between gears.

To upshift from LO-split to HI-split (in the same gear), accelerate the engine to governed speed, move the splitter switch to HI (preselect), depress the clutch and back off the accelerator pedal. Reapply the accelerator and engage the clutch when the audible shift is heard, or when the engine speed falls by approximately 200 rpm. Depressing the clutch may not be necessary to break the driveline torque, but this will vary with road and load conditions.

To upshift from a HI-split gear to the next higher gears LO-split (in HI range), accelerate the engine to governed speed, then move the splitter switch to LO as you move the shift lever through NEUTRAL to the next higher gear. Note that the splitter switch must not be actuated down to the LO position until the main box is in NEUTRAL.

Downshift — Shift from eighth HI-split to eighth LO-split, then seventh HI-split, seventh LO-split and so on (double-clutching between the gears), until you reach fifth LO-split.

While in fifth gear LO-split, flip the range selector down to LO range (preselect), then move the shift lever through NEUTRAL to fourth gear (double-clutch and use the throttle in the normal manner between gears). As the shift lever moves through NEUTRAL, the range shift to LO will be completed. You are now in fourth gear LO-split (LO range). Continue downshifting, using the shift lever in the normal manner until you reach LO speed gear (LO range, LO-split).

To downshift from HI-split to LO-split (in the same gear) as engine speed falls, move the splitter to LO (preselect), then release and reapply the accelerator pedal. An audible shift completion should be heard.

To downshift from a LO-split gear to the next lower gears HI-split (in HI range) as engine speed falls, move the splitter switch to HI as you move the shift lever through NEUTRAL to the next lower gear. Note that the splitter switch must not be actuated up to the HI position until the main box is in NEUTRAL. Remember to double-clutch between gears.

T313 and T313L Reverse — Reverse can be used in LO range only.

T313LR Reverse — Reverse can be used in LO and HI range.

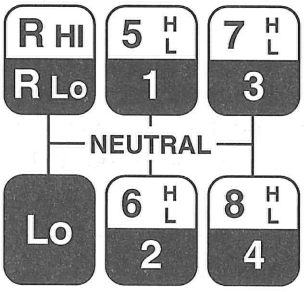
To make a range shift in reverse, bring the truck to a complete stop. Flip the range selector to the range desired (preselect). Move the shift lever out of reverse through NEUTRAL, and then back into reverse again. As the lever moves through NEUTRAL, the range shift will be completed.

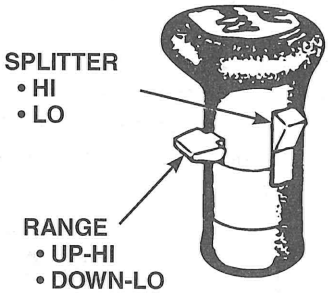
⚠ CAUTION

To avoid transmission damage, do NOT change range while moving in REVERSE.

T313, T313L AND T313LR

SHIFT PATTERN	RANGE SELECTOR





300108m

T313, T313L AND T313LR TRANSMISSION RATIOS

Gear (Main Box)	Splitter	Range	Ratios		
			T313LR	T313	T313L
LO	LO	LO	16.42	13.44	16.42
1	LO	LO	8.78	8.78	8.78
2	LO	LO	6.28	6.28	6.28
3	LO	LO	4.52	4.52	4.52
4	LO	LO	3.22	3.22	3.22
Range Shift Here					
5	LO	HI	2.29	2.29	2.29
5	HI	HI	1.94	1.94	1.94
6	LO	HI	1.64	1.64	1.64
6	HI	HI	1.39	1.39	1.39
7	LO	HI	1.18	1.18	1.18
7	HI	HI	1.00	1.00	1.00
8	LO	HI	0.84	0.84	0.84
8	HI	HI	0.71	0.71	0.71
R	LO	LO	28.98	15.91	15.91
R	HI	HI	6.41	3.52	3.52

Rear Case, Side-Mounted PTO Operating Procedures (T313, T313L and T313LR)

When engaging the PTO —

1. Select LO-split using the splitter switch and select LO range using the range selector.

> **NOTE**
>
> The transmission MUST be in LO range and LO-split at all times during PTO operation.

2. Depress the clutch pedal to disengage the clutch.
3. Set the parking brakes.
4. Move the main box shift lever to the NEUTRAL position.
5. Move the dash-mounted compound NEUTRAL control valve to the ON position, which moves the synchro clutch to a NEUTRAL position.
6. Engage the PTO.
7. Move the main box shift lever to the desired ratio.
8. Release the clutch pedal to engage the clutch.
9. Operate the PTO-driven load.

When disengaging the PTO —

1. Depress the clutch pedal to disengage the clutch.
2. Move the main box shift lever to NEUTRAL.
3. Disengage the PTO.
4. Move the dash-mounted compound NEUTRAL control valve to the OFF position, which moves the synchro clutch back to LO range.
5. Move the shift lever to the desired main gear box ratio.
6. Release the parking brakes.
7. Release the clutch pedal to engage the clutch.

MACK T31321, T313L21 and T313LR21 Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is at operating temperature before making range shifts. Always start in LO range. This also applies to dynamometer testing. When the truck is stationary, do NOT shift into HI range and then start moving the truck. Otherwise, damage to the synchronizer may result.

The T313(L)(LR)21 is a range-shifted transmission with 12 forward highway speeds and an extra LO gear in the LO range. LO and HI ranges are controlled by an air-shift range selector.

NOTE

When making a SPLIT SHIFT from gear to gear, the splitter switch must not be actuated, either up or down, until the main box is in NEUTRAL. When making a SPLIT SHIFT in the same gear to a preselected gear, especially under a heavy load, the splitter will not shift until the driveline torque is relieved. This can be done by depressing the clutch pedal and releasing it, or by backing off the throttle and reapplying it. When making a RANGE SHIFT, it is important to preselect the range shift. This means that the range selector must be moved to its next position (up or down) BEFORE the gearshift lever is moved. Then move the gearshift lever through NEUTRAL to the next desired gear position. As the lever passes through NEUTRAL, the range shift will be completed.

Upshift — For purposes of explaining the shifting procedures through ALL gears, assume that the vehicle has a full load and will climb a slight grade.

Before moving the vehicle, the range selector must be in LO range and the splitter switch in LO-split. With the shift lever in NEUTRAL, move the splitter to LO-split (if needed), then the range to LO range (if needed).

Refer to the shift pattern and move the shift lever to LO speed gear (LO range, LO-split). Apply accelerator, engage the clutch, and accelerate to governed speed. Shift up through first, second, third-fourth speed gears, double-clutching between the gears.

To continue while in fourth gear (LO-split), flip the range selector up to HI range (preselect), then move the shift lever through NEUTRAL to fifth gear. As the lever moves through NEUTRAL, the range shift to HI will be completed. You are now in fifth gear LO-split (HI range). Use a combination of the splitter and shift lever to continue shifting to fifth HI-split, sixth LO-split, sixth HI-split and so on, until you reach eighth HI-split. Remember to double-clutch between gears.

To upshift from LO-split to HI-split (in the same gear), accelerate the engine to governed speed, move the splitter switch to HI (preselect), depress the clutch and back off the accelerator pedal. Reapply the accelerator and engage the clutch when the audible shift is heard, or when the engine speed falls by approximately 200 rpm. Depressing the clutch may not be necessary to break the driveline torque, but this will vary with road and load conditions.

To upshift from a HI-split gear to the next higher gear's LO-split (in HI range), accelerate the engine to governed speed, then move the splitter switch to LO as you move the shift lever through NEUTRAL to the next higher gear. Note that the splitter switch must not be actuated down to the LO position until the main box is in NEUTRAL.

Downshift — Shift from eighth HI-split to eighth LO-split, then seventh HI-split, seventh LO-split and so on (double-clutching between the gears), until you reach fifth LO-split.

While in fifth gear LO-split, flip the range selector down to LO range (preselect), then move the shift lever through NEUTRAL to fourth gear (double-clutch and use the throttle in the normal manner between gears). As the shift lever moves through NEUTRAL, the range shift to LO will be completed. You are now in fourth gear LO-split (LO range). Continue downshifting, using the shift lever in the normal manner until you reach LO speed gear (LO range, LO-split).

To downshift from HI-split to LO-split (in the same gear) as engine speed falls, move the splitter to LO (preselect), then release and reapply the accelerator pedal. An audible shift completion should be heard.

To downshift from a LO-split gear to the next lower gears HI-split (in HI range) as engine speed falls, move the splitter switch to HI as you move the shift lever through NEUTRAL to the next lower gear. Note that the splitter switch must not be actuated up to the HI position until the main box is in NEUTRAL. Remember to double-clutch between gears.

T31321 and T313L21 Reverse — Reverse can be used in LO range only.

T313LR21 Reverse — Reverse can be used in LO and HI range.

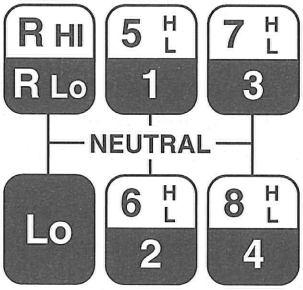
To make a range shift in reverse, bring the truck to a complete stop. Flip the range selector to the range desired (preselect). Move the shift lever out of reverse through NEUTRAL, and then back into reverse again. As the lever moves through NEUTRAL, the range shift will be completed.

