



Power Take-off (PTO)

This information provides specifications for Power Take-off (PTO) applications in MACK vehicles.

Note: We have attempted to cover as much information as possible. However, this information does not cover all the unique variations that a vehicle chassis may present. Note that illustrations are typical but may not reflect all the variations of assembly.

All data provided is based on information that was current at time of release. However, **this information is subject to change without notice.**

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Overview

General

Auxiliary equipment require power take-offs, either when the truck is stationary or when it is in motion.

The work is generally carried out by equipment which is powered by a hydraulic motor. The hydraulic motor, together with a pump and associated equipment, form the basis of the hydraulic system. The pump, which provides the hydraulic pressure and flow to the motor, is the heart of the hydraulic system.

Power Take-off

Note: PTO can only be installed on Allison RDS (Rugged Duty Series) transmissions.

There are a number of different power take-off variants available, with single or double outlets. The power take-off is supplied with one of several output drives, keyed shaft, SAE drive flange or internal splined DIN.

The type of the PTO should be determined by the application. Based on the customer requirement either Direct mount or Shaft Driven PTO shall be installed.

PTO Speed Functions

For the purposes of this manual, PTO (Power Take-off) is a function to maintain engine speed regardless of engine load. Think of it as cruise control for the engine - only instead of maintaining a steady vehicle speed, it is maintaining engine speed. It is most often used to provide increased steady engine speed when operating auxiliary equipment such as hydraulic pumps or compressors. The term "PTO" has come to mean both the function of maintaining constant engine speed during use of auxiliary equipment, as well as a term for the auxiliary equipment itself.

There are two types of PTO engine speed control used in Mack trucks:

Electronic Hand Throttle

(EHT/PTO 0)

This type of PTO is standard equipment; it is initiated and controlled using the cruise control "ON/OFF", "SET / Decel or Resume / Accel switches. Manufacturers refer to this function by different names - Mack calls it "Electronic Hand Throttle" (EHT), even though some of the parameters for programming this function will refer to it as "high idle". (Note that in the North American market, the term "high idle" usually refers to the maximum possible engine speed under no-load conditions).

"Physical" or "Wired" PTO

This type of PTO is most commonly associated with the engagement of engine- or transmission- "Wired" PTO driven accessories, where the user wishes to "remotely" activate the engine speed control function. It is usually accomplished by wiring the auxiliary equipment to the PTO function controller (Cummins ECM) so that engaging one will automatically activate the other. The Cummins ECM controls the engine speed function and it can be only programmed by the authorised MACK dealer.

How each of these different PTO functions operate will depend upon the installed engine. For Cummins engines, the PTO functions are controlled by the Engine ECU.

PTO Functions

A "PTO" icon will appear in the instrument cluster only when 'Remote' ('Wired') PTO is engaged.

Electronic Hand Throttle PTO

The VECU reads the cruise control PTO switch status, and commands the engine into PTO mode when conditions are right. These conditions are program in the VECU and might include a maximum vehicle speed, park brake set or not, etc.

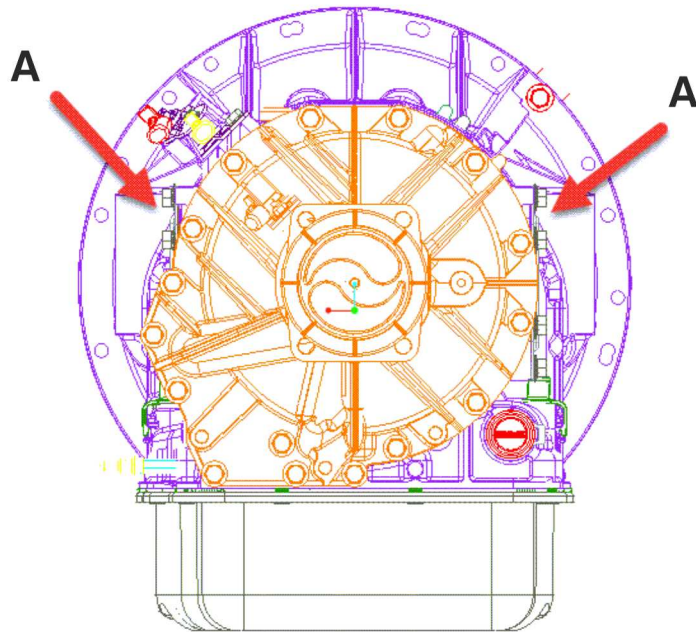
The engine PTO 'set speed' is selected by either pressing the cruise control "RESUME" button, or by using the accelerator pedal to get the desired engine speed and pressing one of the cruise control "SET" buttons (either SET / Decel or Resume / Accel). Once the PTO function is active, the SET / Decel or Resume / Accel buttons can be used to adjust the PTO engine speed (within limits).

