Software Release: 2.8.10043

MURPHY®
by ENOVATION CONTROLS

CE C SP® US

MPC-20
Engine Controller
Operations Manual

Software Release 2.8.10043

*Approved by CSA for non-hazardous locations (Group Safety Publication EIC 61010-1)
Products covered in this document comply with European Council electromagnetic compatibility directive 2004/108/EC and electrical safety directive 2006/95/EC.

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Section 40

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In order to consistently bring you the highest quality, full-featured products, we reserve the right to change our specifications and designs at any time.

Warranty - A limited warranty on materials and workmanship is given with this Murphy product.
A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/warranty.

ENOVATION CONTROLS has made efforts to ensure the reliability of the MPC-20 and to recommend safe use practices in system applications. Please note that in any application, operation and controller failures can occur. These failures might result in full control outputs or other outputs that might cause damage to or unsafe conditions in the equipment or process connected to the MPC-20.

Good engineering practices, electrical codes and insurance regulations require that you use independent external protective devices to prevent potentially dangerous or unsafe conditions. Assume that the MPC-20 can fail with outputs full ON, outputs full OFF or that other unexpected conditions can occur.

Please read the following information before installing.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- A visual inspection of this product before installation for any damage during shipping is recommended.
- Disconnect all electrical power to the machine. Failure to disconnect all electrical power connections before welding can result in damage to the panel and/or its components.
- It is your responsibility to have a qualified technician install the unit and make sure installation confirms with local codes.
- Observe all Warnings and Cautions in each section of these instructions.
- The MPC-20 is designed for use in industrial environments. There might be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.
- Please contact ENOVATION CONTROLS immediately if you have any questions.

IMPORTANT! False or improper use and operation of electronic products could be dangerous. It is required that point-of-operation guarding devices be installed and maintained. All such devices must meet OSHA and ANSI Machine safety standards. The manufacturer shall not accept any responsibility for installation, application or safety of systems.

Table of Contents

Introduction

This document is designed to support a user in getting familiar with the MPC-20 and how to navigate the interface, modify the settings when installing and operating the controller. The Quick Set Up guide assists with establishing the different functions in the MPC-20 System Controller. Before attempting to set up the controller, be sure to read and understand this manual in its entirety.

Murphy PowerCore 20 (MPC-20)

The Murphy PowerCore 20 Controller (MPC-20) is a general all-purpose manual/auto start and manual/auto throttling engine controller. The controller is purposed primarily for pump and irrigation applications. However, it is versatile and flexible enough to be used on many applications outside pump and irrigation. This is a powerful controller that supports J1939 CAN protocols for electronically governed engines as well as mechanical engines for fault and safety shutdowns.

The MPC-20 is flexible in many aspects. The flexibility consists of the ability to:

- use in most applications where auto start or auto throttling is required or desired.
- use the same controller on electronically governed J1939 and mechanical engines.
- use the same controller on 12VDC or 24VDC systems.
- use as auto start or manual start controller.
- use as manual throttle or auto throttle controller.
- change the input type for the analog inputs.
- use additional analog inputs as digital ground inputs.
- assign functions and actions to digital inputs.
- use digital inputs as battery or ground inputs.
- be mounted in all-weather environment.
- be customer-mounted in panel of choice.

Engine Application States

The MPC-20 Controller, while reprogrammable, follows a standard operating sequence. This operating sequence is a set of machine states that happen in a predetermined order. Machine states can be set to zero if not needed or adjusted to fit the application. The following states will be executed during the auto sequence, provided that the corresponding timer has not been set to 00:00:00 or the controller has not been placed in a manual mode of operation:

- Stabilize: This is a timed state to allow the controller to enable the ECU or any senders without warnings or errors. This timer can be disabled if set up for mechanical engine use.
- Stopped: This is a timed state where the engine is ready to be started manually or automatically.

- Standby: This is a timed state that will shut off the LCD backlight, heater and CAN transceiver to conserve power while the unit waits for a key press or an automatic start condition.
- Auto Start Delay: (**available in Auto mode only)** The auto start condition is ignored and must remain active throughout this delay, or the delay is reset to zero.
- Check Safe To Start: This is a non-timed state that will check to ensure the engine can start safely.
- Auto Stop Delay: (available in Auto Mode only) The auto stop condition is ignored and must remain active throughout this delay, or the delay is reset to zero.
- Minimum Run Time: This timer is only active using autostart and with all autostart types except local key and clock. Local stop key will also initiate the stop sequence before the timer expires, if pressed.
- ECU Stabilize Timer: This delay begins timing when the controller is powered up, Spindown or Standby delays have expired. During this delay, the ECU enable output is turned on. The ECU output turns off when the Standby, ETS or Spindown delays begin timing.
- Prestart Delay 1: (available in Auto Mode only) After an auto start condition has been accepted by the controller, this delay begins timing, and the prestart output turns on. When this delay expires, the output is turned off, and the auto sequence continues.
- *Prestart Delay 2 (precrank): (available in Auto Mode only) After an auto start condition has been accepted by the controller, this delay begins timing, and the prestart output turns on. When this delay expires, the output is turned off, and the auto sequence continues. During this delay, the controller checks for faults, J1939 com, etc.
- *Prestart Delay 2 (crank through): (available in Auto Mode only) After an auto start condition has been accepted by the controller, this delay begins timing, and the prestart output turns on. When this delay expires, the output remains on, and the auto sequence continues. The output turns off when the engine actually starts. During this delay, the controller checks for faults, J1939 com, etc.
- Crank: This is a timed state to try and start the engine.
- Crank Rest: This is a timed state to rest the starter between cranks in case the engine did not start during the crank state.
- False Start Check: This is a non-timed state that will ensure the engine stays above the crank cut RPM after cranking.
- Warm-up: (**available in Auto mode only)** This is a timed state that will allow the engine to change from idle to desired warm-up RPM after starting. Warm-up will only set as low as the minimum RPM set point.
- Line Fill 1: (**available in Auto mode only)** This is a timed state that will exit if the timer times out or the pressure set point for this state is reached.
- Line Fill 2: (**available in Auto mode only)** This is a timed state that will exit if the timer times out or the pressure set point for this state is reached.
- Running Loaded: This is a non-timed state that the controller will stay in until a stop condition occurs.

- Cooldown: (**available in Auto mode only)** This is a timed state that will allow the engine to run at a desired speed to cool down before allowing to go into a stopped state.
- Energize to Stop: This is a timed state that will control an output in order to stop the engine.
- Spindown: The time allotted for the engine to stop all revolutions and be in a stopped state with no frequency.
- Post Crank Lockout Delay (setup): This delay begins timing when the engine actually starts. During this delay, the selected function is ignored. When this delay expires, the selected function is armed. During the duration of this delay, the selected function can cycle from active to not active and not reset the delay.
- Post Warmup Lockout Delay (setup):This delay begins timing when the warmup delay expires. During this delay, the selected function is ignored. When this delay expires, the selected function is armed. During the duration of this delay, the selected function can cycle from active to not active and not reset the delay.
- Bubble Lockout Delay (setup): This delay begins timing when the selected function is active. If the selected function is removed during this delay, the delay resets to zero. If the selected function remains active throughout this delay, the selected action will occur.

User Interface

The keypad on the MPC-20 is comprised of 11 tactile buttons. This section describes the functions of each button.

The buttons have the following functions:

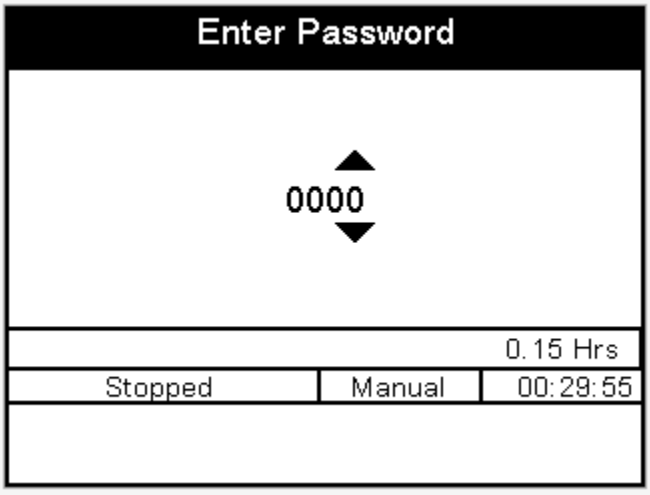
- **Start Key** – Allows the operator to start sequence in Manual Mode or initiate an auto start sequence when in Auto Mode.
- **Stop Key** – Allows the operator to initiate the stop sequence in either mode of operation. A single button press in auto will initiate an auto stop. As a safety feature, when the stop button is pressed twice or held (in auto mode), the controller will skip the cool-down state and (upon shutting down) will place itself in manual mode to eliminate an auto crank condition. This happens if the autostart condition is still present.
- **Auto Key** – Allows the operator to change from Auto to Manual or Manual to Auto Mode by press-hold for 3 seconds.

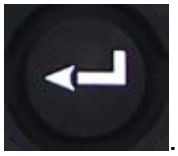
- **Alarm Silence Key** – Allows the operator to silence the internal siren when an alarm or shutdown is present on the controller.
- **Manual Throttle Increase Key** – Allows the operator to manually increase the engine throttle in Manual Mode.
- **Manual Throttle Decrease Key** – Allows the operator to manually decrease the engine throttle in Manual Mode.
- **Menu Key** – Allows the operator to get into and out of the menus.
- **Back Key** – Allows the operator to move back one step while in the menu.
- **Enter Key** – Allows the operator to enter a value in the menu when selected and is used to acknowledge internal and external alarm/shutdowns.
- **Up Key** – Allows the operator to navigate up through the menu and page forward on the main pages.
- **Down Key** – Allows the operator to navigate down through the menu and page reverse on the main pages.

Accessing the Menu

To access the MPC-20 menu, press the menu button: 

The following screen will display to enter the password (3482):



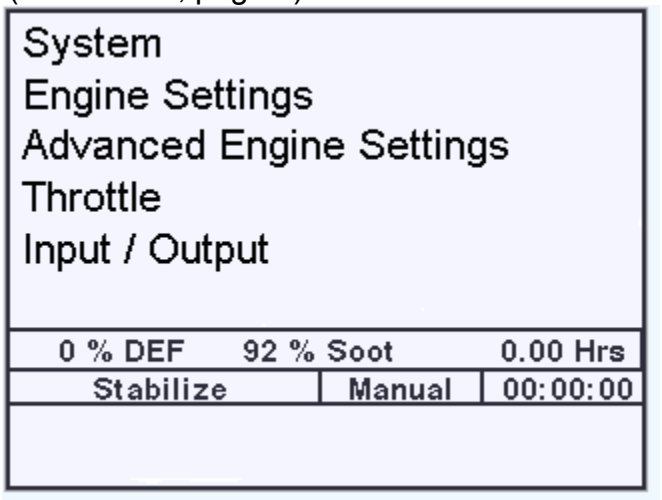
The password will be entered right to left. Utilize the up and down arrows, and press the Enter button after each correct number:  . Entering this password will allow full

access to the menu. If you enter the wrong password, it will reset the display to 0000, allowing you to restart the entering process.

