

EMS467 Monitoring System

*Operation Manual for use with
Program 40-33-2907*

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. The latest version of this manual can be found at www.fwmurphy.com.

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



Please read the following information before installing.

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT:

- Read and follow all installation instructions.
- Please contact FW MURPHY immediately if you have any questions.
- Disconnect all electrical power to the machine.
- Make sure the machine cannot operate during installation.
- Follow all safety warnings of the machine manufacturer.
- A visual inspection of this product for damage is recommended before installing
- It is your responsibility to have a qualified technician install the unit and make sure installation confirms with local codes.

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General Information

The 467 controller is a dedicated microprocessor based engine controller. The installed program is specifically designed for this application.

Sensor Inputs

The 467 controller accepts several different types of inputs. They are configurable to match what the software will support. See the wiring hookup drawing for terminal details.

- 7 - Analog inputs. Configurable for; 4-20 ma., 0-5 VDC, and sender/ground only digital.
- 8 - Digital inputs. These are high/low inputs accepting either B (+) or B (-).
- 1 - Frequency input. This is an optically isolated speed sensing input from a magnetic pickup.

Outputs

- 7 - Digital outputs. These are open collector sinking transistor outputs rated for 200ma.
- 1 - Analog output. This is .4 to 4.2 VDC for throttling tiered diesels.

Communications

- 2 - J1939 CAN ports.
- 1 - RS-485 port.
- 1 - RS-232 port.

Loading Program

Always perform a factory setup after loading a program into the 467.

Control Sequence Outline

Auto Start Stop Conditions

The following choices are available in the “start/stop type” S#:

Single Contact: A remote contact closes to start and re-opens to stop.

Floats (2 contacts): Both contacts close for start and both contacts re-open for stop.

Momentary (2 contacts): One contact momentarily closes for start; one contact momentarily closes for stop.

Transducer: Starting and stopping is controlled by S# set points. System pressure or level is available in the “transducer type” S#.

Clock: Starting and stopping is controlled by P# set points.

NOTE: SCADA START - If the engine is not already running, an auto start can be accomplished through the Modbus start/stop register. This feature does not function if the engine is already running from one of the above conditions.

Auto Start Sequence

With the MAN - OFF- AUTO selector in the “AUTO” position, and there are no failures, [STATUS: SELECTOR -AUTO; STATE: PANEL READY].

NOTE: The Low Fuel alarm is armed anytime the controller is powered up. This is a self-clearing alarm only.

1. When a start condition occurs, the controller will initiate an auto start sequence [STATUS: AUTO START; STATE: START DELAY]:
 - The start condition must remain active throughout the start delay, or the delay will reset to zero.
2. When the “start delay” expires, the following will occur: [STATUS: AUTO START; STATE: PRELUBE DELAY]:
 - The “prelube delay” begins timing.
 - The prelube output turns on.
3. When the “prelube delay” expires, the following will occur: [STATUS: AUTO START; STATE: CRANK ON/OFF]:
 - The following shutdowns / alarms are armed:

1	Low Coolant Level	7	Pump High Housing Temperature (If selected) (N.C. open for fault)
2	High / Low Oil Level	8	Low Fuel Level (Self-clearing alarm only)
3	High Discharge Pressure (If selected)	9	Xducer OOR High (Only if float backup not selected)
4	Overspeed	10	Xducer OOR Low (Only if float backup not selected)
5	Overcrank	11	High Level (If selected) (Self-clearing alarm only)
6	Pump Low Oil Level	12	Lo Level (If selected) (Self-clearing alarm only)

3. Continued

NOTE: If “electronic” is selected for engine type, the ECM will control and arm the shutdowns. The exceptions are any shutdowns external to the ECM, in which case the controller will arm and shutdown as necessary.

- The fuel / ECM enable output is turned on.

NOTE: “WAIT”. If “ECM” is selected in engine type, the controller will go through a fixed 10 second delay to allow the ECM to warm-up prior to cranking.

A “NO SPEED SIGNAL” shutdown will occur if the controller does not read a frequency within 3 seconds after cranking begins (Mechanical engines only) (If selected).

- The crank output is turned on, and cycle cranking begins.

NOTE: CYCLE CRANKING. If the engine does not start on the first crank, the controller will de-energize the starter output for the rest cycle.

OVERCRANK. If the engine fails to start after the number-of-cranking-attempts are exceeded, OVERCRANK will be indicated on the alphanumeric display. The auto start sequence will be stopped, requiring manual reset of the controller. The controller is reset by moving the panel selector switch to the "OFF" position.

4. When the engine speed rises above the crank-stop set-point, the following will occur: [STATUS: AUTO START; STATE: WARMUP TIMING]:

- The “warm-up delay” begins timing.
- The crank output is turned off.
- The prelube output is turned off.
- The internal hourmeter begins recording engine run hours.

NOTE: If “ECM” is selected as the engine type, and the controller is reading the can bus, the controller will display the actual run time being broadcasted. M11 and M12 will show the run time being recorded by the controller.

- The engine is throttled to the “warm-up RPM” set point.

NOTE: If “mechanical” is selected as the engine type, the AT03069 throttle actuator will throttle the engine.

If “electronic” is selected, the ECM throttling is determined by what is selected in the in the “ECM throttle type”.

4. Continued

- The “shutdown lockout” delay begins timing. When this delay expires, the following shutdowns are armed:
 - a. LOW OIL PRESSURE.
 - b. HIGH ENGINE TEMPERATURE.
 - c. LOSS OF SPEED.

NOTE: If the engine speed drops below the crank-stop set-point before the “shutdown lockout” delay expires, the “re-crank” delay begins timing. When this delay expires, cycle cranking will resume.

If the engine speed drops below the crank-stop set-point **after** the “shutdown lockout” delay expires, the engine will be shutdown on **LOSS OF SPEED**.

If “electronic” is selected for “engine type”, the ECM will control and arm the shutdowns. The exceptions are any shutdowns external to the ECM, in which case the controller will arm and shutdown as necessary.

Shutdowns

When a shutdown occurs, the cause is displayed, and the engine is shutdown immediately. The controller must be reset by moving the selector to the “OFF” position. The controller stores the last ten shutdowns.

5. When the warm-up delay expires, the following will occur: [STATUS: AUTO START; STATE: FILL MODE]:

- The “at load” delay begins timing. When this delay expires:
 - The LOW DISCHARGE PRESSURE shutdown is armed.
- The clutch output is turned on when the engine speed reaches the “clutch engage” RPM set point.
- The “fill mode” delay begins timing, the engine is throttled to and remains at the “minimum RPM” set point. When this delay expires: [STATUS: AUTO START; STATE: AT LOAD]:
 - The engine is released to auto throttle determined by what is selected in the “system throttle type”.

Auto Stop Sequence

1. When a stop condition occurs, the controller will initiate an auto stop sequence [STATUS: AUTO STOP; STATE: STOP DELAY]:

- The stop condition must remain active throughout the stop delay, or the delay will reset to zero.

2. When the “stop delay” expires, the following will occur: [STATUS: AUTO START; STATE: COOLDOWN DELAY]:
 - The engine is throttled to the cooldown RPM set point.
 - The clutch output is turned off when the engine speed drops to the “clutch disengage” RPM set point.
 - The “low discharge pressure” shutdown is ignored.
3. When the “cooldown delay” expires, the following will occur: [STATUS: AUTO START; STATE: PANEL READY]:
 - The fuel / ECM enable output is turned off.
 - The internal hourmeter stops recording engine run hours.
 - All shutdowns are ignored.

MAN (Manual) Start Sequence

NOTE: The Low Fuel alarm is armed anytime the controller is powered up. This is a self-clearing alarm only.

