MURPHY®

XM500

Configuration Tool

Version 2.0

Installation and Operations Manual

00-02-0789
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Section 78

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 if you have any questions.

Contents

Introduction

The XM500 I/O Module is a configurable tool that provides sensing options not necessarily available with standard OEM Electronic Control Units (ECU). This integrated, industry-standard enclosure, and proprietary software package offers a variety of SAE-defined SPN assignments such as Fuel Level, Hydraulic Oil Pressure, Low Engine Coolant Level, and Fuel Delivery Pressure as well as user-assignable proprietary parameters.

XM500 Specifications

Power Input: 8 to 28 VDC

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

Digital Inputs: 4 – Ground or battery positive activation

Digital Outputs: 2 – Sinking (500 mA)

- Outputs are NOT reverse polarity protected and will cause damage to the outputs if **B+** is connected to these. Connecting **B+** to the unit voids the warranty.

Thermocouple Input[1]: Type K & Type J

Analog Inputs[2]:

- 1 – battery supply voltage (dedicated)
- 7 – configurable as 0-5 VDC, 4-20 mA, resistive senders or used as an additional Digital Input.

Speed Sensing Input: 2 to 120 VAC RMS from 30 to 10,000 Hz.

Communication Ports: CAN J1939

[1]When the thermocouple input is used, only 5 resistive, 4-20 mA, or 0-5 VDC can be used instead of seven (7).
[2]Analog inputs can be exchanged for digital inputs (battery ground activation only), for a total of eleven digital inputs.

Getting Started

> **NOTE**: **Do not** connect the USB Serial Adapter to the USB port of your computer before you finish installing the UBS COM driver.

A USB connection is required for transferring the configuration from the PC to the XM500.

While the configuration software will function on any PC or laptop running Windows, it will not perform transfers using the USB driver unless the operating system supports USB function. Operating systems supporting USB function include 2000, XP, 2003, Vista, and Windows7. Any or all of the screens in the following steps, or other screens not shown, may give you information about installing the USB COM driver or ask you to take an action. You may need *Administrator Privileges* to install software on the computer.

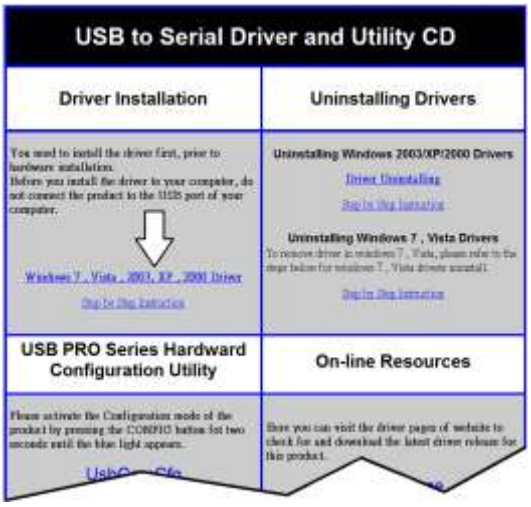
Installing the USB Driver

1. Insert the USB COM CD into your CD-ROM (the disk is 3”/76.2mm) to download the USB Serial Adapter driver.

Select YES to continue the installation of the driver.

2. The **USB COM Series Driver and Utility CD** dialog box appears.

3.



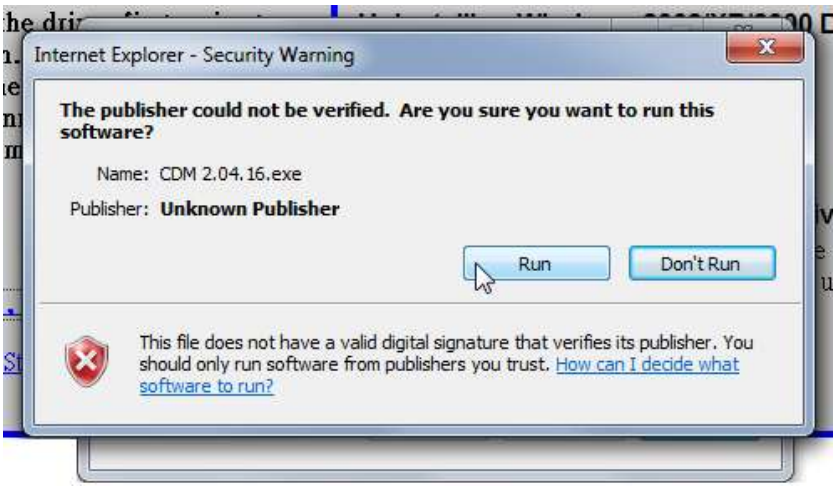
USB COM Series Driver and Utility CD Dialog box

4. Under **Driver Installation,** double click the phrase **“Windows 7 / Vista, 2003, XP, 2000**

Driver” to install the device driver. You may see the following dialog box. Click **Run** to install the driver.

Click RUN to install the driver

5. The **USB COM Install Program** should detect your operating system type and install the driver automatically. However, you will see other dialog boxes. Read the questions and take appropriate action. A sample dialog box follows.



Checking the digital signature

6. When the driver finishes installing, the screen returns to the **USB COM Series Driver and Utility CD** dialog box. Click the Web browser **Close** button in the upper right of the browser window.

7. Remove the USBCOM disk from the CD-ROM drive.

Connecting the XM500 to Your Computer

The following table shows what you will need to connect the XM500 to a computer: It also walks you through connecting the cables and devices.

USB to RS485 Converter Note: Make sure the USB Driver has been installed before connecting the hardware to the computer.	
USB Cable 1. Connect the USB cable square connector end to the RS485 converter.	 
Programming Cable 2. Connect the 9-pin connector to the RS485 converter.	
AC Adapter Cable 3. Connect the AC Adapter Cable to the Programming Cable.	
Cables to XM500 4. Connect the Power Supply/Programming cable to the XM500.	

PC/computer 5. Connect the unconnected end of the USB cable to an open USB connector on the PC.	

System Requirements

A USB 1.1 connection is required for transferring the configuration from PC to the XM500.

While the configuration software will function on any PC or laptop running Windows, it will not perform transfers using the USB driver unless the operating system supports USB function. USB supported operating systems include Win98SE, NT, XP, and Windows 7.

Serial transfers using standard communication ports (COM1, COM2) should be possible on all Windows platforms.

The following details the recommended system requirements for the XM500 Configuration software,

Processor

Dual Core

- Intel Pentium D, 3 GHz & above
- Intel Core Duo, 2 GHz & above
- Intel Core 2 Duo, 2 GHz & above

Single Core

- Intel Pentium 4, 3 GHZ & above
- Intel Core Solo, 1.8 GHz and above

2 GB System RAM and above

USB connection on the PC

Monitor Requirement

Color monitor with resolution of 1024 x 768 pixels or higher

Recommended Operating Systems

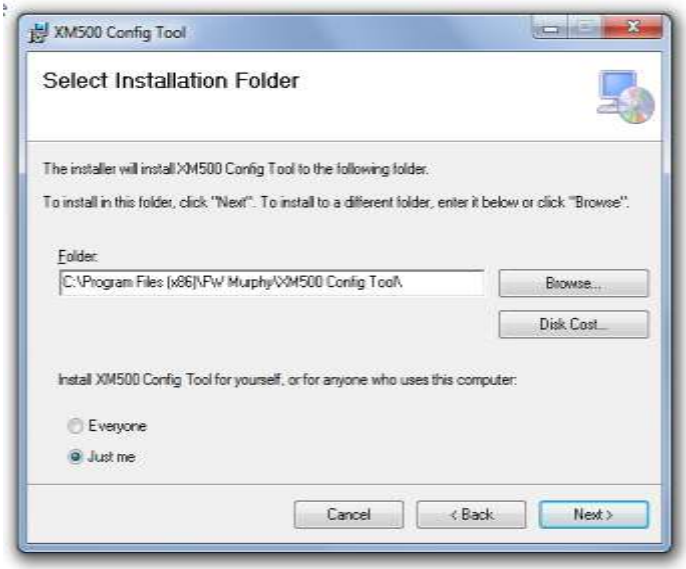
Windows XP Professional with Service Pack installed and Microsoft.Net Framework 4.0

Software Installation Instructions

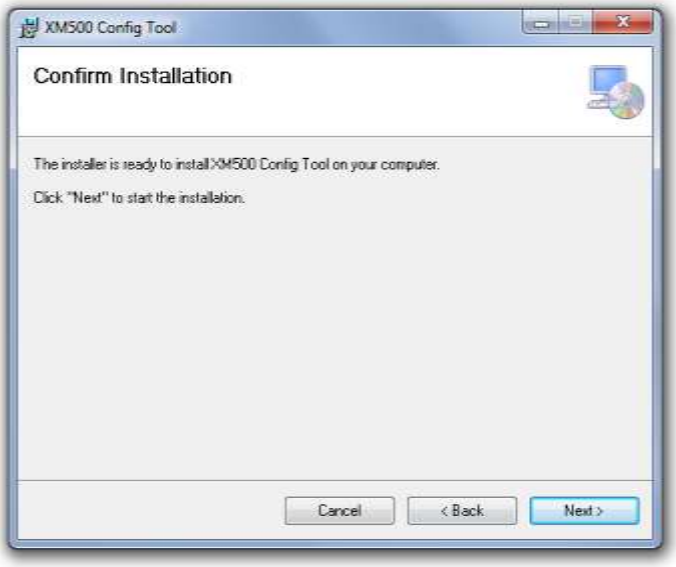
Use the following steps to install the configuration software on a PC or laptop. Make sure you have installed the USB Driver before installing the XM500 software.

