

MaxxForce[®] DT, 9, 10 (2010)

Overview: *In Cab Engine Speed
Control*

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General Overview: In-Cab Engine Speed Control

The In-Cab Engine Speed Control feature allows the operator to set and maintain a constant engine speed without using the accelerator pedal.

This feature controls the engine speed with 6 preset speeds through the steering wheel cruise switches inside the cab to power auxiliary devices.

The document will address unique in-cab engine speed control functionality for MaxxForce® DT, 9, 10.

Description and Operation

The in cab engine speed control provides the operator engine speed control to any installed auxiliary devices from inside the cab. This engine speed control is accomplished by utilizing the steering wheel cruise control switches.

Operation

The operational control of the in-cab engine speed control feature consists of three cruise control switches located on the steering wheel:

- **“Cruise On/Cruise Off”** switch allows the driver to enable or disable the in cab engine speed control preset functionality. The Cruise On switch also has an indicator light.
- **“Resume/Accel”** switch allows the operator to ramp up the engine or cycle through the presets.
- **“Set/Coast”** switch allows the operator to ramp down the engine or cycle through the presets.

The in-cab engine speed control will only operate if the vehicle speed is less than a programmable limit, the PTO input switches are not faulted, and other “interlock” conditions are met (i.e., vehicle speed, engine speed, and engine load are less than programmed values, etc.) are met.

Stationary Variable

Stationary Variable Speed PTO Control

Stationary variable engine speed control allows the operator to select any engine speed within the PTO boundaries. This is done by increasing/ decreasing the engine speed to the desired set point using the set/coast switch and the resume/accel switch. The vehicle must not be moving to activate PTO when programmed to Stationary Variable Mode.

Stationary Variable Speed PTO Setup

In addition to the main setup parameters (i.e. PTO Mode Selection, etc.) there are 3 specific stationary variable speed related PTO parameters; PTO Engine Speed Throttle Up Ramp Rate, PTO Engine Speed Throttle Down Ramp Rate, and PTO Bump Up/Down Step.

Stationary Variable Speed PTO Driver Interaction

In addition to the normal interlock conditions for all PTO operation, perform the following steps for stationary variable PTO operation:

1. Press the cruise on switch.
2. Press the set/coast switch to activate PTO. The current engine speed will be the PTO engine speed set point.
3. Press and hold the resume/accel switch to increase the engine speed set point. The engine speed will increase by the programmed PTO Engine Speed Throttle Up Ramp Rate. When the switch is released the current engine speed will become the set speed.
4. Press and hold the set/coast switch to decrease the PTO speed set point. The engine speed will decrease by the programmed PTO Engine Speed Throttle Down Ramp Rate. When the switch is released the current engine speed will become the set speed.
5. Press and release the resume/accel switch or the set/coast switch to increase or decrease the PTO engine speed set point by the programmed PTO Bump Up/Down Step.
6. Using the accelerator to increase engine speed and momentarily pressing the set/coast switch will set the current engine speed as the PTO engine speed set point.
7. If the PTO operation is interrupted (i.e. brake or clutch pressed, or accelerator pedal, a press of the resume/accel switch will return the engine to the previous PTO engine speed set point.

The clutch, brake, or accelerator interruption described above is dependent on the programming of the PTO Disable with APS, PTO In-Cab Operator Interface, PTO Disable with Clutch, and the PTO Disable with Service Brake parameters.

Stationary Preset

Stationary preset engine speed control allows the operator to select up to 6 preset engine speeds while the vehicle is stationary. The preset speeds are selected using the set/coast switch or the resume/accel switch as described in the Stationary Preset Driver Interaction section.

Stationary Preset Setup

There are up to 6 specific preset engine speed parameters that can be programmed. The preset engine speed parameters are typically programmed in an increasing preset order.

Stationary Preset Driver Interaction

In addition to the normal interlock conditions for all PTO operation, perform the following steps for stationary preset PTO operation:

1. Press the cruise on switch.
2. Press either the set/coast switch or the resume/accel switch to activate PTO.
3. Pressing the resume/accel switch will cycle through PTO Preset 2, 4, and 6 in ascending order.
4. Pressing the set/coast switch will cycle through PTO Preset 1, 3, and 5 in ascending order.
5. Interrupting PTO operation (i.e. clutch, brake, or accelerator) will return the engine to idle (PTO standby). If the set/coast switch is pressed, then the engine will go to preset 1. If the resume/accel switch is pressed, then the engine will go to preset 2.