1. When the selector is in the MAN position, and there are no failures present, the following occurs: [STATUS: MAN; STATE: PRELUBE]:
 - The “prelube delay” begins timing.
 - The prelube output turns on.
2. When the “prelube delay” expires, the following will occur: [STATUS: MAN; STATE: CRANK ON/OFF]:
 - The following shutdowns / alarms are armed:

1	Low Coolant Level	7	Pump High Housing Temperature (If selected) (N.C. open for fault)
2	High / Low Oil Level	8	Low Fuel Level (Self-clearing alarm only)
3	High Discharge Pressure (If selected)	9	Xducer OOR High (Only if float backup not selected)
4	Overspeed	10	Xducer OOR Low (Only if float backup not selected)
5	Overcrank	11	High Level (If selected) (Self-clearing alarm only)
6	Pump Low Oil Level	12	Lo Level (If selected) (Self-clearing alarm only)

NOTE: If “electronic” is selected for engine type, the ECM will control and arm the shutdowns. The exceptions are any shutdowns external to the ECM, in which case the controller will arm and shutdown as necessary.

- The fuel / ECM enable output is turned on.

NOTE: “WAIT”. If “ECM” is selected in engine type, the controller will go through a fixed 10 second delay to allow the ECM to warmup prior to cranking.

2. Continued

NOTE: A “NO SPEED SIGNAL” shutdown will occur if the controller does not read a frequency within 3 seconds after cranking begins (Mechanical engines only) (If selected).

- The crank output is turned on, and cycle cranking begins.

NOTE: CYCLE CRANKING. If the engine does not start on the first crank, the controller will de-energize the starter output for the rest cycle.

OVERCRANK. If the engine fails to start after the number-of-cranking-attempts are exceeded, OVERCRANK will be indicated on the alphanumeric display. The auto start sequence will be stopped, requiring manual reset of the controller. The controller is reset by moving the panel selector switch to the "OFF" position.

3. When the engine speed rises above the crank stop set point, the following will occur: [STATUS: AUTO START; STATE: AT LOAD]:

- The crank output is turned off.
- The prelube output is turned off.
- The “at load” delay begins timing. When this delay expires:
 - The LOW DISCHARGE PRESSURE shutdown is armed (if selected).
- The clutch output is turned on when the engine speed reaches the “clutch engage” RPM set point.
- The internal hourmeter begins recording engine run hours.

NOTE: The engine is manually throttled by the increase / decrease toggle switch. The minimum @ maximum RPM setpoints are ignored in manual operation.

- The “shutdown lockout” delay begins timing. When this delay expires, the following shutdowns are armed:
 - LOW OIL PRESSURE.
 - HIGH ENGINE TEMPERATURE.
 - LOSS OF SPEED.

NOTE: If the engine speed drops below the crank-stop set-point before the “shutdown lockout” delay expires, the “re-crank” delay begins timing. When this delay expires, cycle cranking will resume.

If the engine speed drops below the crank-stop set-point after the “shutdown lockout” delay expires, the engine will be shutdown on LOSS OF SPEED.

NOTE: If “electronic” is selected for” engine type”, the ECM will control and arm the shutdowns. The exceptions are any shutdowns external to the ECM, in which case the controller will arm and shutdown as necessary.

Shutdowns

When a shutdown occurs, the cause is displayed, and the engine is shutdown immediately. The controller must be reset by moving the selector to the “OFF” position. The controller stores the last ten shutdowns.

MAN (Manual) Stop Sequence

1. When the selector is moved to the off position, the following will occur: [STATUS: SELECTOR OFF STOP; STATE: NOT READY]:
 - The fuel / ECM enable output is turned off.
 - The clutch output is turned off.
 - The internal hourmeter stops recording engine run hours.
 - All shutdowns are ignored.

NOTE:For a proper cool-down period, the operator should use the increase / decrease toggle switch to lower the rpm to the appropriate speed.

Selector Switch

The controller will accept inputs from a 3 position selector switch ... MAN -- OFF -- AUTO:

MAN	As described in above sequence outline
OFF	Disconnects control power to prevent the engine from starting or continuing to run through the control panel. Immediate shutdown will occur when the selector is placed in the “OFF” position while the engine is running
AUTO	As described in above sequence outline

Special Features

Shutdown History

The Controller stores the last ten (10) shutdowns that have occurred due to system malfunctions. This record can be found in the P#s

Float Backup

If the level transducer fails high or low, a shutdown will occur. If the float backup feature is enabled, a shutdown will not occur, and the controller will start and stop on floats. During backup float operation, the engine is throttled to the maximum RPM setpoint. This feature remains in effect until the controller is reset, even if the transducer comes back into range. The start/stop and throttle types will have to be set back to TRANSDUCER to resume normal operation.

Overspeed Shutdown

Output 7 can be configured in the 'M' numbers for either operating a clutch actuator or an air damper valve. See Start Sequence for clutch operation. If overspeed is selected, output 7 turns on for 10 seconds if an overspeed shutdown occurs.

Start Override

A single contact start can be enabled without being selected in the start stop type. If CLOCK is selected in the start/stop type, and this feature is enabled in the M numbers, an auto start can occur.

Operation Instructions

Operating the Interface

By using the three push-buttons and the liquid crystal display, you can make set-point changes, acknowledge alarms, and scroll through the display. The graphic below shows the display and push-buttons. The ● ▲ ▼ keys are membrane-type push-buttons. The ● button is best described as an Enter key. You can confirm a set-point and acknowledge alarms with this button. The ▲ button is used for increasing a set-point or scrolling up the display. The ▼ button is used for decreasing a set-point or scrolling down the display. The 2 line dot-matrix liquid crystal display shows information pertinent to its current running mode

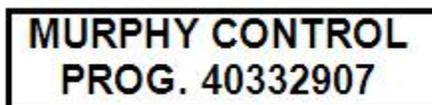


For example, if the controller receives a remote start signal, it will auto start the engine and display the current operation on the screen. These states include Crank On, Crank Off, Warm-up, Cooldown, etc. When the controller has brought the engine on stream, the display will scroll vertically through the engine vital signs. These include Oil Pressure, Engine Temperature, Engine Speed, Running Hours, etc.

First Time Setup

Before using the controller for the first time, it is necessary to configure all the set-points. To access the S-numbers (Setup numbers), use the following procedure:

1. Press the ▼ button until the title page appears.



2. Now, press the ● button once. This will bring up the entry code screen.
3. Next, press the ▲▼ buttons until the appropriate entry code is displayed. See the Secret Code Supplement for your number.
4. Finally, press the ● button once. You are now able to edit the S-numbers.

First Time Setup, *continued*

To change an S-number, the following procedure should be used. We will change the day of the week for this example.

5. Once you have accessed the S-numbers through the above procedure, the screen will show the following:

**SYS 0.0 HRS
S-1 LINE 1 SELECT**

NOTE: The top line may be different. Refer to S1 in S-Number Description and Listing section.

6. Now, press the \blacktriangle button until the following screen appears:

**SYS 0.0 HRS
S7 SET DAY OF WK**

7. Next, press the \bullet button once. This will bring up the following screen:

**SYS 0.0 HRS
FRIDAY**

NOTE: The value in the DAY OF WEEK may vary.

8. Next, press the $\blacktriangle\blacktriangledown$ buttons until the appropriate value is displayed. For demonstration purposes, set the controller to WEDNESDAY.

**SYS 0.0 HRS
WEDNESDAY**

9. Finally, press the \bullet button once. You have now changed the day of the week to WEDNESDAY.

All set-points are adjusted in the same manner as described above. The only difference is which S-number you select before scrolling the set-point change. Once you have adjusted each S-number, with the appropriate values, you must exit the S-number setup mode. To do this, hold the \blacktriangledown button until the following screen is displayed and then press the \bullet button once. This will put the controller back into normal operation mode. If you forget to exit the S-numbers, the controller will exit for you after a pre-programmed amount of time.