1. Insert the XM500 CD into the CD-ROM. The **XM500 Config Tool Setup Wizard** launches. Click **Next** to continue.

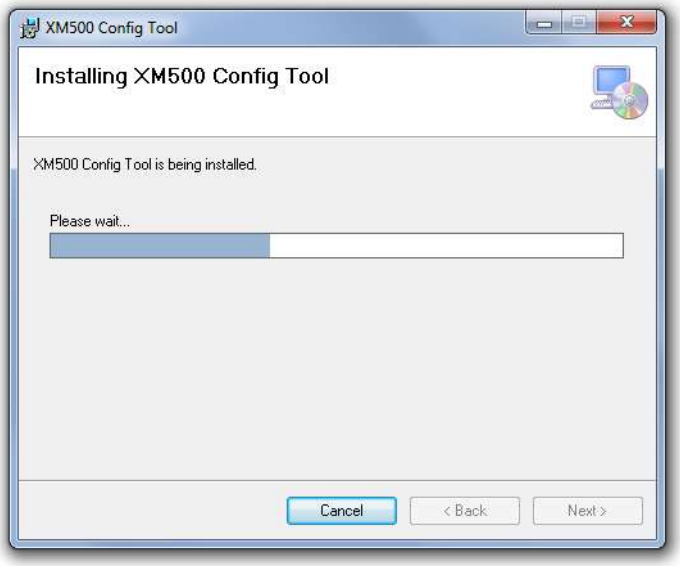
2. You will be asked for a destination folder for the program. You can accept the suggested directory or select a different directory by clicking **Browse** and browsing to the destination folder of your choice. Once the destination folder is determined, select who can use the application – just yourself or anyone who uses this computer. Click **Next** to continue.



3. The Wizard is now ready to install the program. Click **Next** to begin. Installation may take several minutes.



4. The following screen displays while the configuration tool installs.



5. When the installation is complete, click **Close**.

Launching the Application

To access the application, select **XM500 Config Tool** from the list of programs under your **Start** menu, or use the shortcut icon placed on your desktop when the application loaded.

Using the XM500 Application

The XM500 is a configurable Input/Output (I/O) module designed to bring analog input, and digital input and output information onto the SAE J1939 Controller Area Network (CAN). The XM500 Config Tool provides a user-friendly interface allowing the user to create or change the configuration used on the XM500 unit.

Switchable Bootloader and Power Modes

The XM500 uses a switchable-bootloader pin to toggle between the three modes of operation:

Normal Operation Mode

For normal operating mode, the Bootloader switch is in the **OFF** position and remains **OFF** when main power is applied (click the power switch to the **ON** position).

Application Download Mode

When preparing to load the application, have the Bootloader switch in the **ON** position when main power is applied (click the power switch to the **ON** position).

Configuration Load Mode

For the Configuration Load Mode, have the Bootloader switch in the **OFF** position.

	Verify Bootloader switch is OFF, and then turn the main power **ON** (click the power switch to the **ON** position). Once the main power is **ON**, click the Bootloader switch **ON**.

If the Bootloader switch is in the wrong position for the action you are trying to perform, a warning message displays.

XM500 Tabs, Screens, and Text Box Explanations

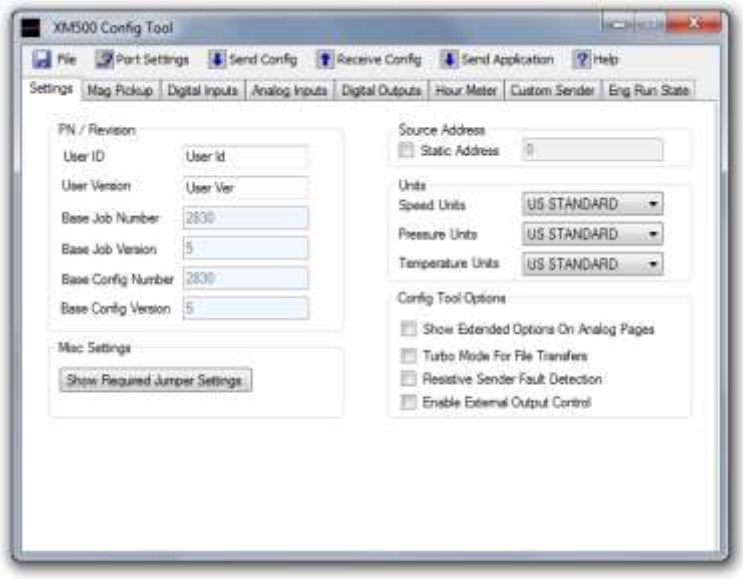
Start the configuration on the Setting Tab where you select basic display and feature options. Then configure your Digital Inputs, Analog Inputs, and Digital Outputs. Depending on your configuration, you may also set parameters, triggers, sources, or values on the Hour Meter, Custom Sender, and Eng Run State Tabs. Starting with the Settings Tab below, this document explains the selections available on each Tab screen.

This application contains Help at the documentation level from the **Menu Bar Help** button or explanations and information for specific items at the **F1 Help** level.

Settings Tab

The **Settings Tab** is the default when opening the application. This is where you set options used by other tabs to process data in this application.

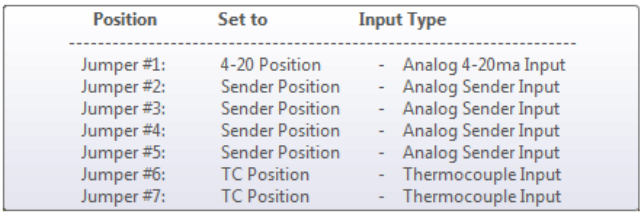
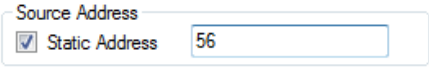
The Base Job Number, Base Job Version, Base Config Number, and Base Config Version were set at the factory and cannot be changed.

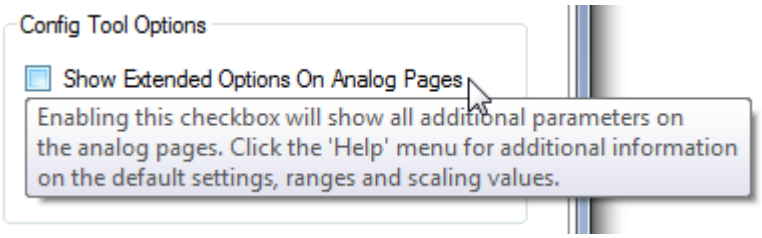
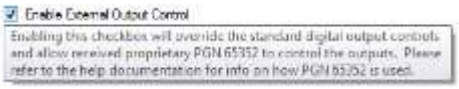


XM500 Settings Tab

The table below lists the text boxes and descriptions, and actions to take on the Settings tab.

Text Boxes & Check Boxes	Description
User ID	A distributor or user identification. If you have a user identification, enter it here.
User Version	A distributor or user software-version identification.

Show Required Jumper Settings	Click in the box to show the jumper settings needed for the loaded configuration. The XM500 scans the configuration and indicates jumper placement by Jumper Number, Position, and Type of Input. See sample below.  Position Set to Input Type Jumper #1: 4-20 Position - Analog 4-20ma Input Jumper #2: Sender Position - Analog Sender Input Jumper #3: Sender Position - Analog Sender Input Jumper #4: Sender Position - Analog Sender Input Jumper #5: Sender Position - Analog Sender Input Jumper #6: TC Position - Thermocouple Input Jumper #7: TC Position - Thermocouple Input For more information on setting Jumpers, see **Verifying Jumper Positions on the XM500** on page 14.
Source Address: Static Address Checkbox Static Address Text Box	To manually set a Static Address, enable the feature by selecting the box.  Source Address Static Address 56 The text box to the right becomes available for text entry. Enter a known and available address for your Network. The range is 0 to 254. ► If the static address check box is not selected, the XM500 will try to acquire a source address starting with address 0 (zero). If that address is not available, the XM500 will arbitrate each address in turn until it finds one available on the CANBUS. ► There are cases where entering a known value is preferable. In a situation where two marine engines have a single CANBUS, and one XM500 for each engine, the static address of each XM500 can be used to identify the specific source of the J1939 data (Port or Starboard).
Units - Speed Units	Choose the format in which to show values, either US Standard or Metric. For example, US Standard is MPH (miles per hour) and Metric is KPH (kilometers per hours).
Units - Pressure Units	Choose the format in which to show values, either US Standard or Metric. For example, US Standard is PSI (pounds per square inch) and Metric is kPa (kilopascals).

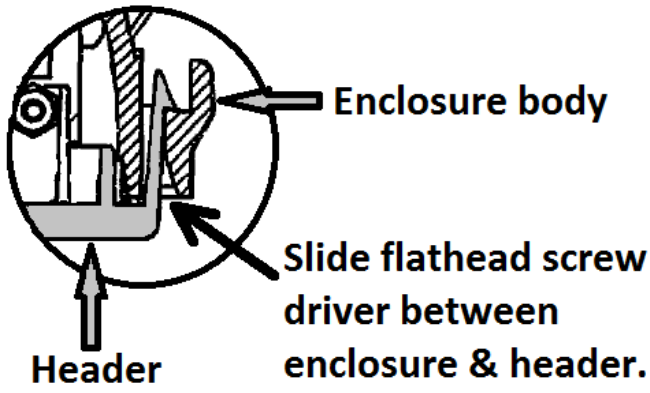
Units - Temperature Units	Choose the format in which to show values, either US Standard or Metric. For example, US Standard shows degrees Fahrenheit (°F) and Metric shows degrees Celsius (°C).
Config Tool Options – Show Extended Options on Analog Pages	Select this option to show the true counts for the analog to digital converter associated with each channel. The Min A/D and Max A/D text boxes show on each Analog Input screen if the option is enabled. ► On the Analog Input screen, if you change the Hardware drop-down list from Sender to 4-20ma or 0-5V, the digital counts automatically fill. The 0-5V is the full range and shows the actual A-to-D counts. 4-20ma is scaled, but contains the necessary counts between 4 milliamps and 20 milliamps. Both are 10-bit analog to digital. Each of the **Config Tool Options** has more information available. Press F1 while pausing on the phrase or check box. 
Config Tool Options – Turbo Mode for File Transfers	Select this option to automatically increase the baud rate (transfer speed) at which the application and configurations are sent to the XM500. ► When configurations are uploaded from the XM500 the transfer is slower as Turbo cannot be applied to that end.
Config Tool Options – Resistive Sender Fault Detection	If this option is selected, a resistive sender with an open or shorted condition broadcasts a DM1 warning message with FMI 7.
Enable External Output Control 	Check this option to enable proprietary PGN 65352 to control the digital outputs by sending data on the CANBUS and overriding standard digital output controls. Settings options (DO1 & DO2) on the **Digital Outputs Tab** become unavailable. For more information, see the **Proprietary Analog SPN Options** in the Analog Inputs Tab section, page 26.

