# M300DP Expansion I/O Control
## for M150B Series Control Panels



# Installation / User Manual

## M300DP Expansion I/O Module
### with Auto Start

P/N: MN10047-01

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## Index

## M300DP Table of Contents

## Connection Details

| Connector | Description |
|---|---|
| P4 | 6 Pin; connects to , black housing |
| S1 | 6 Pin; connects to P1r, grey housing |
| CAN | Yellow & Green wires |
| Oil Pres, Fuel | Analog Inputs - Orange, Green/Black wires |
| Float | Discrete Inputs - White/Black, White, Black |
| Common | Common – connects to Throttle Switch, Black |

## Mechanical Mounting

The Auto Start module has two mounting holes 0.18 Diameter or # 8 screws. The mechanical dimensions are shown in the figure.
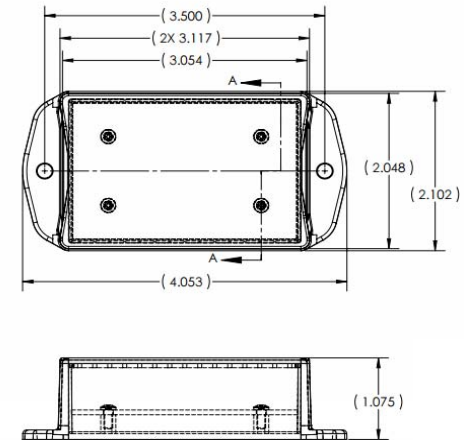


## Updating Display Software

In order for the display to recognize the Auto Start module, the display software must be revision v2.00 or higher. Go to the Main Menu and select the "About" menu selection to check the software version. When the Auto Start module has been installed, the SW Version for the M300 will also be displayed.
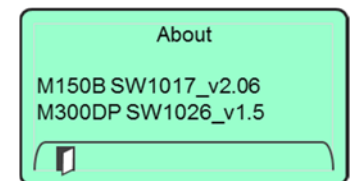


If your software needs updating, contact your local distributor for the latest software revision.

**Insert Auto Start Leads into the Engine Connector**

The Auto Start module provides six wire leads from the module to support two analog inputs, two discrete inputs and an alarm. These leads must be inserted into the P1 connector. The recommended pin locations are shown in the table below.

**Make External Connections**

To connect the two analog signals and the two discrete inputs to the device(s), five pigtails are provided and must be inserted into the Engine harness. The recommended pin locations are shown in Table 3.
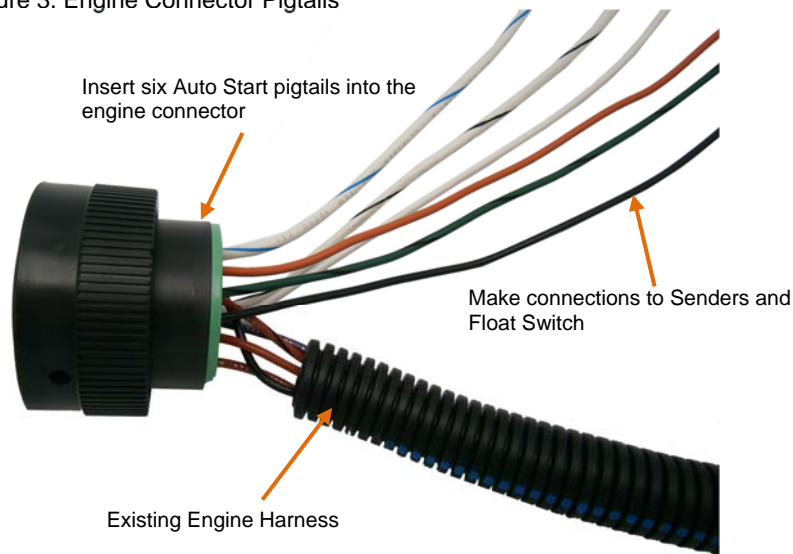
The installer is responsible for making the connection from each pigtail to the device(s) (Oil Pressure Sender, Fuel Sender, Float Switch, etc.).

Figure 3. Engine Connector Pigtails



Insert six Auto Start pigtails into the engine connector

Make connections to Senders and Float Switch

Existing Engine Harness

**Alternate Connection**

Although the installation instructions show the analog and discrete inputs going to the 21 pin engine connector they could also be grouped together on a separate 6 pin connector (DT04-6S).

# Quick Start Guide



Controller Display

Throttle Fast/Slow Button

Key switch



ALARM Indicator

Engine Data Symbol

Engine Data

Engine Data Bar Graph

Data Units

Navigation Keypad
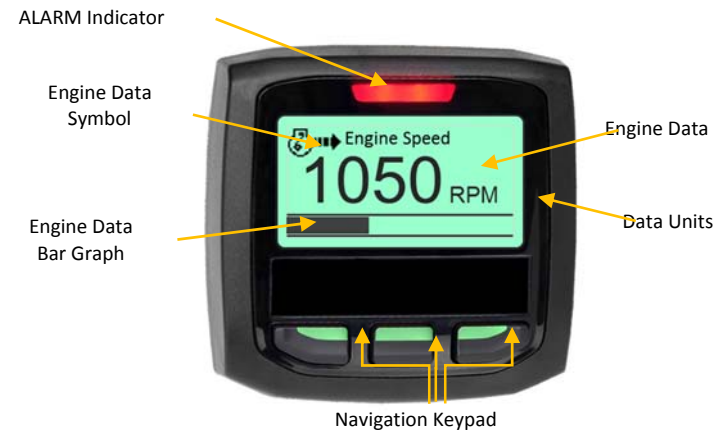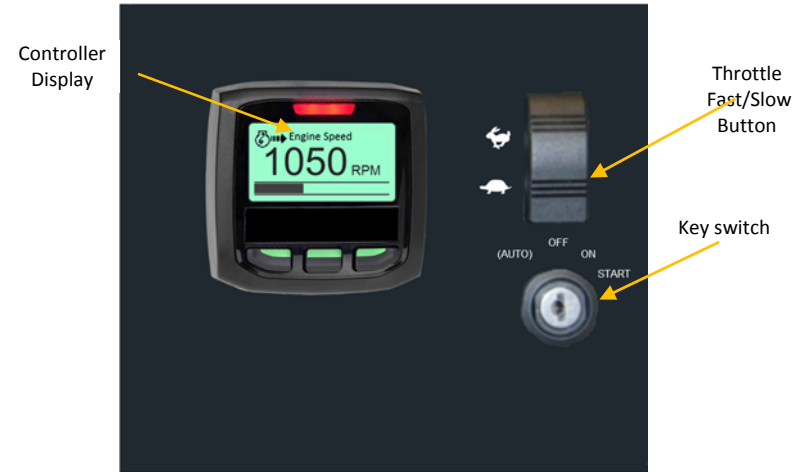
## Powering the System

The M300DP Expansion I/O control module is a dual mode system and can be programmed for either Auto Start (A/S) or expansion I/O capability. The M300DP can be used with all M150B and M150L Series Control Panels.

To power the system turn the key switch to the "ON" position. This will activate the control panel and apply power to the M300DP module and the engine ECU. Should the control panel indicate a fault condition review the M150 Series manual for details and correct the condition before starting the engine.