**SYS 0.0 HRS
S-0 CIRCLE = EXIT**

Main Displays

During normal operation, the controller allows you to scroll through a number of informative front displays by using the ▲▼ buttons. A listing and explanation of each follows:

1	Murphy	This is the first line of the title page.
2	PROGRAM 40-33-2907	Refer to this number when requesting technical assistance.
3	DD MMM YYYY	This line displays the present date
4	HH:MM:SS	This line shows the present time.
5	SYS HOURS: XXXX.X	This displays the current total engine run time.
6	SYS BAT XX.X VDC	This displays the current engine battery voltage.
7	LEAD SPEED XXXX RPM	This displays the internally generated seed for throttle control.
8	ENG XXXX RPM	This displays the current engine RPM sensed from a magnetic pickup or engine ECM.
9	DISCH PR XXX / SYSTEM LEVEL XX.X	This displays the current discharge pressure or system level, if selected, as sensed from a transducer.
10	OIL PR XXX PSI	This displays the current engine oil pressure sensed from a gauge sender or engine ECM.
11	ENG TEMP XXX °F	This displays the current engine jacket water temperature sensed from a gauge sender or engine ECM.
12	FUELXXX%	This displays the current fuel level sensed from a gauge sender.
13	SELECTOR XXXX	There are three positions on the selector switch are displayed on this line: SELECTOR: MAN, OFF, or AUTO.
14	ST: XXXXXX	The below is a list is of the different states the controller will execute during the auto sequence:

Controller States during Auto Sequence

NOT READY	This state occurs when the selector is in the OFF position. No sequence will occur in this state.
PANEL READY	This state occurs when the selector is in the AUTO position and no shutdowns have occurred. The controller is waiting for an auto start condition to occur.
START DLY	This state occurs when a start signal is active and the start delay is timing. The start signal must remain active throughout this delay before the auto sequence can continue.
PRELUBE	This state occurs after the start delay expires. During the prelube state, the prelube output is turned on.
WAIT FOR ECM	This state occurs after the Prime Delay expires if "ECM" is selected in the engine type. During the WAIT state, the unit allows the ECM to warmup prior to cranking.
CRANK ON	This state occurs when cycle cranking begins. During the crank on state, the crank output is turned on.

CRANK OFF	This state occurs when cycle cranking begins. During this state, the crank output is turned off.
RECRANK DLY	This state occurs if the engine speed drops below the "crank stop" set point before the "shutdown lockout delay" expires.
WARMUP	This state occurs after the engine starts. During this state, the controller throttles the engine to the warm-up RPM until this delay expires.
AT LOAD	This state occurs after the Warmup delay expires. The low discharge pressure shutdown is armed when this delay expires.
FILL MODE	This state occurs after the Warmup delay expires. Auto throttling will occur during this state.
STOP DLY	This state occurs when a stop signal is active and the stop delay is timing. The stop signal must remain active throughout this delay before the auto sequence can continue.
COOLDOWN	This state occurs after the Stop Delay has expired. During the Cooldown state, the controller throttles the engine to an idle.
SHUTDOWN	This state occurs if a shutdown condition is detected. Reasons for shutdown include low oil pressure, high engine temperature, overspeed, etc. During this state, the engine is signaled to shutdown and all start signals are ignored until the state is reset by moving the selector to the OFF position and then back into AUTO or MAN.

S-Number Description and Listing

The S-numbers are used for customizing the controller to your specific application. Included in the S-numbers are the adjustable variables for the system. These S-Numbers must be set before trying to use the controller. Following is a list of available S-Numbers and a short description of the function of each. See Entry Code Supplement for the entry code number.

	S-0	Manual 'EXIT' from the S-number setup mode. Press " 'CIRCLE' TO EXIT"										
	S-1	<p>Line One Selection. Sets the variable to be displayed on the top line of the display while in the Setup Select mode. Available:</p> <table border="1"> <tr> <td>SYS HRS</td> <td>ENG TEMP F</td> </tr> <tr> <td>ENGINE RPM</td> <td>DISCH PR PSI</td> </tr> <tr> <td>LEAD SPEED RPM</td> <td>LEVEL FT</td> </tr> <tr> <td>SYSTEM BAT VDC</td> <td>INPUT/OUTPUT STATUS</td> </tr> <tr> <td>OIL PR PSI</td> <td></td> </tr> </table> <p>NOTE: The input / output status information will show an X on an I/O if that particular input is or output is active. If there is no input or the output is OFF, the controller will display an O. This can be used for checking your wiring before starting the engine. For more information, see the section titled "Double Checking Your Wiring".</p>	SYS HRS	ENG TEMP F	ENGINE RPM	DISCH PR PSI	LEAD SPEED RPM	LEVEL FT	SYSTEM BAT VDC	INPUT/OUTPUT STATUS	OIL PR PSI	
	SYS HRS	ENG TEMP F										
	ENGINE RPM	DISCH PR PSI										
	LEAD SPEED RPM	LEVEL FT										
SYSTEM BAT VDC	INPUT/OUTPUT STATUS											
OIL PR PSI												
S-2	Set Time Minutes . To adjust the minutes portion of the Real Time Clock.											
S-3	Set Time Hours . To adjust the hours portion of the Real Time Clock.											
S-4	Set Date Day . To adjust the day portion of the date display.											

	S-5	Set Date Month . To adjust the month.	
	S-6	Set Date Year . To adjust the year.	
	S-7	Set Day of Week . Adjusts day of week Sunday through Saturday. Day advances with date.	
	S-8	Speed Calib	This setting is used to calibrate the speed signal so that the controller will display engine RPM. Simply enter the number of Pulses per revolution the magnetic pickup or alternator supplies to the controller. Another way to set this variable is to get the engine running at a known RPM and then change the number until the top line matches your known RPM. The resulting number is the pulses per revolution. Factory set to 120.
	S-9	Overspeed	This setting allows you to enter the highest speed the engine can run before damage is caused. If the controller senses that the engine has exceeded this speed, it will signal the engine to shutdown. Factory set to 2000.
	S-10	Lockout Delay	This delay is used to ignore conditions such as low oil pressure when the engine first starts to allow the pressure time to reach its normal operating range (adjustable from 1 to 60 seconds). Factory set to 30.
	S-11	LOP @ Low SPD	The 467 Controller gives you two oil pressure shutdown points. For engines that develop very little oil pressure at an idle, you put a lower shutdown setting in this set-point. The controller automatically changes the shutdown point between the Low Speed Shutdown point and the High Speed Shutdown point. Factory set to 15.
	S-12	LOP @ Hi SPD	This set-point is the higher oil pressure shutdown point that is referred to in S11. This is the point that you want the engine to shutdown during normal high speed engine operation. By shutting down the engine at a higher oil pressure, you can avert damage that could be caused by waiting to shut down the engine at the lower set-point needed to accommodate an idle. Factory set to 30.
	S-13	LOP Lo Speed	Set this to your engine idle speed. If the engine is running at this speed, an idle for example, and the oil pressure reaches the set-point selected in S11, the controller will initiate an automatic shutdown. Factory set to 600.