Verifying Jumper Positions on the XM500

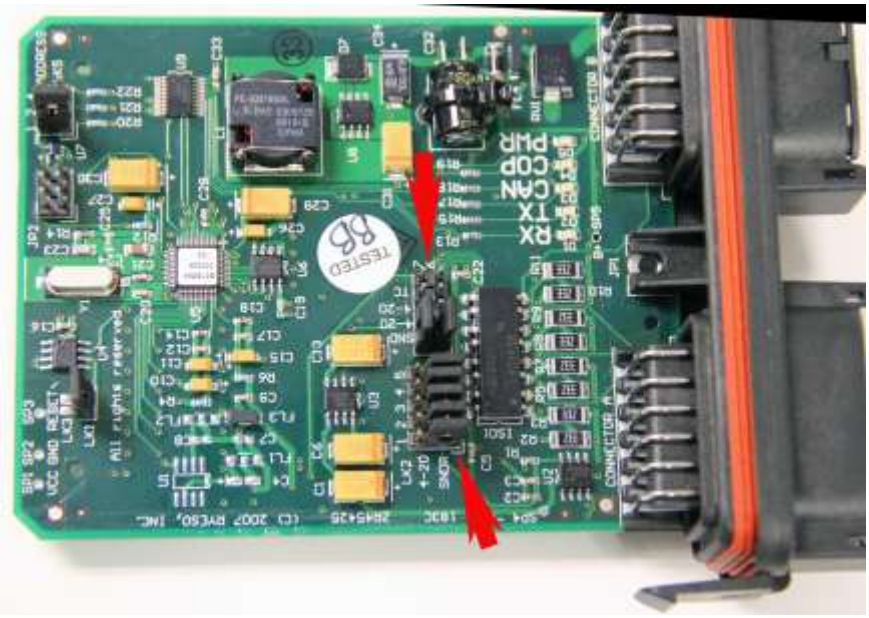
The selections made on the **Analog Input** screen in **Parameter 2-Hardware** (Sender, 4-20ma, or 0-5V) affect jumper placement of the headers on the XM500 printed circuit board. Review the following graphics for opening the enclosure and proper jumper placement. Also, become familiar with the **Settings Tab**, **Show Required Jumper Settings** box on page 12.

Opening XM500 Enclosure

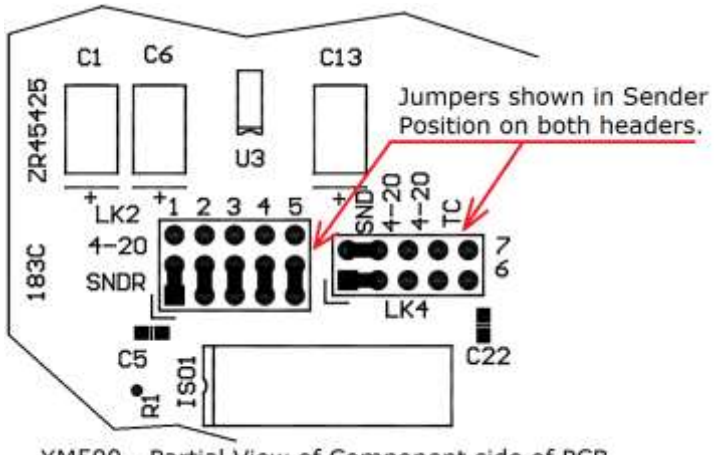
The XM500 enclosure has a snap-in header. Carefully slide a flathead screwdriver between the enclosure body and connector header. On both the left and right of the header, push the flat of the screwdriver sideways toward the enclosure body to pop the tab loose, and then slide connector header away from the enclosure body.



Red arrows in the following photo indicate the Headers. In this example, jumpers on both headers are in the **Sender** position.

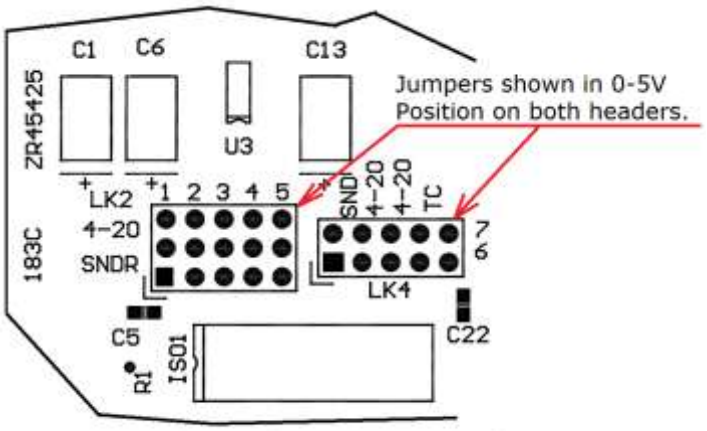


Place jumpers in the locations indicated to set Analog Hardware selections to Sender.



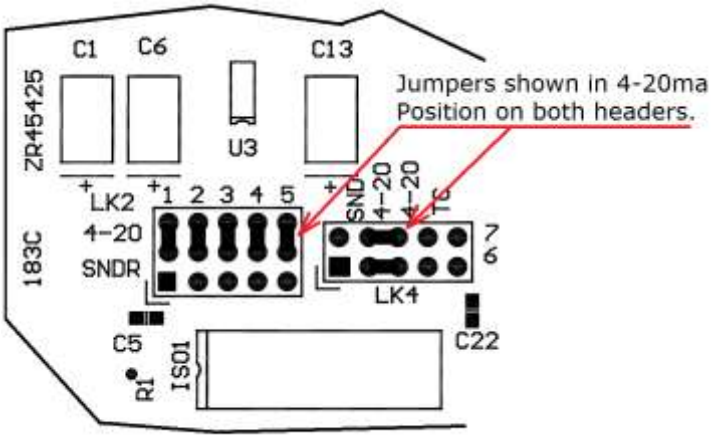
XM500 - Partial View of Component side of PCB

Remove all jumpers to set the Analog Hardware selection to 0-5V.



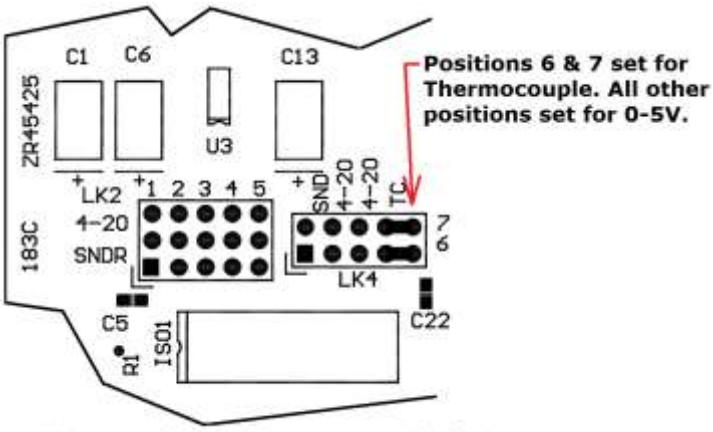
XM500 - Partial View of Component side of PCB

Place jumpers in the locations indicated to set Analog Hardware selections to 4-20ma.



XM500 - Partial View of Component side of PCB

In this view, the jumpers are set for the Analog Input selection of **Thermocouple** on 6 and 7. All other jumpers are removed as for 0-5V.



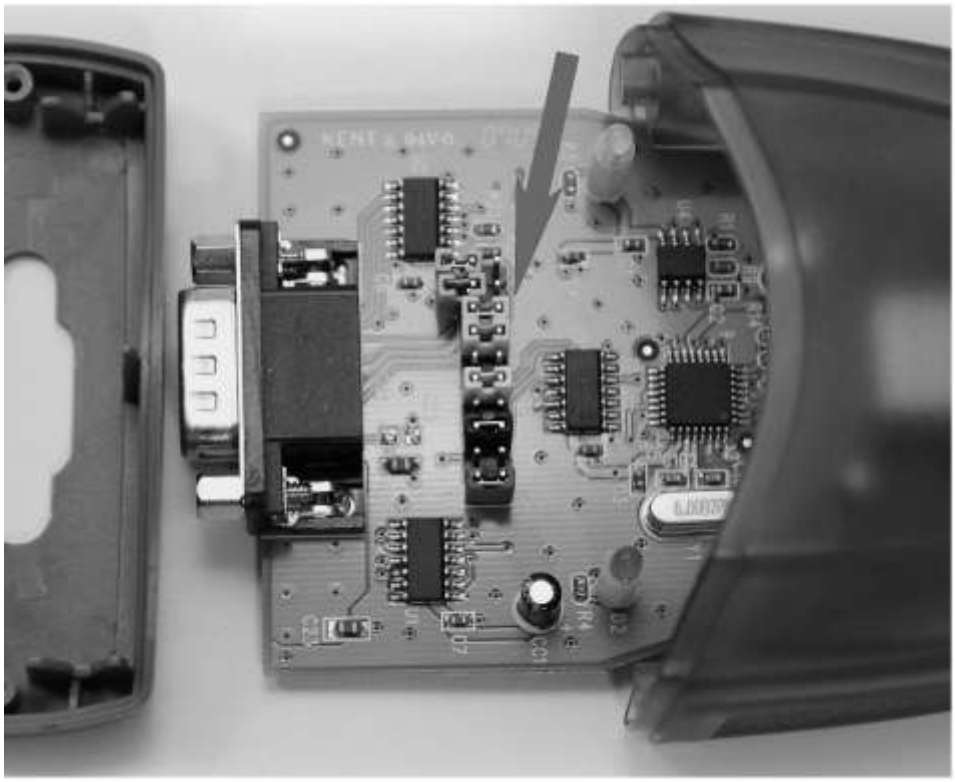
XM500 - Partial View of Component side of PCB

To reassemble the enclosure, carefully slide the PCB/header assembly into the slots provided in the enclosure and push until the tabs snap into place.