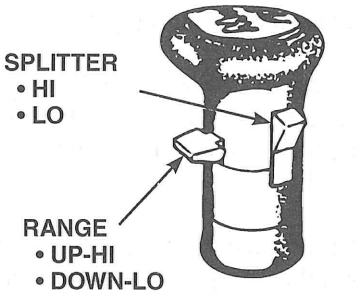
⚠ CAUTION

To avoid transmission damage, do NOT change range while moving in REVERSE.

T31321, T313L21 AND T313LR21

SHIFT PATTERN	RANGE SELECTOR





300108I

T31321, T313L21 AND T313LR21 TRANSMISSION RATIOS

Gear (Main Box)	Splitter	Range	Ratios		
			T31321	T313LR21	T313L21
LO	LO	LO	13.44	16.42	16.42
1	LO	LO	8.78	8.78	8.78
2	LO	LO	6.28	6.28	6.28
3	LO	LO	4.52	4.52	4.52
4	LO	LO	3.22	3.22	3.22
Range Shift Here					
5	LO	HI	2.29	2.29	2.29
5	HI	HI	1.94	1.94	1.94
6	LO	HI	1.64	1.64	1.64
6	HI	HI	1.39	1.39	1.39
7	LO	HI	1.18	1.18	1.18
7	HI	HI	1.00	1.00	1.00
8	LO	HI	0.84	0.84	0.84
8	HI	HI	0.71	0.71	0.71
R	LO	LO	15.91	28.98	15.91
R	HI	HI	3.52	6.41	3.52

MACK T318, T318L and T318LR Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is at operating temperature before making range shifts. Always start in LO range. This also applies to dynamometer testing. When the truck is stationary, do NOT shift into HI range and then start moving the truck. Otherwise, damage to the synchronizer may result.

NOTE

When making a SPLIT SHIFT from gear to gear, the splitter switch must not be actuated, either up or down, until the main box is in NEUTRAL. When making a SPLIT SHIFT in the same gear to a preselected gear, especially under a heavy load, the splitter will not shift until the driveline torque is relieved. This can be done by depressing the clutch pedal and releasing it, or by backing off the throttle and reapplying it. When making a RANGE SHIFT, it is important to preselect the range shift. This means that the range selector must be moved to its next position (up or down) BEFORE the gearshift lever is moved. Then move the gearshift lever through NEUTRAL to the next desired gear position. As the lever passes through NEUTRAL, the range shift will be completed.

Upshift — For purposes of explaining the shifting procedures through ALL gears, assume that the vehicle has a full load and will climb a slight grade.

To prepare for moving the vehicle, position the shift lever in NEUTRAL, select LO-split using the splitter switch, and select LO range using the range selector.

Refer to the shift pattern and move the shift lever to LO speed gear (LO range, LO-split). Apply accelerator and engage the clutch, then accelerate to governed speed. Select HI on the splitter switch (preselect) and release the accelerator pedal long enough for the split shift to complete. Reapply the accelerator. Shift through first LO-split, first HI-split, second LO-split, second HI-split and so on, until you reach fourth HI-split. Remember to double-clutch between gears.

To continue while in fourth gear HI-split, flip the range selector up to HI range (preselect), and as you move the shift lever through NEUTRAL to fifth gear, move the splitter switch from HI to LO. As the lever moves through NEUTRAL, the range shift to HI will be completed. You are now in fifth gear LO-split (HI range). Continue shifting to fifth HI-split, sixth LO-split, sixth HI-split and so on, until you reach eighth HI-split. Remember to double-clutch between gears.

To upshift from LO-split to HI-split (in the same gear), accelerate the engine to governed speed, move the splitter switch to HI (preselect), depress the clutch and back off the accelerator pedal. Reapply the accelerator and engage the clutch when the audible shift is heard, or when the engine speed falls by approximately 200 rpm. Depressing the clutch may not be necessary to break the driveline torque, but this will vary with road and load conditions.

To upshift from a HI-split gear to the next higher gears LO-split (in the same range), accelerate the engine to governed speed, then move the splitter switch to LO as you move the shift lever through NEUTRAL to the next higher gear. Note that the splitter switch must not be actuated down to the LO position until the main box is in NEUTRAL.

Downshift — Shift from eighth HI-split to eighth LO-split, then seventh HI-split, seventh LO-split and so on (double-clutching between the gears), until you reach fifth LO-split.

To continue while in fifth gear LO-split, flip the range selector down to LO range (preselect), and as you move the gearshift lever through NEUTRAL to fourth gear, move the splitter switch from LO to HI. As the shift lever moves through NEUTRAL, the range shift to LO will be completed. You are now in fourth gear HI-split (LO range). Continue downshifting, using the shift lever and splitter in the normal manner, until you reach LO speed gear (LO range, LO-split).

To downshift from HI-split to LO-split (in the same gear) as engine speed falls, move the splitter to LO (preselect), then release and reapply the accelerator pedal. An audible shift completion should be heard.

To downshift from a LO-split gear to the next lower gear's HI-split (in the same range) as engine speed falls, move the splitter switch to HI as you move the shift lever through NEUTRAL to the next lower gear. Note that the splitter switch must not be actuated up to the HI position until the main box is in NEUTRAL. Remember to double-clutch between gears using the accelerator pedal to synchronize the transmission components.

T318 and T318L Reverse — Reverse can be used in LO range only.

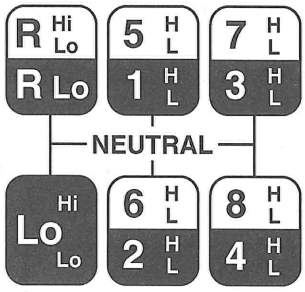
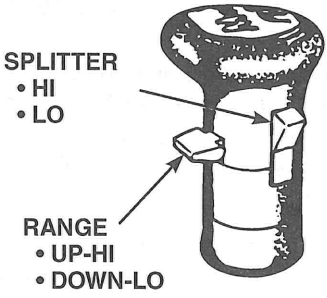
T318LR Reverse — Reverse can be used in LO and HI range.

To make a range shift in reverse, bring the truck to a complete stop. Flip the range selector to the range desired (preselect). Move the shift lever out of reverse through NEUTRAL, and then back into reverse again. As the lever moves through NEUTRAL, the range shift will be completed.

⚠ CAUTION

To avoid transmission damage, do NOT change range while moving in REVERSE.

T318, T318L AND T318LR

SHIFT PATTERN	RANGE SELECTOR
	

300104m

T318, T318L AND T318LR TRANSMISSION RATIOS

Gear (Main Box)	Splitter	Range	Ratios		
			T318	T318LR	T318L
LO	LO	LO	13.44	16.42	16.42
LO	HI	LO	11.40	13.93	13.93
1	LO	LO	8.78	8.78	8.78
1	HI	LO	7.45	7.45	7.45
2	LO	LO	6.28	6.28	6.28
2	HI	LO	5.33	5.33	5.33
3	LO	LO	4.52	4.52	4.52
3	HI	LO	3.83	3.83	3.83
4	LO	LO	3.22	3.22	3.22
4	HI	LO	2.73	2.73	2.73
Range Shift Here					
5	LO	HI	2.29	2.29	2.29
5	HI	HI	1.94	1.94	1.94
6	LO	HI	1.64	1.64	1.64
6	HI	HI	1.39	1.39	1.39
7	LO	HI	1.18	1.18	1.18
7	HI	HI	1.00	1.00	1.00
8	LO	HI	0.84	0.84	0.84
8	HI	HI	0.71	0.71	0.71
R	LO	LO	15.91	28.98	15.91
R	LO	HI	13.49	24.58	13.49
R	HI	HI	3.52	6.41	3.52

Rear Case, Side-Mounted PTO Operating Procedures (T318, T318L and T318LR)

When engaging the PTO —

1. Select LO-split using the splitter switch and select LO range using the range selector.

> **NOTE**
>
> The transmission MUST be in LO range and LO-split at all times during PTO operation.

2. Depress the clutch pedal to disengage the clutch.
3. Set the parking brakes.
4. Move the main box shift lever to the NEUTRAL position.
5. Move the dash-mounted compound NEUTRAL control valve to the ON position, which moves the synchro clutch to a NEUTRAL position.
6. Engage the PTO.
7. Move the main box shift lever to the desired ratio.
8. Release the clutch pedal to engage the clutch.
9. Operate the PTO-driven load.

When disengaging the PTO —

1. Depress the clutch pedal to disengage the clutch.
2. Move the main box shift lever to NEUTRAL.
3. Disengage the PTO.
4. Move the dash-mounted compound NEUTRAL control valve to the OFF position, which moves the synchro clutch back to LO range.
5. Move the shift lever to the desired main gear box ratio.
6. Release the parking brakes.
7. Release the clutch pedal to engage the clutch.

