

WESTERN STATES HIGHWAY EQUIPMENT MANAGERS ASSOCIATION



October 2 - 5, 2017

WSHEMA



MAEK Joe Scarnecchia: Powertrain Sales Development Manager

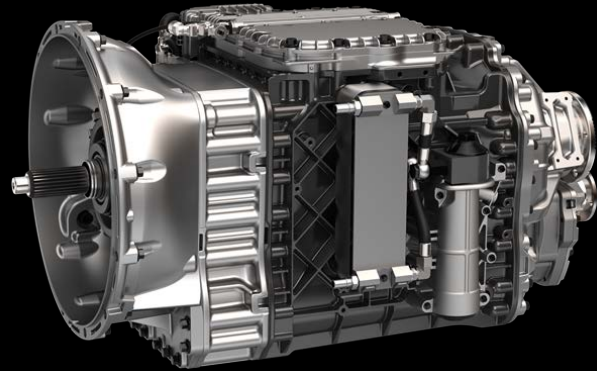
WSHEMA

Mack: GHG17 Engine, Transmission (AMT) & Aftertreatment.

Mack MP7 & MP8 Engine



*Mack mDrive (AMT)
12,13 & 14 Speed*



MACK

*ClearTech One
DPF/SCR*



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Exhaust aftertreatment updates

Lighter weight

Takes up less frame
rail space

Easy Filter
Replacement



ClearTech One

Anthem, Pinnacle & Granite



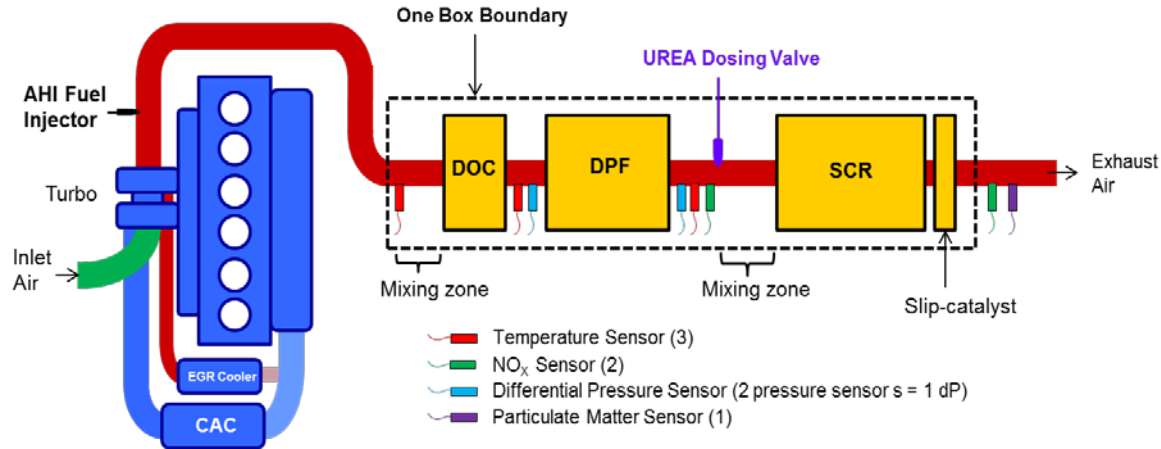
MACK

WSHEMA

Design & Function

The EATS system contains the following main components:

- DPF muffler includes Diesel Oxidation Catalyst (DOC) and Diesel Particulate Filter (DPF)
- Urea Dosing System (UDS) includes Pump unit, Dosage valve and Coolant Control Valve
- Selective Catalytic Reduction (SCR) muffler includes SCR catalyst with Copper Zeolite (CuZe) coating
- Particulate Matter (PM) Sensor



ClearTech One – Fun Facts

- ClearTech One is common across:
 - MP7
 - MP8
- Weight of ClearTech saves 17 lbs
- Space saved is up to 11 inches



CuZe (Copper Zeolite) vs FeZe (Iron Zeolite)

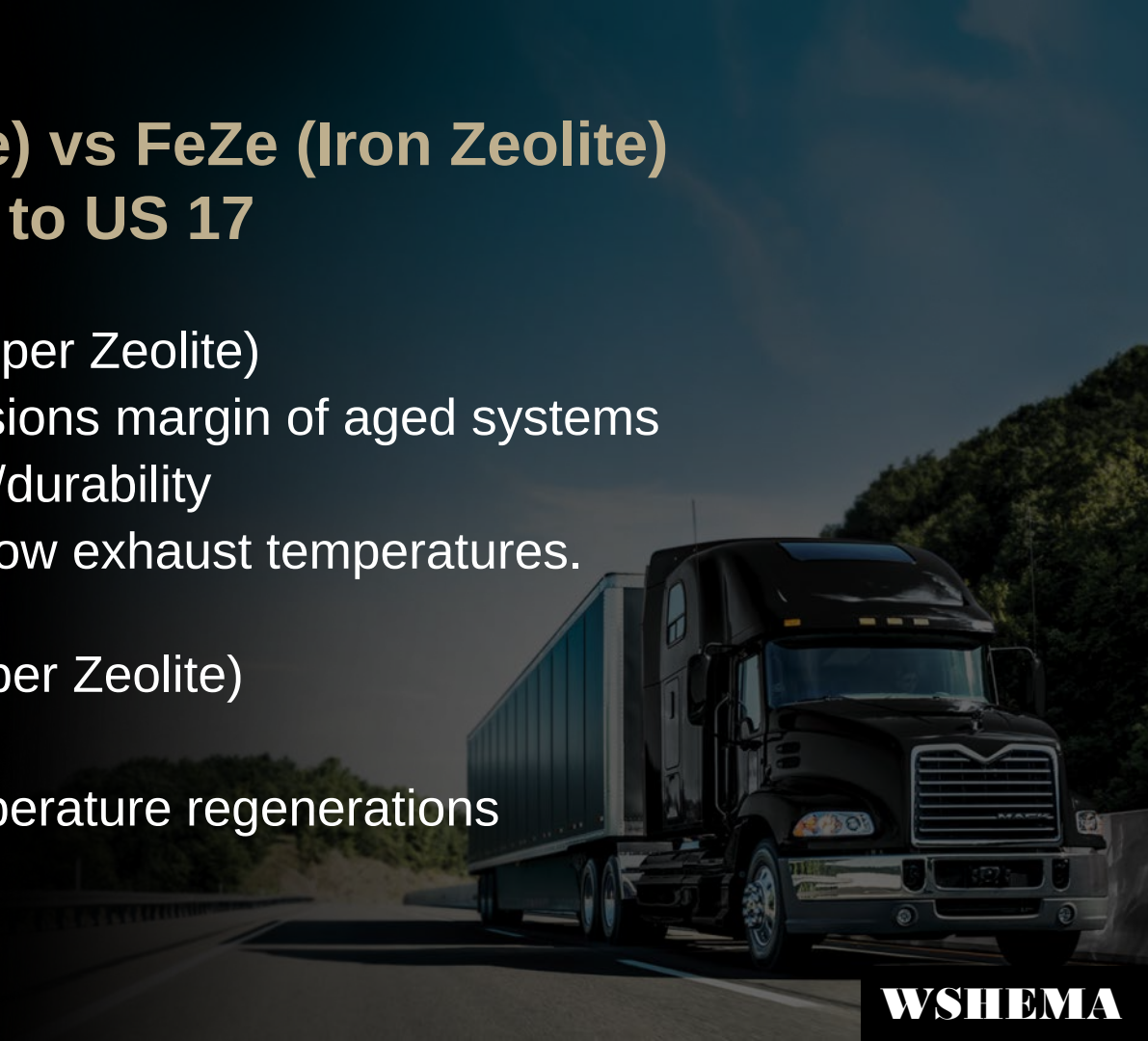
Changes from US 14 to US 17

Advantages of CuZe- (Copper Zeolite)

- Improves NOx emissions margin of aged systems
- Better thermal aging/durability
- Better emissions at low exhaust temperatures.