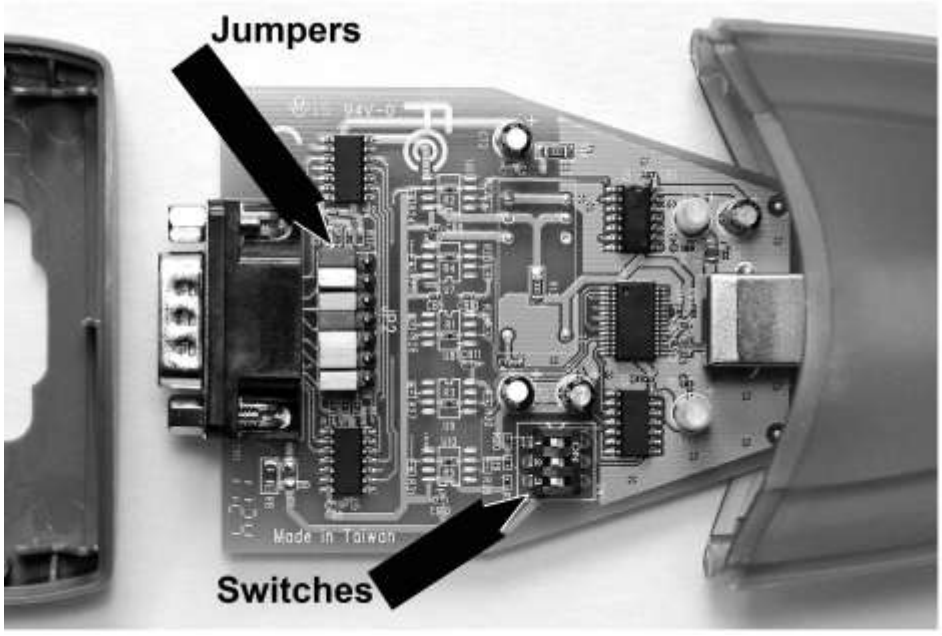
Verifying Jumper Positions on the RS485 Converter

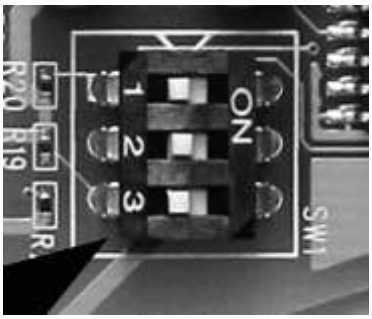
Jumper positions on the RS485 Converter printed circuit boards are set at the factory and should never need adjustment. However, if you are troubleshooting a problem, checking the jumper and switch settings may be necessary.

The RS485 can be equipped with one of two circuit boards. The following photos show both options and the arrows indicate the jumper positions and/or switch settings to check. These photos show the correct positions for jumpers and switches.



This RS485 Converter printed circuit board contains only jumpers.

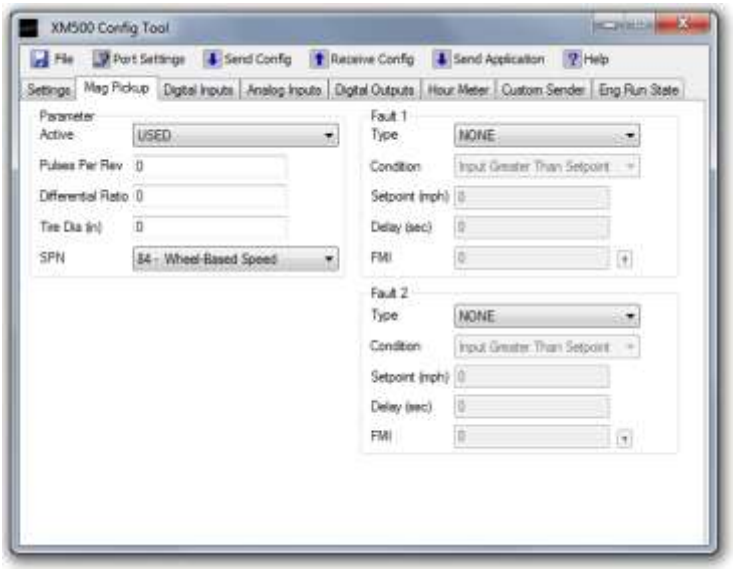




Switch is shown in the same orientation as the adjacent photo.

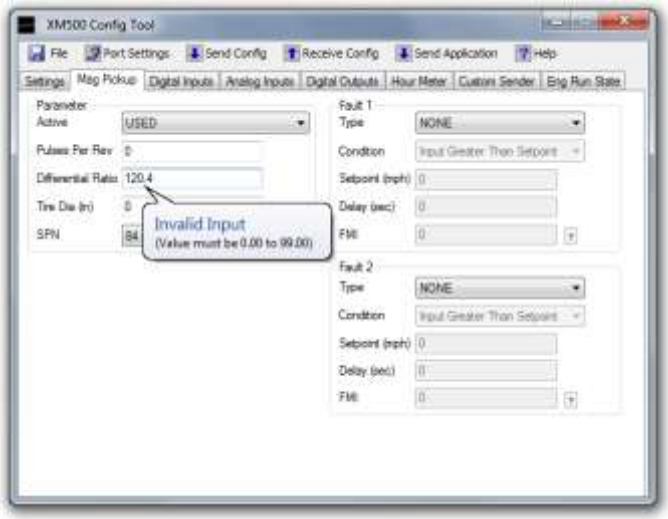
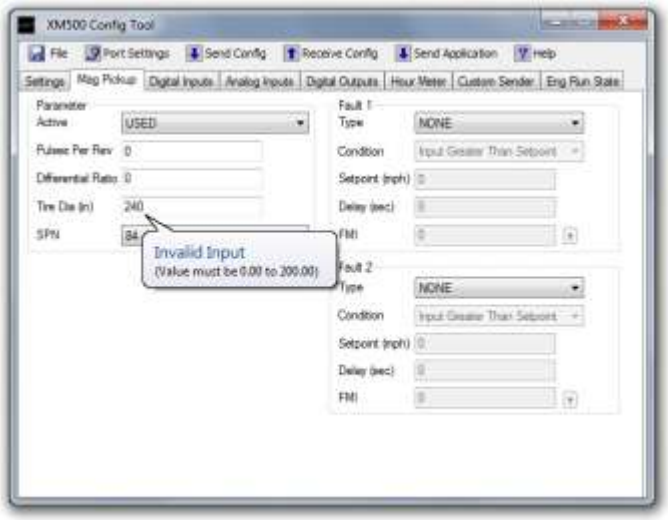
Mag Pickup Tab

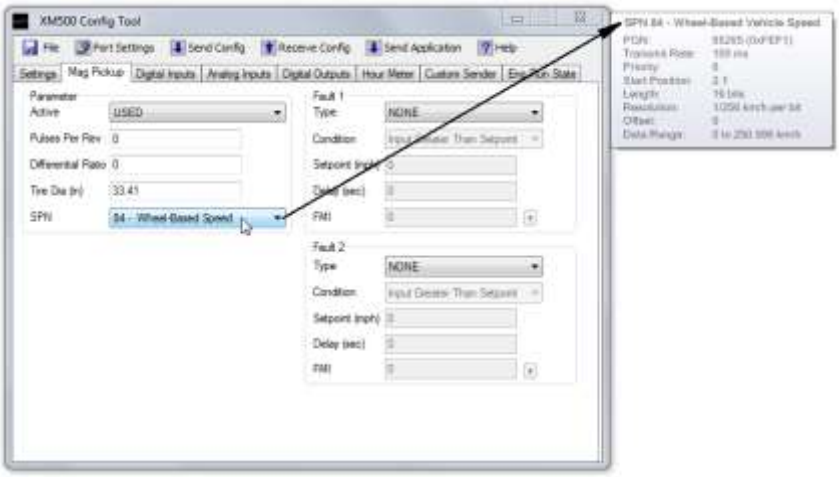
This tab offers configuration of a Magnetic Input with two definable faults for the active parameter.



Magnetic Pickup Tab

The following table lists text boxes, their descriptions, and actions that can be taken on the Mag Pickup Tab. Please note Fault 1 and Fault 2 text boxes and drop-down lists are identical.

Text & Check Boxes	Description
Parameter – Active	Select Used or Unused from the drop-down list. Choose Used and other fields on the screen become available.
Parameter – Pulses Per Rev	For the calculation, specify the tooth count or expected pulses per revolution.
Parameter – Differential Ratio	This is the number of revolutions the engine or transmission output shaft must turn in order to rotate the vehicle's drive axle one complete revolution. This is only available when **wheel-based vehicle speed** (SPN 84) is selected. The value range covers most commercial and non-commercial ratios. 
Parameter – Tire Dia (in)	Enter the tire height in inches. This is only available when **wheel-based vehicle speed** (SPN 84) is selected. The tire diameter range covers most commercial and non-commercial applications 

Parameter – SPN	Select the appropriate SPN for your Magnetic Pickup parameter from the drop down list. With your cursor in the field, press the F1 key for more information on a specific SPN. 
Fault 1 and Fault 2 – Type	Select the fault type for the active parameter. Options are: • None • Amber Alarm With Delay • Amber Alarm Without Delay • Red Alarm With Delay • Red Alarm Without Delay
Fault 1 and Fault 2 - Condition	This is the condition that triggers the alarm action. Select greater or less than the set point fixed for the alarm.
Fault 1 and Fault 2 – Set point (rpm)	Entering a set point allows use of a condition to trigger an alarm.
Fault 1 and Fault 2 – Delay (sec)	If you selected an ALARM with a delay, enter the number of seconds the AMBER or RED Alarm condition must be present before the alarm message is sent.