S-14	LOP Hi Speed	Set this to your engine maximum speed. If the engine is running at this speed, and the oil pressure reaches the set-point selected in S12, the controller will initiate an automatic shutdown. Factory set to 1600.										
S-14 continued		<p>The Graph below shows how the set-point changes between your high speed set-point and low speed set-point. As the engine speed increases, the controller automatically raises the oil pressure shutdown set-point along a straight line between the two set-points you entered.</p> <table border="1"> <caption>Graph Data Points</caption> <thead> <tr> <th>Engine Speed</th> <th>Set-Point</th> </tr> </thead> <tbody> <tr> <td>600</td> <td>10</td> </tr> <tr> <td>1200</td> <td>20</td> </tr> <tr> <td>1800</td> <td>30</td> </tr> <tr> <td>2400</td> <td>40</td> </tr> </tbody> </table>	Engine Speed	Set-Point	600	10	1200	20	1800	30	2400	40
Engine Speed	Set-Point											
600	10											
1200	20											
1800	30											
2400	40											
	S-15	Hi Water TMP Adjust this setting to the engine jacket water temperature you do not want to exceed. If the controller senses a temperature higher than this set-point, it will initiate an automatic shutdown. Factory set to 220.										
	S-16	Lo Fuel Level Enter in the fuel level that will cause a self-clearing alarm to occur. Factory set to 20%.										
	S-17	Warmup DLY You can adjust this variable to the number of seconds you want your engine to warm-up before it engages the clutch and throttles up to an at load condition (adjustable from 1 to 9,999 seconds). Factory set to 180.										
	S-18	Cooldown DLY You can adjust this variable to the number of seconds you wish to cool down your engine before it shuts off after a stop signal is received (adjustable from 1 to 9,999 seconds). Factory set to 180.										
	S-19	Crank Time Set this delay to the desired amount of time you want each engine cranking attempt to last. Consult your engine manual for recommended cranking and resting times (adjustable from 1 to 30 seconds). Factory set to 10.										
	S-20	Rest Time Set this delay to the desired amount of time you want each rest period between cranking attempts to last. Consult your engine manual for recommended resting and cranking times (adjustable from 1 to 30 seconds). Factory set to 10.										
	S-21	Recrank DLY This delay is used to adjust the amount of time the controller will wait for the engine to stop moving before attempting another crank if a false start occurs. A false start is when the engine starts but then dies before the LOCKOUT DELAY has expired (adjustable from 1 to 30 seconds). Factory set to 10.										

	S-22	CRK Stop RPM	This RPM set point is used to adjust where the controller releases the starter during cranking. Set this to the RPM the engine attains just as it starts. This way, the starter is not engaged unnecessarily after the engine starts. You must also set this set point to the speed you release the starter while cranking. This is how the controller senses whether the engine is running or not. You will get a NO SPEED SIGNAL shutdown if this is adjusted too high (adjustable from 0 to 1000 rpm). Factory set to 300.
	S-23	CRK Attempts	Set the number of attempts you would like the controller to try an engine start. If the engine fails to start after the number of attempts you have selected, it will fail the engine and display OVERCRANK on the front display. This shutdown requires a manual reset. Factory set to 6.
	S-24	Warmup RPM	This is the engine RPM the controller will throttle the engine to during warm-up. Consult the engine manual for the optimum warm-up speed. (adjustable from 1 to 9,999 seconds) Factory set to 600.
	S-25	Cooldown RPM	This is the engine RPM the controller will throttle the engine to during cooldown. Consult the engine manual for the optimum cooldown speed. (adjustable from 1 to 9,999 seconds) Factory set to 600.
	S-26	MIN RPM	When throttling to a pressure, the engine will not throttle below this set point. Factory set to 750. This feature not available in the Manual mode.
	S-27	MAX RPM	When throttling to a pressure, the engine will not throttle above this set point. Factory set to 1600. This feature not available in the Manual mode.
	S-28	Rate INC RPM	This set point is used to customize how fast or slow the controller will increase the engine RPM while throttling. Experiment with this number until the proper throttling is achieved. (All engines) Factory set to 10.
	S-29	RATE DEC RPM	This set point is used to customize how fast or slow the controller will decrease the engine RPM while throttling. Experiment with this number until the proper throttling is achieved. (All engines) Factory set to 10.
	S-30	THR MIN PULS	This set point is used to further customize the way controller will throttle the engine. Higher numbers will cause the throttling outputs to stay active for longer periods of time when the system is throttling either up or down. If the engine is hunting then lower the value. If the engine never reaches the set point then increase the value. (Mechanical engines only) Factory set to 8400.
	S-31	THR FDBK DLY	This set point is used to adjust the amount of time the controller waits to sample the change made by the previous throttle pulse. If the system pressure, for example takes a long time to change based on engine speed changes, this set point should be increased. However, if the system pressure responds quickly then set the variable to a smaller value. (Mechanical engines only) Factory set to 2.

	S-32	THR SENSITVY	This set point adjusts the throttle sensitivity when it closes in on the desired set point. Higher numbers cause it to make coarser signal adjustments when approaching a set point than lower numbers. This set point is used to keep the controller from overshooting and undershooting the set point. Lower the number if the controller is hunting. Raise the value if the controller doesn't achieve the desired set point. (Mechanical engines only) Factory set to 700.
	S-33	Set ADJ DLY	This delay allows the controller to stop making adjustments to the engine RPM for this delay. It allows for a settling time after making a speed adjustment (adjustable from 1 to 9,999 seconds). (All engines) Factory set to 2.
<p>NOTE: Changes to S34 will not be recognized until the operator actually exits S34. Changes made while the engine is running will not go into effect until the next auto start occurs.</p>			
	S-34	S/S Type	Enter the type of auto start required: SINGLE CONTACT, FLOATS, MOMENTARY, TRANSDUCER, CLOCK. Factory set to SINGLE CONTACT.
	S-35	System THR Type	Enter the type of system auto throttling required. MAXIMUM RPM, TRANSDUCER, LOCAL THROTTLE. Factory set to MAX RPM.
	S-36	Xducer Type	Enter the type of transducer being used. NONE, PRESSURE, LEVEL. Factory set to NONE. This allows pressure or level to be displayed and alarms and shutdowns to occur.
	S-37	ENG Type	Enter "ECM" for diesels with ECM / J1939. Enter "MECHANICAL" for engines that do not have an ECM. When "ECM" is selected, engine parameters are read from the ECM. Factory set to ECM.
	S-38	ENG THR Type	Enter the type of throttling required. Choices are; ECM J1939 / ANALOG / MECHANICAL. Factory set to J1939.
	S-39	SNDR Types	This set point allows you select between Murphy sending controllers or VDO sending controllers for the Pressure and Temperature senders. Factory set to MURPHY SENDER.
	S-40	Start DLY	Set this delay on engine start to the number of seconds that the start signal must be present before the controller accepts it and initiates an auto start sequence (adjustable from 1 to 9,999 seconds). Factory set to 1.
	S-41	Prelube DLY	The time the prelube output is turned on prior to cranking the engine (adjustable from 1 to 9,999 seconds). Factory set to 1.
	S-42	Stop DLY	Set this delay on engine stop to the number of seconds that the stop signal must be present before the controller accepts it and initiates a stop sequence (adjustable from 1 to 9,999 seconds). Factory set to 1.
	S-43	Start PSI	When "pressure" is selected in the start / stop type, an auto start will occur when the discharge pressure drops to this setpoint. (adjustable from 0 to 1000 PSI) Factory set to 40.