On a successful power up sequence, the system will display the currently configured default display. The factory default screen is Engine Speed.

## Changing Data Displays

To change the data being displayed press any key to activate the softkey menu. Press the change "↻" softkey to access the next data display available.

Main Menu   Next Display

**Connect the Auto Start Module to the Key Switch**

The following four steps provide the detailed modifications to the control panel harness required for the Auto Start module.

1. Remove the P1 connector from the key switch and install the P4 connector of the Auto Start module into the key switch.
2. Remove the wedgelock and insert the Yellow wire removed from the display connector into pin 6 of the P1 connector.
3. Insert the Green wire removed from the display connector into pin 3 of the P1 connector.
4. Re-install the edgelock and plug the P1 connector into the S1 connector of the Auto Start module.

**Connect the Auto Start Module to the Throttle Switch**

The following steps provide the detailed modifications throttle switch.

1. Remove the black wire from the throttle switch and install the black wire with ¼" quick disconnect.
2. Re-install black throttle wire onto the piggyback terminal.

Figure 2. Throttle Switch Connection

Black throttle switch wire plugged into piggyback terminal.
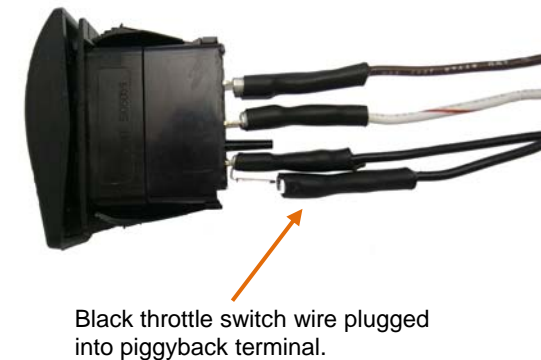
**Re-Assemble**
1. Mount the Auto Start module.
2. Connect the control panel connector (HDP24-21 connector) to the engine harness.
3. Re-install the control panel.
4. Connect battery.
5. Turn ignition key to "ON" position.
6. Ensure digital display is active. If display is not active;
7. Check battery and power connections.
8. Check ignition switch is on position.
9. Ensure system is displaying data for engine speed, oil pressure and temperature.

Figure 1. Auto Start Module

Insert Yellow wire into P3-3 & Green wire into P3-4

S1

P4

Insert six wires into engine connector

Connect Black wire to throttle switch

**Connect the Auto Start Module to the Display**

The following four steps provide the detailed modifications to the control panel harness required for the Auto Start module.
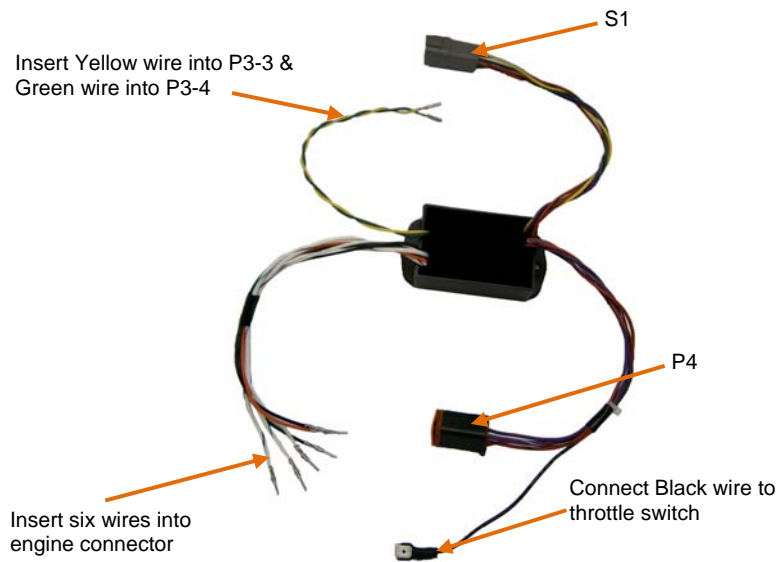1. Remove the wedgelock and the Yellow wire from the P3 connector and insert the Yellow wire from the Auto Start module into the vacated pin location (Pin 3).
2. Remove the Green wire from the P3 connector and insert the Green wire from the Auto Start module into the vacated pin location (Pin 4).
3. Re-install the wedgelock and plug the P3 connector into the display.

# System Overview

The M300DP Expansion module allows the user to program three modes of operation; Expansion I/O Mode, Autostart Mode or Off. In the "Off" mode A/S and Remote Speed functionality is disabled but the settings are retained. The analog inputs remain active and configurable in all modes of operation. The "I/O" mode provides for two additional analog inputs and two additional digital inputs. The digital inputs provide for remote speed control, engine stop or engine inhibit functions. The "A/S" mode provides for the same analog inputs as the "I/O" mode. The digital inputs provide for automatic engine start and engine stop control.

## Menu Navigation

The M150B Series Control Panel has three navigation buttons which are dynamically configured as softkeys. The system softkeys are used to navigate between displays, select menu items and change data. Pressing any of the three buttons will display the softkey menu associated with each button.
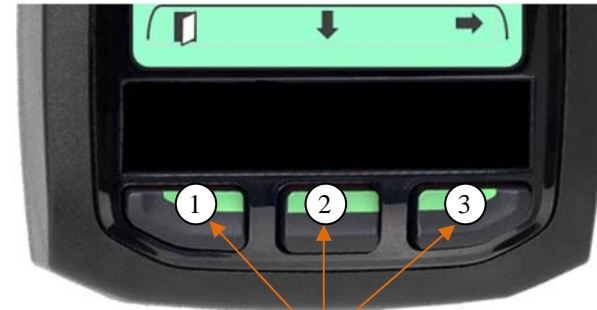
Navigation Buttons

Softkey Buttons:
🔧 : Tools (Main Menu)
▯ : Exit
⟩ : Change
⬇ : Scroll Down
➡ : Select
✚ : Increment Value
— : Decrement Value
✓ : Acknowledge
? : More Information

## Accessing the Main Menu
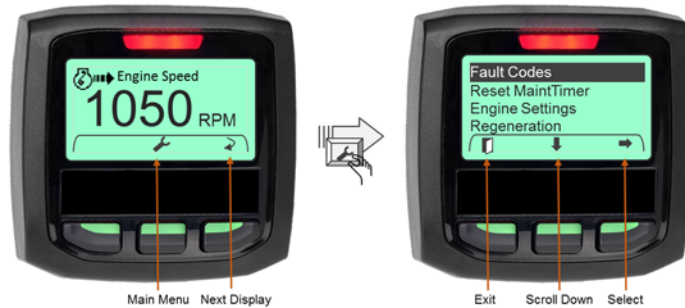
To access the Main Menu press any of the three navigation buttons. The M150B Series will display a softkey popup window defining the available navigation possibilities. Select the Main Menu using the "**Tools**" softkey.
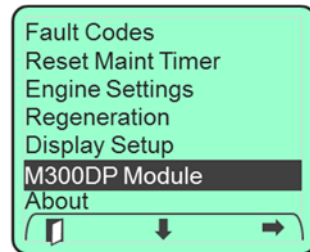
### Navigating the Main Menu

The main menu will be displayed along with the main menu softkey popup window. Navigate through the main menu selections by using the "⬇" key. When the desired menu item is highlighted, press the "➡" key to select the menu item. To exit the main menu and return to the data displays press the EXIT " 🚪 " softkey.