Fault 1 and Fault 2 - FMI	(Failure Mode Indication) Click Help [?] associated with the FMI text box for a list of failure modes, and enter the most appropriate selection. See the sample below.  **FMI Selection Reference** 0 - Data Valid But Above Normal Operational Range: Most Severe Level 1 - Data Valid But Below Normal Operational Range: Most Severe Level 2 - Data Erratic, Intermittent Or Incorrect 3 - Voltage Above Normal, Or Shorted To High Source 4 - Voltage Below Normal, Or Shorted To Low Source 5 - Current Below Normal Or Open Circuit 6 - Curemt Above Normal Or Grounded Circuit 7 - Mechanical System Not Responding Or Out Of Adjustment 8 - Abnormal Frequency Or Pulse Width Or Period 9 - Abnormal Update Rate 10 - Abnormal Rate Of Change 11 - Root Cause Not Known 12 - Bad Intelligent Device Or Component 13 - Out Of Calibration 14 - Special Instructions 15 - Data Valid But Above Normal Operating Range Least Severe Level 16 - Data Valid But Above Normal Operating Range Moderately Severe Level 17 - Data Valid But Below Normal Operating Range Least Severe Level 18 - Data Valid But Below Normal Operating Range Moderately Severe Level 19 - Received Network Data In Error 20 - Data Drifted High 21 - Data Drifted Low 22-30: Reserved For SAE Assignment 31 - Condition Exists

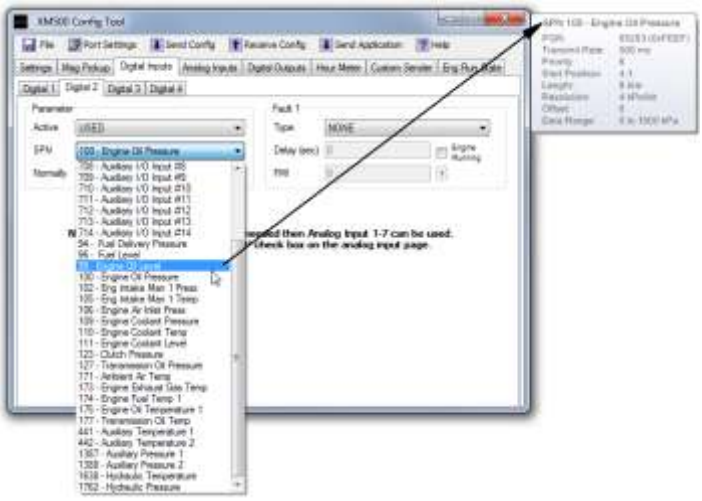
Digital Inputs Tab

There are four identical digital input screens available, Digital 1 through Digital 4. You can define one fault condition for each active parameter.

Digital Inputs Tab

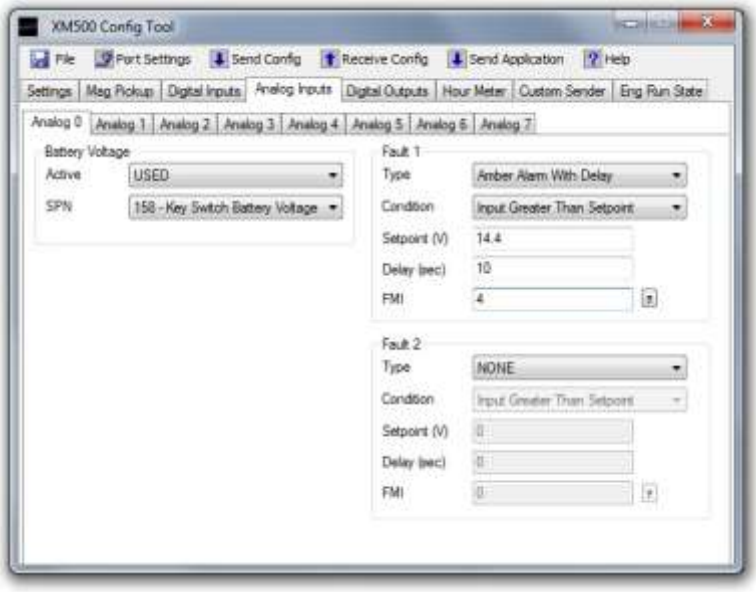
The following table lists text boxes, their descriptions, and actions that can be taken on the Digital Inputs Tab. Additional **F1 Help** is available on two items: SPN and FMI [?]

Text Boxes & Check Boxes	Description
Parameter - Active	Select Used or Unused from the drop-down list. Choose Used and other fields on the screen become available.

Parameter - SPN	This drop-down list contains SPNs (Suspect Parameter Number) and SPN descriptions. Press the F1 key while you are in the SPN list for detailed information associated with each SPN listed. Click the SPN to select it. 
Parameter - Normally	Select Normally OPEN or Normally CLOSED
Fault 1 - Type	Select the fault type for the active parameter. Options are: • None • Amber Alarm With Delay • Amber Alarm Without Delay • Red Alarm With Delay • Red Alarm Without Delay
Fault 1 – Delay (sec)	If you selected an ALARM with a delay, enter the number of seconds the AMBER or RED Alarm condition must be present before the alarm message is sent.
Engine Running checkbox ☑	Select the **Engine Running** checkbox if Fault 1 requires the engine to be running before the fault message is broadcast. Typical usage: Low oil pressure. See the **Eng Run State** Tab for more information.
Fault 1 - FMI	(Failure Mode Indication) Click Help ? associated with the FMI text box for a list of failure modes, and enter the most appropriate selection. See FMI sample on page 21

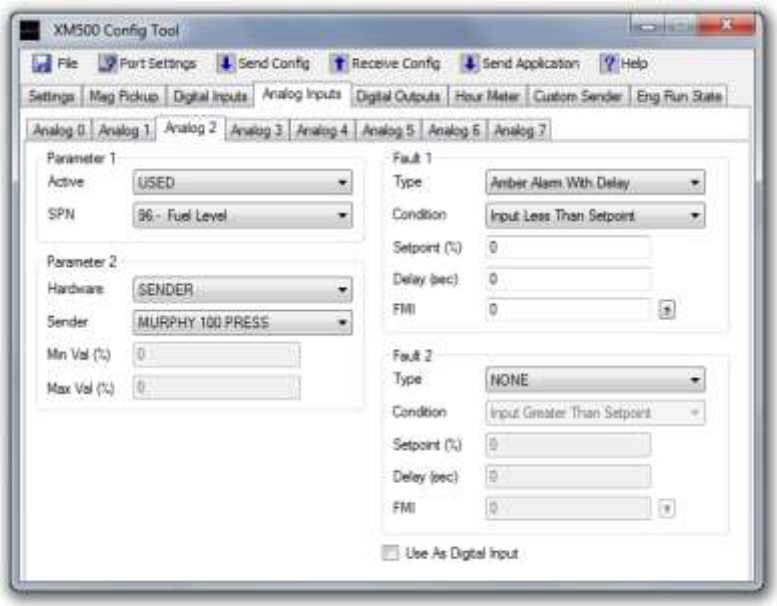
Analog Inputs Tab

There are eight Analog Input screens. Analog 0 (zero) is dedicated to Battery Voltage measured on the Plus (+) and Minus (–) of the XM500. Analog 1 (one) through Analog 7 are identical, but can change depending on selections made on other tabs or in the **Hardware** drop-down lists.



Analog Inputs – Analog 0, Battery Voltage

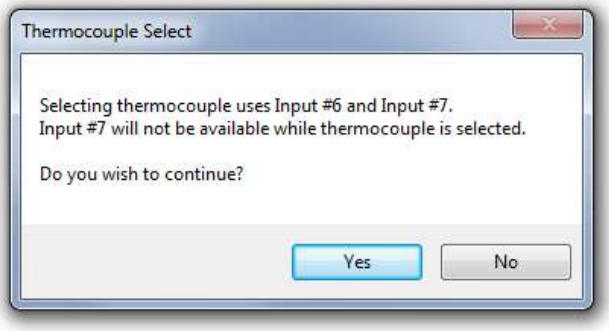
TIP: Fault Value Setpoint can be extended by one decimal point, for example 14.4V.



Analog Inputs – Analog 1 through 7 Example

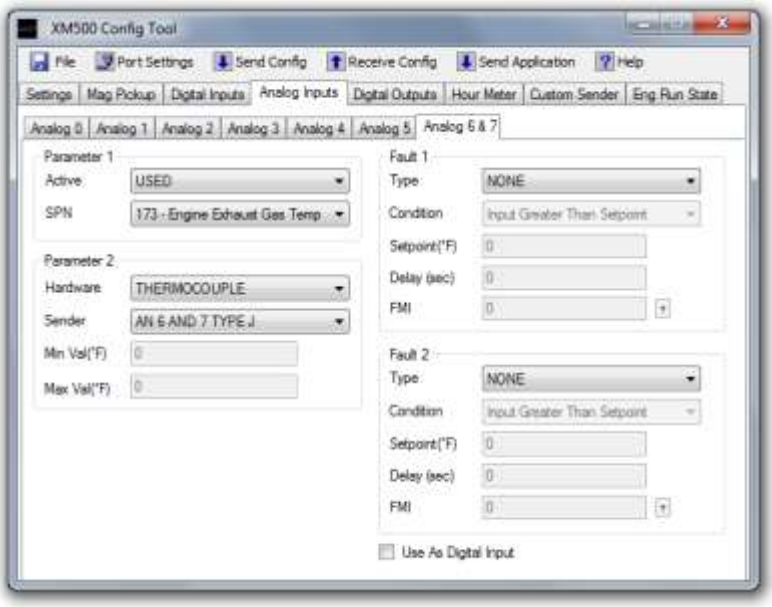
Analog Thermocouple

If you select **Thermocouple** (from the **Hardware** drop-down list) when on the **Analog 6** Tab, Tabs 6 and 7 merge. A thermocouple input requires two analog inputs, and will by default use Input 6 and Input 7. You will see the following message:



Thermocouple message

> **NOTE**: When **Thermocouple** is selected, the only valid SPN choices are: SPN 173 - Engine Exhaust Gas Temp; SPN 175 - Engine Oil Temp; SPN 177 - Transmission Oil Temp.