Preferred Methods for Engaging T318(L)(LR) "Eighteenth" Gear (or any HI-range gear) for Output Shaft Driven Power Take-Off Operation

Method #1

After positioning the vehicle for power take-off operation, and with vehicle wheels off the ground:

1. Shift the transmission to NEUTRAL.
2. Engage power take-off drive.
3. Move the range selector to HI range.
4. Disengage the engine clutch and select REVERSE.
5. Feather the clutch until the transmission range clutch engagement is heard.
6. Disengage the engine clutch.
7. Select 18th speed gear for T318LR.
8. Engage the clutch when power take-off operation is desired.

Method #2

After positioning the vehicle for power take-off operation, and with vehicle wheels on the ground:

1. Shift the transmission to NEUTRAL.
2. Move the range selector to HI range.
3. Disengage the engine clutch and select REVERSE.
4. Feather the clutch until the transmission range clutch engagement is heard.
5. Disengage the engine clutch.
6. Engage power take-off drive.
7. Select 18th speed gear for T318LR.
8. Engage the clutch when power take-off operation is desired.

MACK T31821, T318L21 and T318LR21 Shifting Instructions

⚠ CAUTION

Make sure air pressure is at least 90 psi and unit is at operating temperature before making range shifts. Always start in LO range. This also applies to dynamometer testing. When the truck is stationary, do NOT shift into HI range and then start moving the truck. Otherwise, damage to the synchronizer may result.

NOTE

When making a SPLIT SHIFT from gear to gear, the splitter switch must not be actuated, either up or down, until the main box is in NEUTRAL. When making a SPLIT SHIFT in the same gear to a preselected gear, especially under a heavy load, the splitter will not shift until the driveline torque is relieved. This can be done by depressing the clutch pedal and releasing it, or by backing off the throttle and reapplying it. When making a RANGE SHIFT, it is important to preselect the range shift. This means that the range selector must be moved to its next position (up or down) BEFORE the gearshift lever is moved. Then move the gearshift lever through NEUTRAL to the next desired gear position. As the lever passes through NEUTRAL, the range shift will be completed.

Upshift — For purposes of explaining the shifting procedures through ALL gears, assume that the vehicle has a full load and will climb a slight grade.

To prepare for moving the vehicle, position the shift lever in NEUTRAL, select LO-split using the splitter switch, and select LO range using the range selector.

Refer to the shift pattern and move the shift lever to LO speed gear (LO range, LO-split). Apply accelerator and engage the clutch, then accelerate to governed speed. Select HI on the splitter switch (preselect) and release the accelerator pedal long enough for the split shift to complete. Reapply the accelerator. Shift through first LO-split, first HI-split, second LO-split, second HI-split and so on, until you reach fourth HI-split. Remember to double-clutch between gears.

To continue while in fourth gear HI-split, flip the range selector up to HI range (preselect), and as you move the shift lever through NEUTRAL to fifth gear, move the splitter switch from HI to LO. As the lever moves through NEUTRAL, the range shift to HI will be completed. You are now in fifth gear LO-split (HI range). Continue shifting to fifth HI-split, sixth LO-split, sixth HI-split and so on, until you reach eighth HI-split. Remember to double-clutch between gears.

To upshift from LO-split to HI-split (in the same gear), accelerate the engine to governed speed, move the splitter switch to HI (preselect), depress the clutch and back off the accelerator pedal. Reapply the accelerator and engage the clutch when the audible shift is heard, or when the engine speed falls by approximately 200 rpm. Depressing the clutch may not be necessary to break the driveline torque, but this will vary with road and load conditions.

To upshift from a HI-split gear to the next higher gear's LO-split (in the same range), accelerate the engine to governed speed, then move the splitter switch to LO as you move the shift lever through NEUTRAL to the next higher gear. Note that the splitter switch must not be actuated down to the LO position until the main box is in NEUTRAL.

Downshift — Shift from eighth HI-split to eighth LO-split, then seventh HI-split, seventh LO-split and so on (double-clutching between the gears), until you reach fifth LO-split.

To continue while in fifth gear LO-split, flip the range selector down to LO range (preselect), and as you move the gearshift lever through NEUTRAL to fourth gear, move the splitter switch from LO to HI. As the shift lever moves through NEUTRAL, the range shift to LO will be completed. You are now in fourth gear HI-split (LO range). Continue downshifting, using the shift lever and splitter in the normal manner, until you reach LO speed gear (LO range, LO-split).

To downshift from HI-split to LO-split (in the same gear) as engine speed falls, move the splitter to LO (preselect), then release and reapply the accelerator pedal. An audible shift completion should be heard.

To downshift from a LO-split gear to the next lower gear's HI-split (in the same range) as engine speed falls, move the splitter switch to HI as you move the shift lever through NEUTRAL to the next lower gear. Note that the splitter switch must not be actuated up to the HI position until the main box is in NEUTRAL. Remember to double-clutch between gears using the accelerator pedal to synchronize the transmission components.

T31821 and T318L21 Reverse — Reverse can be used in LO range only.

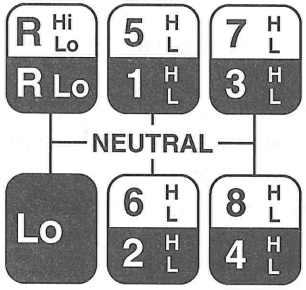
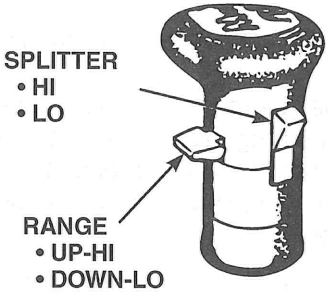
T318LR21 Reverse — Reverse can be used in LO and HI range.

To make a range shift in reverse, bring the truck to a complete stop. Flip the range selector to the range desired (preselect). Move the shift lever out of reverse through NEUTRAL, and then back into reverse again. As the lever moves through NEUTRAL, the range shift will be completed.

⚠ CAUTION

To avoid transmission damage, do NOT change range while moving in REVERSE.

T31821, T318L21 AND T318LR21

SHIFT PATTERN	RANGE SELECTOR
	

300104n

T31821, T318L21 AND T318LR21 TRANSMISSION RATIOS

Gear (Main Box)	Splitter	Range	Ratios		
			T31821	T318LR21	T318L21
LO	LO	LO	13.44	16.42	16.42
LO	HI	LO	11.40	13.93	13.93
1	LO	LO	8.78	8.78	8.78
1	HI	LO	7.45	7.45	7.45
2	LO	LO	6.28	6.28	6.28
2	HI	LO	5.33	5.33	5.33
3	LO	LO	4.52	4.52	4.52
3	HI	LO	3.83	3.83	3.83
4	LO	LO	3.22	3.22	3.22
4	HI	LO	2.73	2.73	2.73
Range Shift Here					
5	LO	HI	2.29	2.29	2.29
5	HI	HI	1.94	1.94	1.94
6	LO	HI	1.64	1.64	1.64
6	HI	HI	1.39	1.39	1.39
7	LO	HI	1.18	1.18	1.18
7	HI	HI	1.00	1.00	1.00
8	LO	HI	0.84	0.84	0.84
8	HI	HI	0.71	0.71	0.71
R	LO	LO	15.91	28.98	15.91
R	HI	LO	13.49	24.58	13.49
R	HI	HI	3.52	6.41	3.52

Rear Case, Side-Mounted PTO Operating Procedures (T31821, T318L21 and T318LR21)

When engaging the PTO —

1. Select LO-split using the splitter switch and select LO range using the range selector.

> **NOTE**
>
> The transmission MUST be in LO range and LO-split at all times during PTO operation.

2. Depress the clutch pedal to disengage the clutch.
3. Set the parking brakes.
4. Move the main box shift lever to the NEUTRAL position.
5. Move the dash-mounted compound NEUTRAL control valve to the ON position, which moves the synchro clutch to a NEUTRAL position.
6. Engage the PTO.
7. Move the main box shift lever to the desired ratio.
8. Release the clutch pedal to engage the clutch.
9. Operate the PTO-driven load.

When disengaging the PTO —

1. Depress the clutch pedal to disengage the clutch.
2. Move the main box shift lever to NEUTRAL.
3. Disengage the PTO.
4. Move the dash-mounted compound NEUTRAL control valve to the OFF position, which moves the synchro clutch back to LO range.
5. Move the shift lever to the desired main gear box ratio.
6. Release the parking brakes.
7. Release the clutch pedal to engage the clutch.

Preferred Methods for Engaging T318(L)(LR)21 "Eighteenth" Gear (or any HI-range gear) for Output Shaft Driven Power Take-Off (PTO) Operation

Method #1

After positioning the vehicle for power take-off operation, and with vehicle wheels off the ground:

1. Shift the transmission to NEUTRAL.
2. Engage power take-off drive.
3. Move the range selector to high range.
4. Disengage the engine clutch and select reverse.
5. Feather the clutch until the transmission range clutch engagement is heard.
6. Disengage the engine clutch.
7. Select 18th speed gear for T318L(R)21.
8. Engage the clutch when power take-off operation is desired.