*Note: The M300DP Module menu option will only be displayed when the MP300DP Module has been installed correctly.*

### Changing Parameter Settings

There are two types of parameters that may be set: Numeric Values and Mode or State.

### Changing a Numeric Value

When the highlighted parameter is a Numeric Value, selecting the "➡" key will change the softkeys to ✚ / − for incrementing and decrementing the numeric value.

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# Appendix B – Field Installation

## Making the Connections

The Auto Start Module shown in Figure 1, has two floating connectors (P4 and S1), 6 wire leads to be connected to the Engine connector, one black lead with a piggyback quick disconnect which goes to the throttle and two leads (Yellow and Green) which go to the .

Also provided are six 6" pig tails (White w/Blue, Orange, Green w/Black, White, White w/Black and Black) which can be used on the engine side of the engine connector to make remote connections to analog and discrete inputs.

**Recommended order**:
1. Verify the battery / battery switch connections to engine per the engine installation diagram. (Refer to engine manufacturer installation manual.). Verify engine is bonded to battery return (-). Verify engine block is connected to battery ground.
2. Disconnect battery.

**Control Panel Modifications**
1. Loosen the four screws (3/32 Hex) and remove the control panel from the housing base. Disconnect the control panel from the engine harness (HDP24-21 connector).
2. Make connections from the Auto Start module to the display. MORE DETAIL IN NEXT SECTION.
3. Make connections from the Auto Start module to the key switch.
4. Make a connection to the throttle switch.
5. Insert the 6 wire leads from the Auto Start module into the 21 pin engine connector (HDP24-21 connector).

**Engine Harness Modifications**
1. Make external connections to the Oil Pressure Sender, Fuel Sender, Float Switch 1, Float Switch 2 and Common to the 21 pin Deutsch connector of the engine harness using the five 6" pigtails.

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# Troubleshooting Guide

| Symptom | Action |
|---|---|
| The M300DP Menu Selection does not show up in the Main Menus | ▪ Check the Yellow and Green wires from the A/S Module and the Display<br>▪ Check the key switch connection (Black Wire)<br>▪ Make sure the M150 Series software version is version 2.00 or higher. |
| Engine does not crank when key switch is in normal Start position | ▪ Check pin D (i.e., Start) connection to the Engine Connector. |
| Engine cranks but does not fire when key switch is in normal Start position | ▪ Check Engine manual for troubleshooting start issues. |
| Auto Start ALERT not displayed when key switch set to Auto Start (Full Counterclockwise position). | ▪ Check the settings to make sure the mode is set to A/S |
| With a discrete input set to Start/Stop, the Auto Start Alert screen is displayed but turns off and then on again | ▪ Make sure the On Delay set for the discrete input are longer than the time the discrete input is bouncing. |
| Engine running but shuts down unexpectedly; then restarts. | ▪ Make sure the Off Delay set for the discrete input are longer than the time the discrete input is bouncing. |
| The auto start countdown does not start when the discrete input is activated | ▪ Make sure DI1 and DI2 are correctly set for Start and Stop<br>▪ Make sure the Active State for DI1 and DI2 are set correctly<br>▪ Make sure the discrete input wires are inserted into the correct pin locations of the Engine Connector. |
| The data for the senders on to an analog input does not show up as an Engine parameter. | ▪ Make sure the analog input wires are inserted into the correct pin locations of the Engine Connector. |
| The data for the senders connected to an analog input shows up on the Engine display but the values are wrong | ▪ Make sure the sender selection for the analog input are set to the correct sender option (US versus Euro) |

The Min RPM engine setting is an example of a numeric value that can be configured. Changing the minimum rpm setting is accomplished by entering the engine settings menu, navigating to the Min RPM menu and then selecting the Min RPM setting via the "➡" softkey. The M150 Series Control Module will display the **+** / **-** softkey popup. The **+** / **-** softkeys are then used to increment and decrement the rpm value.
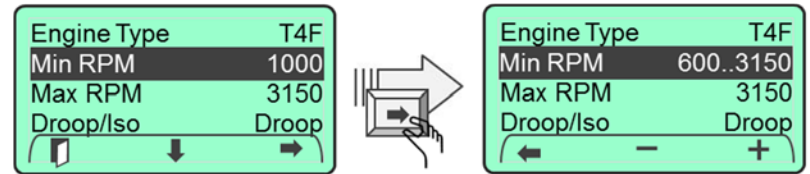
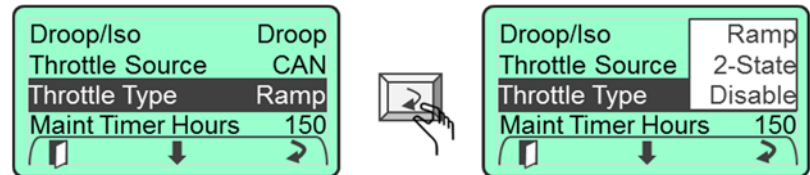Use the "⬅" softkey to return to the previous display.

#### Changing a Mode or State
When the highlighted parameter is a Mode or State, pressing "➡" key will change the softkeys in the popup window.

Pressing the "↻" softkey will step through a predetermined list of modes or states. Stop pressing the softkey when the desired selection is found.

Setting the Throttle Type is an example changing Modes. Go to the Engine Settings menu and use the "⬇" softkey to navigate and highlight the Throttle Type. Press the "↻" softkey until the desired state is displayed.

To return to the previous display, use the EXIT " " softkey. Note: When returning to the Main Menu after making changes, the Save display will appear. Press the "X" softkey to discard the changes or press the "✓" checkmark softkey to save the changes.
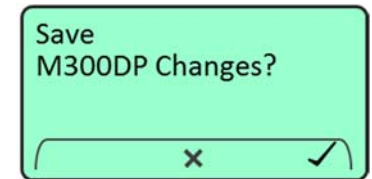
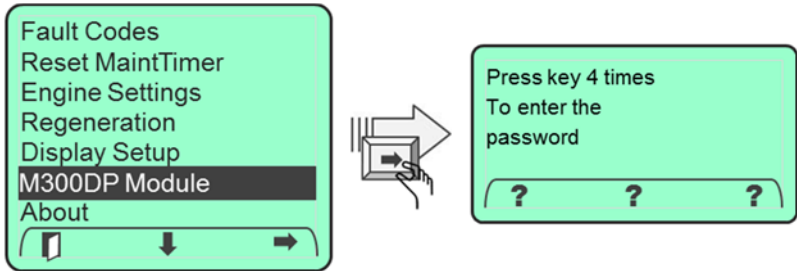**CAUTION:** *Auto Start settings may be viewed while the key switch is in the Auto position; however, if changes are made they will not be saved when the EXIT softkey "▯" is pressed.*
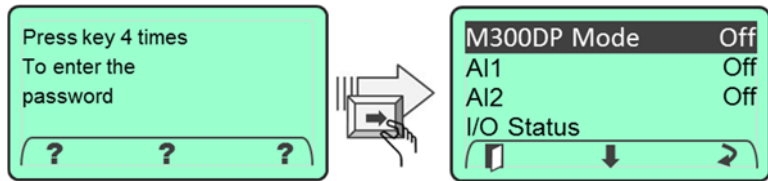
> Setting Changes Prohibited.
> Key In A/S position

## Setting the Mode

Use the "⬇" softkey to select M300DP Module. Then press the "➡" softkey to enter the M300DP Setup Mode. Since the M300DP Mode is password protected, the password screen will be displayed.

