maximatecc

maxAI 430i,maxAI 430iv Technical Manual

Table of Contents

Scope and Use of This Manual

…provide the reader with enough background information to understand the overall operation of the maxAI 430iv…

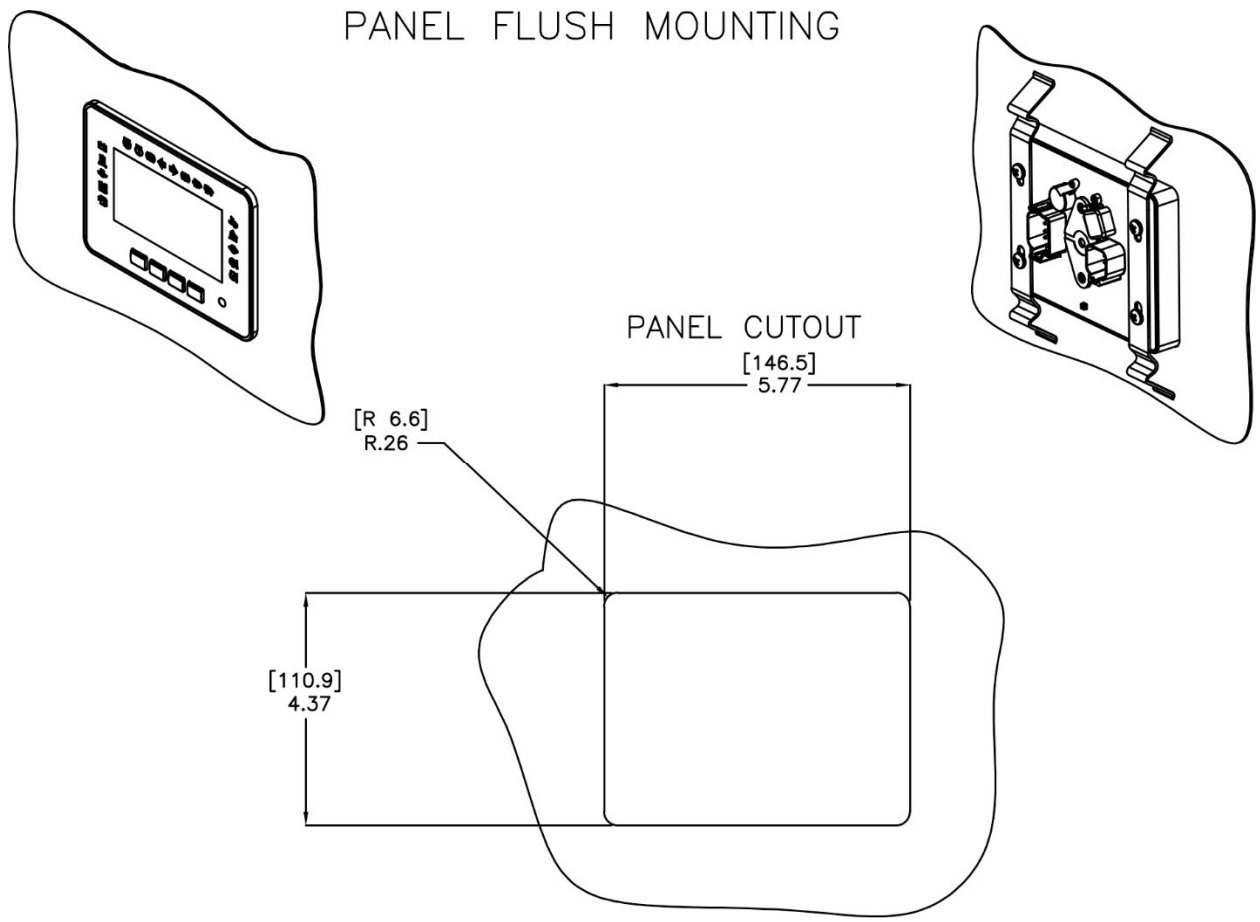
The intent of this manual is to provide the reader with all of the information required to install and troubleshoot the maxAI 430iv display, as well as to provide background information regarding the overall operation of a data-bus. Additional data-bus information not covered in this manual is available from the SAE.

The user is expected to have a basic knowledge of the vehicle's electrical wiring, circuits, and schematics as well as operating parameters normally displayed on an instrument cluster, such as engine RPM, vehicle speed, engine temperature, transmission temperature, engine oil pressure, transmission oil pressure, etc.

Installation Instructions

maxAI 430iv Flush Mounting

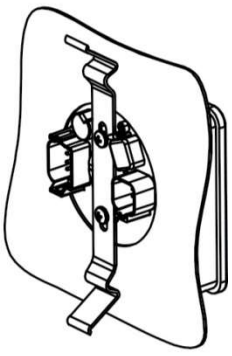
- Recommended panel cut-out size for flush mounting is 146.5mm (5.77”) x 110.9mm (4.37”) with 6.6mm (0.26”) radius on the corners.
- Insert the instrument in the panel and secure the brackets over the mounting points using supplied washer and screw.
- Tighten the screws (5 to 6 in.-lb.) to secure the instrument.



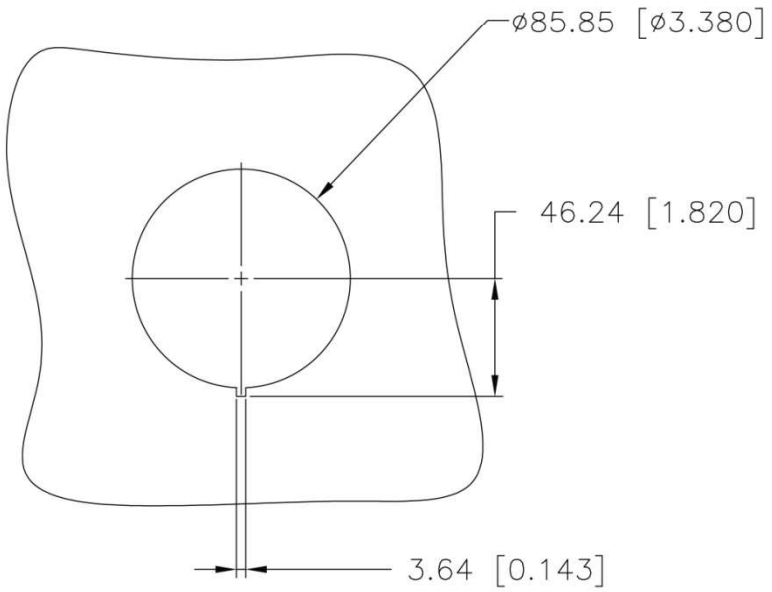
maxAI 430v Hole Mounting

- Recommended panel cut-out size for 3" hole mounting is 85.8mm (3.38".)
- Insert the instrument in the panel and secure the brackets over the mounting points using supplied washer and screw.
- Tighten the screws (5 to 6 in.-lb.) to secure the instrument.