Changes with CuZe- (Copper Zeolite)

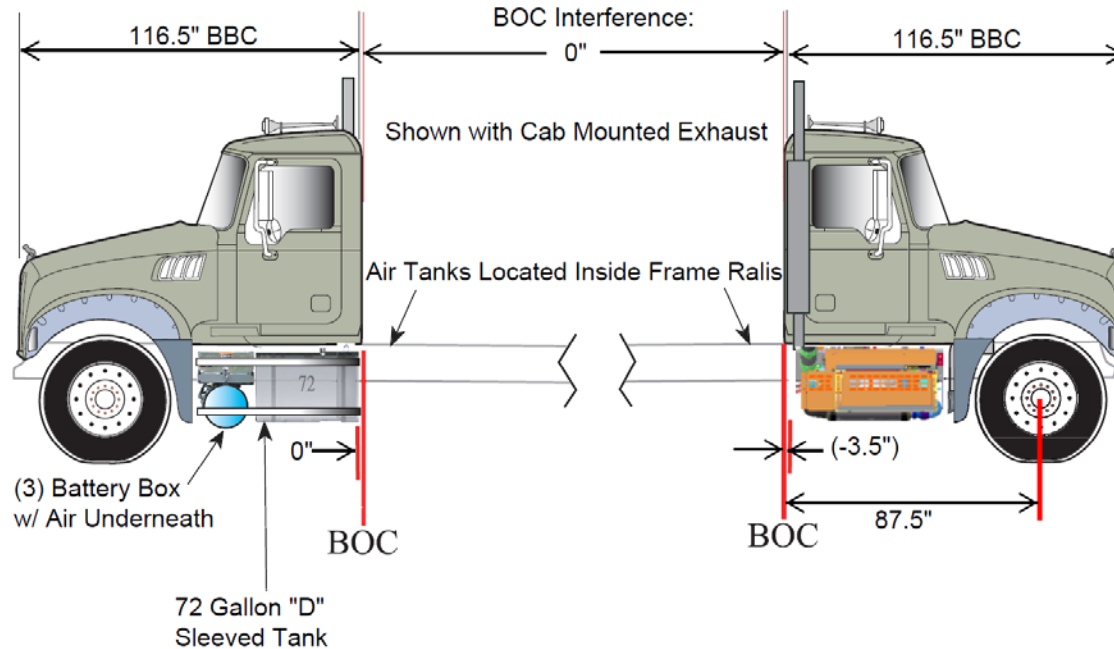
- Sulfur absorption
- Requires higher temperature regenerations



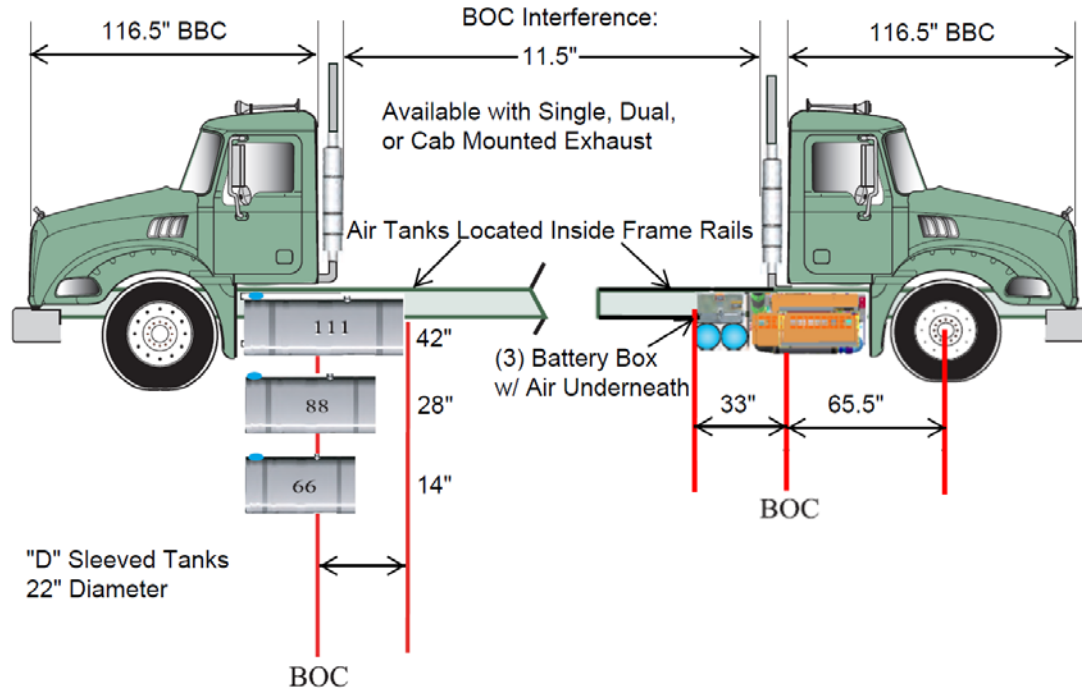
Summary

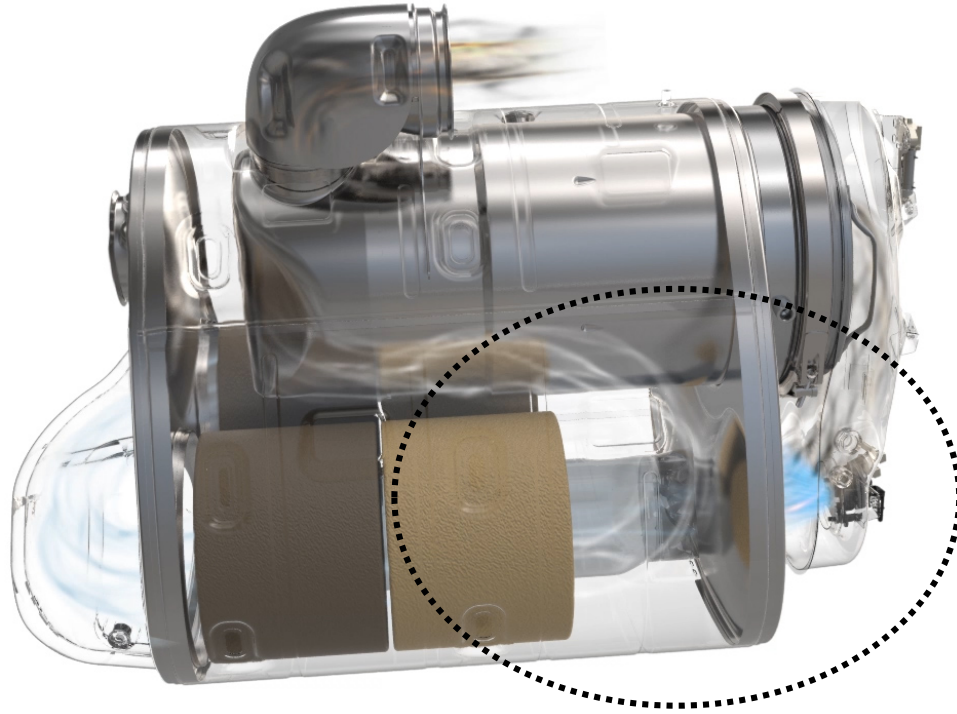
Not much change in day to day
operation of the truck

Axle Forward Chassis Packaging



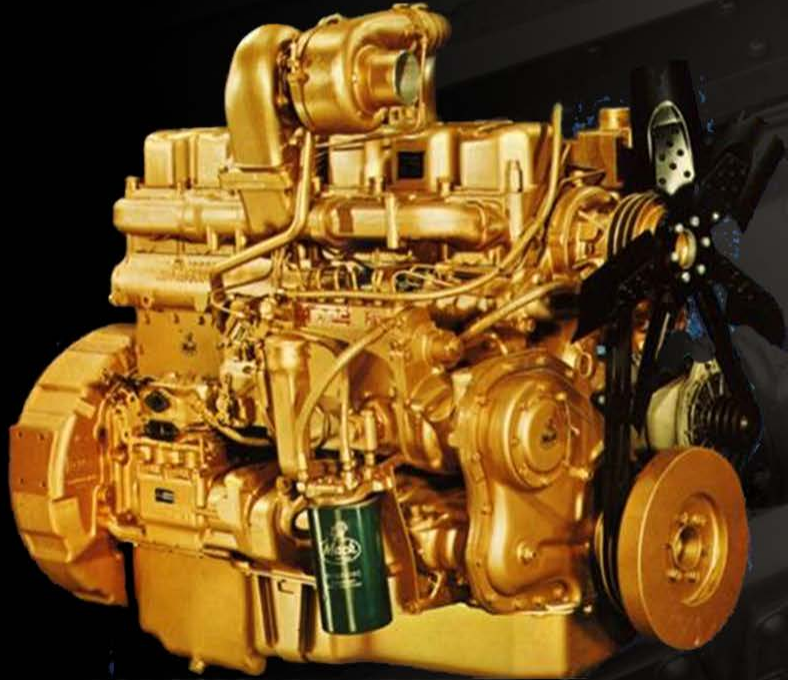
Axle Back Chassis Packaging







Integrated Powertrain Leadership – Then



The Mack brothers pioneered powertrain integration 117 years ago.