Method #2

After positioning the vehicle for power take-off operation, and with vehicle wheels on the ground:

1. Shift the transmission to NEUTRAL.
2. Move the range selector to HI range.
3. Disengage the engine clutch and select REVERSE.
4. Feather the clutch until the transmission range clutch engagement is heard.
5. Disengage the engine clutch.
6. Engage power take-off drive.
7. Select 18th speed gear for T318L(R)21.
8. Engage the clutch when power take-off operation is desired.

Precautions When Descending Grades If Vehicle is Equipped with Eaton AutoShift Generation I and II

⚠ DANGER

When "D" is selected, AutoShift will automatically upshift as engine and road speed increases on downhill grades.

Preselect "Manual" or "H" to prevent unwanted upshifts; use the up and down buttons to command shift. Shifter will beep and not respond to shift requests that will overspeed or excessively lug the engine.

NOTE

Keep engine speed below 2100 rpm to allow commanded upshifts.

Preselect "Low" to maximize engine braking power down steep grades and allow downshifts only. **See your Eaton Driver Instructions Manual for more details.**

AXLES

Rear Axles Other Than MACK

Please refer to the operator's manual provided with your vehicle for axles other than MACK.

MACK Rear Axles

Mack Trucks, Inc. provides axle housings in three capacity classifications:

- Medium Duty
- Heavy Duty
- Extra-Heavy Duty

To deliver the appropriate amount of torque to the driving wheels, MACK offers dual-reduction carriers in a variety of ratios.

Mack Trucks, Inc. offers a large variety of four-wheel-drive tandem axles with top-mounted, dual-reduction carriers (for straight line through drive). Carriers are also available in a large number of ratios.

All four-wheel-drive tandem carriers are available with the MACK inter-axle power divider third differential (with or without a power divider lockout).

MACK rear axles are designed so the entire load is carried by the axle housing (through the wheel bearings mounted on the housing spindle). The rear axle shafts are either free-splined (both ends) or integral flange type. Both types of axle shafts can be removed without removing or disturbing the rear wheels.

To avoid excessive tire wear, proper maintenance must be practiced and rear axle tires must be matched.

⚠ CAUTION

The maximum safe operating oil temperature for a MACK rear axle is 250°F (121°C) for mineral-based oil, and 300°F (148°C) for synthetic-based oil. Continued operation with oil above this temperature will result in rapid deterioration of the oil's lubricating properties and is NOT recommended.

Inter-Axle Power Divider Lockout (If Equipped)

The MACK power divider can be rendered inoperative, during short periods of poor traction, using a power divider lockout. When the power divider lockout is engaged, both axles are locked together (in positive through-drive) for maximum traction with no differential action between axles. It is not necessary to stop the vehicle to engage the power divider lockout. The lockout may be engaged while the vehicle is moving at less than 30 mph, as long as the wheels are not spinning.

⚠ CAUTION

Do not engage the power divider lockout if the wheels are spinning.

NOTE

Even when no traction is available at the spinning wheel, the driver can "feather" the brakes (apply the brakes slightly), creating enough resistance at that wheel to allow power to the axle with traction. Feathering brakes should not be done with power divider lockout engaged.

NOTE

For vendor axles, see the vendor manual furnished with the vehicle.

Engaging the Power Divider Lockout

Normally, the Power Divider switch is in the OUT (disengaged) position. In poor traction conditions, it may be necessary to provide positive through-drive to both axles by flipping the switch to the locked (engaged) position.

1. Push switch to engage.
2. Momentarily release the accelerator pedal to allow the shift to take place, then drive through the slippery area.

NOTE

A lockout indicator lamp will remain lit as long as the lockout is engaged. This is to remind the driver to release the lockout as soon as normal traction is regained.

3. When driving conditions permit, unlock the power divider by moving the Power Divider switch back to the OUT (disengaged) position. Then release the accelerator pedal momentarily (to shift out of the locked position) and drive as usual.

⚠ CAUTION

Do NOT (under any circumstances) engage or disengage the lockout while the drive wheels are actually slipping or spinning; clashing between the lockout sliding clutch and the outer cam may result.

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MAINTENANCE INTRODUCTION

Preventive maintenance is vital to the life of your new vehicle. This section of the Operator's Handbook covers items of importance concerning the proper care of MACK vehicles. A well-run maintenance and lubrication program is the best way to ensure a long life of productive operation.

The operator plays an important role in the proper care of this equipment. By performing daily checks and observing the equipment while in operation, minor defects can be caught and corrected before they become major problems. Make sure any problems are corrected before putting the equipment into operation.

If you have any questions concerning the proper care, maintenance and lubrication of your vehicle, or if you need help in developing a preventive maintenance program, contact the service manager at the local MACK Sales, Parts and Service Center.

NOTE

This handbook contains basic maintenance information. For complete maintenance and lubrication procedures, refer to the *Maintenance and Lubrication Manual (TS494)*.

TURBOCHARGER

The engine turbocharger operates at very high speed, temperatures and pressure. Turbo bearing lubrication is critical, particularly for a newly installed turbo or one which has not been operated for a period of time and all oil has drained from the bearing and shaft surfaces. To avoid turbocharger bearing failure, the following instructions are recommended:

- Start the engine at least every 30 days to ensure turbo bearing lubrication. Operate engine at low idle for approximately five minutes before increasing RPM or driving the vehicle.
- If the engine has not been run for more than 30 days, turbo pre-lube procedure is necessary:
  1. Pour clean engine oil into the oil inlet port at the top of the turbocharger until overflowing.
  2. Spin the compressor wheel by hand several revolutions while wiggling the shaft back and forth. This ensures that oil is distributed over all bearing surfaces.
  3. Install the inlet air duct to the turbocharger, and install the turbocharger drain tube (use a new gasket part No. 590GB2150). Make sure that all clamps are tightened and positioned properly to ensure no leaks in the intake piping.
  4. Disconnect the connector from the VTG control valve.
  5. Again, pour clean engine oil into the turbocharger oil inlet port until overflowing, and then reconnect the oil supply line.
  6. Start the engine and allow it to run at an idle for at least five minutes.

NOTE

Disconnecting the connector from the VTG control valve prevents the turbocharger from reaching excessive speeds when the engine is first started.

  7. After the engine has run for at least five minutes, shut the engine off and reconnect the VTG control valve connector.
  8. Use the V-MAC® service tool to clear the fault code.

CLEANING YOUR VEHICLE

The best protection against environmental influences that can hurt your vehicle's finish is frequent washing and waxing. How often this is required depends on how much the vehicle is used, where it is parked and weather conditions. Frequent washing is required to remove oils, dirt and grime that can stain and oxidize the painted and polished surfaces of your new truck.

Exterior Washing

Recommendations for the first 30 days...

- Only wash the vehicle by hand with cool water, a mild car wash solution and a soft cloth or sponge. Do not use a commercial truck wash.
- Wash the vehicle in the shade, never in direct sunlight.
- Do not dry wipe the finish; always use clean water. Dry wiping could scratch the finish.
- Do not park near factories with heavy smoke fallout for extended periods of time.
- Bird droppings have high acid content and can damage freshly painted surfaces. They should be cleaned off as soon as possible.
- Do not spill gasoline, diesel fuel, oil, antifreeze, transmission fluid or any solvents of the like on the new finish. If you do... IMMEDIATELY rinse off with water. DO NOT WIPE.
- Do not scrape ice or snow from surface. Brush off the loose material with a soft snow brush.

Recommendations for the first 90 days...

- Do not wax or polish the vehicle; this will allow the finish to dry and harden completely. (Do not use waxes or polishes that contain silicone.)

⚠ CAUTION

In the interest of the environment, the vehicle should be washed in special wash bays. Handle cleaning products carefully. Cleaning agents may be poisonous. Keep them out of reach of children. Observe all product warning labels.

NOTE

Do not wash the vehicle in direct sunlight.

⚠ DANGER

Test the service brakes after washing the vehicle. Moisture and/or ice on the brakes can affect braking efficiency.

NOTE

When washing the vehicle in cold/freezing weather, avoid direct water spray into the door lock cylinders, as the water may freeze in the lock mechanisms.

⚠ CAUTION

Proper care of the paint finish is an important part of the durability. Chemicals used to wash the paint should be of neutral pH with a range of between 6 and 8. Detergents containing butyl cellosolve or potassium hydroxide should not be used.

⚠ CAUTION

For chassis used in concrete operations, do not use muriatic acid or similar types of products to clean concrete from the cab or frame surfaces. Use of these types of products will damage the paint finish and void the vehicle warranty. Mack Trucks, Inc. has approved EL-ReadyMix Truck Wash & Wax for removing concrete from the vehicle surfaces. This product is available on a direct ship basis from EMS®. For additional information, contact EMS® at 800-510-8812, or on their web site at www.emssafesolutions.com.

Cab and Hood

- Soften the dirt on your cab with plenty of water and rinse.
- Clean truck with a soft sponge/brush starting at the roof and working downward using slight pressure.
- Use mild detergent. Never use strong soaps or chemical detergents. Any commercially available cleaner designed specifically for automotive finishes may be used for cleaning the cab and hood surfaces. The 3M company and Mequiar's® have a complete line of automotive cleaning products available that are approved for use on MACK vehicles.
- Rinse the sponge or brush often to keep it clean.