PANEL 3" HOLE MOUNTING



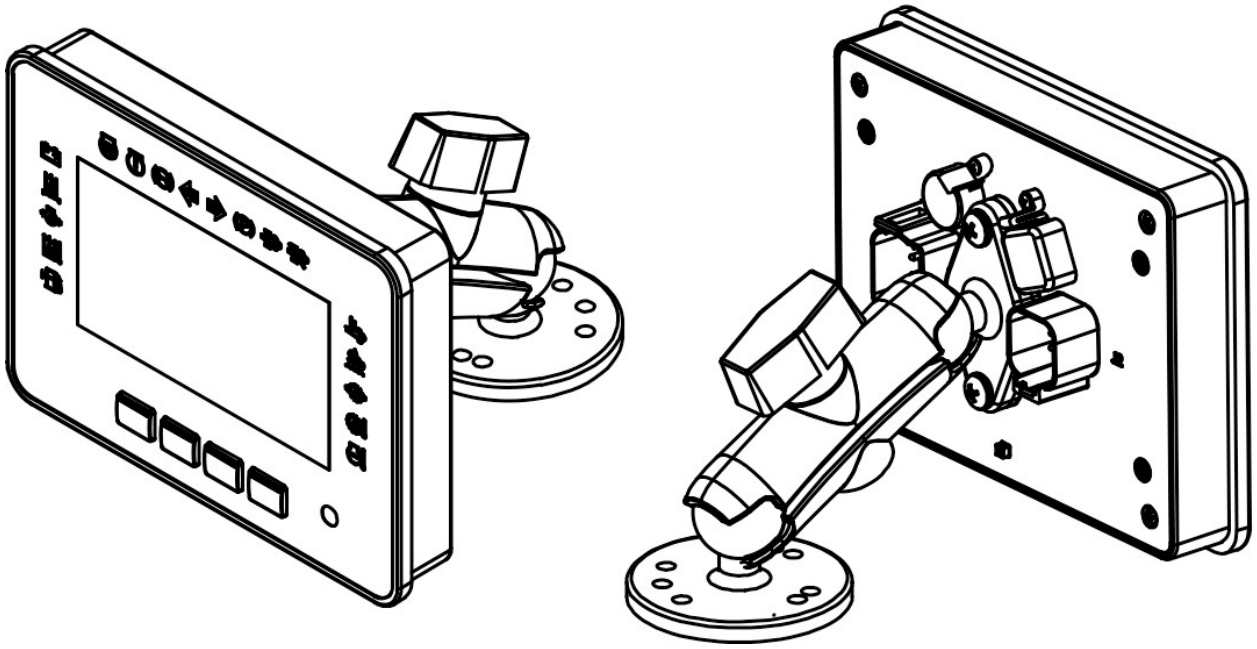
PANEL CUTOUT



maxAI 430v Ram Mounting

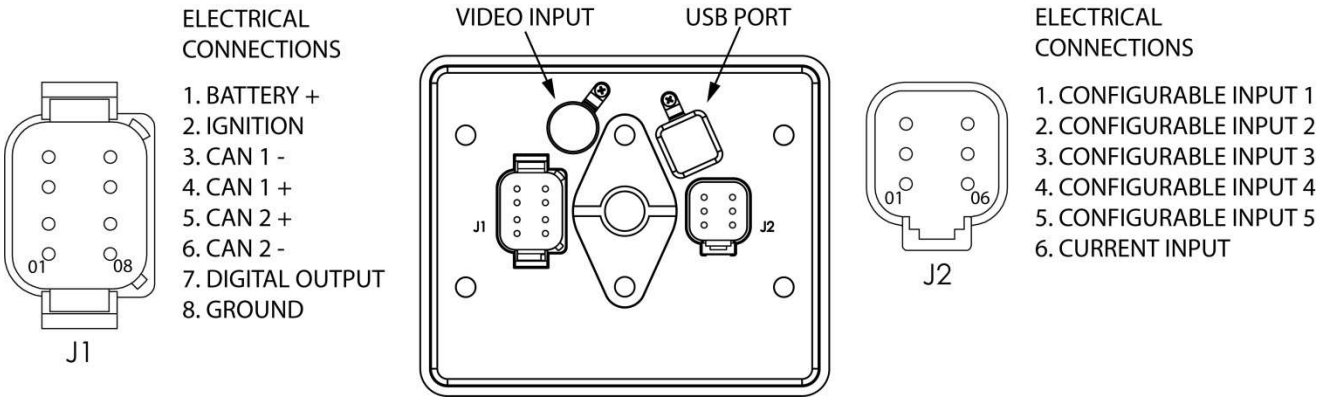
- No panel cut-out is necessary for Ram mounting.
- Determine mounting location for Ram mount and secure the round ball base.
- Secure diamond ball base to the diamond mounting point using supplied washer and screw.
- Tighten the screws (5 to 6 in.-lb.) to secure the instrument.
- Loosen the double socket arm and insert the ball of the diamond base in one end and the ball of the round base in the other end and tighten the double socket arm.

RAM MOUNTING



maxAI 430iv Wiring

Both connectors are used to make the electrical connections.