	S-44	Stop PSI	When "pressure" is selected in the start / stop type, an auto stop will occur when the discharge pressure rises to this setpoint. (adjustable from 0 to 1000 PSI) Factory set to 60.
	S-45	Maintain PSI	When "pressure" is selected in the throttle type, the engine will be throttled between the "minimum" and "maximum" rpm setpoints to maintain this pressure. (adjustable from 0 to 1000 PSI) Factory set to 50.
	S-46	Deadband PSI	When "pressure" is selected in the throttle type, no throttling will occur while the pressure is in the deadband. This set point extends above and below the maintain set point. (adjustable from 0 to 50 PSI) Factory set to 2.
	S-47	High DISCH PSI	When "pressure" is selected in either the start / stop or throttle type, an immediate shutdown will occur if the pressure rises to this setpoint. (adjustable from 0 to 1000 PSI) Factory set to 90.
	S-48	Low DISCH PSI	When "pressure" is selected in either the start / stop or throttle type, an immediate shutdown will occur if the pressure drops to this setpoint (adjustable from 0 to 1000 PSI) Factory set to 25.
	S-49	At Load DLY	This delay begins timing after the warmup delay expires. The Low Discharge Pressure shutdown is armed when this delay expires (adjustable from 1 to 9,999 seconds). Factory set to 180.
	S-50	Fill Mode DLY	This delay begins timing after the warmup delay expires. The engine is held at the minimum RPM set point until this delay expires (adjustable from 1 to 9,999 seconds). Factory set to 180.
	S-51	Pressure MAX	Set this to the maximum value of the pressure transducer. For example, if the transducer range is 0-100 PSI enter 100 (adjustable from 0 to 5000 PSI). Factory set to 100 PSI.
	S-52	Pressure MIN	Set this to the minimum value of the pressure transducer. For example, if the transducer range is 0-100 PSI, enter 0. Factory set to 0.
	S-53	Transducer MAX CNT	With 5 VDC or 20ma. Applied to the analog channel, make the top line read the same value as the bottom line. Factory set to 904. If transducer is 0-5 VDC, enter 1023 in this set point.
	S-54	Transducer MIN CNT	With 1 vdc or 4 ma. Applied to the analog channel, make the top line read the same value as the bottom line. Factory set to 181. If transducer is 0-5 vdc, enter zero in this set point.
	S-55	Start Level	When "level" is selected in the start / stop type, an auto start will occur when the system level reaches this setpoint. (adjustable from 0 to 100.0 FT) Factory set to 15.0 FT.
	S-56	Stop Level	When "level" is selected in the start / stop type, an auto stop will occur when the system level reaches this setpoint. (adjustable from 0 to 100.0 FT) Factory set to 5.0 FT.
	S-57	Maintain Level	When "level" is selected in the throttle type, the engine will be throttled between the "minimum" and "maximum" rpm setpoints to maintain this level. (adjustable from 0 to 100.0 FT) Factory set to 10.0 FT.

	S-58	Deadband Level	When "level" is selected in the throttle type, no throttling will occur while the level is in the deadband. This set point extends above and below the maintain set point. (adjustable from 0 to 100.0 FT) Factory set to 1.0 FT.
	S-59	Level Offset	Enter in feet the distance from the bottom of the tank or sump to the transducer. This value is added to the actual level reading. Factory set to 0.0
	S-60	Level Type	Enter type of level control required. The choices are "Empty", "Fill" or "Proportional". Empty starts on high and stops on low. Fill starts on low and stops on high. S536 and S54 should be set accordingly. Factory set to Empty.
	S-61	High Level	When "level" is selected in either the start / stop or throttle type, a self-clearing alarm will occur if the level reaches this setpoint. Factory set to 20.0 FT.
	S-62	Low Level	When "level" is selected in either the start / stop or throttle type, a self-clearing alarm will occur if the level reaches this setpoint. Factory set to 1.0 FT.
	S-63	Level MAX	Set this to the maximum value of the level transducer. For example, if the transducer range is 0-10.0 FT enter 10.0. (adjustable from 0 to 100 FT) Factory set to 20 FT.
	S-64	Level MIN	Set this to the minimum value of the level transducer. For example, if the transducer range is 0-10.0 FT, enter 0. (adjustable from 0 to 100 FT) Factory set to 0.
	S-65	Xducer OOR High	When "level" is selected in the start / stop or throttle type, and "No" is selected in the float backup enable, a shutdown will occur if the transducer's raw count reaches this set point. Factory set to 1000. This feature is not available if the transducer is 0-5 vdc.
	S-66	Xducer OOR Low	When "level" is selected in the start / stop or throttle type, and "No" is selected in the float backup enable, a shutdown will occur if the transducer's raw count reaches this set point. Factory set to 100. This feature is not available if the transducer is 0-5 vdc.
	S-67	Enable Float Backup	The choices are "Yes" or "No". "Yes" will cause the float switches to take control of the system if the transducer fails on OOR high or low. "No" causes a shutdown if the transducer fails on OOR high or low. During float backup operation, the controller will remain on float operation until the controller is manually reset. S33 is automatically changed to "FLOATS" when a float backup occurs. Factory set to No.
	S-68	Enable PVA20-A	Enter Yes if this oil pressure gauge will be on the RS485 port. Factory set to NO.
	S-69	Enable PVA20-B	Enter Yes if this water temperature gauge will be on the RS485 port. Factory set to NO.
	S-70	Enable PVA20-C-12	Enter Yes if this voltmeter (12vdc) will be on the RS485 port. Factory set to NO.
	S-71	Enable PVA20-C-24	Enter Yes if this voltmeter (24vdc) will be on the RS485 port. Factory set to NO.
	S-72	EnablePVA20-T	Enter Yes if this tachometer will be on the RS485 port. Factory set to NO.

	S-73	Clutch Engage RPM	When the engine speed reaches this set point after the warmup delay has expired, the clutch output is turned on. Factory set to 600.
	S-74	Clutch Release RPM	When the engine speed reaches this set point during the cooldown delay, the clutch output is turned off. Factory set to 600.
	S-75	Unit System	Enter either Metric or English for displayed values. Factory set to English.

P-Number Description and Listing

The 467 Controller has **P**-numbers in addition to the **S**-numbers you configured in the previous step. These are accessed in the same manner but using a different entry code. See the Entry Code Supplement for this code number.

P-0	Manual "Exit" from the S-number setup mode. Press 'Circle' to EXIT.							
P-1	Line One Selection	<p>Sets the variable to be displayed on the top line of the display while in the Setup Select mode. Available:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Engine Speed</td> <td>Oil Pressure</td> </tr> <tr> <td>Run Hours</td> <td>Engine Temperature</td> </tr> <tr> <td>System Voltage</td> <td></td> </tr> </table>	Engine Speed	Oil Pressure	Run Hours	Engine Temperature	System Voltage	
Engine Speed	Oil Pressure							
Run Hours	Engine Temperature							
System Voltage								
P-2	SUN SEL	Set this to YES if you want to start your engine on SUNDAY. Set it to NO if you want to lock out the start time on this day. Factory set to NO.						
P-3	MON SEL	Set this to YES if you want to start your engine on MONDAY. Set it to NO if you want to lock out the start time on this day. Factory set to NO.						
P-4	TUE SEL	Set this to YES if you want to start your engine on TUESDAY. Set it to NO if you want to lock out the start time on this day. Factory set to NO.						
P-5	WED SEL	Set this to YES if you want to start your engine on WEDNESDAY. Set it to NO if you want to lock out the start time on this day. Factory set to NO.						
P-6	THR SEL	Set this to YES if you want to start your engine on THURSDAY. Set it to NO if you want to lock out the start time on this day. Factory set to NO.						
P-7	FRI SEL	Set this to YES if you want to start your engine on FRIDAY. Set it to NO if you want to lock out the start time on this day. Factory set to NO.						
P-8	SAT SEL	Set this to YES if you want to start your engine on SATURDAY. Set it to NO if you want to lock out the start time on this day. Factory set to NO.						
P-9	CLK A RUN TM	This set-point lets you set in the amount of time you would like your engine to run on your first start time. You have three available start times per day (A, B, and C). Factory set to 0.0.						
P-10	CLK A HR	This set-point lets you set the clock hour you would like to start. For example, if you want to start in the 3 o'clock in the afternoon hour, set it to 15. Factory set to 00.						
P-11	CLK A MIN	This set-point lets you set the clock minute you would like to start. For example, if you want to start at 8:30 in the morning, you would adjust this until it read 30 in the minute portion Factory set to 00.						
P-12	CLK B RUN TM	This set-point lets you set in the amount of time you would like your engine to run on your first start time. You have three available start times per day (A, B, and C). Factory set to 0.0.						