- If possible, clean wheels and dirtier areas with a separate sponge/brush. This will help avoid scratching body paint with grit from other areas.
- Rinse truck thoroughly with water and wipe dry with a soft clean chamois or all cotton towels to avoid surface scratches and water spotting.

⚠ CAUTION

Do not clean the underside of the fenders, cab, chassis, etc. without protecting your hands and arms. You may injure yourself on sharp-edged parts.

Chassis

- Wash away excess dirt and grime with water from a hose.
- Use a mild detergent/soap and a soft brush to remove road grime and salts that can collect on the frame.
- Rinse thoroughly with a hose.

NOTE

Cleaning of your chassis on a regular basis will help deter accelerated corrosion and rust on the frame and components. Chemicals used for ice and snow removal and dust control can collect on the frame. If these are not removed in a timely manner, accelerated corrosion can occur on fuel lines, frame, and other components even though they have corrosion protection.

Cab Interior

- For cleaning vinyl upholstery and lining: wipe with a soft cloth, using a good commercial upholstery cleaner. Do not use acetone, lacquer thinner, etc.
- For cleaning fabric upholstery: use an upholstery shampoo specially designed for this purpose. Follow the directions on the manufacturer's label.

Waxing

- Always use waxes and polishes that are non-abrasive. Do not use waxes or polishes that contain silicone.
- When water does not form small drops and roll off clean paint, apply a coat of good hard wax.
- Even if a liquid wax solution is used on a regular basis, it is advisable to protect the finish with a hard wax at least twice a year.
- Your truck may have a basecoat plus clearcoat. Use a basecoat/clearcoat wax on your paint finish.

Polishing

Polish your truck only if the paint has lost its shine and the gloss cannot be brought back with wax. It is recommended to have a professional polish your truck to avoid swirl marks or damage to the painted surface. Mequiar's® has a complete line of waxes, polishes and other cleaning and care products that are approved for use on MACK cabs, hoods and sleeper surfaces.

Winter Warnings

- If you rinse your vehicle with a hose, avoid direct water into lock cylinders. You may experience freezing of the lock mechanism.
- Test brakes after each vehicle wash. Moisture and ice on brakes can affect braking efficiency.

A well kept vehicle can look like new after many years of service. Proper care and maintenance can help you keep your vehicle's beauty and value. You can get an assortment of Mack Trucks approved cleaning products from your local Mack dealer.

TOWING

Tow pins, hooks, eyes, etc., are located in or behind the front bumper. These devices meet the recommendations for towing set forth by the Technology and Maintenance Council (TMC) of the American Trucking Association and can be used for towing a disabled vehicle from the immediate location.

⚠ CAUTION

Do NOT lift and tow any vehicle by tow pins, hooks, eyes, etc. If the vehicle is mired in heavy mud, snow, etc., use a suitable sling-type towing arrangement.

NOTE

Tow pins, hooks, eyes, etc., are NOT intended for use as long-term towing devices.

⚠ CAUTION

Failure to disconnect the driveline or lift the drive wheels off the ground before towing or pushing the vehicle can cause serious transmission damage.

⚠ DANGER

If the drive shaft has been removed for towing, DO NOT reuse bearing retainer bolts or stamped strap bolts, or stamped straps. Reuse of bearing retainer bolts or stamped strap bolts, or stamped straps can cause driveline failure, which can result in separation of the driveline from the vehicle. A separated driveline can result in property damage, serious personal injury or death.

Towing with MACK Air (AL or MAXAIR® 40) Suspension (If Equipped)

During vehicle towing, when the rear axles of a chassis with the MACK AL suspension are raised from the ground, the axle is held in position by the fore-aft torque rods, transverse torque rod and the shock absorbers.

To prevent damage to any of these components during rear towing, the following precautions should be taken:

- Exhaust the air from the air bags.
- Use chains of suitable length and secure the axles to the frame.

⚠ CAUTION

Be sure that the chains do not rub against spring members because this could adversely affect spring member life.

⚠ CAUTION

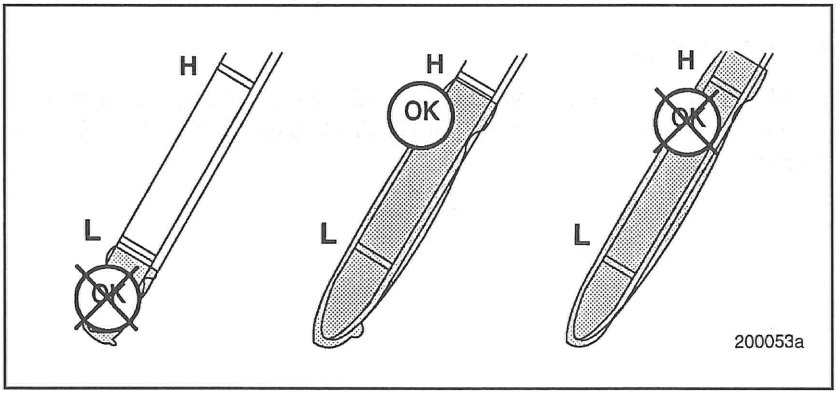
Tow truck operators must be trained in proper hook-up techniques, safety precautions, and the correct operation of their equipment to avoid vehicle damage and personal injury.

ENGINE OIL LEVEL CHECK

As the operator of this vehicle, it is important for you to perform the daily inspections necessary to keep your truck in good shape. Maintaining the proper oil level in your engine crankcase cannot be overemphasized.

Before checking the oil, remember these important points:

- Measurement of the oil level must be taken on level ground.
- If the engine has been running, allow about 15 minutes after shutdown for oil to drain down to the oil pan.
- The level must be close to the FULL line (at least between the ADD and FULL lines) on the dipstick, but must NOT exceed the FULL line (refer to illustration below).

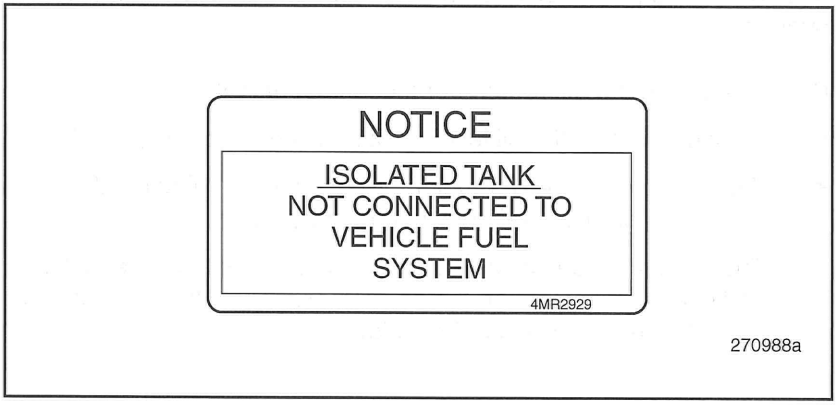


Power Steering Reservoir

The Power Steering system uses only DEXRON® type automatic transmission fluid.

FUEL TANK

Your vehicle may be equipped with an isolated fuel tank. If so equipped, the following label will be affixed to the fuel tank decal.



Fuel Tank Cap

Use MACK approved non-vented cap only or tank damage and/or poor engine performance may result. DO NOT fill to more than 95% of liquid capacity.

COOLING SYSTEM

The cooling system is a pressurized system. The coolant is circulated by a centrifugal pump. It is a typical system in most respects, but there are a few things to keep in mind when checking or working on the cooling system.

⚠ WARNING

Keep clear of fan when engine is running. Fan may start to rotate at high speed without warning.

⚠ WARNING

Avoid injury when checking coolant in a hot engine. Wait for the engine to cool prior to checking the level whenever possible.

Coolant Level Check

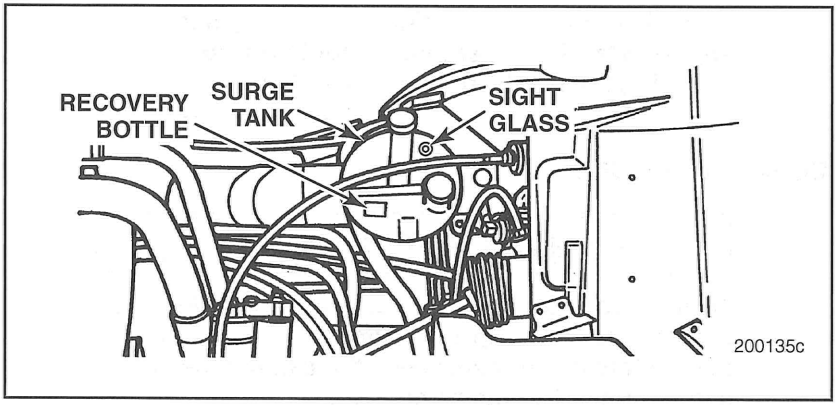
⚠ WARNING

Turn the radiator cap counterclockwise to the first stop but do NOT depress. After the pressure has completely dissipated, press the cap downward and continue turning to remove.