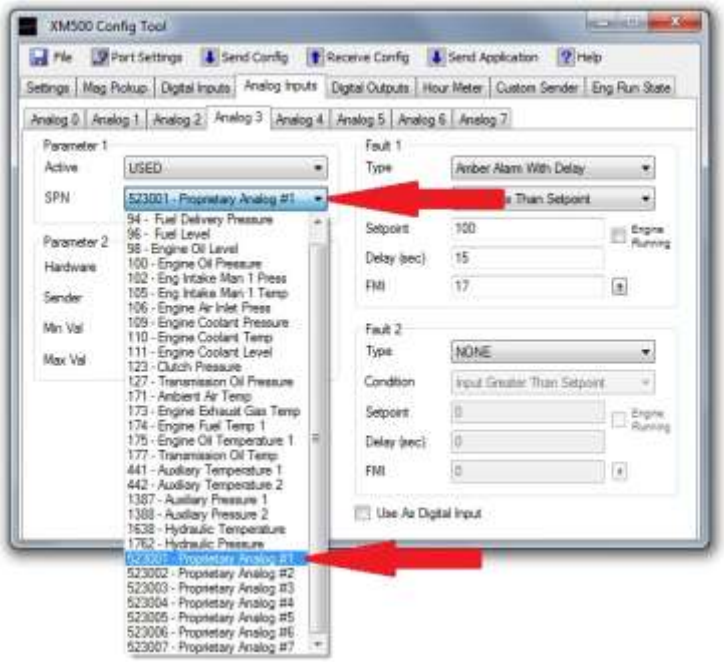
Analog Inputs - Merged tabs 6 & 7 when Thermocouple is selected

Proprietary Analog SPN Options

Seven (7) proprietary* 16-bit Analog Suspect Parameter Numbers (SPNs) have been added to the SPN drop-down list. These allow you to custom configure Analog Inputs.

> NOTE: If you have previously configured your system using the listed J1939 numbers, remember you cannot use the same SPN for more than one input.

*Proprietary indicates specific Suspect Parameter Numbers defined as such by ISO or J1939-standards.



Analog Inputs – Proprietary SPNs

Proprietary SPN and PGN Tables

SPN	PGN	Name	1-based Start Byte	1-based Start Bit	Bit Length	1 unit / bit Resolution	Offset	Min Value	Max Value
523001	65350	Analog 1 In	1	1	16	1	0	0	32767
523002	65350	Analog 2 In	3	1	16	1	0	0	32767
523003	65350	Analog 3 In	5	1	16	1	0	0	32767
523004	65350	Analog 4 In	7	1	16	1	0	0	32767
523005	65351	Analog 5 In	1	1	16	1	0	0	32767
523006	65351	Analog 6 In	3	1	16	1	0	0	32767
523007	65351	Analog 7 In	5	1	16	1	0	0	32767

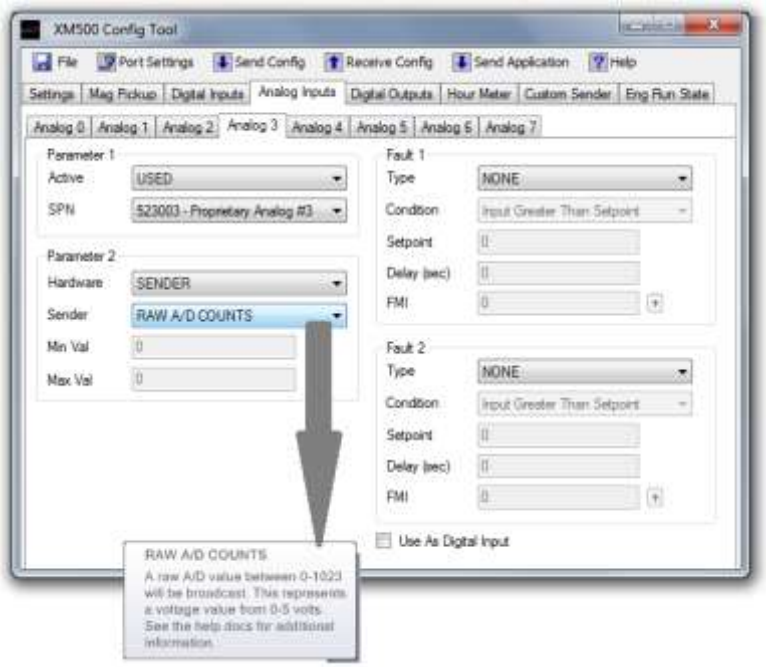
SPN	PGN	Name	1-based Start Byte	1-based Start Bit	Bit Length	1 unit / bit Resolution	Offset	Min Value	Max Value
	65352	Digital Out 1	1	1	2	1	0	0	3
	65352	Digital Out 2	1	3	2	1	0	0	3

Digital Out PGN is received by the XM500.

DIGITAL OUT STATES:	
0 = OFF (Off means outputs are floating)	**2** = Error (This state turns output OFF)
1 = ON (On means outputs are sinking current)	**3** = NOT USED (This state turns output OFF)
If configured to use external out control, and PGN65352 is not received for 3 seconds, then outputs turn off.	

Sender Raw A/D Counts

Select this to place raw A/D values into the specified SPN. This data can be received and scaled by other devices on the CANBUS. **However**, it is recommended this option only be used if you are completely familiar with manipulating raw data. It is also recommended you use SPN 523001 to SPN 523007 to broadcast these values.



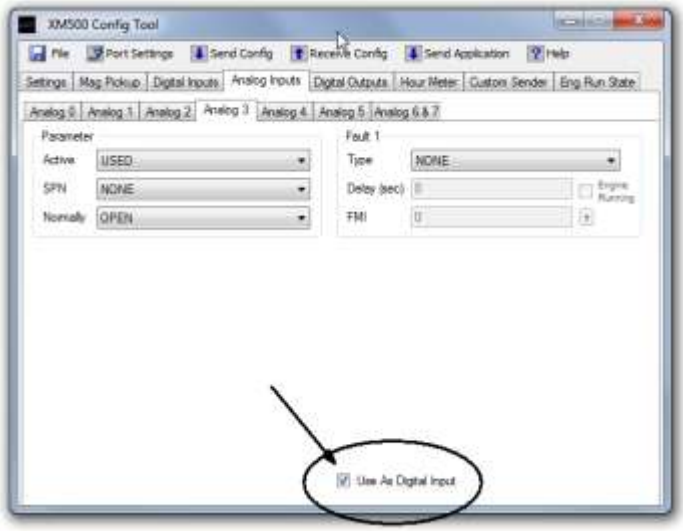
Analog Inputs – Raw A/D Counts

Fields and Descriptions Table

The following text boxes, check boxes, and descriptions apply to Analog Inputs 0 to 7.

Text Boxes & Check Boxes	Description
Parameter 1 – Active	Select Used or Unused from the drop-down list to indicate this input is active. Choose Used and other text boxes or drop-down lists on the screen become available.
Parameter 1 – SPN	Suspect Parameter Number – The SAE J1939 assigned parameter number. In addition to the standard SPNs, this tab also offers 7 proprietary 16-bit Analog SPNs on two PGNs: 65350 and 65351. For more information, see the section on **Proprietary Analog SPN Options** in this document.
Parameter 2 – Hardware	Select Sender, 4-20 ma, or 0-5V. With your cursor in the field, press **F1** for more information. Default Values: 4-20 mA Min A/D 183, Max A/D 905 0-5V Min A/D 0, Max A/D 1023 Sender Select a sender type from the next field.
Parameter 2 – Sender	Select the type of sender from the drop-down list. If you choose 4-20 ma or 0-5V in the Hardware drop-down list, the Sender drop-down list becomes unavailable. If Custom Sender 1 or 2 are selected, the Custom Sender Tab must be completed. See the Custom Sender Tab on page 35 for more information. **TIP -** The Murphy 100 Pressure sender has the same set-points as a Murphy Fuel Sender. You can use the Murphy 100 Pressure sender when you select SPN 96-Fuel Level.
Parameter 2 – Min Val (xxx)	Depending on the selections you made in the SPN, Hardware, and Sender lists, this text box may be unavailable. ► The value definition shown in (parentheses) changes depending on your selection in the SPN list. Enter a Minimum value.

Parameter 2 – Max Val (xxx)	Depending on the selections you made in the SPN, Hardware, and Sender lists, this text box may be unavailable. ► The value definition in (parentheses) changes depending on your selection in the SPN list. Enter a Maximum value.
Parameter 2 – Min A/D	If you selected **Show Extended Options on Analog Pages** in the **Settings** Tab, the true minimum count for the analog-to-digital converter associated with each channel will show in this text box. The Min A/D and Max A/D text boxes show on each Analog Input screen when this option is enabled. ► If you change the Hardware drop-down list from Sender to 4-20ma or 0-5V, the digital counts automatically fill. The 0-5V is the full range and shows the actual A-to-D counts. 4-20ma is scaled, but contains the necessary counts between 4 milliamps and 20 milliamps. Both are 10-bit analog to digital.
Parameter 2 – Max A/D	If you selected **Show Extended Options on Analog Pages** on the Settings Tab, the true maximum count for the analog to digital converter associated with each channel will show in this text box. The Min A/D and Max A/D text boxes show on each Analog Input screen when this option is enabled. ► If you change the Hardware drop-down list from Sender to 4-20ma or 0-5V, the digital counts automatically fill. The 0-5V is the full range and shows the actual A to D counts. 4-20ma is scaled, but contains the necessary counts between 4 milliamps and 20 milliamps. Both are 10-bit analog-to-digital.
Fault 1 and Fault 2 – Type	Select the fault type for the active parameter. Options are: • None • Amber Alarm With Delay • Amber Alarm Without Delay • Red Alarm With Delay • Red Alarm Without Delay
Fault 1 and Fault 2 – Condition	This is the condition that triggers the alarm. Select greater or less than the set point fixed for the first alarm.
Fault 1 and Fault 2 – Set point (rpm)	Entering a set point allows use of a condition to trigger an alarm.