> Fault Codes
> Reset MaintTimer
> Engine Settings
> Regeneration
> Display Setup
> M300DP Module
> About

> Press key 4 times
> To enter the password

The password must be four key presses, in the correct sequence.

> Press key 4 times
> To enter the password

> M300DP Mode     Off
> AI1             Off
> AI2             Off
> I/O Status

The M300 Mode selection is highlighted when entering the M300DP Setup mode. The default setting for M300 Mode is "OFF". The two analog inputs are available when the M300 Mode is set to "OFF".

> M300DP Mode    OFF
> AI1            I/O
> AI2            A/S
> I/O Status
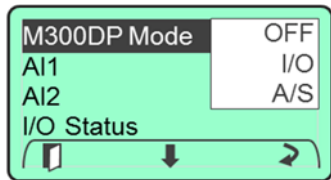
Press the "↻" softkey to switch between the three M300 Mode modes: OFF, I/O, and A/S

Press the "⬇" softkey to move to the next menu item. Press the "▯" EXIT softkey to return to the previous display.

**M300DP Menu**

> Regeneration
> Display Setup
> M300DP
> About

> M300 Mode      A/S
> AI1
> AI2
> Start Delay (s)    10

> M300 Mode      A/S
> AI1            Off
> AI2            Off
> Start Delay (s)    10

> AI1            Off
> AI2            Off
> Start Delay (s)    10
> Speed 1 (rpm)  1500

> AI2            Off
> Start Delay (s)    10
> Speed 1 (rpm)  1500
> Speed 2 (rpm)  1750

> Start Delay (s)    10
> Speed 1 (rpm)  1500
> Speed 2 (rpm)  1750
> Speed 3 (rpm)  2000

> Speed 1 (rpm)  1500
> Speed 2 (rpm)  1750
> Speed 3 (rpm)  2000
> Throttle Operation

> Speed 2 (rpm)  1750
> Speed 3 (rpm)  2000
> Throttle Operation
> DI1 Setup

> Speed 3 (rpm)  2000
> Throttle Operation
> DI1 Setup
> DI2 Setup

> Throttle Operation 2000
> DI1 Setup
> DI2 Setup
> IO Status

> Throttle Operation 2000
> DI1 Setup
> DI2 Setup
> IO Status

# Appendix A - Menu Overview

**Main Menu**
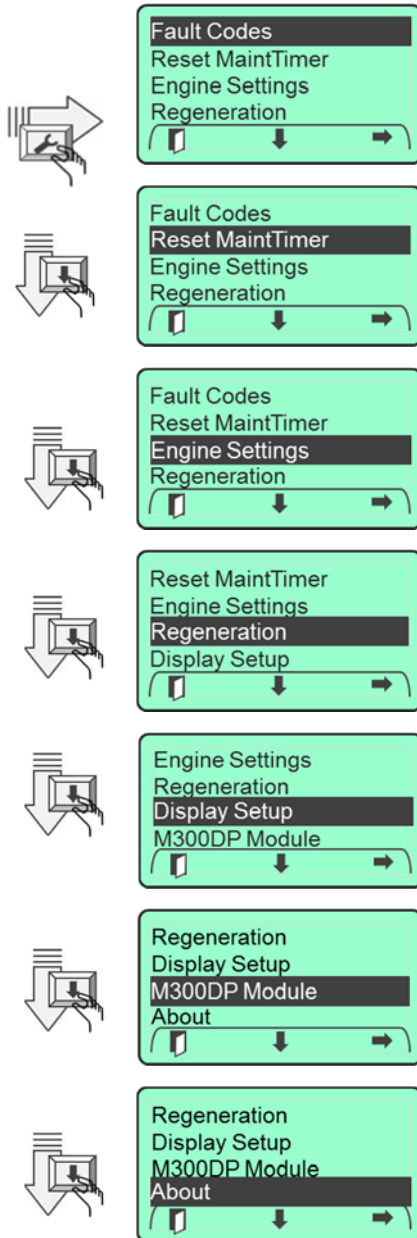
## Analog Input Configuration

The M300DP Module has two analog inputs which are user configurable for the following type of senders:

"Off"
Fuel US (240 to 33 ohms)
Fuel Euro (10 to 180 ohms)
OP 5Bar (10 to 180 ohms)
OP 10Bar (10 to 180 ohms)
Water Level US (240 to 33 ohms)
Water Level Euro. (10 to 180 ohms)



*Note: The analog inputs are accessible for all three modes of operation; Off, I/O and A/S.*

Use the "↓" softkey to navigate to the AI1 or AI2 option, then press the "↻" softkey to switch between these six choices. Stop when the desired mode is displayed. Use the "←" softkey to return to the previous display.
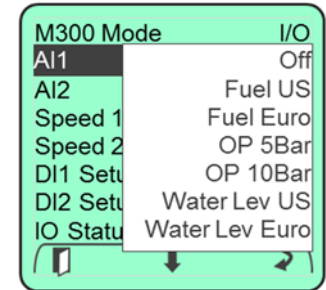
When the sender has been connected and the setup complete, the sender data will appear on the engine display along with the other engine parameters.

## IO Status

IO Status is a diagnostic screen which provides information about the I/O parameters. This information is used for troubleshooting in the field. Use the "↓" softkey to navigate to IO Status, then press the "➡" softkey.
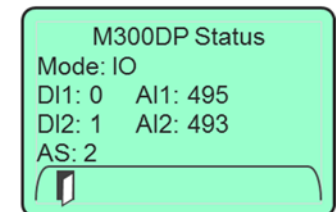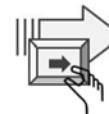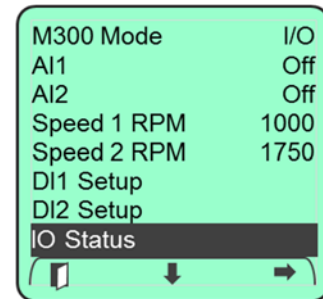


The IO Status display provides the Mode, the status of the DI1 and DI2 inputs and the measurement value (raw ADC cts) for the AI1 and AI2 inputs. AS provides the status of the key switch position: Auto = 1, On =2, Start=3.

# I/O Mode

## Overview

Selecting I/O Mode disables the Auto Start Feature. The system will not operate with the key switch in the "Auto" position. This mode keeps the analog inputs enabled and enables the two digital inputs (DI1 and DI2). The digital inputs may be configured for the following functions;

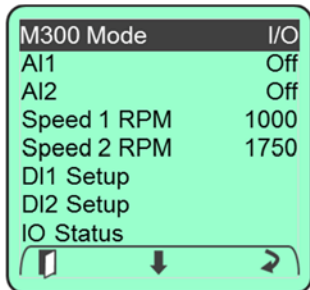Engine Speed Control
Engine Start Inhibit
Engine Stop

*Note: The AI1 and AI2 analog inputs will be active.*

## Remote Speed Settings

The I/O Mode supports two engine speed settings (Speed 1 and Speed 2). The user can program these settings from 600 to 3150 in increments of 50 RPMs. These settings can then be assigned to a digital input to provide for remote speed control via a simple contact closure. See section Remote Throttle Control. *(Note: range of rpm settings may vary based on engine model.)*
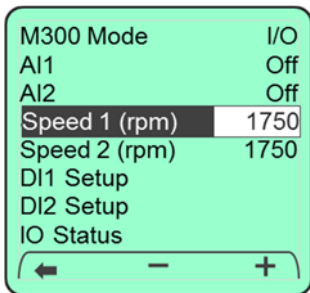
Use the "⬇" softkey to navigate to the Speed 1 or Speed 2 selection, then press the "➡" softkey.