Main Menu

The MPC-20 controller is incredibly versatile within the menu structure. The operator is able to change many parameters and settings from the face without the need of a PC tool, if desired. The controller has to be in its stopped state in order to change a setting in the menu. (The Tier 4 menu is the exception). Described below are the main sections of the controller's menu. **Cycling power to the controller is recommended after making changes to set points.**

(Main Menu, page 1)



System

The controller System menu provides the operator with the ability to set the Date/Time, Units, Language, Brightness, Contrast, Service Reminders and several other system settings. Review System under the Menu Glossary section of this manual for a full list and definition of each setting.

Engine Settings

The Engine Settings menu allows the operator to establish common user-configurable parameters that would be changed from factory default settings when pairing the controller to an engine. This menu allows the operator to choose whether the engine is J1939 or mechanical; the engine's speed source; the minimum and maximum RPM the operator requires/allows the engine to run; the RPM step size; warm-up/cool-down settings; and other common engine settings. Review Engine Settings under the Menu Glossary section of this manual for a full list and definition of each setting.

Advanced Engine Settings

The Advanced Engine Settings menu allows the operator to set up the less common user-configurable parameters that are not in the Engine Settings menu and which would be changed from factory default settings when pairing the controller to an engine. This menu allows the operator to set items such as the J1939 address claim for the controller, ECU Source Address, ECU hour select, crank attempts, crank disconnect speed, clutch engage/disengage speed, run to destruct mode and other user-specific engine settings. Review Advanced Engine Settings under the Menu Glossary section of this manual for a full list and definition of each setting.

Throttle

The Throttle menu allows the operator to set up the items for throttling the engine such as throttle type, rate of RPM increase/decrease, throttle Inc/Dec pulse time, throttle RPM deadband and other parameters pertaining to throttling of the engine. Review Throttle under the Menu Glossary section of this manual for a full list and definition of each setting.

Input / Output

The Input/Output Menu allows the user to establish the I/O needed for the application. This includes Digital Inputs, Analog Inputs, Relay Outputs and Digital Outputs. This menu is tied to other aspects of the controller menu such as Auto Start Functions, Auto Throttling Methods, Analog inputs for Mechanical Engine setup, Warning / Shutdown functions and all outputs needed for starting/controlling the engine and alerting the user.

The Digital Inputs of this menu can be configured from the face of the controller to accept three types of inputs.

- High, B(+)
- Low, B(-)
- Open.

The Analog Inputs of this menu can be configured from the face of the controller to accept one of four types of senders without having to order a new controller or arrange jumpers on the hardware.

- Resistive
- 4-20mA
- 0-5VDC
- B(-) for additional Digital Inputs

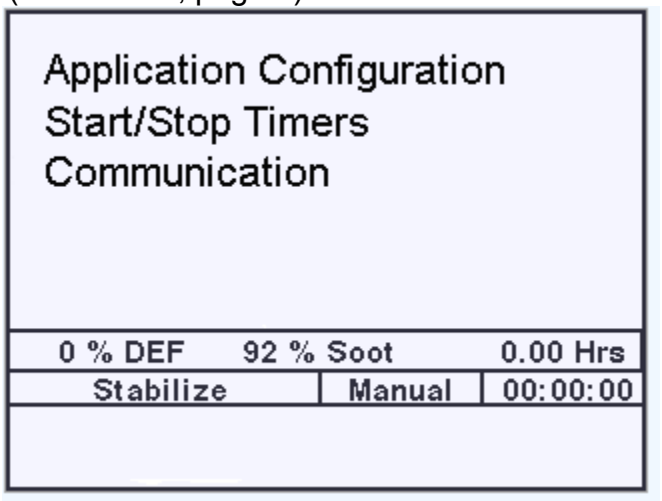
The Outputs are configurable for the operator to choose which output function to use with the desired output type as shown below.

- Relay [10A, Form C]
- Digital Out [200mA, 5VDC]

- Digital Out [2A, B(+)]
- Digital Out [1A, B(-)]

> **NOTE:** Although the functionality exists to set all analog and digital inputs to the same function, Enovation Controls strongly advises against this.

(Main Menu, page 2)



Application Configuration

The Application Configuration menu is where an operator will set up the controller's Auto Start Functions and Auto Throttle Methods, if the intended use is as an auto start and/or auto throttling controller. Depending on which application is chosen in the menu, there are certain auto start functions and auto throttling methods hidden that are not pertinent to the application chosen. This automatic hiding feature allows for a simpler, more intuitive controller menu in the MPC-20. Review Application Configuration under the Menu Glossary section of this manual for the full list and definition of each setting.

Pump All Purpose

The Pump All Purpose application houses most all auto start functions and auto throttling methods of the controller. This application is the most versatile application thus requiring so many combinations of settings for the operator to choose.

The auto start functions and auto throttle methods to choose from are listed below.

Auto Start/Stop Functions

- Level Transducer (will require an Analog Input Setting)
- Flow Transducer (will require an Analog Input Setting)
- Single Contact
- Local Key Start
- Two Contact Maintained
- Two Contact Momentary
- Pressure Transducer (Will require an analog input setting)

Auto Throttle Methods
- Maximum RPM
- Pressure Transducer
- Level Transducer
- Flow Transducer
- Local Throttle Input (This feature throttles the engine proportionally between the minimum and maximum rpm set points.

Center Pivot / Linear Irrigation

The Center Pivot / Linear Irrigation application houses the auto start functions and auto throttle methods meant to be used on center pivot and linear movement irrigation applications.

The auto start functions and auto throttle methods to choose from are listed below.

Auto Start/Stop Functions
- Single Contact (will require a digital input for start and stop)
- Local Start Key
- Two Contact Maintained (will require a digital input for start and stop)
- Two Contact Momentary (will require a digital input for start and stop)

Auto Throttle Methods
- Maximum RPM
- Pressure Transducer (will require an analog input)
- Flow Transducer (will require an analog input)
- Local Throttle Input

Air Compressor

The Air Compressor application houses the auto start functions and auto throttle methods meant to be used on all engine-driven air compressor applications. The MPC-20 allows for the compressor to start/stop and maintain a desired pressure during operation.

The auto start functions and auto throttle methods to choose from are listed below.

Auto Start/Stop Functions
- Single Contact (will require a digital input for start and stop)
- Two Contact Maintained (will require a digital input for start and stop)
- Two Contact Momentary (will require a digital input for start and stop)
- Pressure Transducer (will require an analog input)

Auto Throttle Methods
- Maximum RPM
- Pressure Transducer (will require an analog input)
- Local Throttle Input

Hose Reel Irrigation

The Hose Reel Irrigation application houses the auto start functions and auto throttle methods meant to be used on hose reel irrigation systems. The MPC-20 allows for the hose reel pump to auto start with several methods, including the Local Key Start which may be the most used in this application. The key feature of this application is the auto throttling method. This feature allows the controller to manage the pump's throttle in order to maintain a pressure in the hose during irrigation.

The auto start functions and auto throttle methods to choose from are listed below.

Auto Start/Stop Functions

- Single Contact (will require a digital input for start and stop)
- Local Start Key
- Two Contact Maintained (will require digital inputs for start and stop)
- Two Contact Momentary (will require digital inputs for start and stop)

Auto Throttle Methods

- Maximum RPM
- Pressure Transducer (will require an analog input)
- Local Throttle Input

Frost Protection

The Frost Protection application houses the auto start functions and auto throttle methods meant to be used on frost protection systems. This application allows for wind machine, sprinkler or other forms of frost protection using single contact or a temperature transducer.

The auto start functions and auto throttle methods to choose from are listed below.

Auto Start/Stop Functions

- Single Contact (will require a digital input for start and stop)
- Temperature Transducer (will require an analog input for start and stop)

Auto Throttle Methods

- Maximum RPM

Start / Stop Timers

The Start/Stop Timers menu provides the operator the ability to add a countdown timer and start/stop times. The countdown timer allows for the operator to set a desired countdown time and walk away from the engine for a controlled shutdown when the timer expires. There are eight Start/Stop Timers the operator can choose from within this menu that allows for the specific day and hour the controller will start and stop utilizing the internal clock. Review Start/Stop Timers under Menu Glossary section of this manual for full list and definition of each setting.

Start / Stop timers work in conjunction with other Start / Stop types. If the engine is already running from another Start / Stop type when a Start / Stop timer occurs, the Start / Stop timer is

ignored. Once the engine is started by the Start / Stop timer, the timer has to expire for a controlled shutdown to occur.

Communication

The Communications menu allows the operator to choose the type of RS485 communications such as PVA Gauge, Modbus or Local Display. The menu also allows for the operator to choose the RS485 slave address, RS485 Serial setup and whether or not the controller uses the internal CAN terminating resistor. Review Communication under the Menu Glossary section of this manual for a full list and definition of each setting.

Start/Stop Settings

There are eight automatic start/stop types in the MPC-20. Each is detailed below:

Single Contact Start/Stop:

The Single Contact Start/Stop is when a remote contact closes and remains closed for auto start and re-opens for auto stop.

Two Contact Maintained Start/Stop (commonly known as Floats)

The Two Contact Maintained Start/Stop is when both contacts close for auto start and both contacts open for auto stop (not momentarily). This may also be reversed by altering menu settings.

Two Contact Momentary Start/Stop:

The Two Contact Momentary Start/Stop is when one contact closes momentarily for start and another contact closes momentarily for stop.

(Level, Pressure, Temperature or Flow) Transducer Start/Stop:

A transducer is used for auto throttling and start/stop. There are set points, allowing the operator to enter the appropriate values.

Local Start Key Start/Stop:

The Local Start Key Start/Stop is used to remove any other auto start/stop types within the controller if they are not needed, regardless if in auto or manual modes.

If an auto stop condition occurs during the warmup delay, the controller will enter an auto stop sequence.

Quick-Start Setup Guide

The following sections serve to provide a walk-through of the steps necessary for some of the various configurations and settings available on the MPC-20 Controller. **Cycling power to the controller is recommended after making changes to setpoints.**

Stepping through the Menu will be depicted as follows:

Menu/System/Contrast directs the operator to go into the Menu first, then look for a parameter titled System and press **[Enter]** to go into the System menu. Then look for a parameter titled Contrast and press **[Enter]** to go into the Contrast menu, etc.

Adjusting the Contrast if the screen is too dark/light

1. Access **Menu/System/Contrast.**
2. Utilize the Up and Down arrows to adjust the Contrast (values of 0 to 255), and press **[Enter]** when the desired number appears.
3. Press the **[Menu]** key to leave the Menu Setup screens.

> **NOTE:** The following parameters all utilize the Application Configuration of **Pump All Purpose**. The MPC-20 will hide or display certain parameters that are specific to the Application Configuration chosen.

Setting the MPC-20 to Mechanical Engine

1. Access **Menu/Engine Settings/Engine Type/Mechanical/Speed Source**, and select either Alternator or Magnetic Pickup.
2. Press **[Back]** and down arrow to **Speed Calibration,** press **[Enter]**.
3. Utilize the Up and Down arrows to establish the appropriate number of flywheel teeth or engine alternator pulses, and press **[Enter]**.
4. Press the **[Back]** key twice, and down arrow to **Input/Output**, and press **[Enter]**.
5. Access **Analog Inputs** and assign one Analog input for Oil Pressure and one for Coolant Temperature. Press **[Enter]** to save the settings.
6. Press **[Back]** and access Relay and Digital Outputs.
7. Down arrow to DO1-6, and assign outputs to Crank, Excite Eng. Alternator and Fuel.
8. Press the **[Menu]** key to leave the Menu Setup screens.