Physical or Remote/Wired PTO

This PTO function is activated by applying an external signal to a dedicated PTO input pin on the Cummins EECU. The set speed can be adjusted using the cruise control SET / Decel or Resume / Accel buttons, as above.

Notes

Allison Transmission PTO



T9163240

Fig. 1 Allison transmission PTO Location A

Power take-off (PTO) units are used on vocational vehicles to power hydraulic pumps and other auxiliary equipment, and these units can either be mounted on the engine or the transmission. Allison automatic transmissions may provide PTO mounting locations at both the 9 o'clock and 3 o'clock positions (when viewed from the back of the transmission as seen in figure 1 above).

Hydraulic System and Pumps

Dimensioning of Hydraulic System and Hydraulic Pumps

Note: The body builder should enclose an information binder, delivered with the truck, including **hydraulic system data** (system dimensioning description and dimensioning criteria). Service, function and safety descriptions should also be enclosed.

It is important to dimension an optimum hydraulic system, and to specify the correct pump size to provide sufficient oil flow and prevent overloading of the power take-off.

Pipes, Lines, and Hoses



DANGER

Hoses and pipes should not be routed too near the warm points in the truck. Avoid crossed pipes which could cause chafing. Failure to follow this guide line increases the risk of fire if leakage occurs, and allows undue heat transfer to the hydraulic oil.

Connected to the hydraulic pump are a high-pressure hose, suction and drain lines.

When dimensioning the hydraulic system, it is important that:

- Hoses and lines must be connected to the pump with unions. O-ring seals must be used between pump and union.
- Tapered fittings should be avoided.
- Teflon tape or similar must not be used since pieces can break off and get into the hydraulic system and eventually cause damage.
- If steel piping is used, it must be installed so that movements and vibrations do not cause leakage. Normally hoses must be used nearest the pump.
- Oxide scale must be removed from pipes which have been heat-bent or welded. Flush or blow the pipes clean before installing them.

Notes

High-Pressure Hose

These hoses must have a minimum of four steel wire coil inserts in order to withstand the high pressure in the hydraulic system.

When mounting a high-pressure hose:

- Make sure the hoses are not twisted when connected up.
- Make sure the hoses are long enough.
- Strive to get as few bends as possible on a hose.
- Avoid kinks by using correct unions. Only pressed unions may be used when replacing hose unions.

Note: Check for oil leakage and for high noise levels in the system when the truck is in motion.

Suction Line

The suction line is made of piping or armored hose which retains its shape even when there is vacuum in the line.

To avoid cavitation:

- The suction line should be as short as possible and **should not exceed 4 meters (13.12 ft.)**. In the event longer lines are required, larger line dimensions must be used.
- The suction line should connect to the bottom of the tank and must be correctly tightened to prevent air getting into the oil.
- The suction line must have a wide diameter and must be free from kinks and constrictions. Do not use reducer fittings with restrictions.

Note: Avoid suction lines of high-pressure hooks and hooks made locally from pipe pieces welded together. They could cause unnecessary suction resistance.

Suitable suction line sizes at different flow quantities and with a flow speed of less than 0,8 m/s:

Inner diameter Ø mm (inches)	Flow up to liter/minute (gallons/minute)
50 (2.0)	0–120 (0–32)
64 (2.5)	101–150 (27–40)
75 (3.0)	> 150 (40)

Engine Speed Control

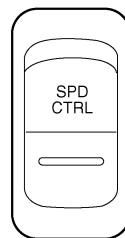
Starting Engine Speed Control

Engine speed control is controlled by the Cummins engine ECU and is programmable with Cummins Insite. Contact your Cummins Dealer for programming details.

EHT or PTO 0 can only be started when the cruise control button is on and set- is pressed. After set is pressed, the engine may ramp to a preprogrammed speed or holding the Accel/resume button will ramp the speed up. If control is then “dropped out” by pressing the brake pedal or changing some other dropout condition, control can be restarted by pressing Accel/resume which will command the engine speed to the previous set speed.

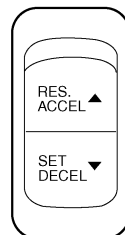
- Cruise set button starts control if PTO and cruise are switched on.
- PTO input starts control if cruise control is switched on.
- PTO input starts control (regardless of cruise inputs).

Note that limits and accelerator pedal disable apply regardless of the state of engine speed control. Rather, they start based on the PTO input state only.



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Fig. 2 ON/OFF Switch



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Fig. 3 Set and Accel/Decel Switch

Notes