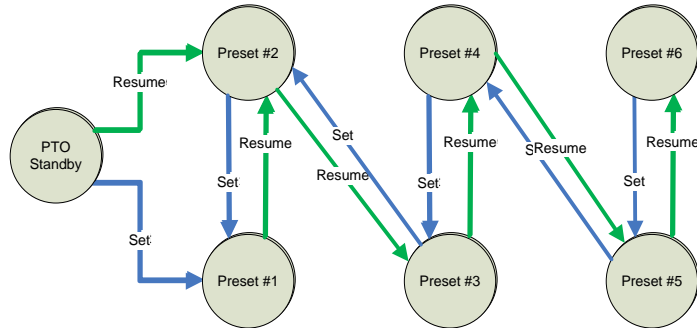
The clutch, brake, or accelerator interruption described above is dependent on the programming of the PTO Disable with APS, PTO In-Cab Operator Interface, PTO Disable with Clutch, and the PTO Disable with Service Brake parameters.

Refer to the **Stationary Preset Diagram** for a general visual representation of how the operator interacts with the switches during stationary preset PTO operation.

Stationary Preset Notes

- Presets speeds that will not be used can be set to 0 rpm.
- If one of the PTO preset engine speeds is programmed to 0 rpm, that setting will be skipped for the next available preset.
- If all of the remaining preset speeds are programmed to 0 rpm, the last preset speed will be maintained.
- The engine will accelerate the engine speed at the programmed PTO Engine Speed Throttle Up Ramp Rate parameter setting when a preset speed is selected that is greater than the current engine speed.
- The engine will decelerate the engine speed at the programmed PTO Engine Speed Throttle Down Ramp Rate parameter setting when a preset speed is selected that is less than the current engine speed.
- Pressing and holding either the set/coast switch or the resume/accel switch will not result in cycling through the preset speeds.

Stationary Preset Diagram



Mobile Variable

Mobile Variable Speed PTO Control

Mobile variable speed control permits a desired variable engine speed to be selected. The vehicle can be moving or stationary during PTO operation.

Mobile Variable Speed PTO Setup

There is one specific mobile variable speed related PTO parameters; PTO Vehicle Speed Limit.

Mobile Variable Speed PTO Driver Interaction

Functionality and setup is identical to Stationary Variable Speed PTO with the exception that a stationary vehicle is no longer required.

Feature Interaction

The In-Cab Engine Speed Control feature interacts with these engine features:

- Cruise Control. There is no interaction with cruise control; however, PTO uses the same switches (resume/accel & set/coast) as the cruise control feature.
- Idle Shutdown Timer (IST)
- Road Speed Limiting (RSL)

Programmable Parameters

The following programmable parameters are required for engine speed control and power take off operation. These parameters should be programmed to the engine speed control operation which will best suit the vehicle conditions expected.

Parameters indicated as Customer Programmable can be adjusted differently than the production assembly plant setting to meet the customer's needs. If the parameter is indicated as non-customer programmable, the parameter setting is preset from the factory and can't be changed without authorization.

There are multiple available PTO configurations. Please see the Parameter Setup section for a few examples and specific setup instructions.