Setting MPC-20 to J1939 Engine

1. Access **Menu/Engine Settings/Engine Type/J1939.**
2. Select J1939, and press **[Enter]**.
3. Ensure the engine is using TSC1 throttle or Inc/Dec inputs into the ECU.
4. Set the outputs for Crank, Excite Eng. Alternator, ECU Enable and Inc/Dec Throttling (if selected).
5. Ensure the analog inputs aren't set to oil pressure or coolant temp (disable or change to something else).
6. Press the **[Menu]** key to leave the Setup screens.

Setting MPC-20 to Auto Start on a Single Contact Input

1. Access **Menu/Application Configuration/Auto Start_Stop Function/Single Contact.**
2. Press **[Back]** once and select **Input / Output/Digital Inputs**.
3. Assign the Function of Single Contact Start/Stop to one of the Digital Inputs.
4. Press the **[Menu]** key to leave the Menu Setup screens.

Setting MPC-20 to Auto Start on Local Key

1. Access **Menu/Application Configuration/Auto Start_Stop Function/Local Start Key** and press **[Enter].**
2. Press the **[Menu]** key to leave the Menu Setup screens.

Setting MPC-20 to Auto Start on Float Inputs

1. Access **Menu/Application Configuration/Auto Start_Stop Function**.
2. Highlight Single Contact, Two Contact Maintained or Two Contact Momentary and press **[Enter].**
3. Press **[Back]** once and access **Input / Output/Digital Inputs**, and select a Digital Input to modify.
4. Assign the appropriate input for the selected AI.

> **NOTE:** If Single Contact is chosen, only one digital input needs to be configured. If Two Contact (Maintained and Momentary) is chosen, two digital inputs need to be configured, one for start and one for stop.

5. Ensure the appropriate number of Digital Inputs is configured (as per the Note above) and press the **[Menu]** key to leave the Menu Setup screens.

Setting MPC-20 to Auto Start on Pressure

1. Access **Menu/Application Configuration/Auto Start_Stop Function/Pressure Transducer**, and press **[Enter].**
2. Complete the parameters that apply (i.e., Maintain Pressure, High/Low Pressure, Start/Stop Pressure, etc.)
3. Press **[Back]** twice and access **Input_Output/Analog Inputs.**
4. Select an Analog Input to modify.
5. Assign the appropriate pressure input for the selected AI.
6. Press the **[Menu]** key to leave the Menu Setup screens.

Setting MPC-20 to Auto Start on Level

1. Access **Menu/Application Configuration/Auto Start_Stop Function/Level Transducer**. Press **[Enter]**.
2. Press **[Back]** once and access **Input_Output/Analog Inputs**, and select an Analog Input to modify.
3. Assign the appropriate level input for the selected AI.
4. Press the **[Menu]** key to leave the Menu Setup screens.

Setting MPC-20 to Auto Start on Flow

1. Access **Menu/Application Configuration/Auto Start_Stop Function/Flow Transducer**. Press **[Enter].**
2. Press **[Back]** once and access **Input_Output/Analog Inputs**, and select an Analog Input to modify.
3. Assign the appropriate flow input for the selected AI.
4. Press the **[Menu]** key to leave the Menu Setup screens.

Setting MPC-20 to Auto Start on Clock

> **NOTE:** Ensure the correct date and time are established in the System menu prior to establishing the Auto Start on Clock settings.

1. Access **Menu/Start_Stop Timers**, and select the first Start/Stop Timer.
2. Select Start Day 1 and then select the appropriate day or Daily.
3. Select Start Time 1 and establish the hour, minute and second to start.
4. Establish the Stop Day and Time as in steps 3-4.

> **NOTE:** The MPC-20 Controller has the ability to establish eight different Start/Stop dates and times. If desired, repeat steps 3-5 for subsequent Timers.

Setting MPC-20 to Auto Start on Temperature

1. Access **Menu/Application Configuration/Frost Protection/Auto Start_Stop Function/Temperature Transducer.** Press **[Enter]**.
2. Press **[Back]** once and access **Temperature Transducer**.
3. Establish a Start and Stop Temperature, and press **[Back]** twice.
4. Access **Input_Output/Analog Inputs**, and select an Analog Input.
5. Assign the appropriate temperature input for the selected AI.
6. Press the **[Menu]** key to leave the Menu Setup screens.

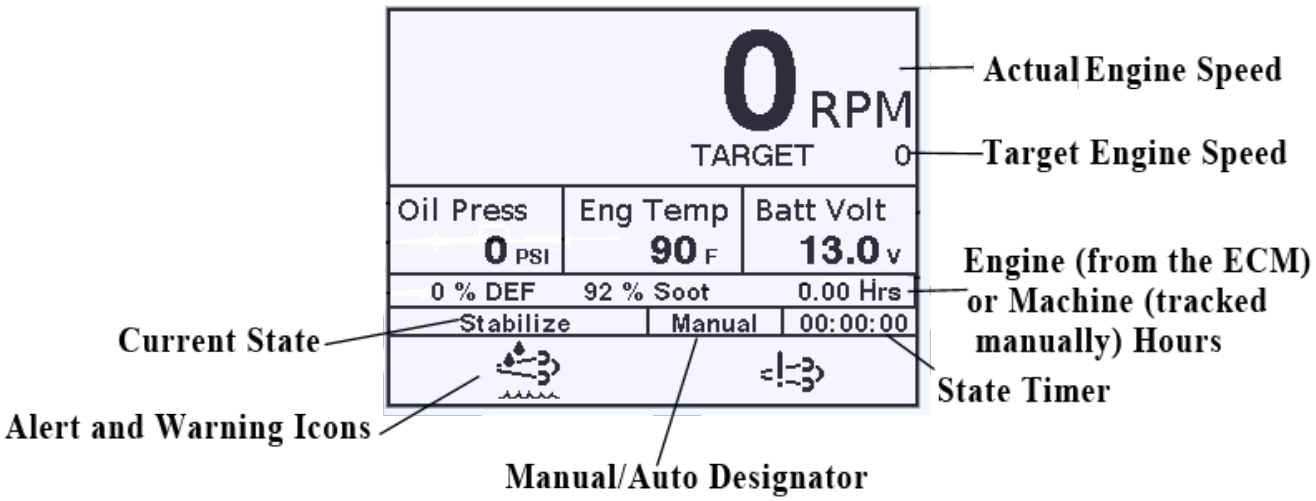
> **NOTE:** If an auto stop condition occurs during the warmup delay, the controller will enter an auto stop sequence.

Setting MPC-20 to Stop the Engine from Utilizing the Countdown Timer

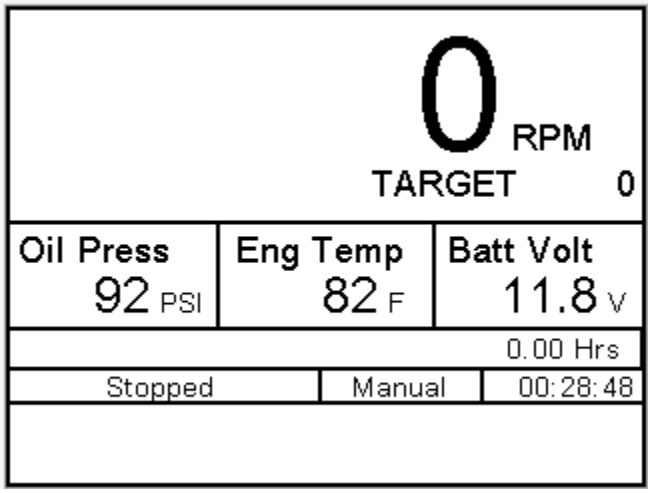
The MPC-20 will control the running of the engine until the chosen stop condition is met or until the Countdown timer runs out of time. Once set, the operator will be required to disable or change the timer in order to eliminate the countdown timer being active on every startup.

1. Access **Menu/Start_Stop Timers/Countdown Timer**.
3. Set the hours, minutes and seconds desired for the running of the engine, and press **[Enter]**.
4. Press the **[Menu]** key to leave the Menu Setup screens.

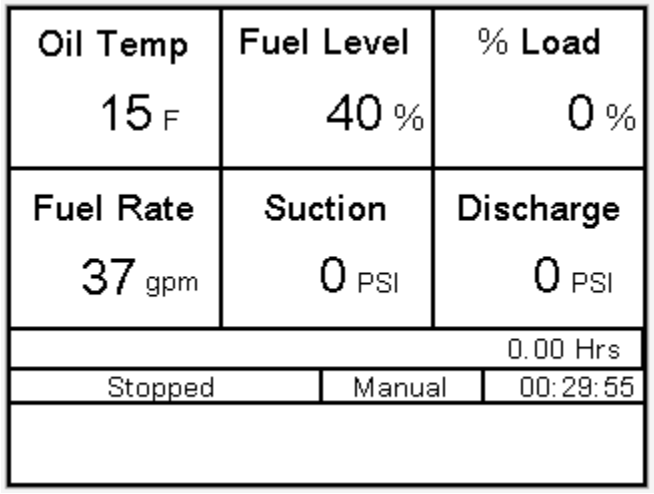
Screen Examples



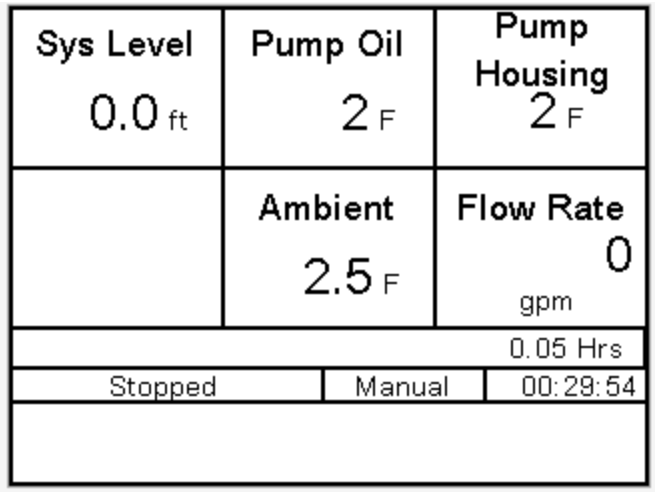
MPC-20 Screens in order



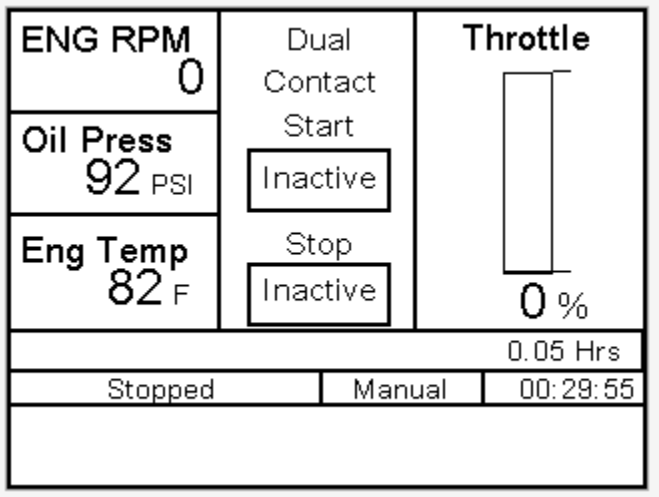
This is the main screen, and it displays actual and target RPM, Oil Pressure, Engine Temperature, Battery Voltage, Engine Hours, Engine State and Mode of Operation.