CONNECTOR J1

- Connect Pin (1) to the positive side of the battery.
- Connect Pin (2) to the positive side of the battery, through the ignition switch.
- Connect Pin (3) to data-bus 1 - (J1939 ONLY).
- Connect Pin (4) to data-bus 1 + (J1939 ONLY).
- Connect Pin (5) to data-bus 2 + (J1939 ONLY).
- Connect Pin (6) to data-bus 2 - (J1939 ONLY).
- Connect Pin (7) to digital output triggered device.
- Connect Pin (8) to Ground

CONNECTOR J2

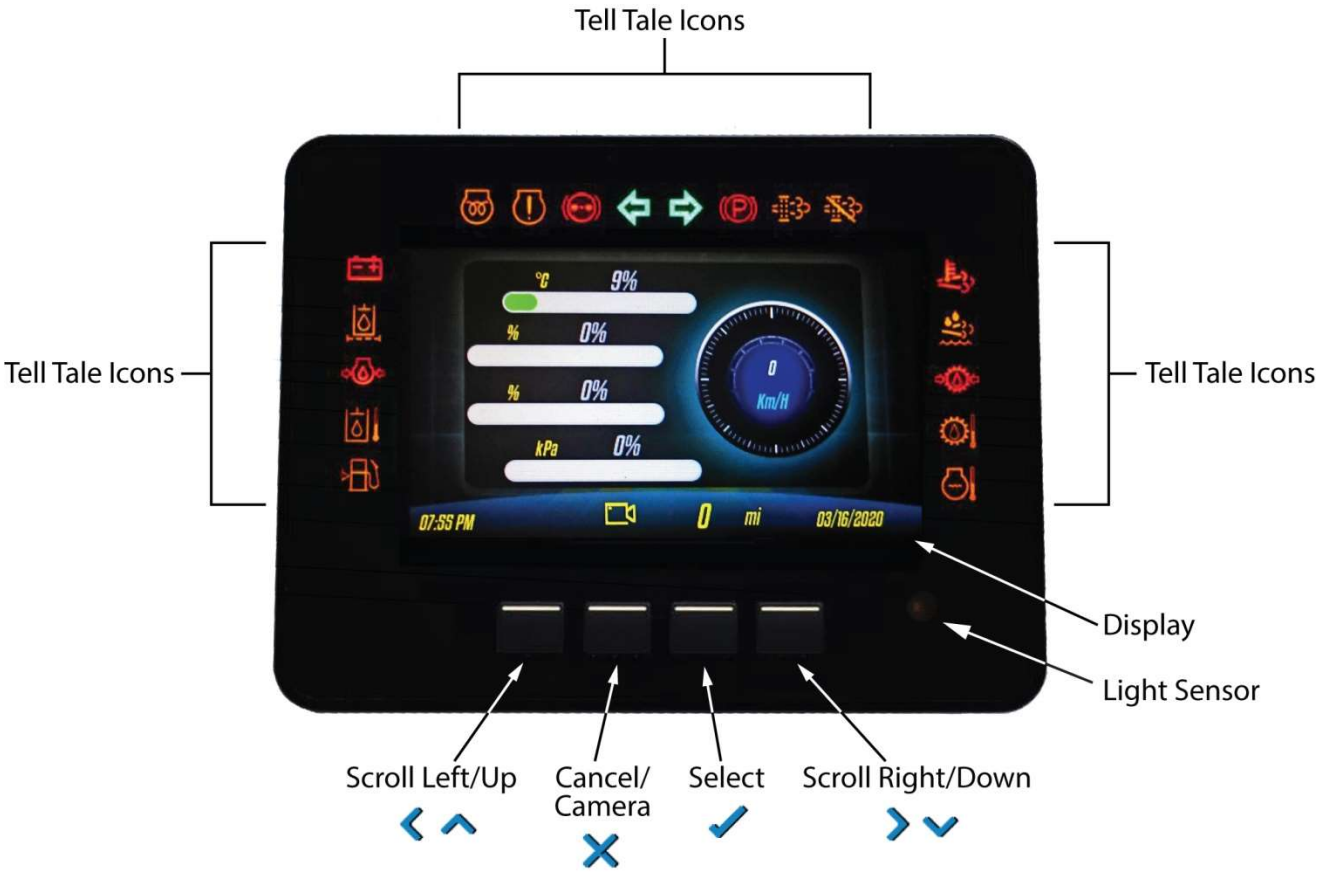
- Connect Pin (1) to analog or digital input (configurable).
- Connect Pin (2) to analog or digital input (configurable).
- Connect Pin (3) to analog or digital input (configurable).
- Connect Pin (4) to analog or digital input (configurable).
- Connect Pin (5) to analog or digital input (configurable).
- Connect Pin (6) to current input

NOTE 1: The instrument does not internally contain a bus termination resistor, per SAE-J1939 specification. See Understanding Data-Bus Operation section for additional information.

NOTE 2: Of the six available inputs, five (1 to 5) can be configured to read voltage, resistance, frequency and digital inputs (LOW/HIGH). One input (6) is dedicated to read current, ideal for 4-20mA sensors. See Appendix C section for additional information.

Display Features

The image below is a detail of the maxAI 430iv display features.

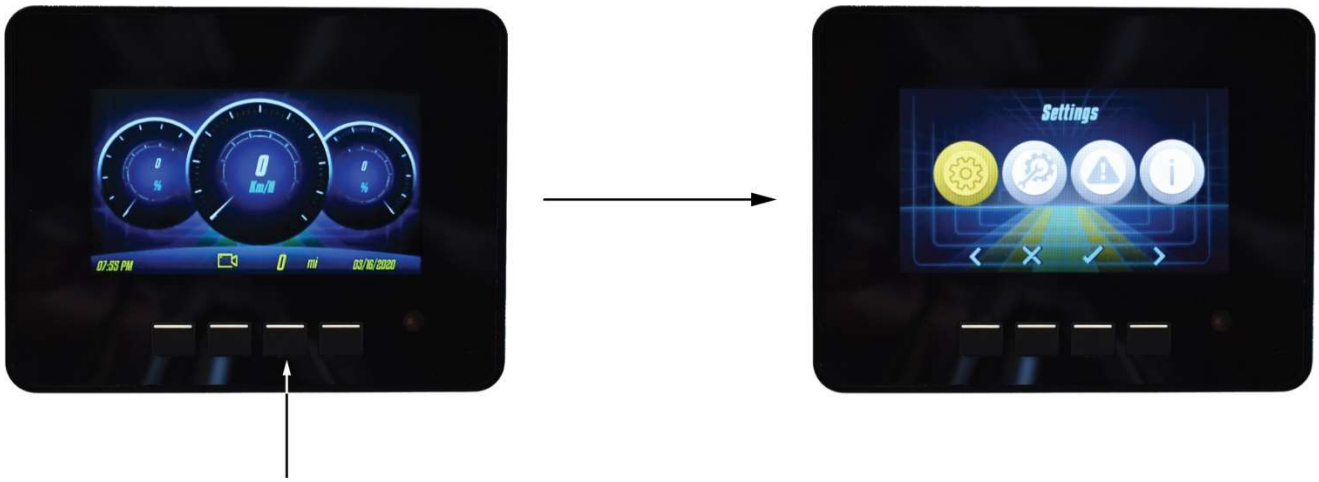


Navigation & Keypad Functions

Select ✓	**Select Key** - Select a menu or parameter
Cancel ✗	**Cancel Key** - Exit a screen or go back
Scroll Up ^	**Up Arrow** - Scroll up through screens or parameters
Scroll Down v	**Down Arrow** - Scroll down through screens or parameters
Scroll Left <	**Left Arrow** - Scroll left through screens or parameters
Scroll Right >	**Right Arrow** - Scroll right through screens or parameters

Basic Navigation

When the 3rd button is pressed, the main menu items are displayed.