CHN Series

The CHN model chassis has both a pressurized surge tank and a non-pressurized plastic coolant recovery bottle where quick checks of coolant level can be made and additional coolant can be added to the system. The recovery bottle is located in the engine compartment, mounted on the left-hand cab bulkhead bracket. Coolant should be visible between the indicator lines on the bottle.

Periodically, the coolant level should be checked by observing the coolant in the pressurized coolant surge tank. The coolant surge tank is located directly above the coolant recovery bottle. Coolant should be visible in the sight glass which is located at the top of the tank. The surge tank should always be full of coolant.



Draining the Cooling System

Whenever repairs are to be made which would require disconnection of coolant hoses, etc., the cooling system should be drained. Carefully remove the filler cap and open all coolant drain cocks.

Refilling the Cooling System

Close all drain cocks and fill with the proper coolant mixture. Run engine with the pressure cap removed until operating temperature is reached and the thermostat opens. Recheck level and add coolant if required. Run the engine long enough to be sure the system is free of air and has the correct amount of coolant.

Protecting the Cooling System

⚠ CAUTION

The concentration of ethylene glycol or propylene glycol in the cooling system must be checked with a refractometer prior to traveling or operating in areas where subfreezing temperatures may be encountered. When adding antifreeze to the system, run the engine for 20 minutes before checking with a refractometer.

NOTE

Your chassis is currently supplied from the factory with engine coolant protection to –10°F (–23°C). Optional coolant protection to –40°F (–40°C) is also available.

Ethylene glycol or propylene glycol-based antifreezes are both approved for all MACK engines. All ethylene glycol and propylene glycol coolants must be low-silicate antifreezes which meet ASTM4985 test (GM6038M SPEC) criteria. These antifreezes are sometimes referred to as heavy-duty diesel coolants. Passenger car coolants do NOT meet this specification.

Be sure to maintain the required level of antifreeze protection for anticipated winter temperatures in your area of operation. A 40% to 60% concentration of antifreeze is required for ASET™ engines, regardless of application, geographic location or ambient air temperature.

⚠ CAUTION

Do NOT exceed a 60% concentration of antifreeze to water. A higher percentage of antifreeze will not increase protection. Concentrations over 60% adversely affect freeze protection and heat transfer rates.

NOTE

Propylene glycol should be checked with a refractometer.

NOTE

ALWAYS mix the water/antifreeze solution before pouring it into the cooling system.

NOTE

The piping arrangement may cause capacity variation depending on the type of cooling system and optional external cooling devices which may be attached. Therefore, it is difficult to tell exactly how much coolant it will take to fill any one particular system.

⚠ CAUTION

Do NOT use coolant solutions which contain anti-leak additives in trucks equipped with coolant filters or conditioners.

⚠ CAUTION

Do NOT use soluble oil-type coolants in any MACK cooling system.

Cooling System Maintenance

The cooling system must be maintained by performing regularly scheduled maintenance as outlined in the *Maintenance and Lubrication Manual (TS494)*. Cold weather operations, however, place added demands on the cooling system. Prevent potential cold weather problems by performing a quick check of the cooling system as outlined below:

- Make a general check for cooling system leaks.
- Inspect hoses and clamps for leaks and condition. Tighten hose clamps to specifications (as required).
- Check coolant level. Add fresh coolant (in specified concentration) as necessary.
- Check and record degree of antifreeze concentration. Add antifreeze as necessary to obtain required protection level.

Winterfronts

A MACK-approved winterfront, although not recommended for normal operation, may be used during cold weather to aid the engine in reaching and maintaining engine coolant temperatures within the normal operating range.

⚠ CAUTION

Use only a MACK-approved winterfront designed for the specific chassis. Restricted air flow through the charge air cooler can cause higher exhaust temperatures, power loss, excessive fan usage, reduced fuel economy and possible engine or charge air cooler damage. The use of any other type of device, such as a radiator cover, cardboard or similar material, is not approved by Mack Trucks, Inc.

NOTE

The minimum operating temperature is 170°F (77°C).

If a winterfront is used, a MACK-approved exhaust pyrometer must also be installed and closely monitored while the engine is in operation.

⚠ CAUTION

DO NOT exceed the maximum exhaust temperature listed on the pyrometer decal. To reduce exhaust temperature, open the winterfront, downshift or reduce engine power.

Refer to the following chart for suggested temperature ranges concerning the use of various cold-weather accessories.

<table>
<tr><th>Expected Coldest Temperature</th><th>MACK Approved Winterfront or Shutters</th><th>Belly Tarp</th><th>Inside/Outside Air</th></tr>
<tr><td>40°F (4°C)</td><td>Prohibited</td><td>Prohibited</td><td>Available</td></tr>
<tr><td>32°F (0°C)
20°F (–7°C)</td><td rowspan="2">Suggested (Center Panel Fully Opened)</td><td>Available</td><td>Suggested</td></tr>
<tr><td>10°F (–12°C)
0°F (–18°C)</td><td>Suggested</td><td rowspan="3">Recommended</td></tr>
<tr><td>–10°F (–23°C)
–20°F (–29°C)
–30°F (–35°C)
–40°F (–40°C)</td><td>Recommended (Center Panel Fully Closed)*</td><td>Recommended</td></tr>
</table>

*Never close winterfront if equipped with viscous fan drive.

⚠ CAUTION

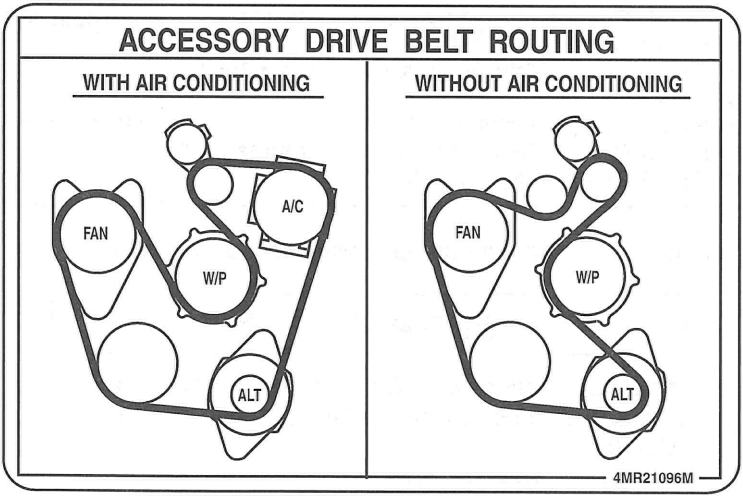
Winter treatments are NOT RECOMMENDED for vehicles which only operate intermittently in cold climates.

⚠ CAUTION

Never fully close the winterfront if equipped with viscous fan drive.

Accessory Drive Belt Routing

The following diagram shows the accessory drive belt routing with and without air conditioning. This diagram is located in a clear area on the outside of the left frame between the radiator and center line of the front axle.

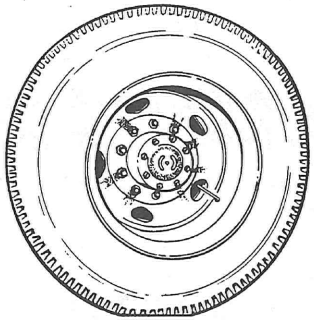


Accessory Drive Belt Routing

WHEELS

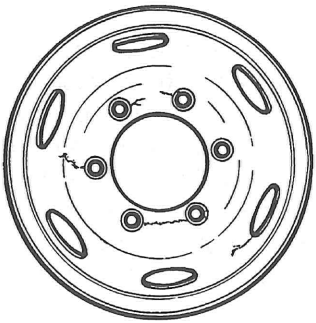
Wheel Inspection

Look at the wheels and cap nuts. Inspect them for evidence of cap nut looseness. Rust streaks from the cap nut ball seat are an indication of looseness. Refer to the *Maintenance and Lubrication Manual (TS494)* for complete procedures concerning wheel inspection and wheel nut tightening.



500032a

Look for cracks around the hand hole, stud hole and wheel. Look for broken studs, wheel damage or improperly seated lock rings.



500031a

Tires

⚠ DANGER

Tires used on multipiece rims must be assembled and inflated only by experienced, qualified personnel. Tires must be inflated in a safety cage whenever possible. If, however, a safety cage is not available, use a portable lock-ring guard. The tire must be deflated prior to removal of the tire-and-rim assembly from the vehicle. Remove the valve core to ensure complete deflation.

⚠ DANGER

NEVER position your body in front of the rim during inflation.

⚠ CAUTION

NEVER use water-based sealants, puncture proofing, or liquid balance materials containing water in All-Steel Radial Ply truck tires.

Inflation Pressure

To ensure maximum mileage and overall performance from your tires, it is essential that they operate at the correct inflation pressure for the load carried. Inflation pressure should be checked daily while the tires are cold. Always use an accurate tire pressure gauge. NEVER bleed air from a hot tire, as it will then be underinflated. Refer to the specific tire manufacturer's data books, or to the vehicle certification label for a complete listing of tire inflation pressures. For additional information concerning tire care, refer to the *Maintenance and Lubrication Manual (TS494).*

⚠ WARNING

UNDER NO CIRCUMSTANCES should you drive on underinflated or overloaded tires. A tire in this condition builds up excessive heat which can result in sudden tire destruction, property damage and personal injury.