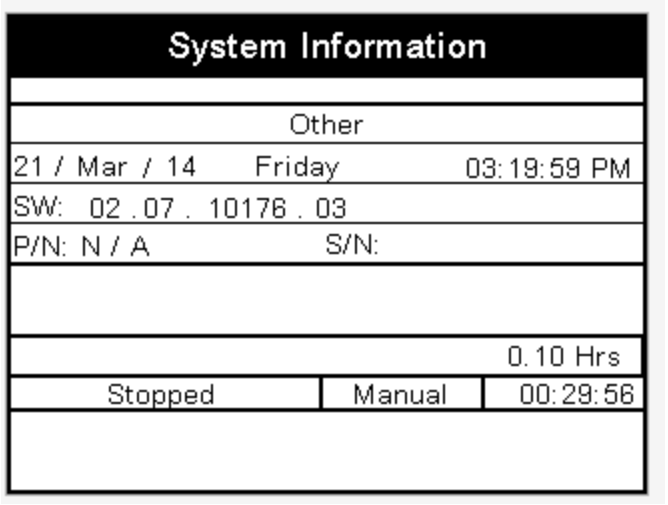
This screen is the first six-up screen, and it displays Oil Temperature, Fuel Level, % Load, Fuel Rate, Suction and Discharge to the operator. If alternate parameters are desired, these may be changed within the free MPC-20 Software Configuration tool.



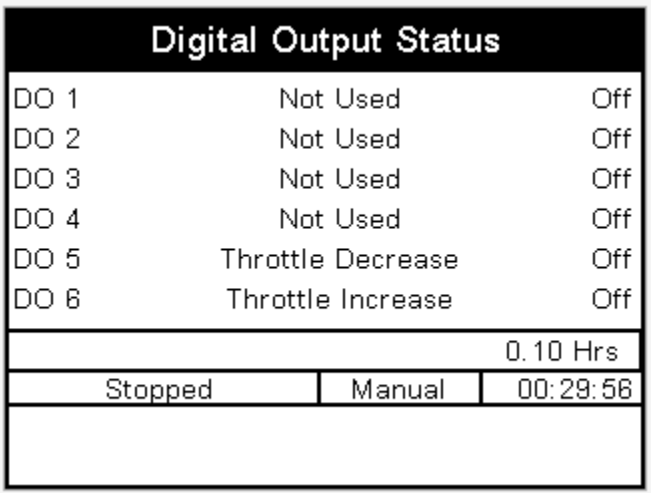
This screen is the second six-up screen, and it displays to the operator System Level, Pump Oil, Pump Housing (temperature), Ambient (temperature) and Flow Rate (gpm). If alternate parameters are desired, these may be changed within the free MPC-20 Software Configuration tool.



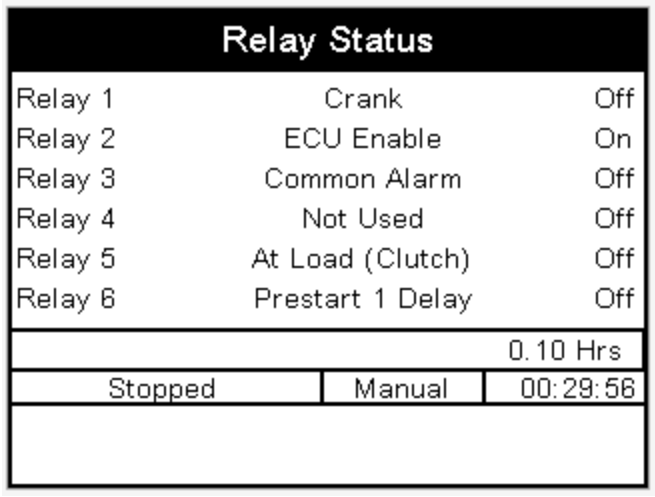
This screen displays the auto start/stop type and will also illustrate the throttling method for the auto start/stop. This screen is set to display dual contact start (floats) and throttling to max RPM.



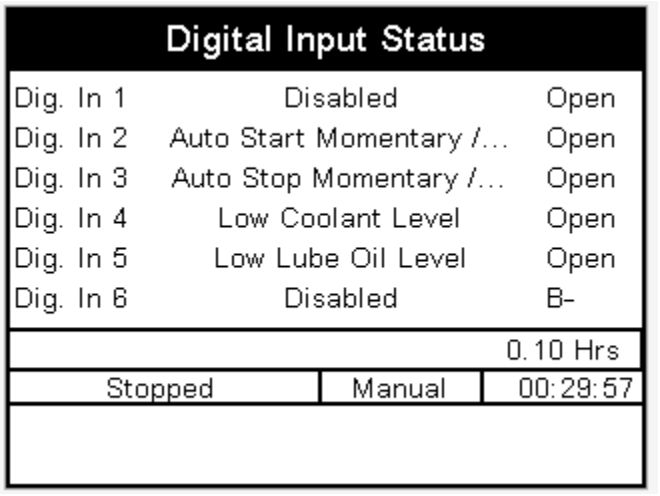
This screen displays the date, day, time, software version number, engine manufacturer, part number (if available) and serial number (if available). This page will assist Technical Services Support should their services be needed.



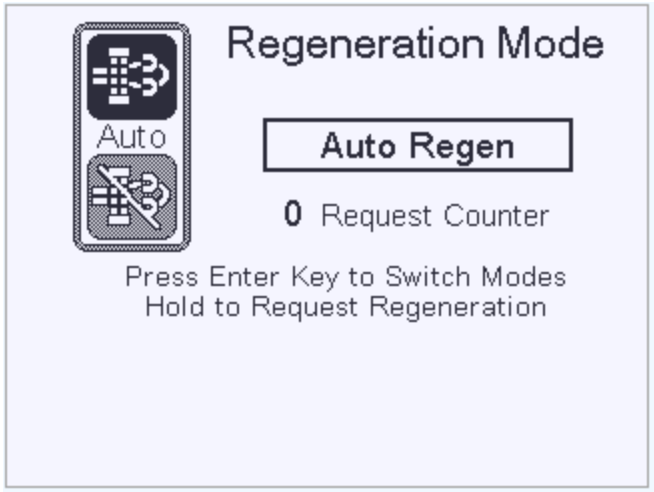
This screen will allow the operator to see what the digital output functions are set to without accessing the menu, and the active setting which informs the user of the output status.



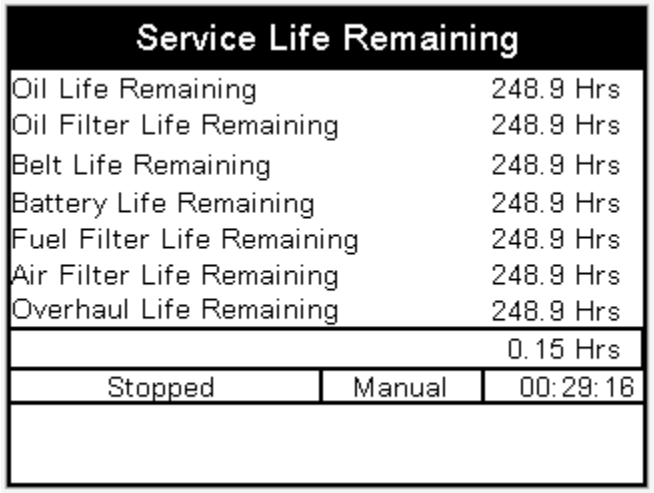
This screen will allow the operator to see what the relay status functions are set to without accessing the menu and the active setting which informs the user of the relay status.



This screen will allow the operator to see what the digital input functions are set to without accessing the menu and the active setting which informs the user of the input status.



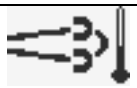
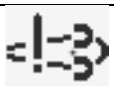
This screen displays the Regeneration Control for Tier 4 engines. Use the Enter button to change from Auto to Inhibit. With Auto Regen selected, hold the Enter button for Regeneration request.



This screen provides a list of service reminders and the hours left until the internal alarm will display the services needed. When 0 hours is reached, the hours will continue to count down in negative numbers.

Warning and Shut-down Icons

The following icons can be displayed at the bottom of the MPC-20 screen to designate that a warning or shut-down situation has occurred:

Icon	Description
	Displays when High Exhaust System Temperature (HEST) is active and exhaust temperature is above normal operating condition.
	Low diesel exhaust fluid. Displays when the DEF is low.
	Displays when engine aftertreatment is in need of a regeneration. This is due to the aftertreatment filter reaching the engine manufacturer's set soot level for a regeneration to occur.
	Displays when the Engine ECU has inhibited a regeneration from occurring. This should also be shown when inhibiting regeneration selection is made in the menu.
	Displays when an emissions aftertreatment malfunction has occurred. Contact your local engine manufacturer's service department for direction.
	Displays when an active and unacknowledged DTC warning exists. The icon will only disappear if the fault has been acknowledged and is no longer active.
	Displays when an active (unacknowledged) DTC shutdown exists.

Icon Troubleshooting

The warnings and shutdowns internally generated by the controller will show an Internal Fault on the top of the screen when a fault is displayed. Check all fluid levels and pressures. Ensure the cooling system and engine are functioning properly.

The warnings and shutdowns the ECU generates will also be accompanied by a cause for the error. Consult with the engine manufacturer regarding fault codes shown on the screen.

If everything checks out normal, consider checking the set points or the bypass timer(s) to ensure the ranges are within normal operating settings.

Menu Glossary

System

Date/Time: allows the setting of the controller's date and time.

Pressure Units: allows the selection of psi, kPa or BAR for pressure designation. **Factory set to PSI.**

Temperature Units: allows the selection of Fahrenheit or Celsius for temperature designation. **Factory set to Fahrenheit.**

Level Units: allows the selection of Feet or Meters for Level designation. **Factory set to Feet.**

Flow Units: allows the selection of gal/min (US), gal/min (UK) and lpm (Liters Per Minute)for flow designation. **Factory set to gal/min (US).**

Brightness: allows the backlight of the screen to be adjusted. **Factory set to 90.**

Contrast: allows the contrast of the screen to be adjusted. **Factory set to 150.**

Backlight Control: turns off (disables) or on (enables) the screen's backlight. **Factory set to Enable.**

Beeper: turns off (disables) or on (enables) the alarm beeper for the controller. **Factory set to Enable**

Standby Timer: setting this timer (HH:MM:SS) allows the screen the designated amount of time before the controller goes into Standby mode. **Factory set to 00:30:00.**

Service Reminders: when the service reminder is set to 0, the alarms will be disabled. However, the countdown will continue and will show the numbers as (-) numbers as it counts down past 0 for the following parameters: **All service reminders factory set to 250 Hrs.**

- Oil Life
- Oil Filter Life
- Belt Life
- Battery Life
- Fuel Filter Life
- Air Filter Life
- Overhaul Life
- Reset All

Stored Fault Codes: allows the operator to query the Engine ECU for review of its stored fault codes.