In 1967, we revolutionize over-the-road trucking with our high torque rise Maxidyne engine. With more torque available at lower rpm, the Maxidyne enabled drivers to hold a gear longer. This gave drivers the power they needed and also saved fuel.

Today, our industry refers to this as downspeeding.

Overview: GHG17

GHG17 is the second step to the Greenhouse Gas regulations rolled out in 2014. This step will further reduce CO² engine output by another 3%.

Powertrain platform and vehicle improvements have been completed while meeting this new requirement.



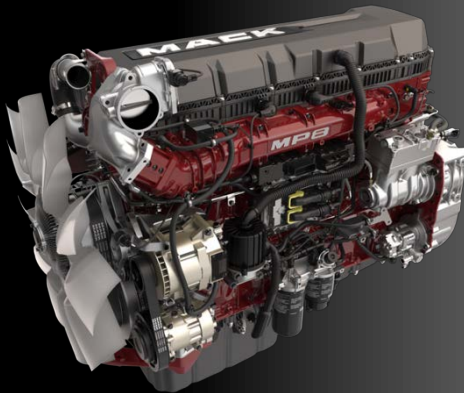
Introducing the 2017 Mack MP Engines

Mack's proven MP engines have evolved

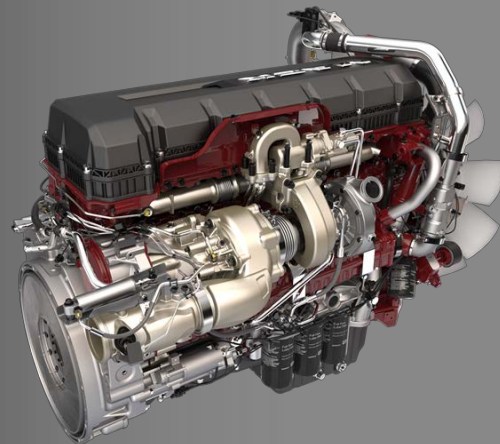
- Higher performance, improved fuel efficiency, simplified maintenance, lighter weight
- Revised components for MP7, MP8
- MP8 with turbo compounding



MACK MP7



MACK MP8

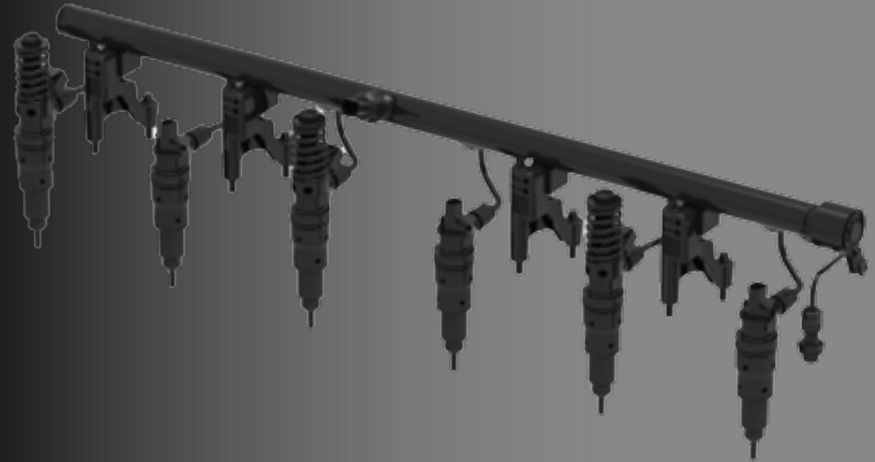


MACK MP8-TC

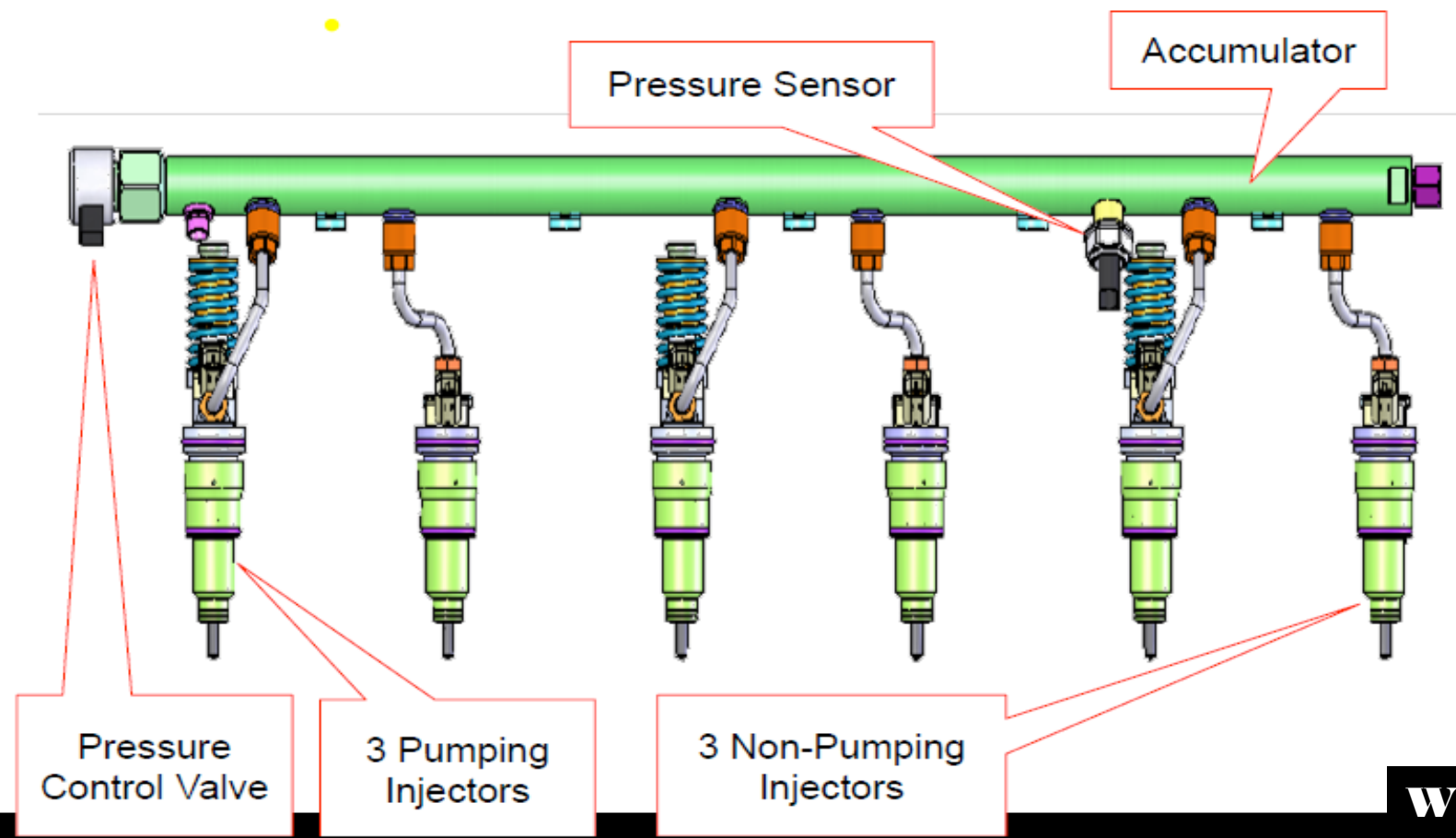
Key Features – Common Rail System

Common rail fuel injection system

- Precise, accurate fuel injection improves efficiency
- Reduced in-cab noise



Common-rail Fuel System



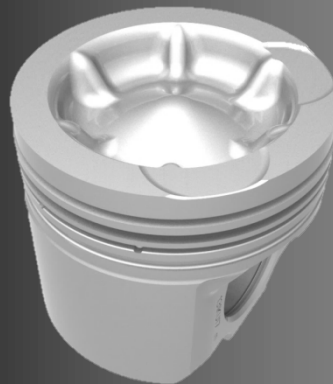
Key Features – Wave Piston Design

Patented wave piston design

- Reduced friction
- Six-wave design improves combustion efficiency
- More complete fuel burn for reduced soot generation