| Parameter Value | Description | Possible Values | Cust Pgrm? | Recommended Settings |
|---|---|--|------------|------------------------------|
| Aux Throttle Control - Mode (7500) | <p>This parameter determines the conditions that the Engine Speed Control (PTO) feature will be functional. Set this parameter to enable PTO operation and to choose which inputs are used for control.</p> <ul style="list-style-type: none"> If set to (0) - The PTO functionality is disabled. If set to (2) - Only the in-cab inputs will be able to control PTO. If set to (3) - Both remote and in-cab inputs will be able to control PTO (See Note 1 & 2). If set to (1) - Only the remote PTO inputs will be able to control PTO (See Note 2). <p>Note 1: The last input received will take priority when Mode 3 is selected.</p> <p>Note 2: Mode 1 and the remote portion of Mode 3 are discussed in the Remote Engine Speed Control document.</p> | <p>0: Disable 1: Remote Operation Only 2: In Cab Operation Only 3: Remote and In Cab Operation</p> | YES | Customer Chosen |
| Aux Throttle Control - In Cab Mode (7502) | <p>Set this parameter after selecting In-Cab Or Remote and In-Cab Operation to determine which PTO mode is active.</p> <ul style="list-style-type: none"> If set to (0) - The switches will not be used. Refer to the Remote Engine Speed Control document. If set to (1) - The switches will be used to select up to 6 preset engine speeds. Refer to the Stationary Preset section for more information. If set to (2) - The switches will be used to adjust the engine speed variably. Refer to the Stationary Variable section for more information. If set to (3) - The switches will be used to adjust the engine speed to a desired set point to allow for vehicle movement. Refer to the Mobile Variable section for more information. | <p>0: None 1: Stationary Preset 2: Stationary Variable 3: Mobile Variable</p> | YES | Customer Chosen |
| Aux Throttle Control - Maximum Engine Speed (7508) | <p>The maximum engine speed that can be reached using any PTO controls.</p> <p>Note 1: This parameter must be set properly to protect PTO related equipment.</p> | Low Idle to High Idle (RPM) | YES | Customer Chosen (See Note 1) |
| Aux Throttle Control - In Cab Operator Interface (7503) | <p>Select this parameter when accelerator, brake or clutch is desired to be ignored during engine speed control operation.</p> <ul style="list-style-type: none"> If set to (0) - The accelerator, brake, and clutch are inputs used for PTO operation. If set to (1) - The accelerator, brake, and clutch will be ignored during PTO operation. <p>Note: Use parameters (7510), (7511) and (7513) to provide the specific input options.</p> | <p>0: Disable 1: Enable</p> | YES | Customer Chosen |

| Parameter Value | Description | Possible Values | Cust Pgrm? | Recommended Settings |
|---|--|-----------------|------------|-----------------------|
| Aux Throttle Control - Ramp Rate (7507) | This parameter sets the speed at which the engine will attempt to increase the engine speed. Note 1: The engine only attempts to increase the engine speed at this rate because actual engine changes are influenced by other factors such as engine load and available engine power. Note 2: This parameter should be set to provide a smooth transition to the desired engine speed to accommodate applicable PTO equipment. | 1 - 1500 RPM | YES | 100 rpm/sec (default) |

Parameters for Preset Engine Speed PTO Configurations

| Parameter Value | Description | Possible Values | Cust Pgrm? | Recommended Settings |
|---|--|---|------------|------------------------------|
| Aux Throttle Control - Preset Engine Speed 1 (SET/ COAST) (7505) | This parameter sets the running engine speed set point that will be maintained when the first (1 st) PTO preset speed is selected OR when SET/ COAST is pressed. Note 1: Presets speeds that will not be used can be set to 0 rpm. Refer to the Stationary Preset section for more information. | Range must be less than the following setting: <ul style="list-style-type: none"> PTO Maximum Engine Speed (7508) | YES | Customer Chosen (See Note 1) |
| Aux Throttle Control - Preset Engine Speed 2 (RESUME/ ACCEL) (7506) | This parameter sets the running engine speed set point that will be maintained when the second (2 nd) PTO preset speed is selected OR when RESUME/ ACCEL is pressed. Note 1: Presets speeds that will not be used can be set to 0 rpm. Refer to the Stationary Preset section for more information. | Range must be less than the following setting: <ul style="list-style-type: none"> PTO Maximum Engine Speed (7508) | YES | Customer Chosen (See Note 1) |
| Aux Throttle Control - Preset Engine Speed 3 (7509) | This parameter sets the running engine speed set point that will be maintained when the third (3 rd) PTO preset speed is selected OR when SET/ COAST is pressed twice. Note 1: Presets speeds that will not be used can be set to 0 rpm. Refer to the Stationary Preset section for more information. | Range must be less than the following setting: <ul style="list-style-type: none"> PTO Maximum Engine Speed (7508) | YES | Customer Chosen (See Note 1) |
| Aux Throttle Control - Preset Engine Speed 4 (7510) | This parameter sets the running engine speed set point that will be maintained when the fourth (4 th) PTO preset speed is selected OR when RESUME/ ACCEL is pressed twice. Note 1: Presets speeds that will not be used can be set to 0 rpm. Refer to the Stationary Preset section for more information. | Range must be less than the following setting: <ul style="list-style-type: none"> PTO Maximum Engine Speed (7508) | YES | Customer Chosen (See Note 1) |
| Aux Throttle Control - Preset Engine Speed 5 (7511) | This parameter sets the running engine speed set point that will be maintained when the fifth (5 th) PTO preset speed is selected OR when SET/ COAST is pressed three times. Note 1: Presets speeds that will not be used can be set to 0 rpm. Refer to the Stationary Preset section for more information. | Range must be less than the following setting: <ul style="list-style-type: none"> PTO Maximum Engine Speed (7508) | YES | Customer Chosen (See Note 1) |