Pressing the **Arrow Keys**  will move the menu selector to the other menu items.

Pressing the **Select Key**  on the highlighted menu item will open up the particular menu page.

Pressing the **Arrow Keys** will move the selection bar to other menu items.

When the desired item is highlighted by the selection bar, pressing **Select Key** will select that item.

Pressing the **Cancel Key**  will return to the previous menu page.

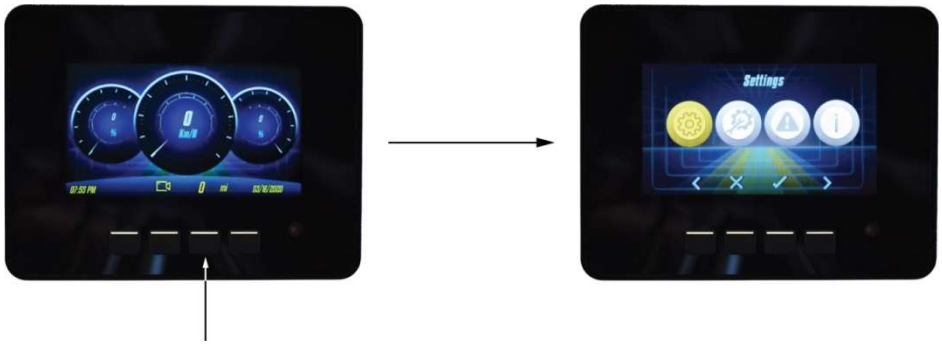
Settings and Menu Options

Getting Started

Basic display settings such as date/time, backlighting, color mode and contrast are adjusted on the maxAI 430iv display. Other instrumentation configurations and controls are performed with the maxAI Configuration Software. See the Configuration Software Installation and Operation Manual for more information.

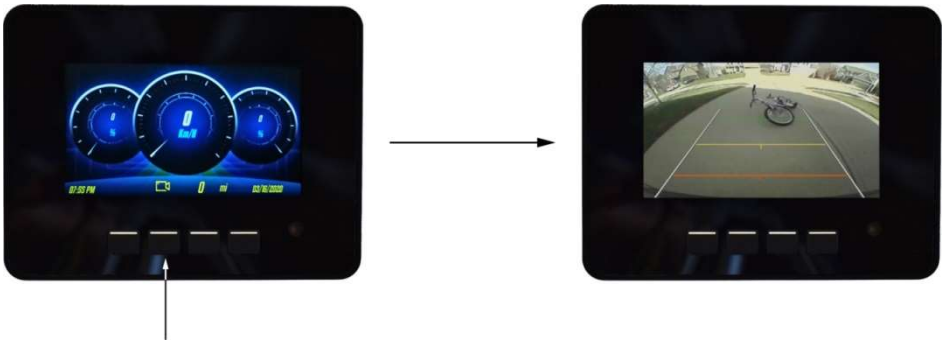
Accessing the Menu

To enter the menu from any of the main screens, press the 3rd button and the 4 menu options will be displayed.



Accessing the Video Input

To view video image from any of the main screens, press the 2rd button. This will switch to video mode and display the video from the attached camera. Press any of the other 3 buttons to return to return. For best video experience, use a camera with 420 lines of resolution.



NOTE : Video functions are currently manually triggered for demo purpose. Future software updates will allow the video to be triggered by a CAN message or analog/digital input as specified for customer application.

Display Menu Navigation

The display menu is broken down into 4 items with sub menus under each item as follows:

1. Settings
    - Date/Time
        - Set Time
        - Set Date
    - Illumination
        - Color Theme
        - Set Brightness
        - Keypad Backlight ON/OFF
    - Language/Units
        - Select Language
        - Select Units
    - Trip Information
        - Reset Trip Hourmeter
        - Reset Trip Odometer
    - Communications
        - Set Baud Rate
    - Service Interval
        - Reset Service
        - Service Enable
        - Service Interval Mode
        - Set Interval
2. Instrument Setup
    - Built-in Configuration
        - Output
        - Screens
    - DPF Regeneration
    - Demo
        - Enable
        - Disable
3. Fault Codes
    - Active Fault Codes
    - Inactive Fault Codes
    - Clear All Fault Codes
4. System Information

Settings

Select settings from main menu by scrolling to **Settings** and pressing the **Select Key**

1-Date/Time

Setting Date/Time

Change the values using the **Arrow Keys** .

Once the value is set, press the **Select Key** to move to the next value. When the **Select Key** is pressed on the last value, the date/time will be set and the screen will return to the **Settings** sub menu.

If an error is made while setting these values, use the **Cancel Key** to return to the previous value.

NOTE: Although date is entered in Day/Month/Year format, it will be displayed in Month/Day/Year format.

2-Illumination

Changing Color Theme

Select **Color Theme**.

Select theme by scrolling to desired theme using the **Arrow Keys**  .

Once the desired color theme is highlighted, press the **Select Key**  to set the color theme. The color theme will be set and the screen will return to the **Illumination** sub menu.

Changing Display Brightness

Select **Set Brightness**.

Adjust the contrast by scrolling up or down using the **Arrow Keys**  .

Once the desired contrast has been reached, set the contrast by pressing the **Select Key**  **.** The contrast will be set and the screen will return to the **Illumination** sub menu.

NOTE: In order to prevent shutoff of the screen, the lowest brightness accepted is 10%. The slider will not go below 10% in order to assure this feature.

Changing Keypad Backlighting

Select **Keypad Backlight**.

Select **ON** or **OFF** by using the **Arrow Keys** . Once the desired backlight has been reached, set the backlight option by pressing the **Select Key** . The keypad backlight will be set and the screen will return to the **Illumination** sub menu.