TODAY'S DESIGN



WAVE DESIGN

THE NEXT EVOLUTION IN PISTON DESIGN

Our innovative wave piston delivers 2% improvement in fuel economy and 90% reduction in soot. By adding small waves to the piston bowl, the engine can utilize more available oxygen in the combustion chamber for a more complete burn than standard piston designs.

Combustion Chamber Burn Patterns



Standard Piston
Combustion Efficiency



Mack® Wave Piston
Combustion Efficiency



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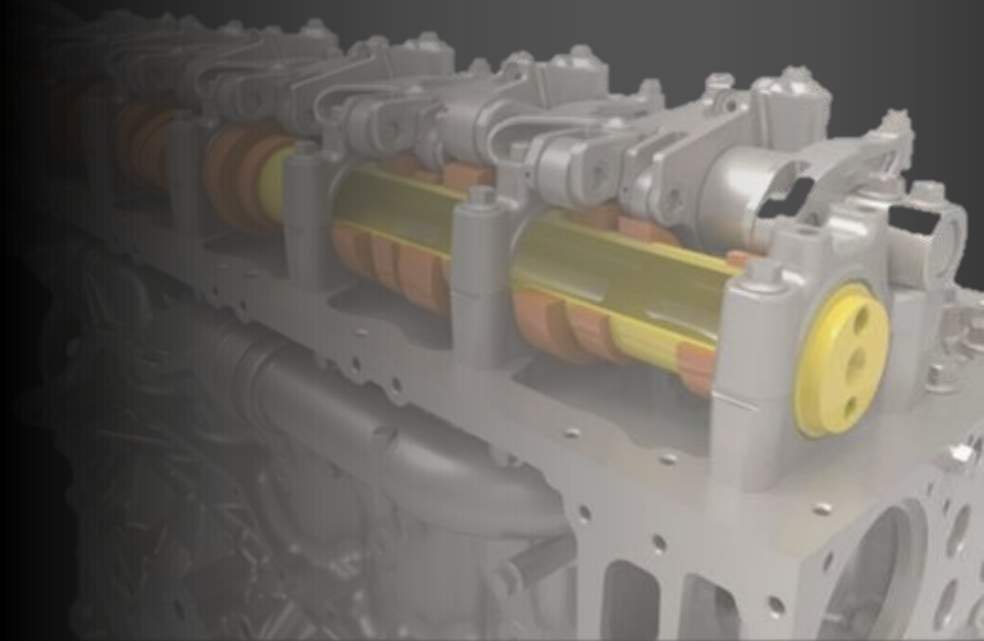
Key Features – Weight Reduction

Assembled camshaft

- Reduces weight by 27 lbs.

Revised MP8 cylinder block

- Reduces weight by 44 lbs.
- Same Mack durability



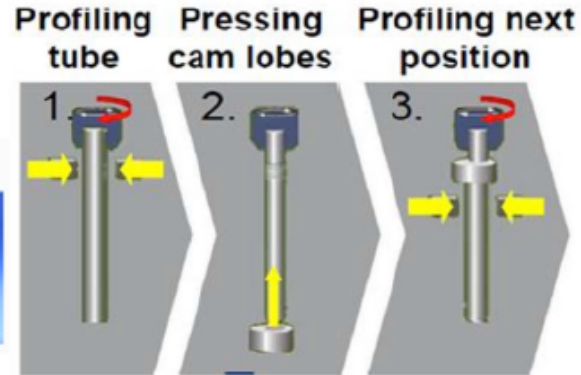
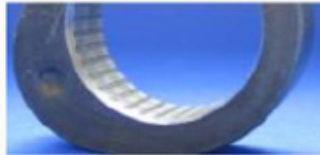
Assembled Camshaft

- The cam is made from individual parts, assembled to the tube one section at a time. Process is to knurl, locate the lobe, press and repeat.

Radial knurling on the tube:



Axial knurling in the lobe:



- Significantly lighter with hollow tube (20 lb. weight savings).
- Improved material match to function. Lobes are made from bearing grade steel. Tube is low carbon steel.
- Lobes machined and hardened individually with better access.
- Joints are press fit with mechanical locking. We are monitoring the joints for loosening. No issues to date.

Key Features – Maintenance

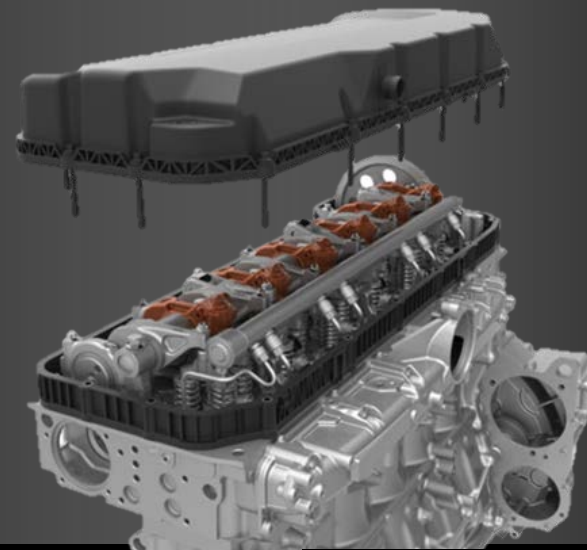
Shimless rocker arms on MP7

- Reduces time required for valve lash adjustments



Two-piece valve cover on MP7

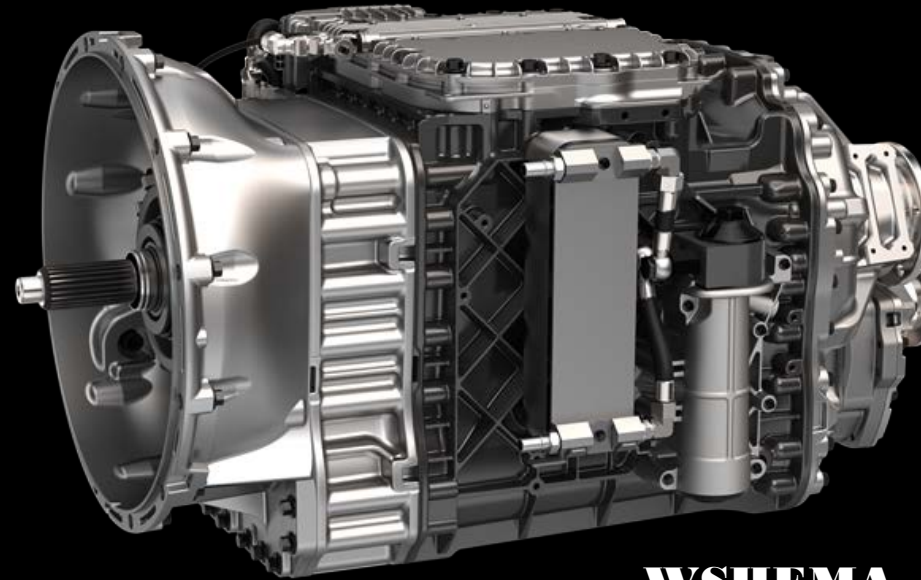
- Easier, faster access to head components
- Requires no removal of electrical components
- Less mess with no oil drip