P-13	CLK B HR	This set-point lets you set the clock hour you would like to start. For example, if you want to start in the 3 o'clock in the afternoon hour, set it to 15. Factory set to 00.
P-14	CLK B MIN	This set-point lets you set the clock minute you would like to start. For example, if you want to start at 8:30 in the morning, you would adjust this until it read 30 in the minute portion Factory set to 00.
P-15	CLK C RUN TM	This set-point lets you set in the amount of time you would like your engine to run on your first start time. You have three available start times per day (A, B, and C). Factory set to 0.0.
P-16	CLK C HR	This set-point lets you set the clock hour you would like to start. For example, if you want to start in the 3 o'clock in the afternoon hour, set it to 15. Factory set to 00.
P-17	CLK C MIN	This set-point lets you set the clock minute you would like to start. For example, if you want to start at 8:30 in the morning, you would adjust this until it read 30 in the minute portion Factory set to 00.
P-18	CLK D RUN TM	This set-point lets you set in the amount of time you would like your engine to run on your first start time. You have one available start time per day (D). Factory set to 0.0.
P-19	CLK D HR	This set-point lets you set the clock hour you would like to start. For example, if you want to start in the 3 o'clock in the afternoon hour, set it to 15. Factory set to 00.
P-20	CLK D MIN	This set-point lets you set the clock minute you would like to start. For example, if you want to start at 8:30 in the morning, you would adjust this until it read 30 in the minute portion Factory set to 00.
P-21	CLK E RUN TM	This set-point lets you set in the amount of time you would like your engine to run on your first start time. You have one available start time per day (E). Factory set to 0.0.
P-22	CLK E HR	This set-point lets you set the clock hour you would like to start. For example, if you want to start in the 3 o'clock in the afternoon hour, set it to 15. Factory set to 00.
P-23	CLK E MIN	This set-point lets you set the clock minute you would like to start. For example, if you want to start at 8:30 in the morning, you would adjust this until it read 30 in the minute portion Factory set to 00.
P-24	DIS PR @ SHDN	Shows what the discharge pressure was when the controller initiated the last failure shutdown. To view the information, press the ● button.
P-25	Level A SHDN	Shows what the system level was when the controller initiated the last failure shutdown. To view the information, press the ● button.
P-26	Oil P @ SHDN	Shows what the engine oil pressure was when the controller initiated the last failure shutdown. To view the information, press the ● button.
P-27	ENG T @ SHDN	Shows what the engine jacket water temperature was when the controller initiated the last failure shutdown. To view the information, press the ● button.
P-28	Fuel L @ SHDN	Shows what the engine fuel level was when the controller initiated the last failure shutdown. To view the information, press the ● button.
P-29	RPM @ SHDN	Shows what the engine speed was when the controller initiated the last failure shutdown. To view the information, press the ● button.
P-30	Last Shutdown	Shows what caused the last failure shutdown and the time in running hours that it occurred. To view the information, press the ● button.

P-31 - 39	##th Shutdown	These P-numbers store the 2nd through the 10th cause of failure shutdown and the date and time they occurred. To view the information, press the ● button.
P-40	Program #	The value in this window is the program and version number. This is helpful information to have before calling the factory for technical help.

M-Number Description and Listing

The 467 Controller has M-numbers in addition to the S & P numbers you configured in the previous step. These are accessed in the same manner but using a different entry code. Contact the factory for the correct entry code.

M-0	Manual 'EXIT' from the S-number setup mode. Press " 'CIRCLE' TO EXIT"							
M1	Line One Selection	<p>Sets the variable to be displayed on the top line of the display while in the Setup Select mode. Available:</p> <table border="1"> <tr> <td>FREQ IN = XXXX HZ</td> <td>ANALOG OUT 1: X.XX VDC</td> </tr> <tr> <td>SYSTEM BAT XX.X VDC</td> <td>DIGITAL INPUTS 1-8 0000 0000</td> </tr> <tr> <td>ANALOG 0-8 RAW COUNTS</td> <td>DIGITAL OUTPUTS 1-7 0000 0000</td> </tr> </table>	FREQ IN = XXXX HZ	ANALOG OUT 1: X.XX VDC	SYSTEM BAT XX.X VDC	DIGITAL INPUTS 1-8 0000 0000	ANALOG 0-8 RAW COUNTS	DIGITAL OUTPUTS 1-7 0000 0000
FREQ IN = XXXX HZ	ANALOG OUT 1: X.XX VDC							
SYSTEM BAT XX.X VDC	DIGITAL INPUTS 1-8 0000 0000							
ANALOG 0-8 RAW COUNTS	DIGITAL OUTPUTS 1-7 0000 0000							
M2	SC10 Address	This is Modbus slave address for the RS485 port. Factory set to 1.						
M3	SC11 Address	This is Modbus slave address for the RS232 port. Factory set to 1.						
M4	Hex View	For reading ram locations from 0000H to FFFFH. Factory set to 0000H.						
M5	Force Output	Using the down arrow to move the cursor under the correct output. From left to right, its outputs 1-7. Turn on the output using the up arrow button, and off by using the down arrow.						
M6	An Out 1 Duty	The vdc on the analog out channel can be increased and decreased by changing the duty value. Factory set to 0.						
M7	Factory Setup	Saying yes in this setpoint forces factory settings into all of the applicable S, P, and M numbers. After pushing the “yes” button, the display will go from “no” to “yes”. Allow the controller to return to “no” before exiting the S number.						
M8	SCADA ENBL	Selecting yes will enable the SCADA comm. alarm. Factory set to NO.						
M9	SCADA AL DLY	After SCADA comm. failure, this delay begins timing. When it expires, a SCADA alarm (adjustable from 0 to 999 sec.). Factory set to 30.						
M10	SYS V MAX	This factor number calibrates the controller to the incoming battery voltage. Improper readings may occur on sender inputs if this setpoint is not 30.5. Factory set to 30.5.						
M11	Run HRS RST	This is the 1000 portion of the engine running hourmeter. This setpoint can be used reset the hourmeter to zero, or enter the correct running hours in 1000's. Factory set to 0.						
M12	Tenth HR RST	This is the 100.0 portion of the engine running hourmeter. This setpoint can be used reset the hourmeter to zero, or enter the correct running hours in 100.0's. Factory set to 0.						
M13	Oil P Lockout	This is a bubble timer to ignore fluctuations in the oil pressure reading and prevent false shutdowns. (adjustable from 1 to 4 seconds) Factory set to 1.						
M14	Can 0 Address	This is the source address for can port 0. Factory set to 43.						

M15	Can 0 ARBITRA	This is to allow the can 0 source address to be arbitrary, beginning at whatever is set in M14. Factory set to CAPABLE NO.
M16	Lost Can 0 DL	If can data is not present throughout this delay, a J1939 com failure shutdown will occur (adjustable from 1 to 10 sec.). Factory set to 3.
M17	Can 1 Address	This is the source address for can port 1. Factory set to 0.
M18	Can 1 ARBITRA	This is to allow the can 1 source address to be arbitrary, beginning at whatever is set in M17. Factory set to CAPABLE NO.
M19	Lost Can 1 DL	If can data is not present throughout this delay, a J1939 com failure shutdown will occur (adjustable from 1 to 10 sec.). Factory set to 3.
M20	Config Mode	Selecting yes allows the download and upload (RS232) of setpoint information when using "EMS Config. V2". Factory set to NO.
M21	No Speed SIG	Selecting yes enables the no speed signal shutdown. This shutdown occurs if a speed signal is not present in the first 3 seconds of the first crank attempt. Factory set to NO.
M22	Hi Pump HSING	Selecting yes enables the high pump housing temp. Factory set to NO.
M23	THROT Dead	When throttling across the can bus, throttling will stop when the actual rpm is within this value from the target. Setpoint. (adjustable from 1 to 100 rpm's) Factory set to 10.
M24	Output 7	This output can be configured for either an overspeed shutdown or the clutch. See the "Special Features" section for details. Factory set to CLUTCH.
M25	STRT OVRRD	Selecting yes enables a single contact start to occur with CLOCK selected in the start/stop type. See the "Special Features" section for details. Factory set to NO.
M26	PWR ECM DT	Selecting yes allows ecm data to be shown on the front display. Selecting YES turns on the ECM enable output for 3 minutes. Factory set to NO.