⚠ CAUTION

Never bleed air from your tires in an attempt to gain traction for a vehicle stuck in snow, ice or mud. This practice provides no additional traction and typically results in underinflated tires. Never bleed air from a hot tire since that tire will then be underinflated.

To adjust for pressure fluctuations induced by temperature changes associated with winter weather, it is recommended that tire inflation pressure be checked daily when the tires are cold (i.e., before the vehicle is driven). Always use an accurate tire pressure gauge.

Inspection

Inspect your tires daily. Look for bulges, cracks, cuts, penetrations and/or oil contamination. If any such damage is found, the tire must be thoroughly inspected by a qualified tire inspector and repaired or discarded immediately, at his discretion. Also, check for uneven wear. If found, a thorough inspection of front end parts and alignment should be made by a qualified mechanic. Refer to the *Maintenance and Lubrication Manual (TS494)* for more information.

Tire Manufacturer's Data Book

Specific and more detailed information can be obtained by referring to the technical data books provided by each tire manufacturer.

Subjects of interest are:

- High-speed or low-speed operation
- Repair, retreading and regrooving
- Use of tire chains
- Mixing radial and bias tires on the same vehicle
- Use of dynamometers
- Tire mounting/dismounting

⚠ CAUTION

For important tire information (i.e., high speed limits, inflation pressures, etc.), consult the product information available through the specific tire manufacturer.

Oil Contamination of Tires

Lubricating oils, fuel oil, gasoline and other petroleum derivatives, if allowed to contact tires, will soften the rubber and destroy the tire. Preventive maintenance is necessary to ensure that oil leakage does not occur. The following areas should be inspected on a regular basis:

- Axle end seals
- Engine seals
- Transmission seals
- Drive axle seals
- Oil filters
- Oil and hydraulic lines (if equipped)
- Refer to the *Maintenance and Lubrication Manual (TS494)*, specific tire manufacturer's books, or to the vehicle certification label, for additional information concerning tires and their care.

BATTERY

⚠ CAUTION

To avoid damage to sensitive electronic equipment, disconnect ALL battery cables and harnesses to electronic control units before welding. Do NOT disconnect batteries while engine is running.

Jump-Starting Engine

If you encounter a situation in which it is necessary to jump-start an engine, use the following procedures.

⚠ WARNING

Batteries which are to be linked together must be of the same voltage (12 to 12, 24 to 24). Take care to observe proper polarity when connecting batteries. Batteries produce explosive gases. Keep sparks, flames, cigarettes, etc., away from batteries at all times. Protect your eyes by wearing safety goggles. Be sure vehicles are NOT touching each other.

⚠ CAUTION

To avoid damaging any electronic controllers when jump-starting a V-MAC vehicle, always turn the ignition switch OFF before connecting the batteries.

NOTE

Your vehicle may be equipped with a jump-start connector which is located on the left rear side of the cab.

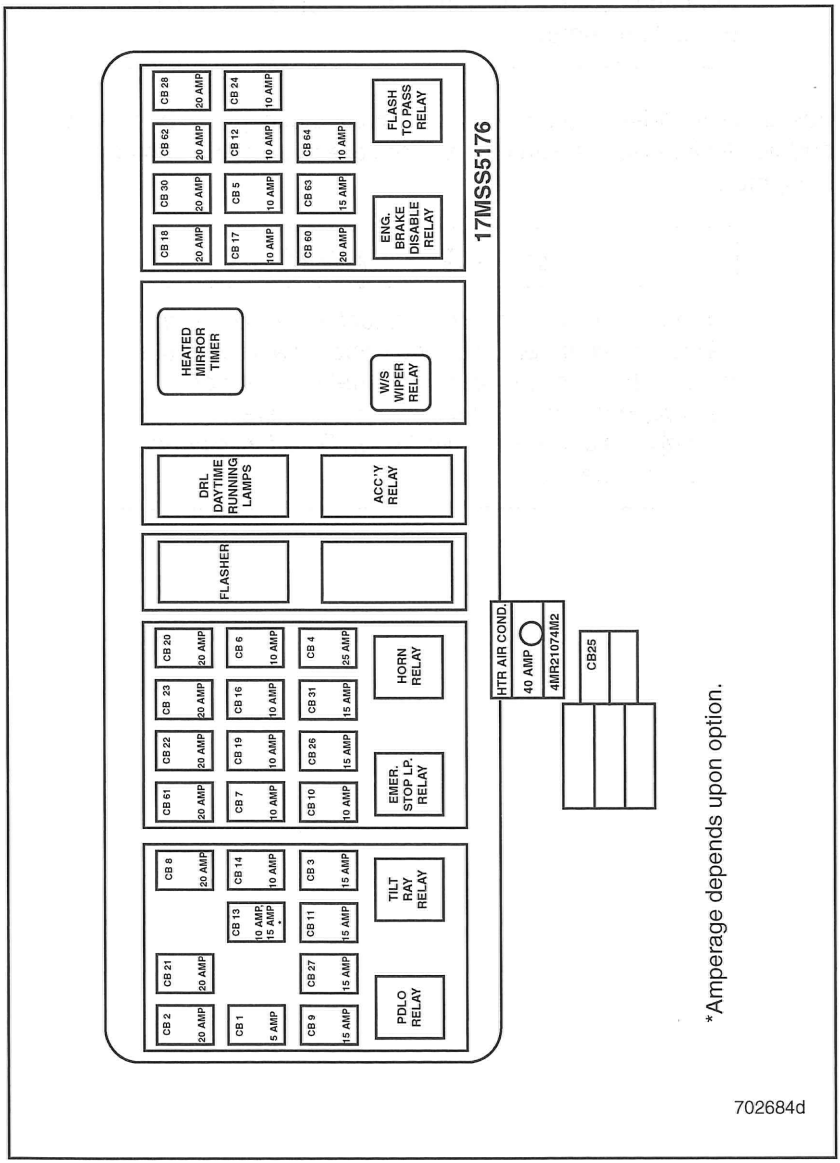
1. Connect the positive (+) cable to positive (+) post of discharged battery or to the positive post of the remote jump-start connector (if equipped).
2. Connect the other end of the same cable to the positive (+) post of the booster battery.
3. Connect the second cable, negative (–) side, to the other post of the booster battery.
4. Make the final connection to the negative (–) battery terminal or the remote jump-start connector (if equipped) of the stalled vehicle, and stand back.
5. Start the vehicle with the booster batteries and then start the stalled vehicle. Shut down the vehicle with the booster batteries and remove the cables in the reverse order of connection.

⚠ WARNING

Do NOT connect the final negative (–) connection to the frame of the stalled vehicle. This would cause all current to flow through the master ground circuit breaker resulting in overload.

ELECTRICAL

Circuit Breaker and Relay Panels



NOTE

For circuit breaker designations, refer to the Circuit Protection charts.

Fuses are standard equipment for all circuits except the headlamps and windshield wipers. Circuit breakers are available as optional equipment.

⚠ CAUTION

For proper installation of electrical accessories, all wiring should meet SAE requirements and be routed through the circuit protection panel with proper amperage fuses or Type II circuit breakers. (Headlights and wipers will be on Type I, cycling-type circuit breakers.)

Some vehicles may be equipped with daytime running lights. For the daytime running lights to be operational, a DRL module must be installed in the relay socket marked either DRL MOD or Running Lamps on the electrical equipment panel. Do NOT install a standard relay into the daytime running light relay socket (marked either DRL MOD or Running Lamps) or a short circuit in the headlight high beam circuit will result.

The headlight circuits are protected by SAE Type I (automatic reset-cycling) circuit breakers that automatically interrupt then restore the flow of current through the circuit in the event of an overload. This cycling will continue until the cause of the overload is repaired.

SAE Type II (automatic reset, non-cycling) circuit breakers (if equipped) provide a complete circuit disconnect until the overload is corrected. The power to the affected circuit breaker must be shut off before the circuit breaker will reset itself.

The circuit protection panel also provides access to battery, ignition and ground terminals for non-factory installed electronic equipment. (On V-MAC chassis, there are two serial link terminals for easy local connection of a trip recording device.)

Electrical Grease

To prevent corrosion of the lamp socket terminals, particularly with the clearance and marker lamp, apply a coating of electrical sealing grease, such as Lubriplate DS-ES or TEK-519, to the socket and terminal assemblies.

⚠ CAUTION

Do not use electrical grease on any V-MAC connectors.