Auto / Manual: allows the controller to power up in either Manual or Auto Mode of operation depending on the selection chosen. **Factory set to Manual.**

Restore Factory Defaults: allows the operator to reset all menu settings set as defaults from the last configuration loaded in the controller.

View Alarm History: allows the viewing of stored alarms.

Clear Event History: allows the clearing of stored events (alarms).

Engine Settings

Engine Type: allows the selection between J1939 and Mechanical. If Mechanical is chosen, some parameters associated with J1939 will no longer appear in the menu. **Factory set to J1939.**

Engine Manufacturer: allows the selection of the specific Engine Manufacturer (i.e., Caterpillar, Cummins, John Deere, Deutz, Kubota, Yanmar, JCB, Volvo, FPT, Isuzu, Other). **Factory set to Other.**

Engine Emission: allows the selection of the emissions controls (i.e., Tier 3 or less, Interim Tier 4, or Tier 4 / EU Stage IIIA, IIIB). **Factory set to Tier 3 or Less.**

Tier 4 Regeneration: (only appears if Interim Tier 4 or Tier 4 / EU Stage IIIA, IIIB is chosen) allows the automatic running or inhibition of regeneration and/or the requesting of a regeneration. Note: Inhibiting the Regen may cause the engine to de-rate or shut down if the soot level is too high. Recommend leaving this setting in Auto Regen. The ECU may not allow the Regen request if certain parameters do not meet the engine manufacturer's requested levels. **Factory set to Auto Regen.**

Speed Source: allows the selection of the appropriate speed source of the engine (i.e., J1939, Alternator or Magnetic Pickup). **Factory set to J1939.**

Speed Calibration: allows the setting of the correct number of flywheel teeth or engine alternator pulses for mechanical engines. When Speed Source is set to J1939, the Speed Calibration menu is hidden. **Factory set to 150.0.**

Minimum Engine Speed: allows the setting of the lowest engine speed for continual operation. The controller will not allow the engine to throttle under the minimum engine speed. **Factory set to 700 RPM.**

Maximum Engine Speed: allows the setting of the highest engine speed for continual operation. The controller will not allow the engine to throttle above the maximum engine speed. **Factory set to 2000 RPM.**

RPM Step Size: allows the setting of the increments by which the RPM will increase or decrease. **Factory set to 25 RPM**

Warm-Up Speed: allows the setting of the speed of the engine during the warm-up phase. This speed setting must be at or above the minimum engine speed setting. **Factory set to 900 RPM.**

Warm-up Delay: allows the operator to set the desired warm-up time/delay for the engine. This is the length of time the engine will run at a lower speed for its warm-up cycle. **Factory set to 00.03.00.**

Cooldown Speed: allows the setting of the speed of the engine while it is cooling down. This speed setting must be at or above the minimum engine speed setting. **Factory set to 900 RPM.**

Cooldown Delay: allows the operator to set the desired cool down time/delay for the engine. This is the length of time the engine will run at a lower speed for its cool down cycle. **Factory set to 00.03.00.**

Warnings and Shutdowns: allows the settings of the parameters between which the following components will operate:

Low Fuel Level Shutdown: allows the operator to select the desired shutdown in the controller for Low Fuel to shut down the engine before running out of fuel. **Factory set to 5%**

Low Fuel Level Warning: allows the operator to select the desired warning in the controller for Low Fuel to alert the operator when fuel is low. **Factory set to 10%.**

High Battery Warning: allows the operator to select the desired warning in the controller for High Battery to alert the operator when the voltage of the battery is too high. **Factory set to 16.0 V.**

Low Battery Warning: allows the operator to select the desired warning in the controller for Low Battery to alert the operator when the voltage of the battery is too low. **Factory set to 10.0 V.**

Weak Battery Warning: allows the operator to select the desired warning in the controller for Weak Battery to alert the operator when the battery is becoming too weak to function. **Factory set to 11.0 V.**

Underspeed Shutdown: allows the operator to select the desired shutdown in the controller for Underspeed Shutdown to alert the operator when the engine is being shut down due to operating below the established minimum speed when in the running loaded state for this shutdown. **Factory set to 0 RPM.**

Overspeed Shutdown: allows the operator to select the desired shutdown in the controller for Overspeed Shutdown to alert the operator when the engine is being shut down due to operating above the established maximum speed when in the running loaded state for this shutdown. **Factory set to 2400 RPM.**

Advanced Engine Settings

J1939 Address Claim: allows the setting of the address for the controller used in the J1939 engine setting. **Factory set to 3.**

ECU Source Address: source address of the ECU being connected to. Normally set to 0, 1 or 2. **Factory set to 0.**

ECU Hour Select: choose from ECU Hours (engine hours reported by the ECU) or Internal (hours calculated internally by the MPC-20 (provided the RPM>50). **Factory set to ECU Hours.**

Crank Attempts: format of 0.00 to 20.00. The number of times the engine will attempt to start before providing an overcrank shutdown. **Factory set to 3.**

Crank Disconnect Speed: the speed at which the crank will disconnect barring other input parameters. **Factory set to 500 RPM**.

Clutch Engage Speed: the speed at which the clutch will engage. **Factory set to 1200 RPM.**

Clutch Disengage Speed: the speed at which the clutch will disengage. **Factory set to 1000 RPM.**

Run to Destruct: choose from Enable or Disable. This setting will prevent the controller from shutting down the engine for any fault shutdown to allow a run to destruct condition. This setting is primarily used for marine or fire pump applications. **CAUTION: If enabled, the operator must manually select Disable to allow shutdowns and protect the engine. Factory set to Disable**

Timers: establish parameters for the:

Auto Start Delay: the auto start condition must remain active throughout this delay for an auto start to occur. If the auto start condition is removed during this delay, the delay is reset to zero. **Factory set to 00.00.03**

Auto Stop Delay: this auto stop condition must remain active throughout this delay for an auto stop to occur. If the auto stop condition is removed during this delay, the delay is reset to zero. **Factory set to 00.00.03**

Minimum Run Time: auto stop conditions are ignored during this delay. **Factory set to 00.00.00**

ECU Stabilize Timer: on startups, this delay allows the ECU to stabilize and broadcast on the CAN bus prior to actual cranking. **Factory set to 00.00.05**

Crank Time: this is the length of time the crank output is turned on during cycle cranking. **Factory set to 00.00.10**

Crank Rest: this is the length of time the crank output is turned off during cycle cranking. **Factory set to 00.00.10**

Prestart Delay 1: after an auto start condition has been accepted by the controller, this delay begins timing, and the prestart #1 output turns on. When this delay expires, the output is turned off, and the auto sequence continues. **Factory set to 00.00.00**

Prestart Delay 2: after an auto start condition has been accepted by the controller, this delay begins timing, and the prestart #2 output turns on. **Factory set to 00.00.00**

Prestart Delay 2 Mode: this setting determines if the prestart #2 output is active through the crank state or only through the prestart #2 state. Prestart functions are available in Manual mode. **Factory set to PreCrank.**

Energize to Stop Time: this delay begins timing and an output is turned on after an auto stop condition has been accepted by the controller. The output is turned off when this delay expires. **Factory set to 00.00.00**

Spindown Timer: this delay begins timing when there is no call to run and the engine speed is zero. No auto start functions will occur until this delay expires. **Factory set to 00.00.30**

Post Crank Lockout Setup: this is a setup for a delay that begins timing when the engine actually starts. During this delay, the selected functions (Warnings and Shutdowns) are ignored. When this delay expires, the selected functions are armed. During the duration of this delay, the selected functions can cycle from active to not active and not reset the delay.

Post Crank Lockout Time. **Factory set to 00.00.30**
Post Crank Lockout 1. **Factory set to Low Oil Pressure**
Post Crank Lockout 2. **Factory set to Low Discharge Pressure**.
Post Crank Lockout 3. **Factory set to Disabled.**
Post Crank Lockout 4. **Factory set to Disabled**.
Post Crank Lockout 5. **Factory set to Disabled.**

Post Warm-up Lockout Setup: this is a setup for a delay that begins timing when the warm-up delay expires. During this delay, the selected functions (Warnings and Shutdowns) are ignored. When this delay expires, the selected functions are armed. During the duration of this delay, the selected functions can cycle from active to not active and not reset the delay.

Post Warm-up Lockout Time. **Factory set to 00.00.00**
Post Warm-up Lockout 1. **Factory set to Disabled.**
Post Warm-up Lockout 2. **Factory set to Disabled.**
Post Warm-up Lockout 3. **Factory set to Disabled**.
Post Warm-up Lockout 4. **Factory set to Disabled**.
Post Warm-up Lockout 5. **Factory set to Disabled.**

Bubble Lockout Setup: this is a setup for a delay that begins timing when the selected functions are active. If the selected functions are removed during this delay, the delay resets to zero. If the selected functions remain active throughout this delay, the selected action for the parameter will occur.

Bubble Lockout Time. **Factory set to 00.00.00**
Bubble Lockout 1. **Factory set to Disabled.**
Bubble Lockout 2. **Factory set to Disabled**.
Bubble Lockout 3. **Factory set to Disabled.**
Bubble Lockout 4. **Factory set to Disabled**.
Bubble Lockout 5. **Factory set to Disabled.**

Warnings and Shutdowns: establish parameters for the:

Low Fuel Level Warning: sounds a warning when the fuel level reaches the set lower limit parameter. **Factory set to 10%**

Low Fuel Level Shutdown: shuts down the engine when the fuel level reaches the set lower limit parameter. **Factory set to 5%**

High Battery Warning: sounds a warning when the charge on the battery reaches the set higher limit parameter. **Factory set to 16.00 V.**

Low Battery Warning: sounds a warning when the charge on the battery reaches the set lower limit parameter. **Factory set to 10.00 V.**

Weak Battery Warning: sounds a warning when the charge on the battery reaches the set parameter for weakness. **Factory set to 11.00 v.**

LOP High Speed: the speed setting in which the Low Oil Pressure (LOP) will be active at high speed. **Factory set to 2000 RPM.**

LOP Warning/High Speed: the Low Oil Pressure (LOP) setting in which the controller will provide a warning if dropping below at high speed. **Factory set to 35.00 psi.**

LOP Shutdown/High Speed: the Low Oil Pressure (LOP) setting in which the controller will provide a shutdown if dropping below at high speed. **Factory set to 30.00 psi.**

Low Oil Pressure Warning: sounds a warning when the oil pressure reaches the set lower limit parameter for oil pressure. **Factory set to 15.00 psi.**

Low Oil Pressure Shutdown: shuts down the engine when the oil pressure reaches the set lower limit parameter for oil pressure. **Factory set to 10.00 psi.**

High Oil Temp Warning: sounds a warning when the oil temperature reaches the set higher limit parameter for oil temperature. **Factory set to 210 F.**

High Oil Temp Shutdown: shuts down the engine when the oil temperature reaches the set higher limit parameter for oil temperature. **Factory set to 225 F.**

High Oil Pressure Warning: sounds a warning when the oil pressure reaches the set higher limit parameter for oil pressure. **Factory set to 200.0 psi.**

High Oil Pressure Shutdown: shuts down the engine when the oil pressure reaches the set higher limit parameter for oil pressure. **Factory set to 200.00 psi.**

High Engine Temp Warning: sounds a warning when the temperature of the engine reaches the set higher limit parameter for temperature. **Factory set to 210 F.**

High Engine Temp Shutdown: shuts down the engine when the temperature of the engine reaches the set higher limit parameter for temperature. **Factory set to 225 F.**

Low Engine Temp Warning: sounds a warning when the temperature of the engine reaches the set lower limit parameter for temperature. **Factory set to 32 F.**

Underspeed Shutdown: shuts down the engine when the speed reaches the set lower limit parameter for speed. **Factory set to 0 RPM.**

Overspeed Shutdown: shuts down the engine when the speed reaches the set higher limit parameter for speed. **Factory set to 2400 RPM.**

Throttle Menu

Throttle Type: allows the selection of J1939 TSC1, Pulse Inc/Dec or Analog 0-5VDC as the throttle type for the engine. **Factory set to J1939 TSC1.**

J1939 TSC1: this setting will be used when an electronic engine is used for J1939 Throttling. (Verify with Engine Dealer this type of throttling is accepted on the specific engine).