3-Language/Units

Selecting Language

Select **Language**.

Select language by scrolling to desired language using the **Arrow Keys** .

Once the desired language is highlighted, press the **Select Key** to set the language. The language will be set and the screen will return to the **Language/Units** sub menu.

NOTE: The current version of the maxAI 430iv software only supports English language. Future software updates will include additional language options.

Selecting Units

Select **Units**.

Select units by scrolling to desired unit of measure using the **Arrow Keys**  .

Once the desired unit of measure is highlighted, press the **Select Key**  to set the units. The units will be set and the screen will return to the **Language/Units** sub menu.

4-Trip Information

Resetting Trip Hourmeter

Select **Reset Trip Hourmeter**.

Press the **Select Key** to confirm reset or **Cancel Key** to cancel. At this point the screen will return to the **Trip Information** sub menu.

Resetting Trip Odometer

Select **Reset Trip Odometer**.

Press the **Select Key** to confirm reset or **Cancel Key** to cancel. At this point the screen will return to the **Trip Information** sub menu.

5-Communications

Selecting Baud Rate

Select **Set Baud Rate**.

Select baud rate by scrolling to desired rate using the **Arrow Keys** .

Once the desired baud rate is highlighted, press the **Select Key** to set the rate. The baud rate will be set and the screen will return to the **Communications** sub menu.

Cluster Source Address

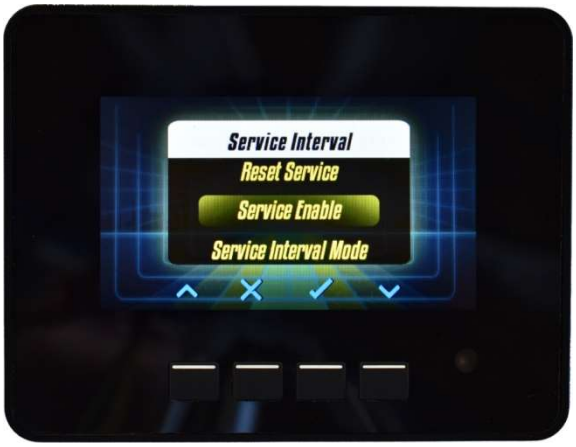
* This feature is currently unavailable.

ECM Source Address

* This feature is currently unavailable.

6-Service Interval

Selecting Service Enable

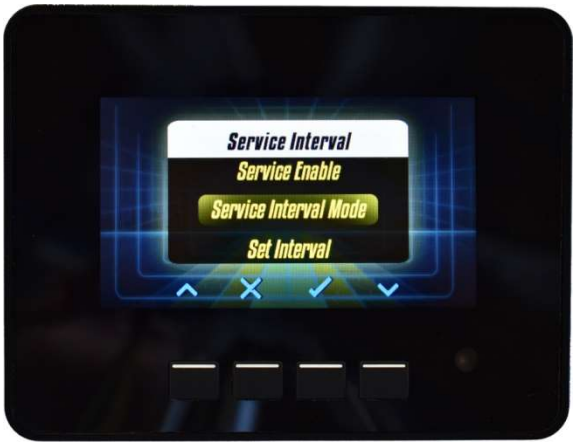


Select **Service Enable**

Select **Enable** or **Disable** by using the **Arrow Keys**  .

Once the desired option is highlighted, press the **Select Key**  to make your selection. At this point the screen will return to the **Service Interval** sub menu.

Selecting Interval Mode



Select **Service Interval Mode**

Select **Odometer** or **Hourmeter** by using the **Arrow Keys** .

Once the desire option is highlighted, press the **Select Key** to make your selection. At this point the screen will return to the **Service Interval** sub menu.

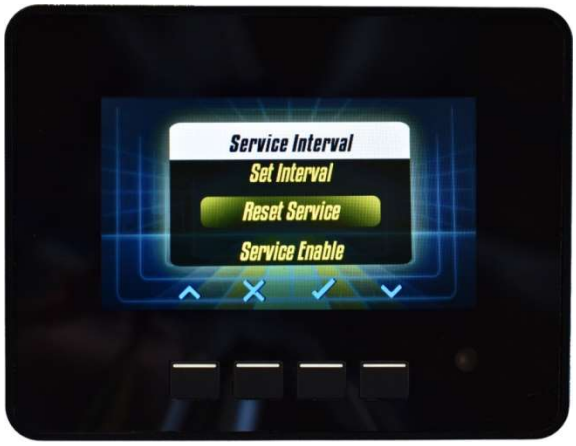
Selecting Set Interval

Select **Set Interval**

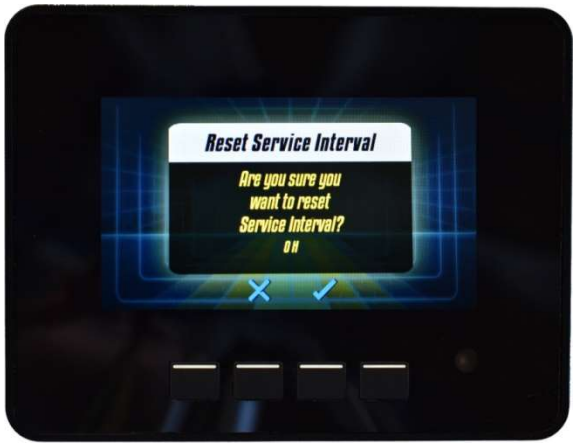
The digit being adjusted will be highlighted. Adjust the digit by using the **Arrow Keys** .

Once the desired value is reached select it and move to the next digit by pressing the **Select Key** . Once all digits are set the screen will return to the **Service Interval** sub menu. If at any point in this process a previous digit needs to be adjusted, press the **Cancel Key** to move backwards through the digits**.**

Reset Service Interval



Select **Reset Service**



A confirmation window will appear. Press the **Select Key** to confirm the reset. If you do not wish to reset, press the **Cancel Key** to return to the service interval sub menu.

Instrument Setup

Select instrument setup from main menu by scrolling to **Instrument Setup** and pressing the **Select Key** 

1-Demo

Turning Demo Mode On/Off

Select **Demo**.

Select Enable or Disable by scrolling to desired option using the **Arrow Keys**  .

Once the desired option is highlighted, press the **Select Key**  to enable or disable the demo mode. At this point the screen will return to the **Instrument Setup** sub menu.