Mack *m*DRIVE HD



12,13 & 14 SPEED PRODUCTS & APPLICATIONS



Mack *m*DRIVE HD 13- and 14-Speed

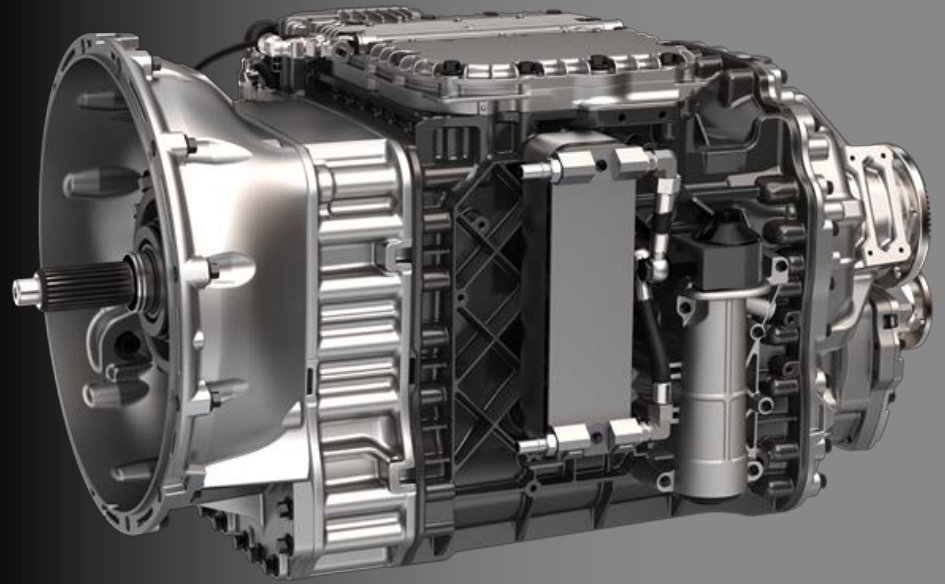
Mack *m*DRIVE HD with low reduction creeper gears

- The first to offer low reduction gears in AMT
- 13-speed: low reduction creeper gear
- 14-speed: ultra-low reduction creeper gears for slow speed operations

Tailored for vocational applications

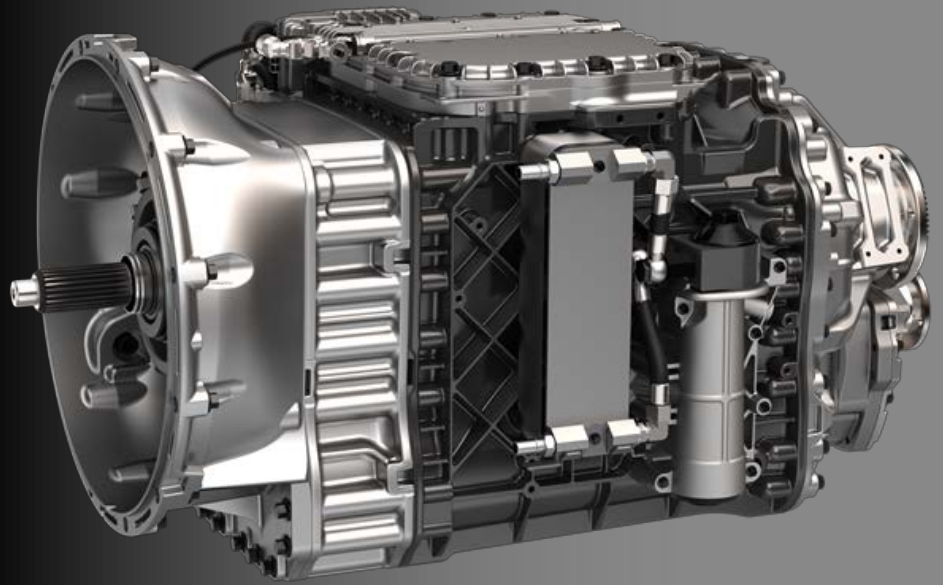
- Low-speed maneuverability, startability for heavy loads

Now available for order



mDRIVE HD Changes

- Added towing capabilities
- Increased application use possible due to lower reduction gears
- Better startability and flexibility for better fuel economy
- The 13- & 14-speed transmissions are 4.75 inches longer and 90 lbs. heavier than the current mDRIVE HD



mDRIVE HD Gear Ratios

MAIN 12 GEARS
REMAIN THE
SAME
THROUGHOUT

mDRIVE™		
Gear	Direct	OD
1	14.941	11.729
2	11.729	9.211
3	9.036	7.094
4	7.094	5.571
5	5.538	4.348
6	4.348	3.414
7	3.436	2.698
8	2.698	2.118
9	2.078	1.632
10	1.632	1.281
11	1.274	1
12	1.000	0.785
R1	-17.485	-13.727
R2	-13.727	-10.779

mDRIVE™ HD		
Gear	Direct	OD
1	14.941	11.729
2	11.729	9.211
3	9.036	7.094
4	7.094	5.571
5	5.538	4.348
6	4.348	3.414
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8	2.698	2.118
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10	1.632	1.281
11	1.274	1
12	1.000	0.785
R1	-17.485	-13.727
R2	-13.727	-10.779

NEW

mDRIVE™ HD 13 speed		
Gear	Direct	OD
C	19.376	17.544
1	14.941	11.729
2	11.729	9.211
3	9.036	7.094
4	7.094	5.571
5	5.538	4.348
6	4.348	3.414
7	3.436	2.698
8	2.698	2.118
9	2.078	1.632
10	1.632	1.281
11	1.274	1
12	1.000	0.785
RC	-37.49	-20.531
R1	-17.485	-13.727
R2	-13.727	-10.779
R3	-8.623	

NEW

mDRIVE™ HD 14 speed	
Gear	OD
C1	32.037
C2	19.376
1	11.729
2	9.211
3	7.094
4	5.571
5	4.348
6	3.414
7	2.698
8	2.118
9	1.632
10	1.281
11	1
12	0.785
RC	-37.49
R1	-13.727
R2	-10.779
R3	-8.623



OPERATING INFORMATION 13 & 14 SPEED

Operating Information – *m*DRIVE™ HD 13 speed

General

- *m*DRIVE HD 13 speed has one forward low ratio gear. When engaged, the Co-Pilot™ will show “C”
 - C is used in normal driving when the vehicle is heavily loaded or starting on steep grades
- It is possible to shift between C and the normal gears while the vehicle is moving
- It is possible to use the C (crawler gear) for idle driving mode

Reverse

- The 13 speed OD has 3 reverse gears RC to R2
- The 13 speed Direct has 4 reverse gears RC to R3
- RC through R2 are in Low Range and R3 is in High Range
- When the “R” button is pushed on the selector pad the gearbox will select R1. RC and R2 can be selected manually using the downshift/upshift buttons
- It is not possible to shift between Low and High Range while moving (R2 to R3)
- R3 can only be accessed with the vehicle standing still. To go fast in reverse, select R3 at stand still

<i>m</i> DRIVE™ HD 13 speed		
Gear	Direct	OD
C	19.376	17.544
1	14.941	11.729
2	11.729	9.211
3	9.036	7.094
4	7.094	5.571
5	5.538	4.348
6	4.348	3.414
7	3.436	2.698
8	2.698	2.118
9	2.078	1.632
10	1.632	1.281
11	1.274	1
12	1.000	0.785
RC	-37.49	-20.531
R1	-17.485	-13.727
R2	-13.727	-10.779
R3	-8.623	

Operating Information – *m*DRIVE HD 14 speed

General

- *m*DRIVE HD 14 speed has two forward low ratio gears.
- The Co-Pilot™ will show “C1” and “C2”
 - C1 is a low speed gear– curb pouring or heavy haul low speed maneuvering
- It is possible to shift between all the forward gears while moving