Use the **+** / **-** softkeys to increment and decrement, the Speed RPM value, respectively. Use the "⬅" softkey to return to the previous display.

## Digital Input Setup

The menu selections for DI1 Setup and DI2 Setup are used to configure the two discrete inputs. They are accessed from the main menu of the M300DP Module selection.
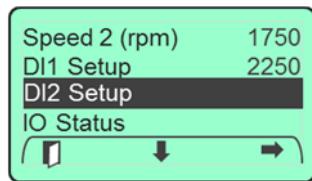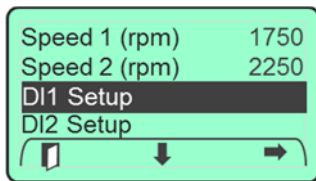
# Default Settings

Upon receiving the Auto Start module, the unit will be set to the following values. Setting the module back to defaults is made by using the "Reset to Defaults" which is under the ENGINE SETTINGS menu level.

| Parameter | Default Value |
|---|---|
| Display Settings | |
| M300 Mode | OFF |
| Speed 1 | Engine Min RPM |
| Speed 2 | 1500 RPM |
| Speed 3 | Engine Max RPM |
| Throttle Profile | |
| Speed1 (s) | 5 |
| Speed1 Ramp (s) | 5 |
| Speed2 (s) | 5 |
| Speed2 Ramp (s) | 5 |
| Speed3 (s) | 5 |
| Stop (s) | 5 |
| DI1 Setup | OFF |
| DI2 Setup | OFF |
| AI1 | OFF |
| AI2 | OFF |
| On Delay(s) | 10 |
| Off Delay(s) | 10 |
| Start Retries | 0 |

# Technical Specifications

| Parameter | Specification |
|---|---|
| Operating Voltage | 9 to 32 VDC |
| Communication | J1939 CAN 2.0B |
| Operating Temperature | -30C to +70C (-22F to 158F) |
| Storage Temperature | -40C to +80C (-40F to 176F) |
| Reverse Polarity Protection | Yes |
| Salt Spray | IEC60068-2-52 1996 |
| EMC | IEC61000 and EN55022 |
| Degree of Protection | IP67 |
| Dimensions | 102.294mm x 53.39mm x 27.3mm (4.053" x 2.102" x 1.075") |
| System Protection | Provided externally |

# System Components

| Part Number | Description |
|---|---|
| M300DP | EM; Expansion I/O Module w/Autostart |
| MN10047 | Manual; M300DP B Series Expansion I/O Control |
| MN10059 | Data Sheet; M300DP B Series Expansion I/O Control |
| | |
| | |

Use the "⬇" softkey to navigate to either DI1 Setup or DI2 Setup, then press the "➡" softkey to configure the functionality of the digital input.
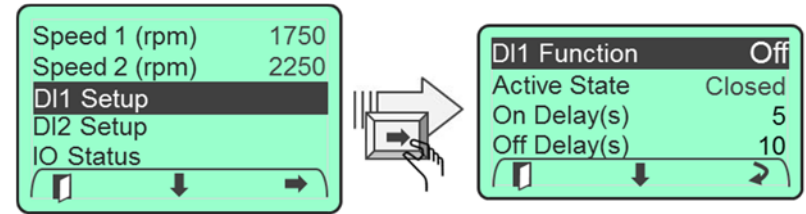


### Digital Input Functionality

Several digital input parameters provide the user with flexibility to match their specific application. These inputs should be configured before activating the system. First the functionality of the digital input must be configured. The choices are; "Off", "Stop", "Speed 1", "Speed 2" and "Start Inhibit". See Table 1 for more detail.
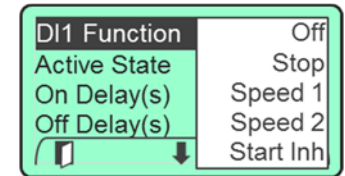


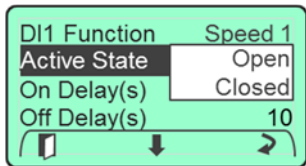Press the "↻" softkey to switch between these choices. Stop when the desired mode is displayed.

**Table 1. DI1 and DI2 Functionality**

| | |
|---|---|
| Stop: | When configured to "Stop", the digital input (when active) will stop the engine. If engine is running when the "Stop" signal is activated the ignition will be removed. Ignition will be reapplied after 5 seconds. If the "Stop" signal is active when ignition is applied (key on) the engine start signal will be disabled preventing engine cranking. |
| Speed 1: | When configured to "Speed 1", the digital input (when active) will ramp the engine to the Speed 1 setting. If this input is active during an engine start the engine will ramp to this setting immediately upon starting. |
| Speed 2: | When configured to "Speed 2", the digital input (when active) will ramp the engine to the Speed 2 setting. If this input is active during an engine start the engine will ramp to this setting immediately upon starting. |
| Start Inh: | When configured to "Start Inhibit", the digital input (when active) will prevent the engine from cranking until the input is inactive. *Note: Setting this input active while the engine is running has no effect on engine operation.* |
| Off: | Disables the input. |

*NOTE: When the DI1 and DI2 inputs are configured as speed inputs, DI2 has priority over DI1 regardless of whether it has been configured to Speed 1 or Speed 2. The throttle switch has priority over both DI1 and DI2. See Remote Throttle Control section for more detail.*

**Active State**

Configuring the active state allows the user to set the digital input for an input device that has Normally Open (N.O.) contacts or Normally Closed (N.C.) contacts. The active state for a N.O. switch is "Closed" (closure to ground) and the active state of a N.C. switch is "Open" (input is open).

Press the "↻" softkey to switch between these two choices. Stop when the desired mode is displayed.

**On/Off Delay(s)**

The On/Off Delay parameters control how long (0.0 to 60.0 seconds) the active and inactive states must be stable before action is taken.

Use the **+** / **-** softkeys to increment and decrement, the On/Off Delay value, respectively. Use the "◄" softkey to return to the previous display.
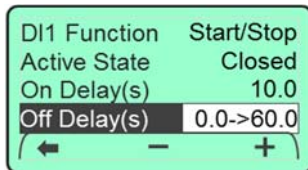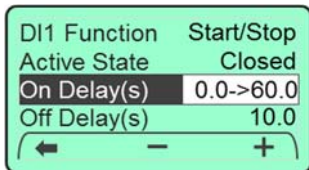
## Remote Throttle Control

The ability to remotely control engine speed is accomplished by using the Speed settings in conjunction with the Digital inputs. Configuring a digital input and assigning it to a speed setting allows the operator to control the engine speed by activating the digital input. Engine speed is prioritized by the last subsystem to command the throttle. The subsystems are; throttle (rabbit / turtle) switch and digital inputs.