2-Built-In Configuration

Selecting Built-In Configuration

Select **Built-In Configuration**

You will have the option to configure the instrument **Screens** or the instrument **Output** type.

Select **Output** or **Screens** by scrolling to desired option using the **Arrow Keys**  .

Once the desired option is highlighted, press the **Select Key**  .

Setting up **Screens**

Select **Screens**

Use the **Arrow Keys** to scroll through the five available screens. To turn the screen ON/OFF press the **Select Key** while on the highlighted screen.

If screen is turned on, the **Arrow Keys** will allow you to scroll throught the

Layouts.

NOTE: If a screen is already turned on, but you wish to adjust further details of that screen, you must first turn screen off and then back on before proceeding.

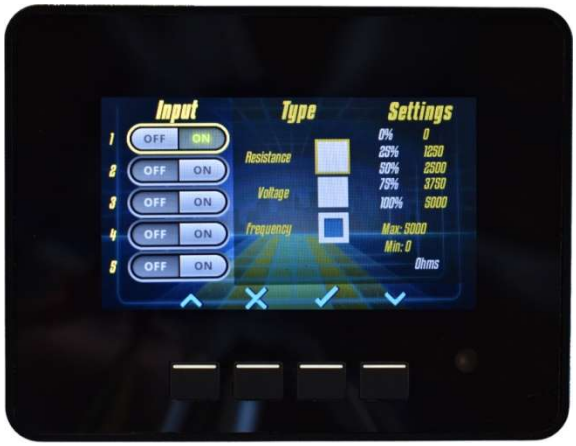
Once the desired screen layout is highlighted, press the **Select Key** to set the screen layout, then once **Edit** is highlighted, press the **Select Key** to set the parameters for each instrument on the new screen.

The instrument to be configured will be highlighted. To adjust the highlighted instrument press the **Select Key** ✓ or use the **Arrow Keys** ^ v to scroll to a diferent instrument.

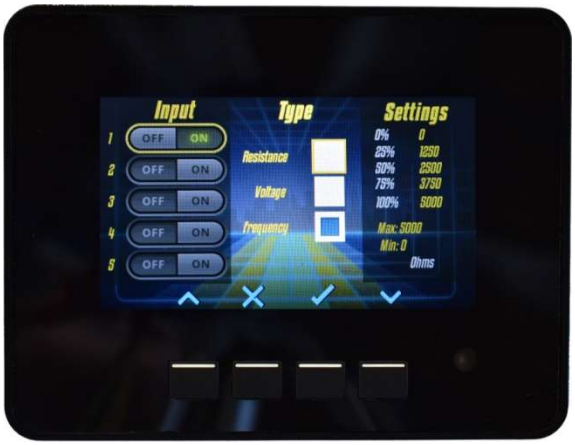
Once the instrument to be configured is selected, use the **Arrow Keys** ^ v to select the type of signal.

After selecting the signal type, you will need to select the signal source. Use the **Arrow Keys** to scroll between **CAN** or **Analog.** Once the desired source is selesected, press the **Select Key** to set the source.

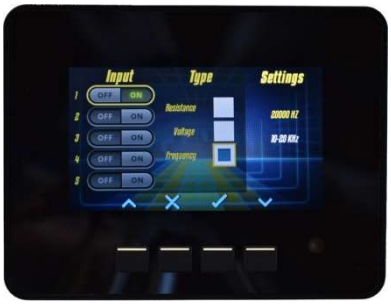
NOTE: Signal Settings in config may show metric as the selected units, but this will automatically adjust based on the units selected in instrument set up.



When selecting an analog signal source, the analog input and type must be selected. After selecting Analog, the input screen will appear. Use the **Arrow Keys** to scroll to the desired input then press the **Select Key** to turn the input on.



Once the input is selected, select the signal type. Use the **Arrow Keys** to scroll to the desired signal type. Available types include **Resistance**, **Voltage**, and **Frequency**. Once the desired signal type is highlighted, press the **Select Key** to select the type.



Once the type is selected, the screen will highlight the settings for the input and type. These settings cannot be changed in **Built-In Configuration**. To adjust these settings please refer to the **maxAI PC Configuration Tool.** In order to return to the gauge configuration screen press the **Cancel Key** to step backwards.

Repeat this for each instrument being configured as well as selecting the odometer/hourmeter.

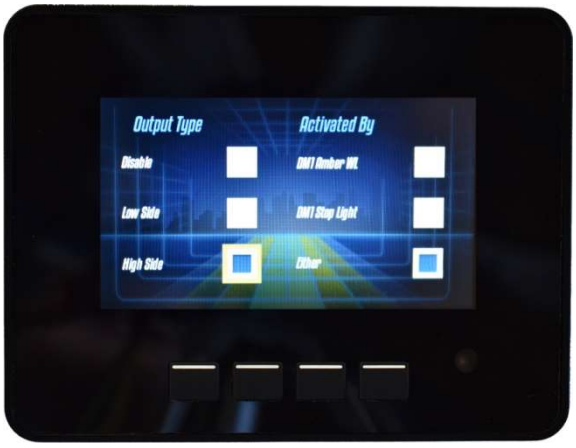
When finished with each parameter, press the **Cancel Key** to return to the previous **Screens** sub menu.

Once all **Screens** changes are made, press the **Cancel Key** to save and return to the **Built-In Configuration** sub menu.

Before finalizing changes and returning to the **Built-In Configuration** sub menu, you will be prompted to confirm saving changes. Press the **Select Key** to save the changes or press the **Cancel Key** to discard the changes.

Setting up **Output**

Select **Output**



Use the **Arrow Keys** to scroll through the **Output Types**. To select the output, press the **Select Key** while on the highlighted output type. Only one output can be selected, so selecting an ouput will automatically deselect any output option already selected.

Once the **Output Type** has been selected, continue using the **Arrow Keys** to scroll to the **Activated By** options. To select the activation source, press the **Select Key** while on the highlighted activation selection. Like with the **Output Type**, only one activation source can be selected, so selecting an activation source will automatically deselect any activation option already selected.

NOTE: If no Output Type changes are desired, but you wish to change the activation type, simply scroll past the output selections and go straight to the activation selections.

Once all **Output** changes are made, press the **Cancel Key** to save and return to the **Built-In Configuration** sub menu.

3-DPF Regeneration

Selecting DPF Regeneration

Select **DPF Regeneration**

DPF Regeneration information will be displayed. Press the **Back Key** to return to the **Instrument Setup** sub menu.