Pulse Inc/Dec: this setting will be used when throttling a mechanical engine, using a throttle actuator and also an electronic engine using digital pulses into the ECU for throttling.

Analog 0-5 VDC: this setting will be used for throttling an electronic engine utilizing 0-5V output.

Auto Throttle Type: Factory set to NON PID Auto Throttle.

NON PID Auto Throttle: this type does not use the P I D adjustments found in the Transducer setups in the Application menu.

PID Auto Throttle: this type does use the P I D adjustments found in the Transducer setups in the Application menu.

Target RPM Step Size: this is the step size of the target RPM when increasing and decreasing. The actual rate of change is much higher when throttling in auto vs. manually with the push buttons. **Factory set to 25 RPM.**

Throttle Deadband RPM: (only appears when Pulse Inc/Dec or Analog, 0-5 VDC is chosen for the Throttle Type) format of # RPM. Plus/minus value added to the target to provide a range of RPM during which the throttle is not active. No throttling will occur when the engine RPM is within the RPM deadband.

Throttle Inc/Dec Pulse: (only appears when Pulse Inc/Dec is chosen) format of # mS. The amount of time to pulse the throttle. Increase this value for faster engine response, decrease this value for slower engine response.

Throttle Inc/Dec Pulse Delay: (only appears when Pulse Inc/Dec is chosen) format of # mS. The amount of delay time before pulsing the throttle. Increase this value for slower engine response, decrease this value for faster engine response.

Throttle Inc Rate: the rate the engine is signaled to increase in RPM. **Factory set to 10 RPM/s.**

Throttle Dec Rate: the rate the engine is signaled to decrease in RPM. **Factory set to 10 RPM/s.**

Analog Minimum Value: (only appears when analog throttle type is chosen) The analog throttle output will not go lower than this setpoint. **Factory set to .50 V.**

Analog Maximum Value: (only appears when analog throttle type is chosen) The analog throttle output will not go higher than this setpoint. **Factory set to 4.5 V.**

Input / Output Menu

Digital Inputs (1-6): for each of the digital inputs, the ability to select the following parameters exists:

Digital input 1. **Factory set to Disabled**
Digital Input 2. **Factory set to Auto Start Momentary/Maintained**
Digital Input 3. **Factory set to Auto Stop Momentary/Maintained**
Digital Input 4. **Factory set to Low Coolant Level**
Digital Input 5**. Factory set to Low Lube Oil Level**
Digital Input 6. **Factory set to Disabled**

Function:
- Disabled
- Single Contact Start/Stop
- Auto Start Momentary / Maintained
- Auto Stop Momentary / Maintained
- Remote Alarm Acknowledge
- Low Fuel Level
- Fuel Leak
- Fuel Filter Restriction
- Low Lube Oil Level
- Low Coolant Level
- Remote Stop
- Idle Engine
- Water in Fuel
- No Flow
- Engine Over Speed
- Crank Termination
- Air Damper Closed
- Air Filter Restriction
- Battery Charger Fail
- Oil Filter Restriction
- Run To Destruct Override
- User 1 through User 6
- Speed 1 through Speed 5
- Parking Brake (Kubota)
- Neutral Switch (Kubota)

Active
- B- (ground input to a function chosen above) **Factory Default**
- B+ (battery positive to a function chosen above).
- Open (sender/switch is open)

Action
- Not Used
- Warning
- Shutdown **Factory Default**
- Shutdown, Controlled (The input will initiate an auto stop. The input has to be inactive for the controller to accept a new auto start signal.)
- Relay Control: used to control one of the relay outputs.

DI Speed Set points: used in place of Throttle Inc/Dec. Provides five throttle set points to which the engine will throttle. These speed inputs will override any other throttling type. When inputs are not active, any other throttling type in use will resume. Digital input 1 will override 2 through 4. Digital 2 will override 3 through 5, and so on.

Analog Inputs (1-8): for each of the analog inputs, the ability to select the following parameters exists:

Analog input 1. **Factory set to Disabled**
Analog Input 2**. Factory set to Disabled**
Analog Input 3**. Factory set to Disabled**
Analog Input 4. **Factory set to Disabled**
Analog Input 5**. Factory set to Disabled**
Analog Input 6**. Factory set to Disabled**
Analog Input 7. **Factory set to Disabled**
Analog Input 8. **Factory set to Disabled**

Function:

- Disabled
- 4-20 mA Oil Pressure
- 0-5V Oil Pressure
- 4-20mA Coolant Temp
- 0-5V Coolant Temp
- 4-20mA Fuel Level
- 0-5V Fuel Level
- 4-20mA Oil Temp
- 0-5V Oil Temp
- 4-20mA Suction Pressure
- 0-5V Suction Pressure
- 4-20mA Discharge Pressure
- 0-5V Discharge Pressure
- 4-20mA System Level
- 4-20mA Flow Rate
- 4-20mA Pump Oil Temperature
- 0-5V Pump Oil Temp
- 4-20mA Pump Housing Temp
- 0-5V Pump Housing Temp
- 4-20mA Ambient Temp
- 0-5V Ambient Temp
- 4-20mA Gear Box Pressure
- 0-5V Gear Box Pressure
- 0-5V Throttle Input
- Datcon Oil Pressure
- Murphy Oil Pressure
- VDO5 Bar Oil Pressure
- VDO7 Bar Oil Pressure
- Murphy Coolant Temp
- Datcon Coolant Temp
- VDO Coolant Temp
- Murphy Fuel Level
- VDO Fuel Level
- Datcon Fuel Level
- Murphy Oil Temp
- Datcon Oil Temp
- VDO Oil Temp
- Murphy Discharge Pressure
- Murphy Suction Pressure
- Datcon Pump Housing Temp
- Murphy Pump Housing Temp
- VDO Pump Housing Temp
- Murphy Pump Oil Temperature
- Datcon Pump Oil Temperature
- VDO Pump Oil Temperature

Murphy PMK-400 Pressure
Analog.Digital1

Sensor Setup (only appears when the analog inputs are configured. This sets the range of sensors for 4-20mA or 0-5V senders).
Oil Pressure (0-5V) or (4-20mA)
Ambient Temp (0-5V) or (4-20mA)
Coolant Temp (0-5V) or (4-20mA)
Discharge Pressure (0-5V) or (4-20mA)
Fluid Pressure (0-5V) or (4-20mA)
Fuel Level (0-5V) or (4-20mA)
Oil Temp (0-5V) or (4-20mA)
Pump Housing Temp (0-5V) or (4-20mA)
Pump Oil Temp (0-5V) or (4-20mA)
Suction Pressure (0-5V) or (4-20mA) By raising the minimum value (5mA or 1V) in the sensor setup, a negative Suction Pressure can be read by the Controller.
Flow Rate (4-20mA)
Speed (4-20mA)
System Level (4-20mA)
Set mA per Ft

Relay (1-6) and Digital (1-6) Outputs: these same parameters are used for both the Relay and Digital Outputs.

Relay 1. **Factory set to Crank.**
Relay 2. **Factory set to ECU Enable.** The controller will not transmit on the CAN bus when this output is off.
Relay 3. **Factory set to Common Alarm.**
Relay 4. **Factory set to Not Used.**
Relay 5. **Factory set to At Load (Clutch).**
Relay 6. **Factory set to Prestart 1 Delay.**
DO1 (5V, 200mA). **Factory set to Not Used.**
DO2 (5V, 200mA). **Factory set to Not Used.**
DO3 (B+, 2A) **Factory set to Not Used.**
DO4 (B+, 2A). **Factory set to Not Used.**
DO5 (B-, 1A). **Factory set to Throttle Decrease.**
DO6 (B-, 1A). **Factory set to Throttle Increase.**

Not Used
Prestart 1 Delay Please see Timers on page 26.
Prestart 2 Delay Please see Timers on page 26.
Crank Please see Timers on page 26.
Fuel Please see Timers on page 26.
ECU Enable Used for enabling the ECU on electronic engines. This output is on anytime the controller is powered up or in the crank/run state. It's turned off if the controller is in the standby state.
Excite Engine Alternator Used for alternators requiring excite from battery. This output is turned on in the crank/run state.
At Load (Clutch) This output is turned on when the warm-up delay has expired and the engine reaches the clutch engage RPM set point. It is turned off during the cool down delay and the engine reaches the clutch disengage RPM set point.
Gov. Control This output turns on after the warmup delay expires and turns off when the cooldown delay begins timing.
Shutdown This output turns on when a fault shutdown occurs.
Common Alarm This output turns on when either a shut-down or a non shut-down warning occurs.
Remote Alarm This output turns on when a either a shut-down or a non shut-down warning occurs.
Air Damper N/De-energized This output turns off during the energize to stop delay.
Not in Auto This output turns on when the controller is in the manual mode.

Air Damper N/Energized This output turns on during the energize to stop delay.
Energize to Stop Please see Timers on page 26.
Engine Running This output turns on after the engine actually starts and off when the engine stops.
Throttle Increase
Throttle Decrease The increase and decrease outputs are used for the pulse inc/dec throttling type.
Digital Input (1-6) A digital input can be assigned to turn on a digital output.
Analog (1-8) Digital An analog input configured to be a digital input can be assigned to turn on a digital output.

Application Configuration

Application

Pump All Purpose: The Pump All Purpose application houses most all auto start functions and auto throttling methods of the controller. This application is the most versatile application thus requiring so many combinations of settings for the operator to choose. **Factory Default**

Center Pivot / Linear Irrigation: The Center Pivot / Linear Irrigation application houses the auto start functions and auto throttle methods meant to be used on center pivot and linear movement irrigation applications.

Air Compressor: The Air Compressor application houses the auto start functions and auto throttle methods meant to be used on all engine-driven air compressor applications. The MPC-20 allows for the compressor to start/stop and maintain a desired pressure during operation.

Hose Reel Irrigation: The Hose Reel Irrigation application houses the auto start functions and auto throttle methods meant to be used on hose reel irrigation systems. The MPC-20 allows for the hose reel pump to auto start with several methods, including the Local Key Start which may be the most used in this application. The key feature of this application is the auto throttling method. This feature allows the controller to manage the pump's throttle in order to maintain a pressure in the hose during irrigation.