Example A;
   If the system is being commanded by the throttle switch and a digital input becomes active and is programmed to speed 1 or speed 2 the system will follow the digital input commanded speed.

Example B;
   If the system is being commanded by a digital input and the throttle switch becomes active the system will follow the throttle switch. If the throttle switch is configured for ramp operation, the engine speed will be incremented or decremented from the current engine speed. In 2-State operation the engine speed will be commanded to the commanded 2 state engine speed.

Example C;
   If a digital input is commanding the engine speed and the digital input becomes inactive and no other digital input is active, the engine speed will revert to the last throttle switch commanded speed.

# Wiring Diagram
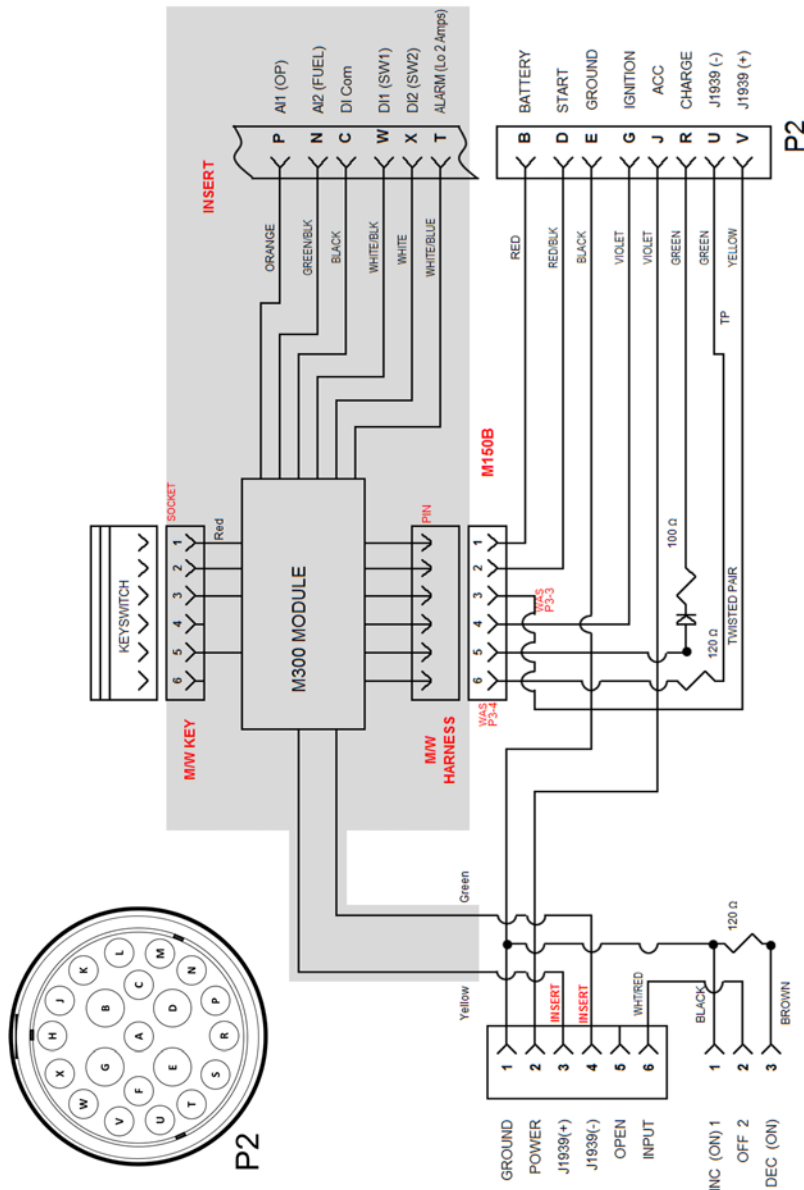
## Engine Connector

The engine connector is labeled "Engine" and must be modified to support the Auto Start module. This connector mates directly to the on-engine harness connector.

Table 4. Engine Connector Pin Definitions

| Signal | PIN Number | Engine Harness Connector – P2 | Contact Size | Wire Color |
|---|---|---|---|---|
| B+ | B | Battery +  (10A) | 12 | Red |
| Start | D | Starter (30) | 12 | Red/Black |
| Ground | E | Ground | 12 | Black |
| Ignition Out | G | ECU Power (Ignition) | 12 | Violet |
| Key  On | J | Accessory (15) | 16 | Violet |
| Charge In | R | Charge Lamp | 16 | Dark Green |
| CAN Lo | U | CAN Low (twisted pair) | 16 | Light Green |
| CAN Hi | V | CAN High (twisted pair) | 16 | Yellow |
|  |  |  |  |  |
| AI 1 | P | A/S – Analog input 1 (recommend Oil Press connection) | 16 | Orange |
| AI 2 | N | A/S – Analog input 2 (recommend Fuel/Water Sender connection) | 16 | Green/Black |
| DI 2 | X | A/S – Digital input 2 (engine speed, engine control, float connections) | 16 | White |
| DI 1 | W | A/S – Digital input 1 (engine speed, engine control, float connections) | 16 | White/Black |
| Signal Common | C | A/S – Sender input Common | 16 | Black |
| Alarm Output | T | A/S – Alarm (Switch Closure to ground LO-2 Amp Max) | 16 | White/Blue |
| No Connection | A, F,H,K,L,M, S,T | | | |

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# Auto Start Mode

**Auto Start Mode (A/S Mode)**
Selecting the A/S Mode provides remote engine control including engine start/stop and speed control. In the A/S mode the DI1 and/or DI2 discrete inputs can be configured to control engine operation. Selections such as; Start/Stop, Start, Stop,  Start Inhibit, Speed 1, Speed 2 and Speed 3 are available. The AI1 and AI2 analog inputs will be also active.

## AI1 and AI2 Setup

See Analog Input Configuration section for more detail.

## Start Retries

The number of engine start cycles to be executed after the initial Auto Start (A/S) sequence is enabled and activated but engine does not start. A start cycle is 10 seconds of cranking followed by a 5 second wait. The number of start retries can be configured for 0 to 3 retries. When configured for 0 retries the engine start cycle will activate one time only, on the initial Auto Start command.

## Start Delay(s)

The time (seconds) from when Auto Start (A/S) is activated and the engine cranking begins. This parameter is programmable from 0 to 30 seconds.

Use the "⬇" softkey to navigate to the Start Delay option, then press the "➡" softkey.

Use the ✚ / ➖ softkeys to increment and decrement, the Start Delay value, respectively. Use the "⬅" softkey to return to the previous display.

## Speed Settings

The A/S Mode supports the setup of three different engine speed settings. These settings can be used in the throttle profile setup and remote speed assignments. The speed values (RPM) may be programmed from 600 to 3150 in increments of 50 RPMs. *(Note: range of rpm settings may vary based on engine model.)*

| M300 Mode | A/S |
|---|---|
| AI1 | Off |
| AI2 | Off |
| Start Retries | 3 |
| Start Delay(s) | 10 |
| Speed 1 (rpm) | …3150 |
| Speed 2 (rpm) | 1750 |

Use the "⬇" softkey to navigate to the Speed 1 RPM, Speed 2 RPM or Speed 3 RPM options, then press the "➡" softkey.