Reverse

- When the “R” button is pushed on the selector the gearbox will select R1
- RC through R2 are in Low Range and R3 is in High Range

<i>m</i> DRIVE™ HD 14 speed	
Gear	OD
C1	32.037
C2	19.376
1	11.729
2	9.211
3	7.094
4	5.571
5	4.348
6	3.414
7	2.698
8	2.118
9	1.632
10	1.281
11	1
12	0.785
RC	-37.49
R1	-13.727
R2	-10.779
R3	-8.623

Operating Information – *m*DRIVE HD 14 speed

General

- *m*DRIVE HD 14 speed has two forward low ratio gears. The Co-Pilot™ will show “C1” and “C2”
 - C1 is a low speed extreme crawler gear– curb pouring curb or heavy haul low speed maneuvering
 - C2 is used in normal driving when the vehicle is heavily loaded or starting on steep grades
- It is possible to shift between C1 and C2 as well as between the crawler gears and the normal gears while the vehicle is moving
- It is possible to use the C1 & C2 (crawler gears) for idle driving mode

Reverse

- There are 4 reverse gears RC to R3.
- RC through R2 are in Low Range and R3 is in High Range
- When the “R” button is pushed on the selector pad the gearbox will select R1, RC and R2 can be selected manually using the downshift/upshift buttons
- It is not possible to shift between R2 and R3 while moving
- R3 can only be accessed with the vehicle standing still

<i>m</i> DRIVE™ HD 14 speed	
Gear	OD
C1	32.037
C2	19.376
1	11.729
2	9.211
3	7.094
4	5.571
5	4.348
6	3.414
7	2.698
8	2.118
9	1.632
10	1.281
11	1
12	0.785
RC	-37.49
R1	-13.727
R2	-10.779
R3	-8.623

Operating Information - *m*DRIVE HD 14 speed

Automatic mode

- The transmission will in some situations select C2 as the starting gear
- In automatic mode it is also possible to select C1, C2 gear 1-5 as the start gear

Manual mode

- In manual mode it is possible to select C1, C2 gear 1-5 as the start gear
- With the *m*DRIVE HD 14 speed it maybe difficult to upshift from C1 to C2 as well as from C2 to 1 in steep grades (due to the 65% steps between gears)

mDRIVE HD 13 & 14 Features (changes from 12 speed)

Transmission PTO

- When standing still it is only possible to select N1 and N2 (low or high split) as before. However, it is possible to operate the transmission PTO when a crawler gear is engaged.

Power launch – manual operation

- Used to break the drive wheels loose when stuck in the mud, etc. “Enhanced Construction” software is required
- Power launch with the 13 speed can be initiated in C & 1 as well as RC & R1
- Power launch with the 14 speed can be initiated in C2 & 1 as well as in R1

Power launch – automatic operation

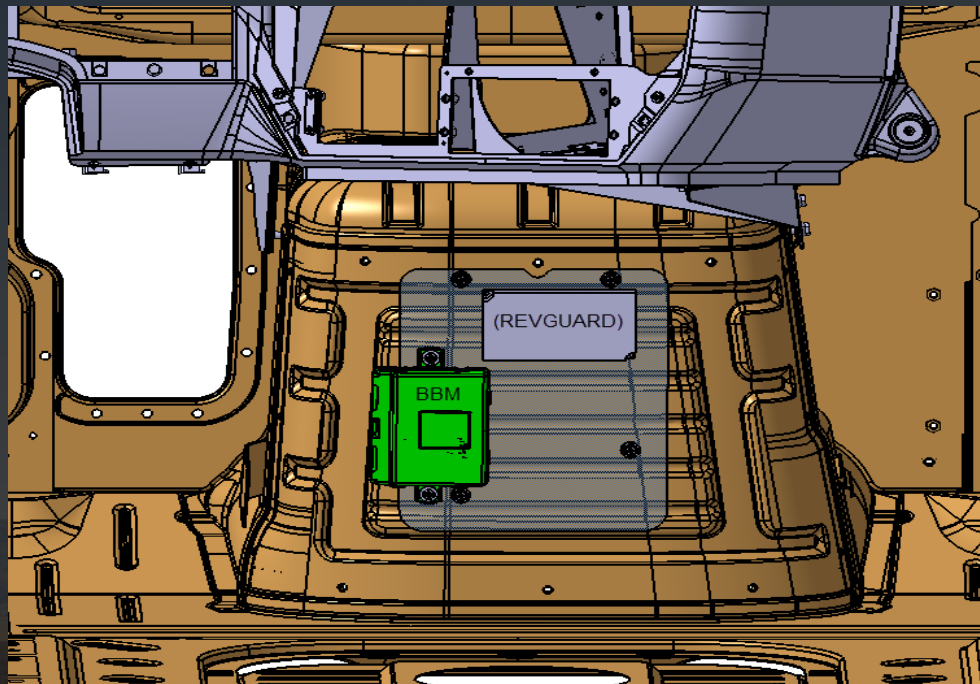
- “Enhanced Construction” software is required and the same gears as mentioned above may be used
- The adjusted start gear is kept if as long as the vehicle has not operated in 6th gear or higher

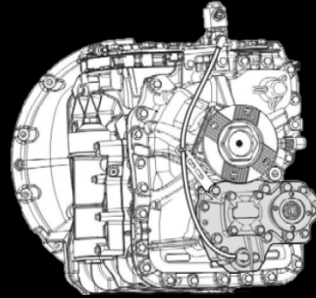
Manual power launch:

To activate, select the lowest forward or reverse gear, hold the minus button while depressing the accelerator to attain wanted clutch engagement speed (max 1300 rpm). The clutch will engage when the minus button is released

Body Builder Module

- The Transmission Control Unit (TCU) that controls the PTO in today's *mDRIVE* transmission has been removed
- This function is now provided through a Body Builder Module (BBM) located in the cab doghouse area under the plastic doghouse cover
- There are new main cab harnesses for all *mDRIVE* models

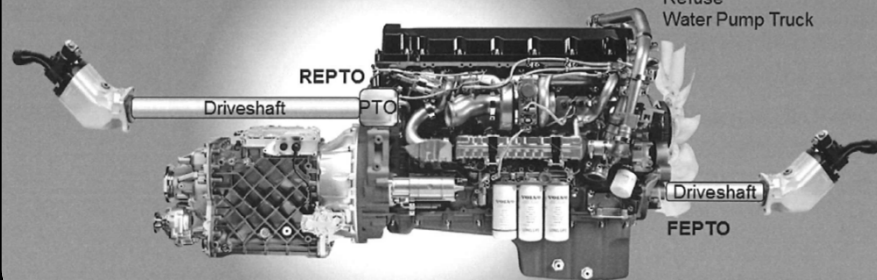




BEST APPLICATIONS & PTO USAGE

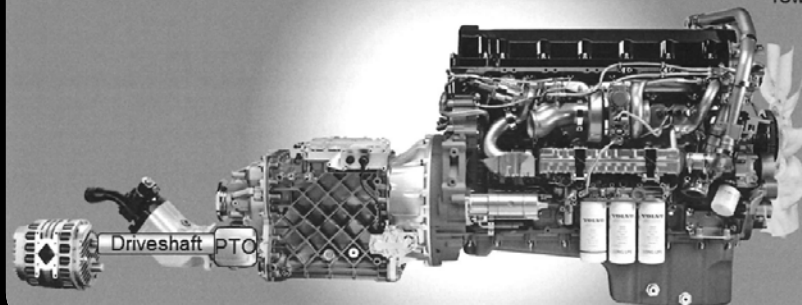
Clutch Independent PTO

Mixers
Plow Trucks
Refuse
Water Pump Truck



Clutch Dependent PTO

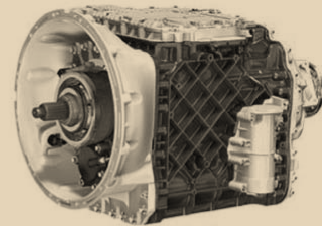
Dump Truck
Roll-Off
Tow Truck





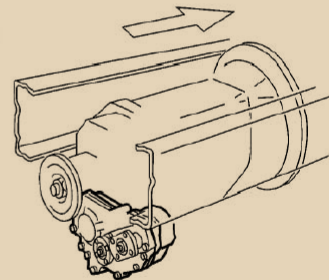
Moving PTO Operations

- ❖ If the vehicle is to have a moving PTO operation, an mDRIVE with a REPTO or FEPTO is recommended.
- ❖ Transmission mounted PTO's are primarily used for stand-still operation, with the gearbox in neutral. However it is possible to engage PTO in vehicle speeds up to 6 MPH.