Engine Running	Engine Running is used as a condition to determine if the engine is running. See the **Eng Run State Tab** on page 36 for more information.
Fault 1 and Fault 2 – Delay (sec)	If you selected an ALARM with a delay, enter the number of seconds the AMBER or RED Alarm condition must be present before the alarm message is sent.
Fault 1 and Fault 2 – FMI	Failure Mode Indication Click Help [?] associated with the FMI text box for a list of failure modes and enter the most appropriate selection. See the FMI sample on page 21.
Use as Digital Input 	Select the check box to emulate a digital input. The screen changes to mirror a Digital Input screen. For more information on **Digital Inputs**, see page 22. 

Digital Outputs Tab

> **NOTE**: If you are using proprietary Digital Out PGNs (65352- 1 and 2), and have checked **External Output Control** on the **Settings** tab, the normal Shutdown and Warning output parameter settings are disabled.

Two screens are available under this tab: **Shutdown Output (DO1)** and **Warning Output (DO2)**. If any of the parameters being monitored by the XM500 contain a red alarm, the Shutdown triggers. If any of the parameters contain an amber warning, the Warning triggers. The Warning Output can be used as an “Engine Running” Output by selecting the **Engine Running Output** check box on the Warning screen.

> **NOTE:** The **Active** drop-down list on the **Eng Run State** tab must be “Used” or the **Engine Running Output** check box is disabled on the **Digital Outputs** tab.

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Digital Outputs - Shutdown

The following text boxes, check boxes, and descriptions apply to the Shutdown Output.

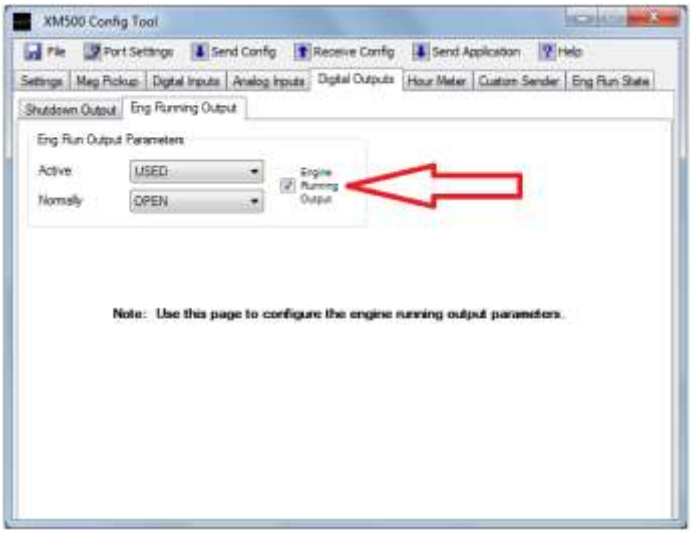
Shutdown Output

Text Boxes & Check Boxes	Description
Shutdown Output Parameters – Active	Select Used or Unused from the drop-down list.
Shutdown Output Parameters – Normally	Select Normally OPEN (the output is switched to ground when a fault occurs) or Normally CLOSED (the output becomes ungrounded when a fault occurs).

Digital Outputs - Warning

Warning Output

Text Boxes & Check Boxes	Description
Warning Output Parameters – Active	Select Used or Unused from the drop-down list.
Warning Output Parameters – Normally	Select **Normally OPEN** (the output is switched to ground when a fault occurs) or **Normally CLOSED** (the output becomes ungrounded when a fault occurs).
Engine Running Option	Select the check box to convert the Warning Output screen to the Eng Running Output screen.



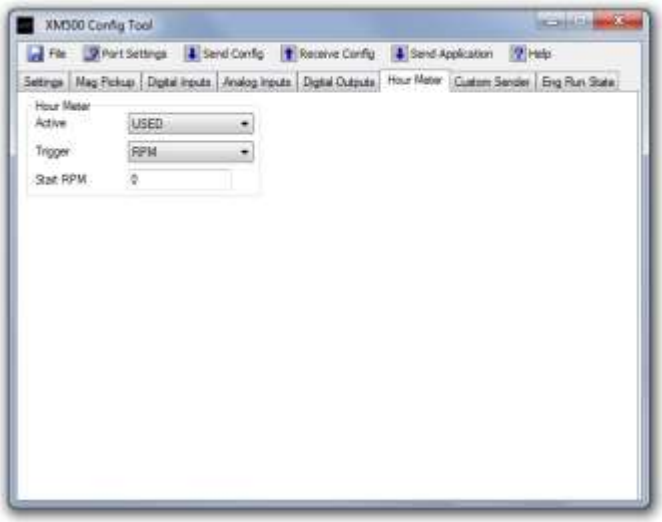
Digital Outputs – Eng Running Output

Eng Running Output

Text & Check Boxes	Description
Warning Output Parameters – Active	Select Used or Unused from the drop-down list.
Warning Output Parameters – Normally	Select Normally OPEN (the output is switched to ground when a fault occurs) or Normally CLOSED (the output becomes ungrounded when a fault occurs).
Engine Running Option	Clear the check box to convert the Eng Running Output screen to the Warning Output screen.

Hour Meter Tab

Setting the **Active** drop-down list to **Used** records the amount of time the engine is running. The trigger can be either RPM or one of the Digital Inputs. **Start RPM** is available if RPM is used as a trigger.



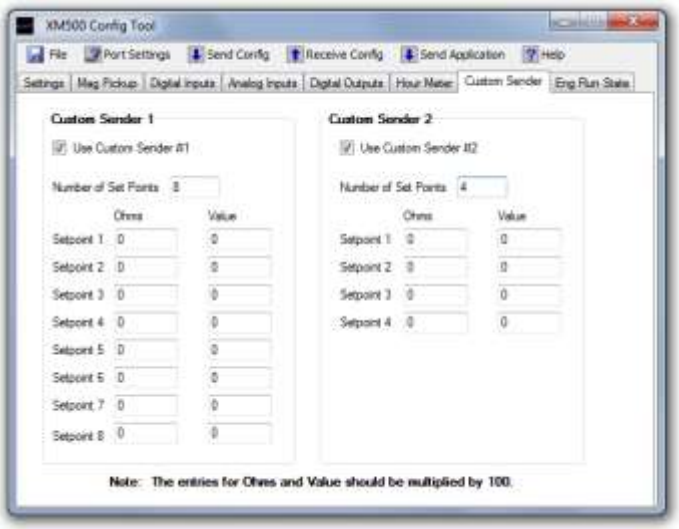
Hour Meter screen

TIP - If you select a **Digital Input** or **Analog as Digital input**, the screen that corresponds to the trigger item must be active.

Text & Check Boxes	Description
Hour Meter – Active	Select Used or Unused from the drop-down list. Choose Used and the other text boxes on the screen become available.
Hour Meter – Trigger	Select the event to start the tracking action.
Hour Meter – Start RPM	If your Trigger is RPM, enter the RPM at which the XM500 will begin to keep track of the time the engine is running.

Custom Sender Tab

Use the Custom Sender Tab when you have a specific sender curve not covered by one in the application.

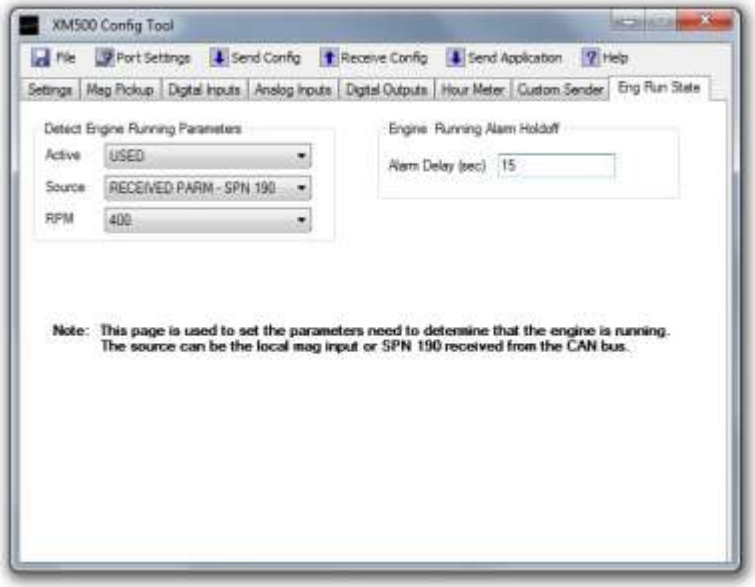


Custom Sender Tab

Text & Check Boxes	Description
Use Custom Sender #1	If you selected a **Custom Sender** option on an **Analog** screen (from the Parameter 2 – Sender list), select this to enable **Custom Sender #1**.
Number of Set Points	Enter the number of plot points for a sender curve. The range is 2 to 8. Move the cursor from the box and the set points readjust to the number of points selected. If a value outside the range is entered, an error message displays.
Set point 1 through 8	Enter **Ohms** and **Values** for each set point on the curve. Find this information on data sheets provided by the sender manufacturer.
Use Custom Sender #2	If you selected a **Custom Sender** option on an Analog screen (from the Parameter 2 – Sender drop-down list), select this check box to enable **Custom Sender #2**.
Number of Set Points	Enter the number of plot points along the sender curve. The range is 2 to 8. Move the cursor and the set points readjust to the number of points you selected. If a value outside the range is entered, an error message displays.
Set point 1 through 8	Enter the **Ohms** and **Values** for each set point on the curve. Find this information on the data sheets provided by the sender manufacturer. Only set points selected in **Number of Set Points** display.

Eng Run State Tab

Set conditions on the **Engine Run State Tab** to determine when the engine is running. The source can be **SPN 190** received off the CANBUS or off the **Magnetic Pick up**. All analog and digital faults can use **Engine Running** as a condition. See **Digital Inputs** (page 22) and **Analog Inputs** (page 24) for more information.



Engine Run State Tab

TIP: For some analog parameters, you will want to delay alarms on start-up until the RPM reaches a starting threshold. Use **Engine Running Alarm Holdoff** to set a delay at initial start-up to allow the engine to reach threshold. This allows oil pressures, etc. time to come up before alarms and warnings activate.

The following table lists text boxes, their descriptions, and actions that can be taken on the Eng Run State Tab.