Fault Codes

Select fault codes from main menu by scrolling to **Fault Codes** and pressing the **Select Key**

1-Active Fault Codes

Viewing Active Fault Codes

Select **Active Fault Codes**

Active fault codes will be displayed. Use the **Arrow Keys** to select Engine, Transmission, or Retarder faults to be viewed. To exit the active fault codes screen, press the **Back Key** to return to the **Fault Codes** sub menu.

NOTE: Fault codes are displayed according to J1939-71 error definition. Diagnostic Trouble Codes (DTC) is made up of 4 independent fields, including Suspected Parameter Number (SPN), Failure Mode Identifier (FMI), Occurrence Count (OC), and SPN Conversion Method (CM.) Please refer to J1939-71 for DTC definitions.

2-Inactive Fault Codes

Viewing Inactive Fault Codes

Select **Inactive Fault Codes**

Inactive fault codes will be displayed. Use the **Arrow Keys** to select Engine, Transmission, or Retarder faults to be viewed. To exit the inactive fault codes screen, press the **Back Key** to return to the **Fault Codes** sub menu.

3-Clear All Fault Codes

Clearing Fault Codes

Select **Clear All Fault Codes**

Press the **Select Key** ✓ to clear all fault codes or **Cancel Key** ✗ to back out without clearing the codes. At this point the screen will confirm clear completed. Press the **Select Key** ✓ to return to the **Fault Codes** sub menu.

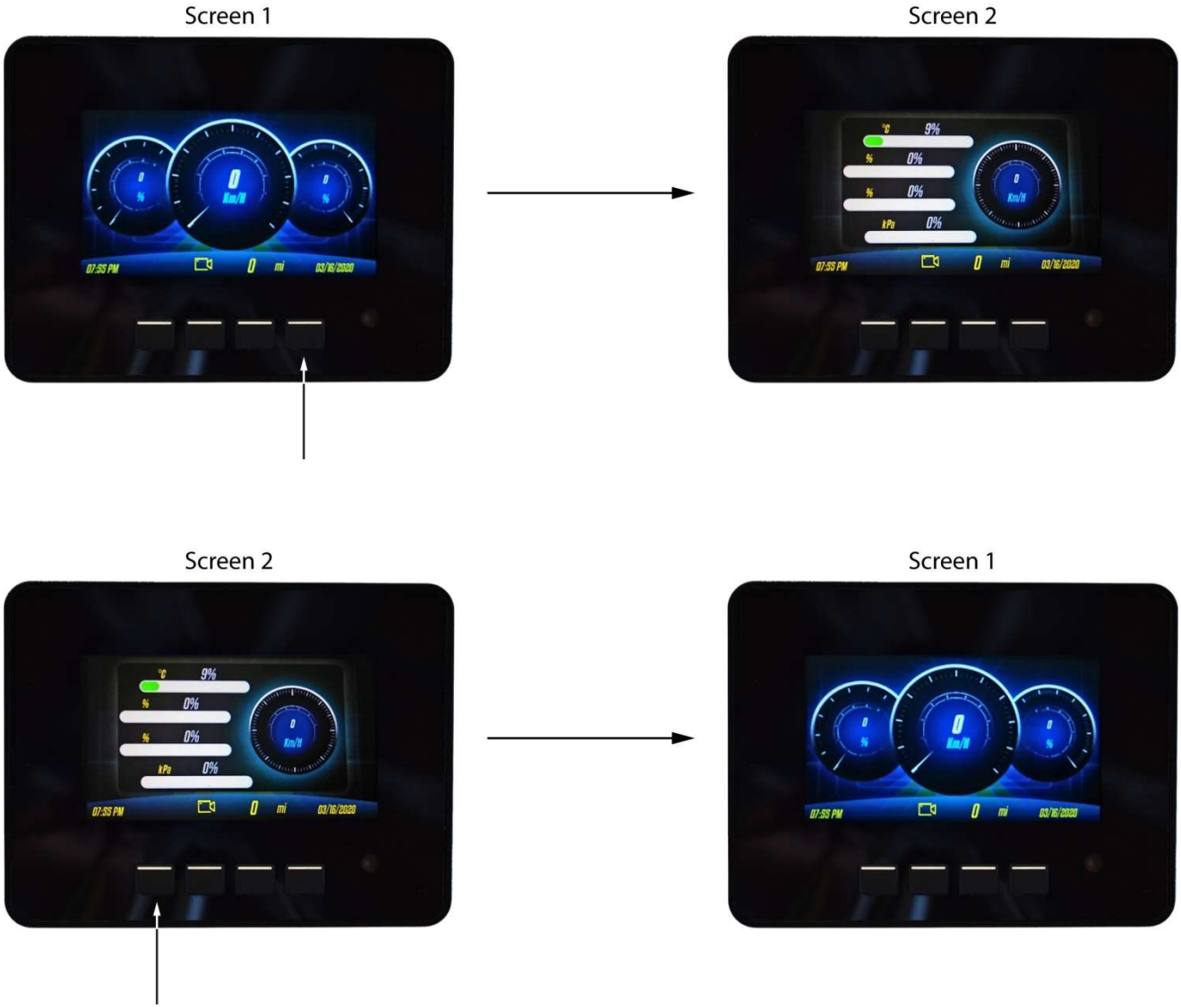
System Information

Select system information from main menu by scrolling to **System Information** and pressing the **Select Key** 

maxAI 430iv system information will be displayed. To exit the system information screen, press the **Back Key**  to return to the main menu.

Navigating Display Screens

The maxAI 430iv can display up to 5 screens of instrumentation. To navigate these screens, scroll left and right using the **Arrow Keys** 



Understanding Data-Bus Operation

… data-bus is like an information super-highway in the vehicle…

Data-Bus Basics

While this information applies to many types of data-busses, the maxAI 430iv operates exclusively over the SAE J1939 data-bus.

The data-bus is like an information super-highway in the vehicle. A data-bus allows various controllers, such as the engine controller, transmission controller, chassis controller, etc. to communicate with each other and any other components connected to the data-bus.