Frost Protection: The Frost Protection application houses the auto start functions and auto throttle methods meant to be used on frost protection systems. This application allows for wind machine, sprinkler or other forms of frost protection using single contact or a temperature transducer.

Auto Start / Stop Function

Single Contact (Center Pivot/Linear Irrigation, Air Compressor, Hose Reel Irrigation, Frost Protection)
Local Start Key (Center Pivot/Linear Irrigation, Hose Reel Irrigation)
Two Contact Maintained (Center Pivot/Linear Irrigation, Air Compressor, Hose Reel Irrigation) **Factory Default**
Two Contact Momentary (Center Pivot/Linear Irrigation, Air Compressor, Hose Reel Irrigation)
Pressure Transducer (Air Compressor, Hose Reel Irrigation)
Level Transducer (Pump All Purpose)
Flow Transducer (Pump All Purpose)
Temperature Transducer (Frost Protection)

Auto Throttle Method

Maximum RPM (Pump All Purpose, Center Pivot/Linear Irrigation, Air Compressor, Hose Reel Irrigation, Frost Protection) **Factory Default**
Pressure Transducer (Pump All Purpose, Center Pivot/Linear Irrigation, Air Compressor, Hose Reel Irrigation)
Level Transducer (Pump All Purpose)
Flow Transducer (Pump All Purpose, Center Pivot/Linear Irrigation)
Local Throttle Input - this is for use when an analog input is selected for 0-5V throttle input. (Pump All Purpose, Center Pivot/Linear Irrigation, Air Compressor, Hose Reel Irrigation)

Pressure Transducer

Maintain Pressure. The engine will be throttled between the min. and max. RPM set points to maintain this pressure. **Factory set to 0 psi.**

Deadband Pressure. This extends above and below the maintain set point, no throttling occurs while the pressure is in the deadband. **Factory set to 0 psi.**
Pressure Maintain. Suction / Discharge. Suction starts on high, stops on low. Suction throttles by decreasing the RPM below the deadband and increasing the RPM above the deadband. This is opposite of Discharge pressure. **Factory set to Discharge.**
Steady / Proportional. Steady throttles the engine to the max. RPM set point when starting and stopping on pressure. Proportional throttles the engine proportionally between the min. and max. RPM set points when starting and stopping on pressure. 0 psi must be selected in the maintain pressure for the steady/proportional features to work. **Factory set to Steady.**
Line Fill 1 Speed. The engine is throttled to this speed after warm-up to purge the line. **Factory set to 900 RPM.**
Line Fill 1 Delay. This is the time the engine is held at the Line Fill 1 speed. **Factory set to 00.00.00.**
Line Fill 1 Pressure. The engine is held at the Line Fill 1 Speed until either this pressure set point is reached or the Line Fill 1 Delay expires. **Factory set to 0 psi.**
Line Fill 2 Speed. The engine is throttled to this speed after warm-up to purge the line. **Factory set to 900 RPM.**
Line Fill 2 Delay. This is the time the engine is held at the Line Fill 1 speed. **Factory set to 00.00.00.**
Line Fill 2 Pressure. The engine is held at the Line Fill 1 Speed until either this pressure set point is reached or the Line Fill 1 Delay expires. **Factory set to 0 psi.**
Line Fill 2 features only available when Hose Reel is selected in the Applications menu.
Start Pressure. When the pressure reaches this set point, an auto start will occur. **Factory set to 0 psi.**
Stop Pressure. When the pressure reaches this set point, an auto stop will occur. **Factory set to 0 psi.**
Pressure P. Allows adjustment If using PID throttling. **Factory set to 0.020**
Pressure I. Allows adjustment if using PID throttling. **Factory set to 0.020**
Pressure D. Allows adjustment if using PID throttling. **Factory set to 0.001.**

Level Transducer

Maintain Level. The engine will be throttled between the min. and max. RPM set points to maintain this level. **Factory set to 0.0 ft.**
Deadband Level. This extends above and below the maintain set point, no throttling occurs while the level is in the deadband. **Factory set to 0.0 ft.**
Steady / Proportional. Steady throttles the engine to the max. RPM set point when starting and stopping on level. Proportional throttles the engine proportionally between the min. and max. RPM set points when starting and stopping on level. 0.0 ft must be selected in the maintain level for the steady/proportional features to work. **Factory set to Steady.**
Level Type. Empty / Fill. Empty starts on high, stops on low. Empty throttles by decreasing the RPM below the dead band, and increasing the RPM above the dead band. This is opposite of Fill. **Factory set to Empty.**
Start Level. When the level reaches this set point, an auto start will occur. **Factory set to 0.0 ft.**
Stop Level. When the level reaches this set point, an auto stop will occur. **Factory set to 0.0 ft.**
Level P. Allows adjustment If using PID throttling **Factory set to 0.020**
Level I. Allows adjustment if using PID throttling. **Factory set to 0.020**
Level D. Allows adjustment if using PID throttling. **Factory set to 0.001.**

Flow Transducer

Start Flow Rate. When the flow reaches this set point, an auto start will occur. **Factory set to 0 gpm.**
Stop Flow Rate. When the flow reaches this set point, an auto stop will occur. **Factory set to 0 gpm.**
Maintain Flow.The engine will be throttled between the min. and max. RPM set points to maintain this flow. **Factory set to 0 gpm.**
Steady / Proportional. Steady throttles the engine to the max. RPM set point when starting and stopping on flow. Proportional throttles the engine proportionally between the min. and max. RPM set points when starting and stopping on flow. 0 gpm must be selected in the maintain flow for the steady/proportional features to work. **Factory set to Steady.**
Deadband Flow. This extends above and below the maintain set point, no throttling occurs while the flow in the deadband. **Factory set to 0 gpm.**

Flow Maintain Type. In / Out. Empty / Fill. In starts on low, stops on high. In throttles by increasing the RPM below the deadband and decreasing the RPM above the deadband. This is opposite of Out. **Factory set to Out.**
Flow P. Allows adjustment if using PID throttling **Factory set to 0.020**
Flow I. Allows adjustment if using PID throttling. **Factory set to 0.020**
Flow D. Allows adjustment if using PID throttling. **Factory set to 0.001.**

Temperature Transducer

Start Temperature. When the temperature drops to this set point, an auto start will occur. **Factory set to 32 F**
Stop Temperature. When the temperature rises to this set point, an auto stop will occur. **Factory set to 32 F**.

Warnings and Shutdowns

High Level Warning. **Factory set to 0.0 ft**.
High Level Shutdown. **Factory set to 0.0 ft.**
Low Level Warning**. Factory set to 0.0 ft.**
High Flow Warning**. Factory set to 0 gpm.**
High Flow Shutdown. **Factory set to 0 gpm.**
Low Flow Warning. **Factory set to 0 gpm**.
Low Flow Shutdown. **Factory set to 0 gpm**.
High Discharge Pressure Warning. **Factory set to 0.00 psi.**
High Discharge Pressure Shutdown. **Factory set to 0.00 psi**.
Low Discharge Pressure Warning. **Factory set to 0.00 psi.**
Low Discharge Pressure Shutdown. **Factory set to 0.00 psi.**
High Suction Pressure Warning. **Factory set to 0.00 psi.**
High Suction Pressure Shutdown**. Factory set to 0.00 psi.**
Low Suction Pressure Warning. **Factory set to 0.00 psi.**
Low Suction Pressure Shutdown. **Factory set to 0.00 psi.**
High Pump Housing Temp. Warning. **Factory wet to 32 F**.
High Pump Housing Temp. Shutdown. **Factory set to 32 F.**
High Pump Oil Temp. Warning. **Factory set to 32 F**.
High Pump Oil Temp. Shutdown. **Factory set to 32 F**.

Start / Stop Timers

This section allows the setting of the timers to start and stop the engine. There are eight timers, each with a Start Day and a Stop Day, a Start Time and a Stop Time.

Countdown Timer: The countdown timer will be active upon every auto startup until the time is changed or disabled. It is used when it is desirable for a machine to run for a specific amount of time unmonitored and then shut itself off when that time has expired or when an alternate Stop condition has been met. Format of HH:MM:SS

Start / Stop Timer (1-8): each of the eight timers contains the ability to select from the following parameters:

Days of the week are factory set to Off.
Start and stop Times are factory set to 12.00.00 AM.

Start Day
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Daily
- Off

Start Time: format of HH:MM:SS

Stop Day:
- Sunday
- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Daily
- Off

Stop Time: format of HH:MM:SS

Communication

Communication Type:

PVA Gauge: this function will be used if utilizing PVA Gauges on the RS485 Modbus.

Modbus: this function will be used if using a SCADA or telemetry device for polling the Modbus register list. See Modbus Register Map. **Factory Default.**

Local Display: this function will be used to connect the display to a remote viewing application. This can be a program running on a PC or another MPC-20 set up as a remote viewer.

Slave Address. This is the Modbus slave node number. **Factory set to 1**.

Serial Setup.

Baudrate. **Factory set to 19200**.

Stopbits. **Factory set to 1**.

Parity. **Factory set to None**.

PV CAN Backlight Enable. **Factory set to Off**.

Can Termination. **Factory set to Enable.**

Modbus Registers

> **NOTE: The registers labeled Read/Write will allow the operator to change values through the Modbus as a temporary modification. If power is cycled to the MPC-20, the values changed via Modbus will revert back to the last value entered locally at the MPC-20.**

REGISTER #	TYPE	DESCRIPTION	
40001	Read Only	Current Engine Hours	
40002	Read Only	Running Hours LSB.	
40003	Read Only	Current RPM.	
40004	Read Only	Modbus Voltage	
40005	Read Only	Current Oil Pressure	
40006	Read Only	Current Engine Temperature	
40007	Read Only	Current Engine State:	
		#0	ECU Stabilize Delay timing: (1) yes (0) no
		#1	Engine Stopped: (1) yes (0) no
		#2	Controller in Standby Mode: (1) yes (0) no
		#3	Prestart Delay 1 Timing: (1) yes (0) no
		#4	Check Safe to Start: (1) yes (0) no
		#5	Prestart 2 Delay Timing: (1) yes (0) no
		#6	Crank on: (1) yes (0) no