Work-around for transmission mounted PTO's:

1. Manually place the transmission in the desired PTO operating range (N1/N2) while stationary. **Do not shift the range with PTO engaged or damage may occur.**
2. Engage the PTO also while stationary
3. Move the vehicle up to the operational speed which varies based on rear axle ratio, drive tire size, engine RPM and transmission gear selected.



The mDRIVE cannot change gear with the PTO active, as the PTO would add torque and inertia load on the synchronization components.

The PTO cannot be engaged while driving over 6 MPH, as the activation mechanism is not designed for any differential speed between PTO and gearbox. If the PTO is turned on while the vehicle is moving over 6 MPH, the PTO switch will illuminate, the PTO indicator will appear in the dash however the PTO will not engage. Even if the vehicle is slowed to less than 6 MPH the PTO will not engage. The vehicle must be brought to a complete stop, transmission shift pad set to neutral then follow the work-around shown above.

Body Builder Support



RESOURCES

www.macktrucks.com > Trucks > Body Builder

Phone Support

800-868-6225, opt 1 for
Commercial Mack BB Support
Eugene Olenick

877-770-7575, opt 1 for
Aftermarket Mack BB Support
Bruce Smith, David Troupe, David Hill

- ☐ Provide Direct input to Sales Engineering to improve 'body ready' order and build processes (Plug N Play concept)
- ☐ CAD Layout and file transfer
- ☐ Work directly with key suppliers in the resolution of installation & performance issues
- ☐ Act as liaison with body companies to ensure compliance to industry standards and requirements

<http://www.macktrucks.com/trucks/body-builders/>

Click here for sales & finance incentives → CUSTOMER PORTAL CONTACT US MACK SHOP → US & CANADA FIND A DEALER SHOPPING TOOLS Q

MACK TRUCKS PARTS & SERVICES POWERTRAIN & SUSPENSIONS COMMUNITY

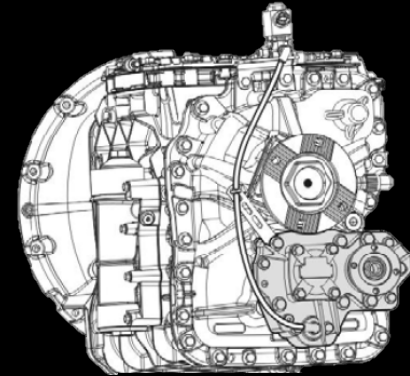
Mack Body Builder Technical Support Group

Build with Confidence. The new Body Builder technical support group, available only from Mack Trucks.

Mack eMedia site. Click here to visit the eMedia site or browse the table of documents below.

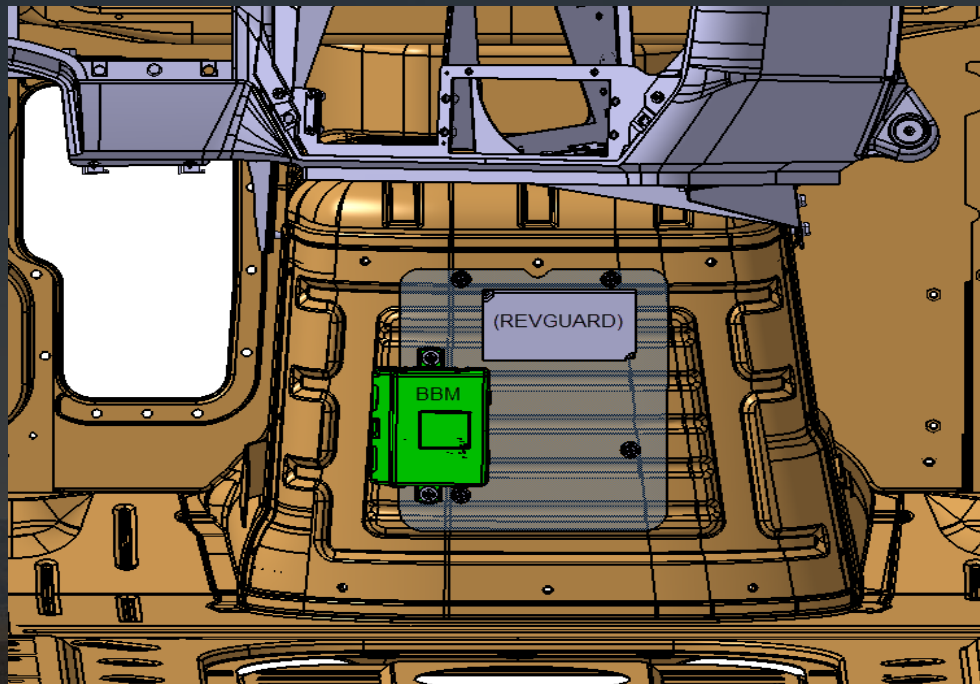
Description & link to Product Info page with FREE PDF download	Printed Copy Cost
2007 BodyBuilder Service Information. *UPFITTERS GUIDE for Mack CXU, CHU, GU, MRU, And LEU 1-011	\$37.00
2010 BodyBuilder Service Information Kit, CHU, CXU, GU, LEU, MRU, TD PV776-K-BodyBuilder-M2010	\$45.00
2013 BodyBuilder Service Information Kit, CHU, CXU, GU, LEU, MRU, TD PV776-K-BodyBuilder-M2013	\$40.00

- BB Support Contact info
- PTO info
- BodyBuilder product info
- BodyLink Electrical Guide
- Multiplexing Guide



Body Builder Module

- The Transmission Control Unit (TCU) that controls the PTO in today's *mDRIVE* transmission has been removed
- This function is now provided through a Body Builder Module (BBM) located in the cab doghouse area under the plastic doghouse cover
- There are new main cab harnesses for all *mDRIVE* models



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**PRODUCT
FEATURES**

**DRIVER
ENVIRONMENT**





Illuminated Controls

Familiar, automotive-style controls

STEERING WHEEL



Standard

Urethane foam rim

Gunmetal spokes

All controls located on the D-panel
Also available with steering wheel
controls and Satin Aluminum spokes



Premium

Leather-wrapped rim

Leather horn pad

Satin Aluminum spokes

Steering wheel controls



Ultra

(70-inch StandUp Sleeper only)

Dark Saddle leather- wrapped rim

Leather horn pad Satin

Aluminum spokes Steering
wheel controls



ND C

CK



MACK



Flat-Bottom Steering Wheel

An industry-first, allowing more belly room and clearance for entry or exit.



mDRIVE™ Controls
Intuitive placement—and
the option to install it
even higher on the dash.



Rocker Switches
New, larger, laser-etched switches.



D-Panel Gauges
Customize the dash
with 4 optional
auxiliary gauges.



Infotainment Display

7" touchscreen interfaces with steering wheel buttons and manages tools like Sirius XM, Weather Band, TomTom truck navigation, Apple CarPlay and optional back-up camera.



Power Window, Lock and Mirror Controls

More comfort and control than manual windows.