| Parameter Value | Description | Possible Values | Cust Pgrm? | Recommended Settings |
|---|---|---|------------|--|
| Aux Throttle Control - Preset Engine Speed 6 (7512) | This parameter sets the running engine speed set point that will be maintained when the sixth (6 th) PTO preset speed is selected OR when RESUME/ ACCEL is pressed three times. Note 1: Presets speeds that will not be used can be set to 0 rpm. Refer to the Stationary Preset section for more information. | Range must be less than the following setting: <ul style="list-style-type: none"> PTO Maximum Engine Speed (7508) | YES | Customer Chosen (See Note 1) |
| Aux Throttle Control - Maximum Vehicle Speed (7501) | This parameter is the maximum vehicle speed that the PTO will be allowed to operate. Note 1: Set this parameter to the maximum vehicle speed that the PTO is typically used. | 0 - 20 mph | YES | Customer Chosen (See Note 1) |

Parameters for PTO Override Configurations

| Parameter Value | Description | Possible Values | Cust Pgrm? | Recommended Settings |
|---|---|---|------------|----------------------|
| Aux Throttle Control - SPDT Enable (7519) | This programmable parameter allows the operator to use a single switch to activate PTO PRESET 1 or 2. NOTE 1: After PTO/ RPTO has been enabled, PTO and/ or RPTO will require a transition in the state of the PTO control switches (CC RESUME/ SET, or RVAR/ RPRE switches) to transition to a new PRESET mode from the current state. For example, a transition in the state of the PTO control switches would require a release of the CC SET switch then re-activation to transition from PRESET 1 to PRESET 3 while CC ON remains active. NOTE 2: A combination of ON, RVAR or RPRE with SET will select PRESET1. A combination of ON, RVAR, or RPRE with RESUME will select PRESET 2. | 0: Disable the ability to activate the PTO enable signal (CC/PTO On, RPRE, RVAR) at the same time as the PTO incrementing signal (Set, Resume) 1: Enable the ability to activate the PTO enable signal (CC/PTO On, RPRE, RVAR) at the same time as the PTO incrementing signal (Set, Resume) | YES | Customer Chosen |
| Aux Throttle Control - Enable ATC Overrides (7526) | This parameter allows the operator to enable or disable In Cab PTO overrides. | 0: Disable the In- Cab PTO overrides 1: Enable the In- Cab PTO overrides | YES | Customer Chosen |
| Aux Throttle Control - Disable ATC with Service Brake (7514) | This parameter allows operator to set the Service Brake to disable the In Cab PTO. | 0: Service Brake Disables PTO 1: Service Brake Does Not Change PTO | YES | Customer Chosen |
| Aux Throttle Control - Disable ATC with Parking Brake Released (7515) | This parameter allows the use of PTO without requiring the parking brake set. Note: Depending on the calibration; some calibrations have the Parking Brake interactions with PTO disabled permanently. | 0: Parking Brake Disables PTO 1: Parking Brake Does Not Change PTO | YES | Customer Chosen |