Wiring Precautions

There are several precautions you can take on initial installation to reduce chances of failure over time. Many of these steps may take a few extra minutes to do at the time of installation; however, they can also save many headaches in the future. We strongly recommend that you follow these precautionary steps.

1. **Place suppression diodes across all inductive loads.** These loads typically include pilot relays, solenoid valves, starter solenoids, etc. This helps increase contact life and eliminate a source of electrical interference.
2. **Wire power leads directly to battery Post.** When hooking your power supply to your Man- Off - Auto switch (AUTOMATIC MODE) or OFF-ON switch (MANUAL MODE), run you're wiring directly to the battery post. This helps minimize noise generated from battery chargers and alternators.
3. **Pilot excessive loads.** Many of the outputs on the 467 Controller are rated for low current, control type loads. Do not run high current loads directly to the controller.
4. **Use stranded wire for hookup.** Solid wire transmits vibration and is more likely to crystallize and break when it is subjected to movement.
5. **Separate AC and DC wiring.** Never run AC and DC handling wiring together. AC signals may get coupled into the control circuits leading to erratic operation.

6. **Wire standby battery charger directly to battery.** Standby chargers must be wired directly to the battery. Failing to do this may result in erratic operation due to electronic "noise" coupled into the microprocessor.
7. **Special precautions for spark ignition engines.** Magnetos and ignition coils produce high voltage and cause high frequency interference. The 467 Controller is designed to filter out much of this interference; however, precautions must be taken to protect the controller. Sender and shutdown wiring must be routed away from the magneto and spark coil wiring. Resistor spark plugs and spark plug wires reduce electrical interference and may also be required in especially "noisy" environments.
8. **Use shielded cable on magnetic pickup.** Shielded cable is recommended for connecting the magnetic pickup to the 467 Controller. This helps prevent signal loss and the possible coupling of electrical interference into the relatively sensitive speed sensing circuit. The shield should only be grounded on one end.

INFORMATION - Proper care during installation will help your 467 Controller live a long and trouble-free operating life. If for any reason you have questions during installation, feel free to give us a call.

Double Checking Your Wiring

The 467 controller has built in diagnostic information for confirming your wiring before you attempt to auto start your engine. The diagnostic information is found in the M-numbers under M1 LINE 1 SELECT. The factory default line 1 display shows the Frequency in HZ from the magnetic pickup.

The next (8) screens show the raw count values for the configurable analog inputs. Choices: senders or ground digital / 4-20ma. / 0-5 vdc. If sender is selected, field wiring can be checked by grounding the input which will change the displayed raw count to "0".

**ANLG IN 4: 0-1023
SELECTION**

- 0 BATTERY VOLTAGE (NOT AVAILABLE).
1. TEMPERATURE SENDER (MECHANICAL ENGINE ES2T OR VDO).
2. OIL PRESSURE SENDER (MECHANICAL ENGINE ES2P OR VDO).
3. LOW COOLANT LEVEL (L150).
4. LOW OIL LEVEL (L129).
5. FUEL LEVEL (ES2F).
6. SYSTEM TRANSDUCER (PRESSURE OR LEVEL).
7. LOCAL THROTTLING POTENTIOMETER (0-5 VDC).

This screen represents the 8 standard digital only inputs. A "0" means the input is not active. An "X" means the input is active.

**DIN 1-8 00X00000
ENTER SELECTION**

1. AUTO POSITION ON "MAN-OFF-AUTO" SELECTOR SWITCH.
2. MANUAL POSITION ON "MAN-OFF-AUTO" SELECTOR SWITCH.
3. SINGLE, FLOAT, MOMENTARY, START CONTACT.
4. FLOAT, MOMENTARY, STOP CONTACT.
5. PUMP LOW OIL LEVEL SWITCH.
6. INCREASE (INC-DEC TOGGLE).
7. PUMP HOUSING HIGH TEMP. (N.C. OPENS ON FAULT).
8. DECREASE (INC-DEC TOGGLE).

The next screen shows the state of your transistor to ground outputs. A "0" means the output is not active. An "X" means the output is active.

**DO 1-7 0X0000
ENTER SELECTION**

1. FUEL / IGNITION / ECM ENABLE.
2. CRANKING.
3. COMMON FAIL.
4. THROTTLE DECREASE (AT03069)
5. THROTTLE INCREASE (AT03069)
6. PRELUBE / PRIME / GLOWPLUG
7. CLUTCH OR OVERSPEED 10 SECOND AIR DAMPER.

Customer Wiring Interface List Port 1 DB 25 Connector

467 Pin Assignment	Relay Board Assignment	RELAY	HARDWARE ASSIGNMENT	PROGRAM PIN ASSIGNMENT
1	31		Analog 4	High / low Oil Level L-129 Input
2	33		Analog 0	Battery Monitor (No customer hookup)
3	35		Analog 7	Local Pot Throttling (0-5 vdc)
4	37		Analog 1	Electric Gauge Sender for Engine Water Temperature (from ES2T-250)
5	39		Input 1	Auto Position of Man Off Auto Toggle Switch
6	11		Input 2	Man Position of Man Off Auto Toggle Switch
7	COM 1=B+ NO=8 NC=7 COM 2=18 NO=16 NC=17	K6	Output 1	Fuel Solenoid /ECM Enable Output
8	20		Battery +	Battery Plus
9	20		Battery +	Battery Plus
10	COM 1=6 NO=4 NC=5 COM 2=15 NO=13 NC=14	K2	Output 2	Crank Output
11	9 & 10		Battery -	Ground
12	NO = 21 & 22	K1	Output 3	Common Fail Output

13	1		Frequency Input	Frequency Input
14	32		Analog 6	Discharge Pressure Transducer input
15	34		Analog 5	Fuel Level (from ES2F)
16	36		Analog 3	Low Coolant Level (from L150)
17	38		Analog 2	Electric Gauge Sender for Engine Oil Pressure (from ES2P-100)
18	40		Input 3	Single, Float, Momentary Start Input
19	12		Input 4	Float, Momentary Stop Input
20	NO = 23 & 24	K3	Output 4	Throttle Decrease Output
21	NO = 25 & 26	K4	Output 5	Throttle Increase Output
22	NO = 27 & 28	K5	Output 6	Prelube Output
23	NO = 29 & 30	K7	Output 7	Clutch or Overspeed air damper Output
24	3		RS485 -	RS485 (-)
25	2		RS485 +	RS485 (+)

Port 2 DB9 Male

Transmit	Modem	Pin 3
Receive	Modem	Pin 2
DTS	Not Used	Pin 8
RTS	Not Used	Pin 7
Ground	Not Used	Pin 5

Port 3 DB9 Female

Can 1 HI	ECM (If Selected)	Pin 1
Can 1 LO	ECM (If Selected)	Pin 2
Can 2 HI	Peer to Peer (Not Used)	Pin 3
Can 2 LO	Peer to Peer (Not Used)	Pin 4
Analog Out	ECM throttling	Pin 4
Digital Input 5	Pump Low Oil Level	Pin 5
Digital Input 6	Increase (inc-dec toggle)	Pin 6
Digital Input 7	Pump High Housing Temp (N.C. opens on fault)	Pin 7
Digital Input 8	Decrease (*inc-dec toggle)	Pin 8

Modbus Communications

The 467 implements a MODBUS RTU style communications protocol. The following will describe the communications and the register and coil implementation for the 467.