Light Control Module

All exterior lights from one place

LIGHT CONTROL MODULE FUNCTIONS

1. Daytime running light (DRL) override
2. Lights off
3. Parking lamps
4. Head lamps
5. Fog lamps - pull on / push off (activate only with headlamps on)
6. Loading / perimeter lamps
7. Hazard switch
8. Dash illumination dimmer

**HEADLAMPS AUTOMATICALLY TURN ON WHEN
WIPERS ARE TURNED ON - STANDARD**





Right Stalk

Manages engine brake and
Co-Pilot

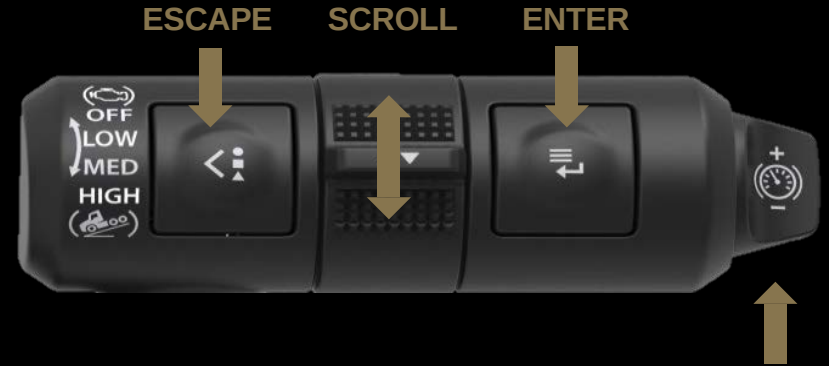
RIGHT STALK FUNCTIONS

Engine Brake Lever Up/Down

- OFF
- LO
- MED
- HI
- Momentary
- With *m*DRIVE, this activates the MaxiBrake (B mode)
- Without *m*DRIVE, this makes the current MPH the downhill engine brake target MPH.

Set engine brake level displays in Co-Pilot Display

Driver Information Display Controls



Toggle on end of stalk for brake downhill set speed or Cruise 'n Brake over speed set speed (fore-aft)



Left Stalk

Manages high beams,
signals, wipers.

LEFT STALK FUNCTIONS



Self-canceling Turn Signals

Stalk Up/Down

Hi-Beam Control

Back (aft): Hi beam flash (momentary)

Forward = Hi beam lock

Marker Interrupt (End Button)

Wipers (Rotating/Scroll Ring)

Wash

OFF

Wipers Intermittent 1 (10-12 sec)*

Wipers Intermittent 2 (5-6 sec)*

Wipers intermittent 3 (2-3 sec)*

LO

HI

** Any intermittent position starts with an immediate swipe.*

Digital-Analog Gauges

Solid dial hands with
the precision of digital
instruments.





Day Display



Night Display

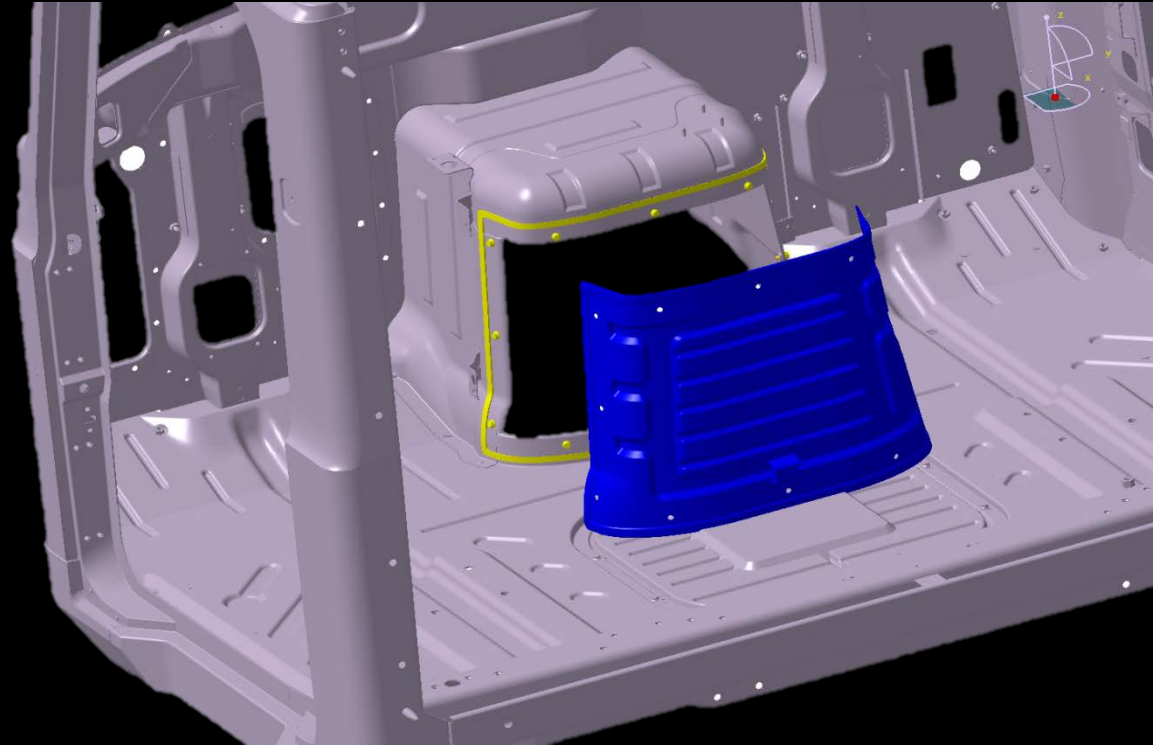
Mack® Co-Pilot™

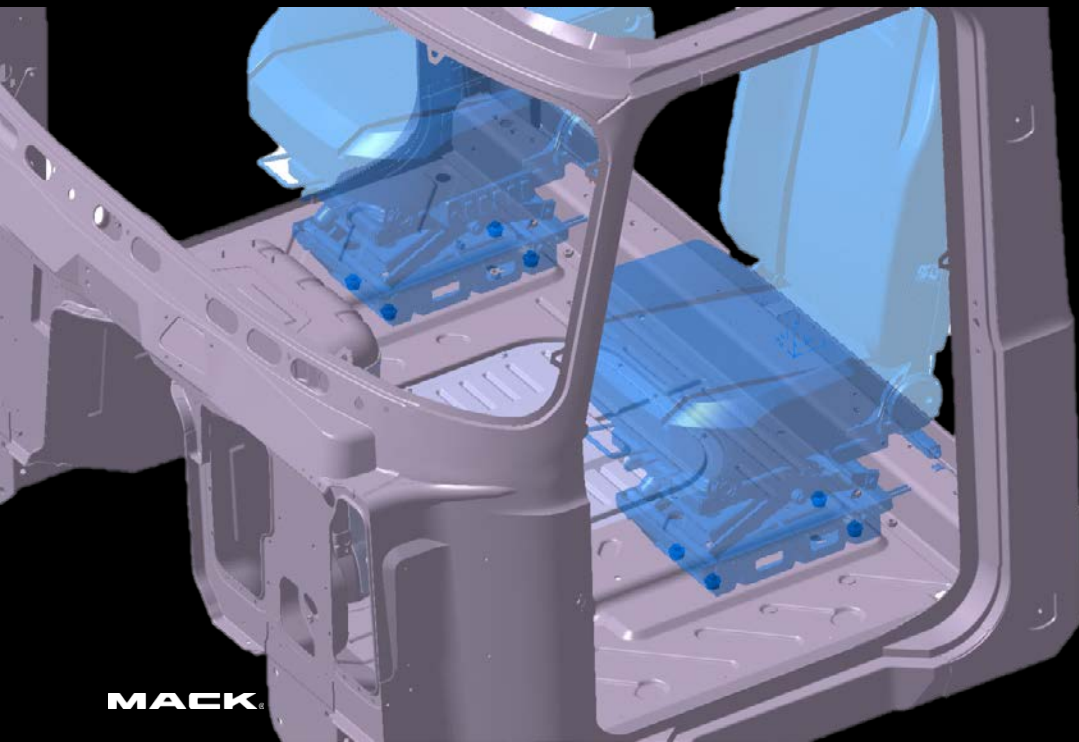
5" full-color digital display provides enhanced visibility and simpler navigation.



Efficient Engine Access

Engine cover accessible by removing only one trim panel. Reduces engine doghouse removal labor time by 9 minutes (estimated).





Seat Mounting

Nuts welded in floor replace holes to allow for one-person seat installation.