Use the ✚ / ➖ softkeys to increment and decrement, the Speed RPM value, respectively. Use the "⬅" softkey to return to the previous display.

| Start Retries | 3 |
|---|---|
| Start Delay(s) | 10 |
| Speed 1 (rpm) | …3150 |
| Speed 2 (rpm) | 1750 |
| ⬅ | ➖ | ✚ |

## Throttle Profile

When A/S is activated, a throttle profile can be used to control the engine startup speed. Use the "⬇" softkey to navigate to the Throttle Profile option then press the "➡" softkey. The 5 Throttle Profile parameters representing four profile segments of speed operation will be displayed. These segment allow the user to configure the following;
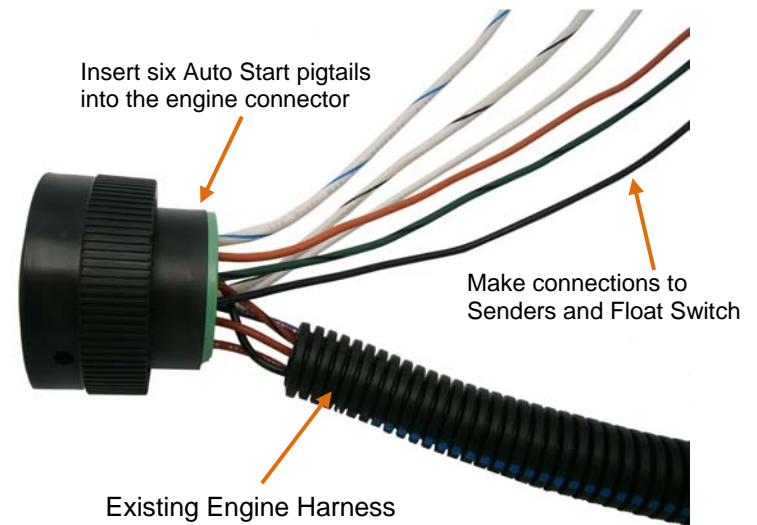
1. Segment 1: engine start rpm (speed 1) and time (seconds) to maintain that rpm
2. Segment 2: ramp time to speed 2 and time to maintain speed 2 value.
3. Segment 3: ramp time to speed 3
4. Segment 4: ramp time to minimum engine speed before engine is stopped.

| M300 Mode | A/S |
|---|---|
| AI1 | Off |
| AI2 | Off |
| Start Retries | 3 |
| Start Delay (s) | 10 |
| Speed 1 (rpm) | 1000 |
| Speed 2 (rpm) | 1750 |
| Speed 3 (rpm) | 2250 |
| Throttle Profile | |
| DI1 Setup | |
| DI2 Setup | |
| IO Status | |

| Speed 1(s) | 100 |
|---|---|
| Ramp->Speed 2(s) | 10 |
| Speed 2(s) | 30 |
| Ramp->Speed 3(s) | 10 |
| Ramp->Min(s) | 15 |

Figure 3. Engine Connector Pigtails



Insert six Auto Start pigtails into the engine connector

Make connections to Senders and Float Switch

Existing Engine Harness

# Installing the Control Panel with Auto Start

**⚠ CAUTION**

**The safety messages that follow have CAUTION level hazards.**

ALWAYS ensure the power supply is OFF and battery cables are disconnected before you make any electrical connections.

## Making the Connections

The control panel has one round connector with 21 contacts. This connector is an HDP24 Deutsch connector and provides the connection to the engine connector. (Note: Some engines may require an interface harness for this connection. Contact MBW Technical Support Team for details.) The supply power MUST be OFF when interconnecting the system.

 Recommended order:
1. Verify the battery / battery switch connections to engine per the engine installation diagram. (Refer to engine manufacturer installation manual.) Verify engine is bonded to battery return (-). Verify engine block is connected to battery ground.
2. Disconnect battery.
3. Make external connections to DI1, DI2, AI1, and AI2.
4. Install control panel into the housing. Attach engine connector to housing using supplied locknut and ring.
5. Fasten control panel to housing using #8 8-32 screws (not supplied).
6. Connect engine harness connector to mating control panel connector (HDP24-21 connector).
7. Connect battery.
8.  Turn ignition key to "ON" position.
9. Ensure digital display is active. If display is not active;
   a. Check battery and power connections.
   b. Check ignition switch is on position.
10. Ensure system is displaying data for engine speed, oil pressure and temperature.

**Make External Connections**

To connect the two analog inputs and the two discrete inputs to the sender(s), five pigtails are provided and must be inserted into the Engine harness. The recommended pin locations are shown in Table 4.

The installer is responsible for making the connection from each pigtail to the device(s) (Oil Pressure Sender, Fuel Sender, Float Switch, etc.).

Use the "⬇" softkey to navigate to one of the 5 Throttle Profile numeric values, then press the "➡" softkey.
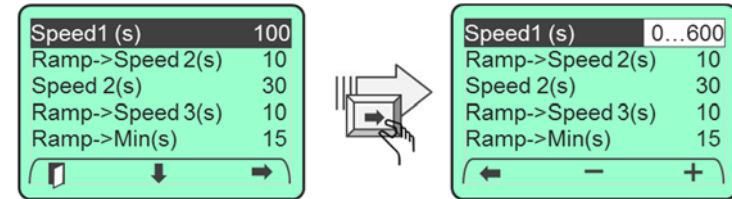


Use the ✚ / ➖ softkeys to increment and decrement, the numeric value.
Use the "⬅" softkey to return to the previous display.

**Table 2. Throttle Profile Selections**

| | |
|---|---|
| Speed 1(s): | This parameter determines how many seconds the engine will run at Speed 1 setting. |
| Ramp->Speed 2(s): | This parameter determines the ramp time from engine Speed 1 to Speed 2 in seconds. |
| Speed 2(s): | This parameter determines how many seconds the engine will run at Speed 2 setting. |
| Ramp->Speed 3(s): | This parameter determines the ramp time from engine Speed 2 to Speed 3 in seconds. |
| Ramp->Min(s): | Ramp->Min (s) – This parameter determines ramp time from current speed to the speed programmed on the Engine screen for Min RPM before stopping the engine. |

*Note: If a Throttle Profile parameter is set to zero, that segment of the profile will be skipped.*

Example; Throttle Profile
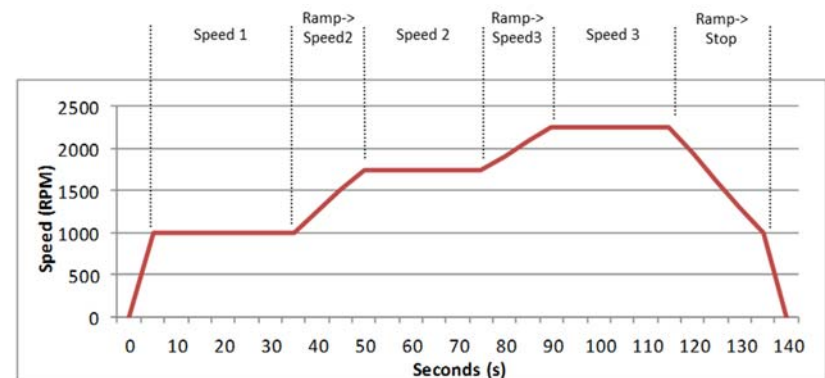
# Digital Input Setup