Protocol

The 467 controller will reply to RTU MODBUS communications. This communications protocol uses RS232 standards set to 9600 baud rate, no parity, eight (8) bits and one (1) stop bit.

a. **MODBUS® command code 03**

Read Holding Register Status: Reads the binary contents of the holding register in the 467 controller.

b. **MODBUS® command code 06**

Preset Single Register: Presets a value into a single holding register.

c. **MODBUS® command code 16**

Preset Multiple Registers: Presets values in a sequence of holding registers.

Registers

Registers are adjustable or varying data locations within the controller whose value is an integer value not just on or off. They can represent the system analog input for flow or pressure. The registers could be an adjustable system parameter such as delay on start. The following is a list of the registers that can be accessed. The maximum number of registers that can be read at one time is 125. The starting address of the registers is 40001.

NOTE: If a query is made to the 467 controller beyond the published amount of registers, the 467 controller will ignore the message as an invalid query.

Register #	Type	Description
40001	Read Only	Running Hours, upper byte
40002	Read Only	Running Hours, lower byte
40003	Read Only	Engine RPM
40004	Read Only	Battery Voltage (12.5 will read 125)
40005	Read Only	Oil Pressure
40006	Read Only	Engine Temperature

40007	Read Only	<p>System Status – Following is a description of the bits:</p> <table border="1"> <tr><td>Bit 0 (LSB)</td><td>Auto Ready (1) Yes, (0) No</td></tr> <tr><td>Bit 1</td><td>Prelube Timing: (1) Yes, (0) No.</td></tr> <tr><td>Bit 2</td><td>Start Delay Timing: (1) Yes, (0) No</td></tr> <tr><td>Bit 3</td><td>Warmup Delay Timing: (1) Yes, (0) No</td></tr> <tr><td>Bit 4</td><td>Fill Mode: (1) Yes, (0) No.</td></tr> <tr><td>Bit 5</td><td>At Load: (1) Yes, (0) No</td></tr> <tr><td>Bit 6</td><td>Stop Delay Timing: (1) Yes, (0) No</td></tr> <tr><td>Bit 7</td><td>Cooldown Delay Timing: (1) Yes, (0) No</td></tr> <tr><td>Bit 8</td><td>Common Failure: (1) Yes, (0) No</td></tr> <tr><td>Bit 9</td><td>Spare</td></tr> <tr><td>Bit 10</td><td>Spare</td></tr> <tr><td>Bit 11</td><td>Spare</td></tr> <tr><td>Bit 12</td><td>Spare</td></tr> <tr><td>Bit 13</td><td>Spare</td></tr> <tr><td>Bit 14</td><td>Spare</td></tr> <tr><td>Bit 15 (MSB)</td><td>Spare</td></tr> </table>	Bit 0 (LSB)	Auto Ready (1) Yes, (0) No	Bit 1	Prelube Timing: (1) Yes, (0) No.	Bit 2	Start Delay Timing: (1) Yes, (0) No	Bit 3	Warmup Delay Timing: (1) Yes, (0) No	Bit 4	Fill Mode: (1) Yes, (0) No.	Bit 5	At Load: (1) Yes, (0) No	Bit 6	Stop Delay Timing: (1) Yes, (0) No	Bit 7	Cooldown Delay Timing: (1) Yes, (0) No	Bit 8	Common Failure: (1) Yes, (0) No	Bit 9	Spare	Bit 10	Spare	Bit 11	Spare	Bit 12	Spare	Bit 13	Spare	Bit 14	Spare	Bit 15 (MSB)	Spare
Bit 0 (LSB)	Auto Ready (1) Yes, (0) No																																	
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Bit 12	Spare																																	
Bit 13	Spare																																	
Bit 14	Spare																																	
Bit 15 (MSB)	Spare																																	
40008	Read Only	<p>Shutdown Status - Following is a description of the bits:</p> <table border="1"> <tr><td>Bit 0 (LSB)</td><td>Low Oil Pressure (1) Yes, (0) No</td></tr> <tr><td>Bit 1</td><td>High Engine Temperature: (1) Yes, (0) No.</td></tr> <tr><td>Bit 2</td><td>Low Coolant Level: (1) Yes, (0) No</td></tr> <tr><td>Bit 3</td><td>High Low Oil Level: (1) Yes, (0) No</td></tr> <tr><td>Bit 4</td><td>Loss of Speed: (1) Yes, (0) No</td></tr> <tr><td>Bit 5</td><td>No Speed Signal: (1) Yes, (0) No</td></tr> <tr><td>Bit 6</td><td>Overspeed: (1) Yes, (0) No</td></tr> <tr><td>Bit 7</td><td>Overcrank: (1) Yes, (0) No</td></tr> <tr><td>Bit 8</td><td>High Discharge Pressure: (1) Yes, (0) No</td></tr> <tr><td>Bit 9</td><td>Low Discharge Pressure: (1) Yes, (0) No</td></tr> <tr><td>Bit 10</td><td>High System Level: (1) Yes, (0) No</td></tr> <tr><td>Bit 11</td><td>Low System Level: (1) Yes, (0) No</td></tr> <tr><td>Bit 12</td><td>Loss of Pressure Sender: (1) Yes, (0) No</td></tr> <tr><td>Bit 13</td><td>Loss of Temperature Sender: (1) Yes, (0) No</td></tr> <tr><td>Bit 14</td><td>Spare</td></tr> <tr><td>Bit 15 (MSB)</td><td>Spare</td></tr> </table>	Bit 0 (LSB)	Low Oil Pressure (1) Yes, (0) No	Bit 1	High Engine Temperature: (1) Yes, (0) No.	Bit 2	Low Coolant Level: (1) Yes, (0) No	Bit 3	High Low Oil Level: (1) Yes, (0) No	Bit 4	Loss of Speed: (1) Yes, (0) No	Bit 5	No Speed Signal: (1) Yes, (0) No	Bit 6	Overspeed: (1) Yes, (0) No	Bit 7	Overcrank: (1) Yes, (0) No	Bit 8	High Discharge Pressure: (1) Yes, (0) No	Bit 9	Low Discharge Pressure: (1) Yes, (0) No	Bit 10	High System Level: (1) Yes, (0) No	Bit 11	Low System Level: (1) Yes, (0) No	Bit 12	Loss of Pressure Sender: (1) Yes, (0) No	Bit 13	Loss of Temperature Sender: (1) Yes, (0) No	Bit 14	Spare	Bit 15 (MSB)	Spare
Bit 0 (LSB)	Low Oil Pressure (1) Yes, (0) No																																	
Bit 1	High Engine Temperature: (1) Yes, (0) No.																																	
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Bit 15 (MSB)	Spare																																	
40009	Read Only	Discharge Pressure – Current discharge pressure																																
40010	Read Only	System Level – Current system level																																
40011	Read/Write	Engine Start/Stop (1) Yes, (0) No																																
40012	Read/Write	Maximum RPM Setpoint																																

Entry Code Supplement

IMPORTANT - Knowledge of these codes allows you to set the operating parameters of the controller. You can customize the operation to fit your specific application. Keep this number away from anyone that you do not want to have access to this kind of customization

P-Numbers

The P-numbers contain clock functions and the shutdown history. The code number is **61**.

S-Numbers

The S-numbers contain critical information and control functions. Be sure that only qualified personnel have access to this entry code. The code number is **64**.

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