Text Boxes & Check Boxes	Description
Detect Engine Running Parameters – Active	Select **Used** or **Unused** from the drop-down list. Choose **Used** and other text boxes on the screen become available.
Detect Engine Running Parameters – Source	Select a source for the **Engine Running** message. **Received Parameter – SPN 190** indicates the message is received off the CANBUS. **Mag Pickup Input** indicates it is a magnetic input (For more information, see the **Mag Pickup Tab** - page 18).
Detect Engine Running Parameters – RPM	Select the threshold at which the Engine Running message is sent. The range is 100 RPM to 1000 RPM.
Engine Running Alarm Holdoff – Alarm Delay (sec)	Enter the number of seconds you want to delay alarms on start-up. Entering a number in this field sets a delay at initial start-up to allow oil pressures or other parameters to come up to threshold before alarms and warnings activate.

Pre-Programmed Resistive Senders

This section contains the Pre-programmed Resistive Sender Curve tables that are available for selection on the **Analog Tab** screens.

*The Murphy 400 Pressure table is not pre-programmed, and is shown here for reference only. Review this information when filling out Custom Sender 1 or Custom Sender 2 tables.

VDO 250 Temperature

OHMS	Fahrenheit	Celsius
22	250	121.11
29.4	230	110.00
34	220	104.44
38	210	98.88
46	200	93.33
51.3	190	87.77
62	180	82.22
92	160	71.11
134	140	60.00
190	120	48.88
287.4	100	37.77

VDO 300 Temperature

OHMS	Fahrenheit	Celsius
18.6	300	148.88
23	280	137.77
31	260	126.66
42	240	115.55
57	220	104.44
76	200	93.33
105.7	180	82.22
135	160	71.11
322.8	120	48.88
1000	75	23.88
3600	25	-3.88
4740	5	-15.00

VDO 320 Temperature

OHMS	Fahrenheit	Celsius
80	320	160.00
99	300	148.88
128	280	137.77
170	260	126.66
237	240	115.55
350	220	104.44
490	200	93.33
750	180	82.22
1130	160	71.11
1815	140	60.00

VDO 400 Temperature

OHMS	Fahrenheit	Celsius
14.5	400	204.44
18	370	190.55
23	350	176.66
30.5	325	162.77
41	300	148.88
56	275	135.00
82	250	121.11
120	225	107.22
182	200	93.33
270	175	79.44
482.5	150	65.55

VDO 30 Pressure

OHMS	PSI	KPA
7.5	0	0
45	5	34.47
70	10	68.94
100	15	103.42
128	20	137.89
164	25	172.36
195	30	206.84

VDO 80 Pressure

OHMS	PSI	KPA
10	0	0
36	10	68.94
61	20	137.89
84	30	206.84
108	40	275.79
132	50	344.73
156	60	413.68
179	70	482.63
192	80	551.58

VDO 100 Pressure

OHMS	PSI	KPA
10	0	0
34	10	68.95
52	20	137.90
69	30	206.84
84	40	275.79
97	50	344.74
108	60	413.69
121	70	482.63
137	80	551.58
155	90	620.53
180	100	689.48

VDO 150 Pressure

OHMS	PSI	KPA
10	0	0
26	10	68.95
40	20	137.90
53	30	206.84
67	40	275.79
78	50	344.74
90.5	60	413.69
103	70	482.63
115	80	551.58
127	90	620.53
138	100	689.48
149	110	758.42
160	120	827.37
178	140	896.32
189.5	150	965.27

VDO 400 Pressure

OHMS	PSI	KPA
10	0	0
36	50	344.73
66	100	689.47
82	150	1034.21
103	200	1378.95
125	250	1723.68
141	300	2068.42
161	350	2413.16
184	400	2757.90

MURPHY 100 Pressure/Fuel Level

OHMS	PSI	KPA
33	100	689.48
47	90	620.53
60	80	551.58
74	70	482.63
88	60	413.69
103	50	344.74
123	40	275.79
143	30	206.84
171	20	137.90
205	10	68.95
240	0	0

MURPHY 300 Temperature

OHMS	Fahrenheit	Celsius
25.3	300	148.88
40	284	140.00
52	266	130.00
74	248	120.00
89	230	110.00
120	212	100.00
164	194	90.00
227	176	80.00
321	158	70.00
680	122	50.00
1029	104	40.00
1594	86	30.00
3127	60	15.55
7833.7	30	-1.11
14425	5	-17.75

MURPHY 30 Pressure

OHMS	PSI	KPA
10	0	0
92	1	6.90
36.6	5	34.47
64	10	68.95
91	15	103.42
120	20	137.90
146.5	25	172.37
180	30	206.54

MURPHY 400 Pressure (for reference only)

OHMS	PSI	KPA
33	400	2758
47	360	2482
60	320	2206
88	240	1655
103	200	1379
143	100	827
171	80	552
240	0	0

YANMAR 114 Pressure

OHMS	PSI	KPA
12	114	786.00
43	57	393.00
83	0	0

YANMAR 100 Temperature

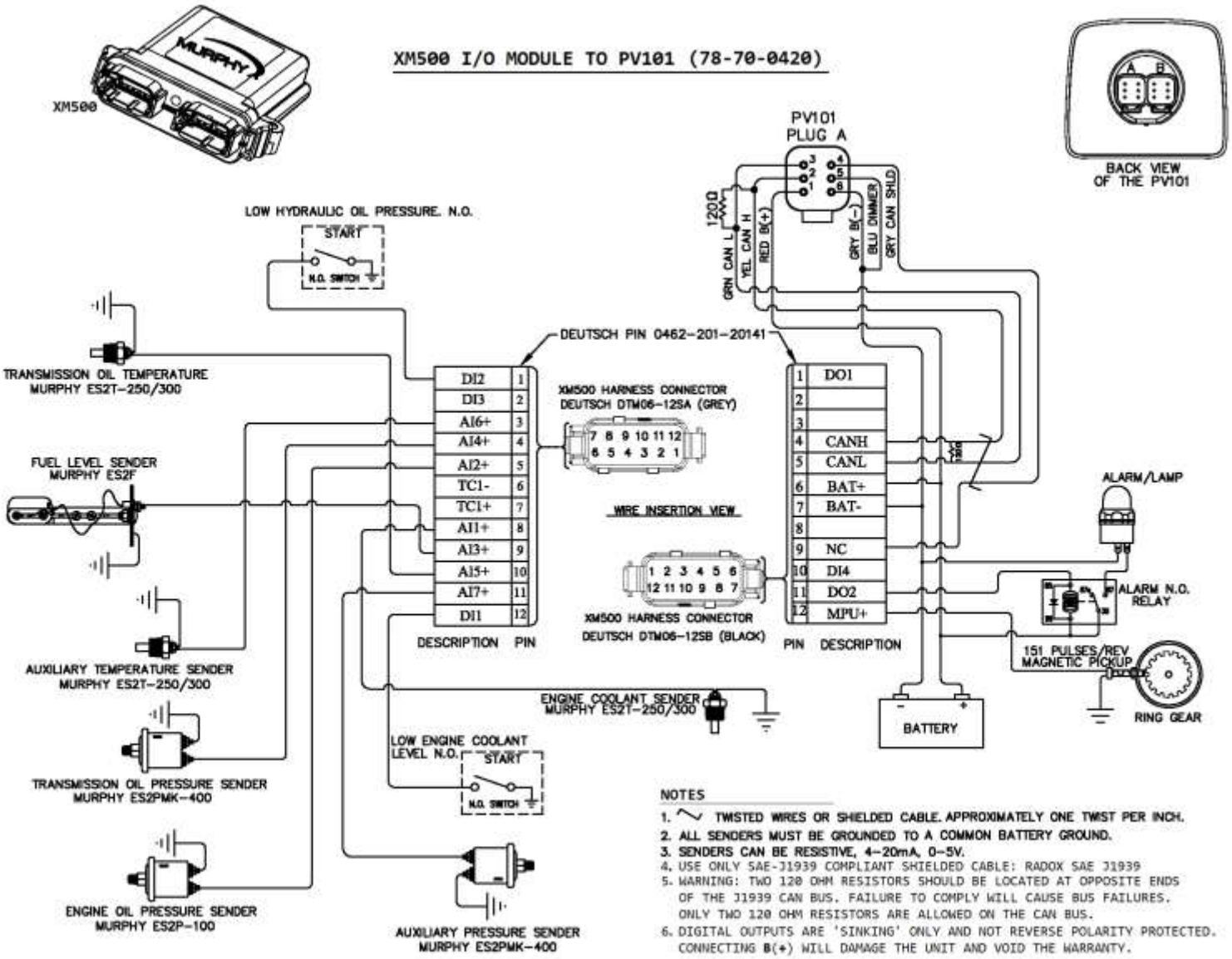
OHMS	VAL(F)	VAL(C)
63.5	212	100
170	158	70
350	122	50
770	86	30
1000	32	0

Menu Bar

There are six options on the menu bar; File, Port Settings, Send Config, Receive Config, Send Application, and Help. The following table lists the options in the drop-down menus and associated descriptions.

FILE **New Config** – Nothing is entered or saved. This is the default when the application opens. **Open Config** – To open a file in a working directory or folder on the PC. You can navigate to this location. **Save Config** – If changes were made to an open config, this saves the config and changes to the same location. **Save Config as**…- Rename and save the config. It is saved in the last place it was located. **Exit** – Closes the application.
PORT SETTINGS Scans the available communication ports and reports which are connected to an XM500.
SEND CONFIG Sends the currently loaded configuration to the XM500. If cables are not properly connected or switches are not in the correct position, warning messages alert you to the problems.
RECEIVE CONFIG Uploads the configuration currently residing on the XM500 controller to the PC.
SEND APPLICATION Sends the XM500 software from the PC to the XM500 controller.
HELP **Documentation** – Brings up the file that contains installation instructions and information on using the application. **About** – Contains the Version and Copyright information. **Diagnostic Window** – Brings up the Diagnostic Window. Customer Service may ask you to access this window if you need troubleshooting assistance.

Wiring Diagram Example



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