The menu selections for the DI1 and DI2 Setup are used to program the operation of the two discrete inputs. In A/S mode the digital input configuration provides for an additional speed selection and the ability to start or start/stop the engine.
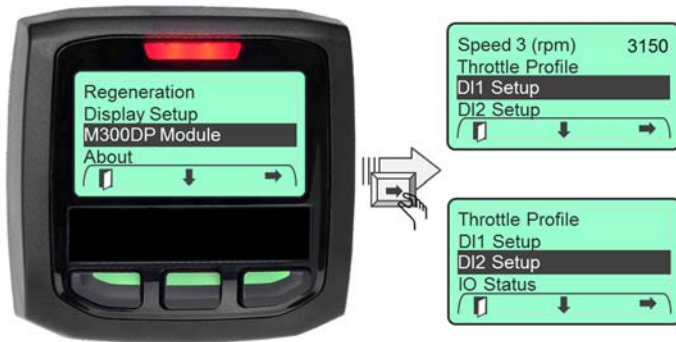
Use the "⬇" softkey to navigate to either DI1 Setup or DI2 Setup, then press the "➡" softkey.

### Digital Input Functionality

Several digital input parameters provide the user with flexibility to match their specific application. These inputs should be configured before activating the system. First the functionality of the digital input must be configured.  The choices are; "Off", "Start", "Stop", "Start/Stop", "Speed 1", "Speed 2", "Speed 3" and "Start Inhibit".

Press the "↻" softkey to switch between these eight choices. Stop when the desired mode is displayed. See Table 3 for more detail.
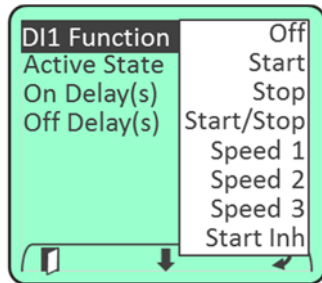
### Digital Input Function Priority

"Off" - No action taken
"Stop" - A stop command will cause engine to stop.
"Start Inhibit" - Will prevent engine from cranking.
"Start" - Will crank engine engine
"Speed Commands" - are based on digital input assignment. DI2 has priority over DI1.

When the Auto Start input is activated, the control system will exit the power save mode and indicate an impending engine start sequence by generating a countdown sequence to engine start. If the system has been wired for an alarm, an audible alarm will be heard during this time. See the Installation section of this manual for more information.

**⚠ CAUTION**

Disable Auto Start mode when service is performed on the engine.

### Auto Start Operation

When Auto Start has been activated the display will indicate the time to start by showing the engine countdown. After the countdown has expired the M300 will provide an engine start signal causing the engine to crank. The crank signal will activate for 10 seconds. If the engine did not start the system will try to restart the engine. The number of retries is based on the user setting "Start Retries". Should the engine fail to start after all retries have been completed the system will provide an Auto Start Failed display. See Auto Start Failure.

### Auto Start Failure

If the engine fails to start the Auto Start Failed alert will be displayed. The system will remain in this condition until the key switch is cycled "Off" and then back to the "Auto" or "On" position.

# Activating Auto Start

To activate the Auto Start Sequence:
- Enable Auto Start mode
- Set the key switch to the "Auto" position
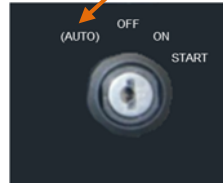- Activate input the DI1 or DI2 inputs configured for Start.

**Enable Auto Start Mode**

To use the Auto Start feature the M300DP Mode must be set to A/S. See the section on M300 Setup.

Selecting "A/S" enables the Auto Start mode.

Note: A/S is not activated until key switch is in Auto position.

**Set the Key Switch in the "Auto" Position**

When the ignition switch is placed in the "Auto" position (key switch in a fully counter-clockwise position) an ALERT will be displayed on the main engine display. This window will display for approximately 1 minute. The system will then enter a power save mode, waiting for the Auto Start input to activate.

Note: If the ignition switch is in the "ON" position the auto start feature will not activate.

**Activate the DI1 or DI2 inputs**

There are two discrete inputs, DI1 and DI2, which may be used to initiate an Auto Start sequence. See the Installation section of this manual for more information.

**Table 3. Digital Input Selections**

| | |
|---|---|
| Off: | Disables the discrete input |
| Start: | When configured to Start, the digital input will be used to Start the engine. |
| Stop: | When configured to "Stop", the digital input (when active) will stop the engine. If engine is running when the "Stop" signal is activated the ignition will be removed. Ignition will be reapplied after 5 seconds. If the "Stop" signal is active when ignition is applied (key on) the engine start signal will be disabled preventing engine cranking. Note: Make sure to set one DI to Start/Stop or Stop |
| Start/Stop: | When configured to Start/Stop, the digital input will be used to "Start" the engine when the digital input transitions to the active state. An engine "Stop" will occur when the digital input transitions to the inactive state. |
| Speed 1: | When configured to Speed 1, the digital input will ramp the engine to the Speed 1 setting. |
| Speed 2: | When configured to Speed 2, the digital input will ramp the engine to the Speed 2 setting. |
| Speed 3: | When configured to Speed 3, the digital input will ramp the engine to the Speed 3 setting. |
| Start Inh: | When configured to "Start Inhibit", the digital input (when active) will prevent the engine from cranking until the input is inactive. Note: Setting this input active while the engine is running has no effect on engine operation. |

**Active State**

Each digital input can be configured to determine its active state. This allows the user to set the digital input for an input device that has either Normally Open (N.O.) contacts or Normally Closed (N.C.) contacts. The active state for a N.O. switch should be set to "Closed" (closure to ground) and the active state of a N.C. switch should be set to "Open" (input is open).
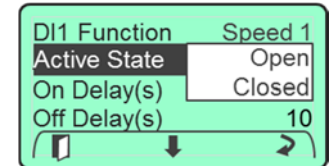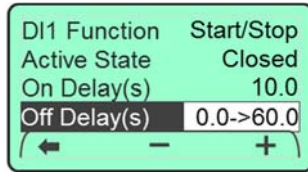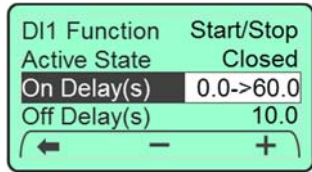
Press the "↺" softkey to switch between these two choices. Stop when the desired setting is displayed.

**On/Off Delay(s)**

The On/Off Delay parameters control how long (0.0 to 60.0 seconds) the active and inactive states must be stable before action is taken and the Auto Start sequence is started.

Use the **+** / **-** softkeys to increment and decrement, the On/Off Delay value, respectively. Use the "**←**" softkey to return to the previous display.

| DI1 Function | Start/Stop |
|---|---|
| Active State | Closed |
| On Delay(s) | 0.0->60.0 |
| Off Delay(s) | 10.0 |
| ← | — + |

| DI1 Function | Start/Stop |
|---|---|
| Active State | Closed |
| On Delay(s) | 10.0 |
| Off Delay(s) | 0.0->60.0 |
| ← | — + |

# Typical Auto Start Application



Typical Application Normally Open (N.O.) Switch