REGISTER #	TYPE	DESCRIPTION	
		#7	Crank Rest: (1) yes (0) no
		#8	False Start Check: (1) yes (0) no
		#9	Warmup Delay Timing: (1) yes (0) no
		#10	Line Fill 1 Delay Timing: (1) yes (0) no
		#11	Line Fill 2 Delay Timing: (1) yes (0) no
		#12	Running Loaded: (1) yes (0) no
		#13	Cooldown Delay Timing: (1) yes (0) no
		#14	Energize to Stop Delay Timing: (1) yes (0) no
		#15	Spindown Delay Timing: (1) yes (0) no
40008	Read Only	Shutdown Status: The following is a description of the bits:	
		Bit 0	Overspeed SD Status: (1) yes (0) no
		Bit 1	Underspeed SD Status: (1) yes (0) no
		Bit 2	Overcrank SD Status: (1) yes (0) no
		Bit 3	Low Oil Pressure SD Status: (1) yes (0) no
		Bit 4	High engine Temperature SD Status: (1) yes (0) no
		Bit 5	Low Fuel SD Status: (1) yes (0) no
		Bit 6	Low Discharge Pressure SD Status: (1) yes (0) no
		Bit 7	High Discharge Pressure SD Status: (1) yes (0) no
		Bit 8	Speed Signal Lost SD Status: (1) yes (0) no
		Bit 9	Low Lube Level SD Status: (1) yes (0) no
		Bit 10	Fuel Leak SD Status: (1) yes (0) no
		Bit 11	Fuel Filter Restriction SD Status: (1) yes (0) no
		Bit 12	Air Damper Closed SD Status: (1) yes (0) no
		Bit 13	Air Filter Restriction SD Status: (1) yes (0) no
		Bit 14	Oil Filter Restriction SD Status: (1) yes (0) no
		Bit 15	Remote Stop SD Status: (1) yes (0) no
40009	Read Only	Shutdown Status: The following is a description of the bits:	
		Bit 0	Coolant Level SD Status: (1) yes (0) no
		Bit 1	High Level SD Status: (1) yes (0) no
		Bit 2	Low Level SD Status: (1) yes (0) no
		Bit 3	High Flow SD Status: (1) yes (0) no
		Bit 4	Low Flow SD Status: (1) yes (0) no
		Bit 5	High Pump Oil Temperature SD Status: (1) yes (0) no
		Bit 6	High Pump Housing Temperature SD Status: (1) yes (0) no
		Bit 7	Water in Fuel SD Status: (1) yes (0) no
		Bit 8	Low Suction SD Status: (1) yes (0) no
		Bit 9	High Suction SD Status: (1) yes (0) no
		Bit 10	High Engine Oil Pressure SD Status: (1) yes (0) no
		Bit 11	High Engine Oil Temperature SD Status: (1) yes (0) no
		Bit 12	Low Gear Box Pressure SD Status: (1) yes (0) no

REGISTER #	TYPE	DESCRIPTION
		Bit 13 High Gear Box Pressure SD Status: (1) yes (0) no
		Bit 14 Battery Charger Fail SD Status: (1) yes (0) no
		Bit 15 Red Lamp Status: (1) yes (0) no
40010	Read Only	Current Discharge Pressure. kPa
40011	Read Only	Current System Level. Feet
40012	Read / Write	Modbus Start Stop: (1) yes (0) no
40013	Read / Write	RPM Run Speed
40014	Read Only	Current Ambient Temperature. Celsius
40015	Read Only	Auto / Manual Mode: (1) Auto (0) Manual
40016 through 40037	Read Only	Reserved
40038	Read / Write	Pressure Start Engine. kPa
40039	Read / Write	Pressure Stop Engine. kPa
40040	Read / Write	Pressure Maintain Value. kPa
40041	Read / Write	Level Maintain Start. Feet
40042	Read / Write	Level Maintain Stop. Feet
40043	Read / Write	Level Maintain Value. Feet
40044	Read / Write	FlowRate.Start. Gpm
40045	Read / Write	FlowRate.Stop. Gpm
40046 through 40200	Read Only	Reserved
40201	Read Only	Version.App.1
40202	Read Only	Version.App.2
40203	Read Only	Version.App.3
40204	Read Only	Version.App.4
40205	Read Only	Version.Config.1
40206	Read Only	Version.Config.2
40207	Read Only	Version.Config.3
40208	Read Only	Serial Number
40210	Read Only	J1939.Engine.Catalyst Tank Level
40211	Read Only	J1939.Engine.Diesel Particulate Filter 1 Soot Load Percent.
40212	Read Only	J1939.Transmit.Diesel Particulate Filter Regeneration Inhibit Switch
40213	Read Only	J1939.Engine.Diesel Particulate Filter Active Regen Inhibited Due to Inhibit Switch
		#0 (LSB) Inhibited Due to Inhibit Switch: (1) yes (0) no
		#1 Reserved
		#2 Reserved
		#3 Reserved
		#4 Reserved
		#5 Reserved

REGISTER #	TYPE	DESCRIPTION
		#6 Reserved
		#7 Reserved
		#8 Reserved
		#9 Reserved
		#10 Reserved
		#11 Reserved
		#12 Reserved
		#13 Reserved
		#14 Reserved
		#15 (MSB) Reserved
40214	Read Only	State Timer.
40215	Read Only	Engine RPM Setpoint.
40216	Read Only	AllPurposeAutoStartFunction
		#0 Single Contact
		#1 Local Start Key
		#2 Two Contact Maintained
		#3 Two Contact Momentary
		#4 Pressure Transducer
		#5 Level Transducer
		#6 Flow Transducer
40217	Read/Write	Pressure Deadband. kpa
40218	Read/Write	Level Deadband. Feet
40219	Read/Write	Flow Deadband. US Gal/min
40220	Read/Write	Start Temperature. Celcius
40221	Read/Write	Stop Temperature. Celcius
40222	Read Only	Current Ambient Temperature. Celcius
40223	Read/Write	Maintain Flow. US Gal/min
40224	Read/Write	RPM Low Idle
40225	Read Only	Service Reminder: Air Filter Life.
40226	Read Only	Service Reminder: Air Filter Life Remaining.
40227	Read Only	Service Reminder: Battery Life.
40228	Read Only	Service Reminder: Battery Life Remaining.
40229	Read Only	Service Reminder: Belt Life.
40230	Read Only	Service Reminder: Belt Life Remaining.
40231	Read Only	Service Reminder: Fuel Filter Life.
40232	Read Only	Service Reminder: Fuel Filter Life Remaining.
40233	Read Only	Service Reminder: Oil Filter Life.
40234	Read Only	Service Reminder: Oil Filter Life Remaining.
40235	Read Only	Service Reminder: Oil Life.
40236	Read Only	Service Reminder: Oil Life Remaining.

REGISTER #	TYPE	DESCRIPTION
40237	Read Only	Service Reminder: Overhaul Life.
40238	Read Only	Service Reminder: Overhaul Life Remaining.
40239	Read Only	Current Fuel Level
40240	Read/Write	Save Changes to Modbus: (1) yes (0) no
40241	Read Only	Modbus EEPROM Saved: (1) yes (0) no
40242	Read Only	Warning Status: The following is a description of bits:
		#0 Low Fuel Warn Status: (1) yes (0) no
		#1 Fuel Leak Warn Status: (1) yes (0) no
		#2 Fuel Filter Restriction Warn Status: (1) yes (0) no
		#3 Low Lube Level Warn Status: (1) yes (0) no
		#4 Coolant Level Warn Status: (1) yes (0) no
		#5 Water in Fuel Warn Status: (1) yes (0) no
		#6 No Flow Warn Status: (1) yes (0) no
		#7 High Engine Oil Temperature Warn Status: (1) yes (0) no
		#8 Low Oil Pressure Warn Status: (1) yes (0) no
		#9 High Engine Temperature Warn Status: (1) yes (0) no
		#10 High Discharge Pressure Warn Status: (1) yes (0) no
		#11 Low Discharge Pressure Warn Status: (1) yes (0) no
		#12 High Suction Warn Status: (1) yes (0) no
		#13 Low Suction Warn Status: (1) yes (0) no
		#14 High Level Warn Status: (1) yes (0) no
		#15 Low Level Warn Status: (1) yes (0) no
40243	Read Only	Warning Status: The following is a description of bits:
		#0 High Flow Warn Status: (1) yes (0) no
		#1 Low Flow Warn Status: (1) yes (0) no
		#2 High Pump Oil Temperature Warn Status: (1) yes (0) no
		#3 High Pump Housing Temperature Warn Status: (1) yes (0) no
		#4 Low Gear Box Pressure Warn Status: (1) yes (0) no
		#5 High Gear Box Pressure Warn Status: (1) yes (0) no
		#6 Air Damper Closed Warn Status: (1) yes (0) no
		#7 Air Filter Restriction Warn Status: (1) yes (0) no
		#8 Oil Filter Restriction Warn Status: (1) yes (0) no
		#9 Low Engine Temperature Warn Status: (1) yes (0) no
		#10 High Engine Oil Pressure Warn Status: (1) yes (0) no
		#11 Battery Charger Fail Warn Status: (1) yes (0) no
		#12 Run To Destruct Warn Status: (1) yes (0) no
		#13 Battery High Warn Status: (1) yes (0) no
		#14 Battery Low Warn Status: (1) yes (0) no
		#15 Amber Lamp Status: (1) yes (0) no

Slave Address: the Modbus Slave device address.

Serial Setup:

- Baud Rate
  - 9600
  - 19200
  - 38400
  - 57600
  - 115200
- Stop Bits
  - 0
  - 1
  - 2
- Parity
  - None
  - Odd
  - Even

PV CAN Backlight Enable

- Off
- On

CAN Termination

- Enable
- Disable

PC Configuration Software

The MPC-20 controller is the first engine controller released utilizing Murphy's PowerVision Configuration Studio®. With PowerVision, engineering will be able to deliver quicker software updates with the flexibility of a software developer's environment. The new addition of PowerVision to this controller gives Enovation Controls the ability to provide a free-of-charge basic PC configuration program to change default parameters in the controller to all customers.

The simplified version of PowerVision that will be utilized to create the configuration for the MPC-20 Controller will be available via download from our website (Forum).
http://forum.fwmurphy.com/viewforum.php?f=49

Customers who require a developer's environment to change or add additional functionality in the controller may do so in their own time without waiting or paying non-recurring engineering fees (also referred to as NRE) to make the changes (requires purchase of full version of PowerVision Configuration Studio®).

Specifications

Electrical

Display: 3.8” Monochrome, Transflective, White Backlight LCD with Heater

Operating Voltage: 8-32 VDC, protected against reverse battery polarity and load-dump

Power Consumption: 18W max without 2 2A High-sides active, 146W max with 2 2A High-sides active

Communications

- **2-CAN:** J1939 (only one supported in initial release)
- **USB:** 2.0B (Only supported for programming)
- **Ethernet:** (Not supported in initial release)
- **RS485:** Modbus RTU

Connection: Delphi SICMA 90 way connector

Keyboard: 11 Tactile Feedback Buttons

Inputs

- **6-Digital Inputs:** configurable (high/low)
- **8-Analog Inputs:** configurable (4-20mA, 0-5V, resistive)
- **1-Frequency Input:**
  - supporting Magnetic Pickup:
    - (2 Hz – 10 kHz, 3.6 VAC – 120 VAC)
  - Supporting Engine Alternator:
    - (2 Hz – 10 kHz, 4.5 VRMS – 90 VRMS)

Outputs

- **6-Relays:** 10A, SPDT, Form C (30 VDC @ 10A max.), 40A maximum aggregate @ 85C
- **2-Low-side Outputs:** 1A
- **2-High-side Outputs:** 2A
- **2-5V Outputs:** 200mA (to drive external relays)
- **1-Analog Output:** 0-5V

Real-time clock: with battery backup

Environmental

Operating Temperature: -40°F to 185°F (-40°C to +85°C)

Storage Temperature: -40°F to 185°F (-40°C to +85°C)

Protection: IP 67 front and back, Panel seal is IP66 when used with Accessory Gasket

Emissions: SAE J1113

Immunity: SAE J1113

Vibration: Random vibration, 7.86 Grms (5-2000 Hz), 3 axis

Shock: ± 50G in axis

Mechanical

Case Material: Polycarbonate/ABS

Keypad/Gasket Material: Silicone

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Software Release: 2.8.10043

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