| Parameter Value | Description | Possible Values | Cust Pgrm? | Recommended Settings |
|---|---|---|------------|----------------------|
| Aux Throttle Control - Disable ATC with Driveline Status (7516) | This parameter allows the use of In Cab PTO without requiring the Driveline Status indicate 'driveline disengaged'. Note: For Automatic transmissions, 'Driveline Status' refers to the gear selector; moving the gear selector from the Park/ Neutral position will cancel the current In Cab PTO mode. For Manual transmissions, 'Driveline Status' refers to the clutch switch or gear selector status; pressing the clutch or moving the gear selector from 'Neutral' will cancel the current In Cab PTO mode. | 0: Driveline Status Disables PTO operation 1: Driveline Status Does Not Change PTO operation | YES | Customer Chosen |
| Aux Throttle Control - Disable ATC with In- Cab Controls (7517) | This parameter allows operator to disable the ATC with In Cab Controls. | 0: In- Cab Controls Disables PTO 1: In- Cab controls Do Not Change PTO | YES | Customer Chosen |
| Aux Throttle Control - Disable ATC with Vehicle Speed (7518) | This parameter allows In Cab PTO to be disabled with vehicle speed. | 0: Vehicle Speed Limit Disables PTO 1: Vehicle Speed Limit Does Not Change PTO | YES | Customer Chosen |

Parameter Setup

Possible In-Cab PTO Applications

The In-Cab PTO feature is application specific. This section briefly describes one example of in-cab PTO configuration and operation. This configuration will likely need to be modified to meet the needs of the actual application that the owner/operator requires.

Please review the description and operation section and the programmable parameters for a better understanding of how the various engine speed control parameters and the engine speed control mode might be best configured for your vehicle.

EXAMPLE A - Typical In-Cab PTO Scenario

In this example, the operator requires two preset engine speeds while the vehicle is stationary. The presets are activated via the cruise control switches.

Adjust parameters as follows:

| Parameter Name | Action Required |
|---|---|
| Aux Throttle Control Mode (7500) | Select 2: Enabled - In Cab Operation Only |
| Aux Throttle Control - In Cab Mode (7502) | Select 1: Stationary Preset |
| Aux Throttle Control - Preset Engine Speed 1 (Set/Coast) (7505) | Set this to 900 rpm |
| Aux Throttle Control - Preset Engine Speed 2 (Resume/Accel) (7506) | Set this to 1100 rpm |
| Aux Throttle Control - Preset Engine Speed 3 (Set/Coast 2x) (7509) | Set this to 0 rpm |
| Aux Throttle Control - Preset Engine Speed 4 (Resume/Accel 2x) (7510) | Set this to 0 rpm |

| Parameter Name | Action Required |
|---|-------------------|
| Aux Throttle Control - Preset Engine Speed 5 (Set/Coast 3x) (7511) | Set this to 0 rpm |
| Aux Throttle Control - Preset Engine Speed 6 (Resume/Accel 3x) (7512) | Set this to 0 rpm |

Operation:

1. Activate the PTO by pressing the cruise on switch on the steering wheel.
2. Activate the 1st preset engine speed (900 rpm) by pressing the set/coast switch.
3. Activate the 2nd preset engine speed (1100 rpm) by pressing the resume/accel switch.

EXAMPLE B - In-Cab PTO with Variable Speed Control Scenario

In this example, the operator requires the engine speed to be able to ramp up and down within a range of engine speeds while the vehicle is stationary. The engine speed is controlled through the cruise control switches.

Adjust parameters as follows:

| Parameter Name | Action Required |
|---|---|
| Aux Throttle Control Mode (7500) | Select 2: Enabled - In Cab Operation Only |
| Aux Throttle Control - In Cab Mode (7502) | Select 2: Stationary Variable |

Operation:

1. Activate the PTO by pressing the cruise on switch on the steering wheel.
2. Increase the current engine speed by pressing and holding the resume/accel switch. Release the switch when the desired engine speed is reached.
3. Decrease the current engine speed by pressing and holding the set/coast switch. Release the switch when the desired engine speed is reached.

Frequently Asked Questions

How many presets can I configure in the in-cab PTO feature?

Six preset engine speeds can be programmed if Stationary Preset mode is selected. Refer to the stationary preset section for more information.

My application requires a ramp in rather than step increments for engine speed control. Can I do this with in cab PTO?

Yes, refer to Example B in the parameter setup section for details.

My application uses external PTO controls (located outside the cab). How do I set these up?

An example of this application is described in the remote engine speed control document.

Definitions/Acronyms

The following terms are referenced in this document:

| Acronym | Definition |
|----------------|--------------------------|
| APS | Accelerator Pedal Sensor |
| ECM | Engine Control Module |
| IST | Idle Shutdown Timer |
| PTO | Power Take Off |
| RSL | Road Speed Limiting |
| VSS | Vehicle Speed Sensor |