Circuit Protection Charts

Cab Circuit Protection			
#1 — 5A	#2 — 20A	#3 — 15A	#4 — 25A
VCU (Clock) 12 V ABC Cluster	Headlamps, Low-Beam, DRL Module	Park & Tail Lps., Cab ID Lps., Panel Lps.	Direct Lps., Flasher
#5 — 10A	#6 — 10A	#7 — 10A	#8 — 20A
Tractor Stop Lps.	Dome Lps., Courtesy Lps.	Ign. Switch	Cigar Lighter, Horn
#9 — 15A	#10 — 15A	#11 — 15A	#12 — 10A
CB Posts	Communication Connector (DDL), Radio	Battery Stud	Electric Door Locks or Spare
#13 — A*	#14 — A**	#15	#16 — 10A
*ABS: WABCO D Full, Eaton 6S/6M or with ATC = 10A ABS: Eaton 4S/4M or without ATC = 15A	**ABS: WABCO D Full, Eaton 6S/6M or with ATC = 10A	Open	Vehicle Control Unit (VCU)
#17 — 10A		#18 — 20A	#19 — 10A
Clutch Switch, Engine Brake, Cruise, On/Off & Set/Resume, Override Switch, Park Brake, PTO w/o T2000, Spare (VCU) Relay Coils		Spare (VCU) CDS	Gauges, PDLO Switch, Digital Display, Indicator Lmps.
#20 — 20A	#21 — 20A	#22 — 20A	#23 — 20A
Htd. Mirrors, Moto-Mirror, Cold Start	Windshield Wiper & Washer	LH Window Lift Motor	RH Window Lift Motor

Cab Circuit Protection			
#24 — 10A	#25 — 30A/40A	#26 — 15A	#27 — 15A
Spare	Heater/Air Conditioner	Hook-Up Lps.	Ignition Stud
#28 — 20A	#29	#30 — 20A	#31 — 10A
HTD Seats	Open	Opt. Ign. Sw. Spare	Spare or Auto. Shift Trans.
#60 — 25A	#61 — 20A	#62 — 20A	#63 — 15A
2-Power Outlet Sockets	Opt. Batt. Sw. Spare	Spare	Spare
#64 — 10A			
Spare or lighting trans.			

Engine Circuit Protection (V-MAC IV)			
#32 — 20A	#33 — 30A	#34 — 30A	#35 — 30A
Spare	Trailer Stop Lps.	Reverse/Neutral Power	Cab & Trailer Clearance Lps., Mirror Illum.
#36 — 20A	#37 — 30A	#38 — 30A	#39 — 30A
Fog Lps.	Trailer Tail Lps.	Engine ECU	Trailer ABS Power
#40 — 25A	#41 — 15A		#42 — 20A
Spare	Fan Clutch, Torque Limiter, PTO w/T2000, Webb Fuel Level Sensor, Super 10 Top 2 Trans.		Back-Up Lps.
#43 — 20A	#44 — 25A	#45 — 30A	#46 — 20A
Air Management Optional Engine	Air Dryer, Htd. Drain Valve	Spare/Fuel Separator, Fuel Heater	Spare or Heated Seats
#47 — 20A	#48 — 50A	#49 — 10A	#50 — 30A
Spare or Meritor Trans. EOA	Sleeper Box	ABS	Aux. Cooling

Electrical Accessory Connection Points

⚠ CAUTION

The electrical systems on all MACK chassis include a circuit breaker located in the ground circuit. Any additional electrical components that may be added MUST not be connected directly to the battery or negative connection of the starter. Doing so may defeat the protection provided by this circuit breaker. Components may be ground connected to other locations, such as frame or engine grounding points.

This MACK chassis is ready for convenient installation of electrical accessories. Use only the designated CB jacks on the dashboard, or battery post (12 volts), ignition, ground post, buffered tachometer (RPM) output, and buffered speedometer (MPH) output connections available on the electrical equipment panel. Each connection point is described below.

Battery Post (BATT)

This is a 12-volt, unswitched battery power connection. It can be used to power external devices that require power at all times, even when the key is turned off. This source is protected by a 20-amp circuit breaker.

Ignition Post (IGN)

This is a 12-volt, switched battery power connection. It can be used to power external devices that require power only when the key is turned on. This source is protected by a 15-amp circuit breaker.

Ground Post (GND)

This is a ground connection. It can be used as a power return connection for external devices.

⚠ WARNING

The tachometer output, speedometer output, and serial links A and B are for specific hookups. These terminals should be used only for their specified purposes and connection to these terminals should be done only by a qualified service technician.

NOTE

The tachometer output and speedometer output are 50% duty cycle, Transistor-Transistor Logic (TTL) compatible, square wave signals that are calibrated to provide a standard pulse rate of 12 pulses per engine revolution. TTL compatibility of these outputs may be affected by other devices connected to these outputs.

Tachometer (RPM) Output

This terminal is to be used for devices requiring information for engine speed signals. (See the Warning and Note above.)

Speedometer (MPH) Output

This terminal is to be used for devices requiring information for vehicle speed signals. (See the Warning and Note above.)

SAE/ATA J1708 Posts (Serial Links A and B)

This is a serial communication interface. It conforms to the SAE/ATA J1708 Recommended Practice for Serial Data Communications Between Microcomputer Systems in Heavy-Duty Vehicle Applications. (See the Warning above.)

CB Radio Power Jack

The CB radio power jacks are located on the dashboard of the day cab, and on the headliner of the sleeper.

Power Jack (+) This is a 12-volt, switched battery connection. It is to be used to power the vehicle's CB radio. It is protected by a 15-amp circuit breaker and will supply power only when the key is turned ON.

Power Jack (–) This is a ground connection. It is to be used as a power return connection for the vehicle's CB radio.

CB Radio Power Jack (+) Located on the Dashboard or Cab Headliner

This is a 12-volt, switched battery connection. It is to be used to power the vehicle's CB radio. It is protected by a 15-amp circuit breaker and will supply power only when the key is turned ON.

CB Radio Power Jack (–) Located on the Dashboard or Cab Headliner

This is a ground connection. It is to be used as a power return (–) connection for the vehicle's CB radio.

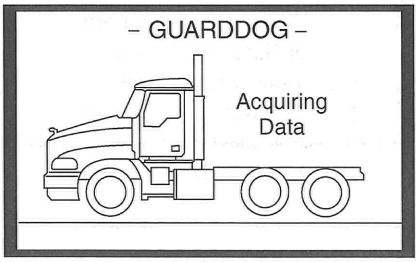
CO-PILOT®

Co-Pilot® is an in-dash computer that allows the vehicle operator to monitor information supplied by the V-MAC® electronic control system. The Co-Pilot® enhances the functions of V-MAC® by entering requested information with the stalk switch. The Co-Pilot® is very "user friendly" and prompts the operator with messages on the display screen. For more information on how to use the Co-Pilot®, please consult the *V-MAC® IV Vehicle Management and Control with Co-Pilot® Display Operator's Guide, TS898.*

GuardDog™ (Optional; Must be Enabled)

GuardDog™, an active maintenance monitoring system, uses sensor readings to show the status of routine maintenance requirements. If the vehicle is equipped with the GuardDog™ system, Co-Pilot® will display GuardDog™ related maintenance items under the following conditions:

- When the vehicle is started



GuardDog™ Acquiring Data Screen 703777a

- During driving as individual maintenance items become due



GuardDog™ Maintenance Due Screen 703774a

- Manually through the GuardDog™ Status screen



GuardDog™ Status Screen 703775a

For more information on GuardDog™ and the Co-Pilot® display, please refer to the *V-MAC® IV Vehicle Management and Control with Co-Pilot® Display Operator's Guide, TS898.*

METRIC CONVERSIONS

NOTE

Use all tools on the fasteners they were made to be used on. Use metric tools on SI metric units only. Never try to use metric tools on U.S. pound-inch units or U.S. pound-inch tools on SI metric units.

⚠ CAUTION

Potential external/internal thread mismatch condition(s) may occur with certain metric thread-inch thread fastener combinations, and with fastener combinations involving incompatible metric fastener systems. A given thread mismatch condition can result in thread stripping and/or assembly weakness leading to potential service failure, thereby rendering a vehicle non-operational and/or unsafe for operation. The specific external/internal thread combinations from which such problems can result are identified and set forth in Maintenance and Lubrication Manual (TS494).

U.S. to SI Conversions		
1 inch	=	25.4 millimeters
1 mile	=	1.61 kilometers
1 pint (U.S. liquid)	=	.473 liter
1 quart (U.S. liquid)	=	.946 liter
1 cubic inch	=	.01639 liter
1 pound-foot	=	1.3558 Newton meters
1 horsepower	=	.746 kilowatt
1 pound/square inch	=	6.895 kilopascals
degrees Fahrenheit	=	(1.8 x degrees Celsius) + 32
1 gallon (U.S. liquid)	=	.83267 Imperial gallon
SI to U.S. Conversions		
1 millimeter	=	.03937 inch
1 kilometer	=	.6214 mile
1 liter	=	2.1134 pints (U.S. liquid)
1 liter	=	1.0567 quarts (U.S. liquid)
1 liter	=	61.024 cubic inches
1 Newton meter	=	.7376 pound-foot
1 kilowatt	=	1.34 horsepower
1 kilopascal	=	.145 pound/square inch
degrees Celsius	=	.556 x (degrees Fahrenheit –32)
1 Imperial gallon	=	1.2009 gallons (U.S. liquid)

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