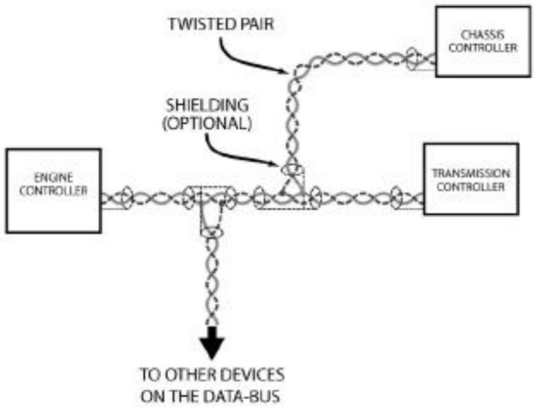
Most new diesel engines are controlled by an Engine Control Module (ECM) that uses information from various sensors to adjust operating parameters, such as fuel injection, to optimize power, increase fuel economy, and lower emissions. The data-bus enables the ECM to send/receive vast amounts of information to/from the transmission computer or any other computer connected to the data-bus, greatly simplifying the vehicle's electrical system.

The data-bus contains most operating information about the vehicle, such as engine and vehicle speed, coolant and oil temperatures, oil and fuel pressures, as well as error codes from the various controllers.

Data-Bus Hardware

The physical aspects of the data-bus are quite simple. It's nothing more than a pair of wires twisted together, commonly referred to as a twisted pair, running from one controller to another.

SAMPLE DATA-BUS ILLUSTRATION



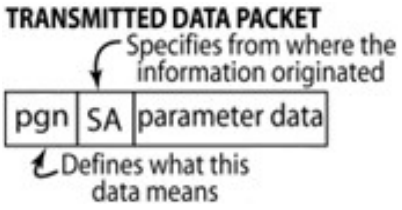
Data-Bus Communication Protocol Basics

SAE J1939 data-bus devices transmit data to and/or receive data from the bus. Data is broken down into a structured format, designated specifically by the SAE standard, containing a Source Address (SA), a Parameter Group Number (PGN), and parameter data.

The source address is the number at the beginning of the data packet that identifies where the data was transmitted from. For example, SA 0 indicates that the data packet was transmitted from the primary engine controller.

The parameter group number is the identification label for the group of data that follows the PGN. This defines what type of information the parameter data will be (e.g. engine oil pressure values).

The parameter data is a group of data bytes that contain the specific values of the particular PGNs parameters (e.g. engine oil pressure). When a device *listening* to the data-bus *hears* the appropriate SA and PGN, it then reads the desired data to complete the data transmission.



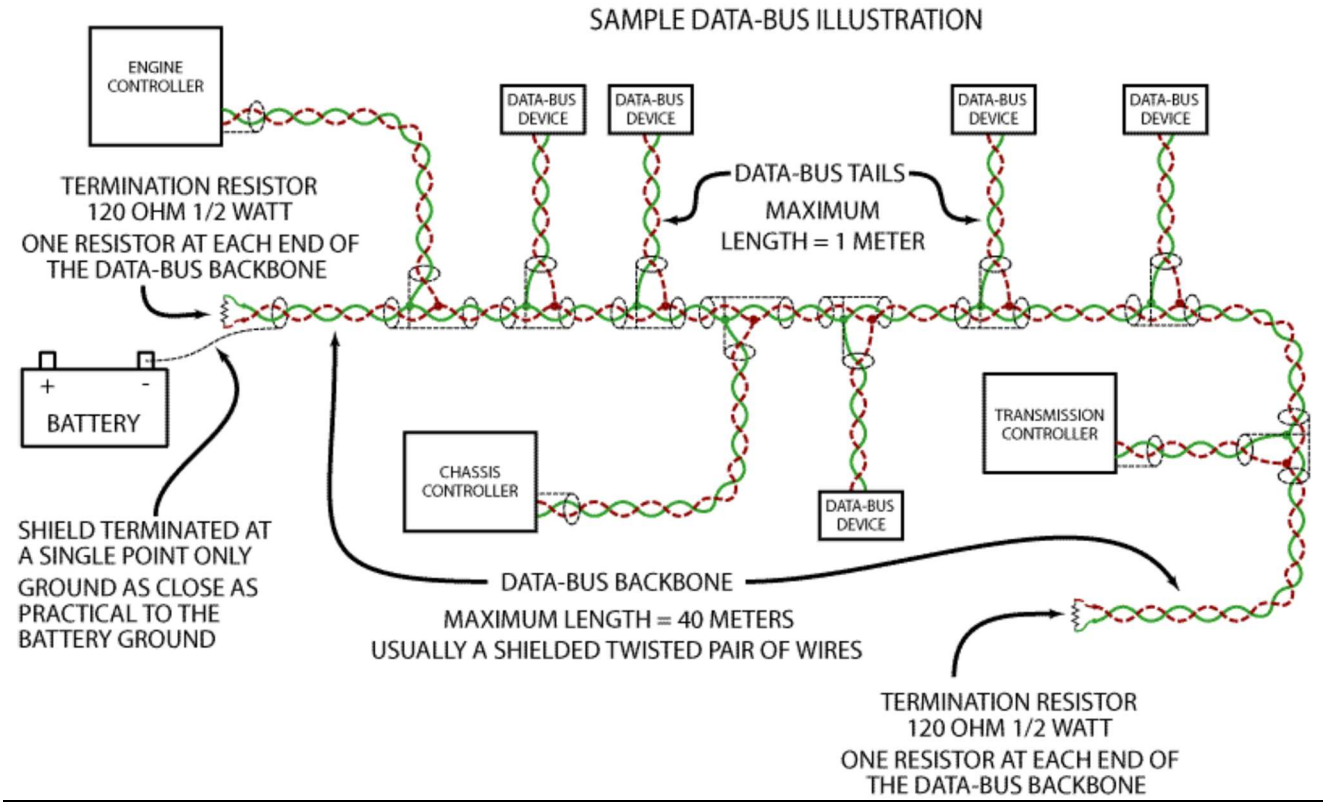
Data-Bus Termination

The SAE specification for the J1939 data-bus requires data-bus termination. The J1708/1587 data-bus does not require termination. Termination is required to attenuate any electrical noise developed by the high-speed data transfer. If the termination resistors are not present, loss of data-bus communication may occur.

Termination simply means installing two 120Ω ½-Watt resistors between positive bus wire and negative bus wire at each end of the data-bus backbone. If the installation involves connecting to an existing data-bus, termination should already exist and no additional termination is required. The SAE specification forbids the use of internal data-bus termination, because the data-bus must remain intact if any device is removed. If a specific module terminated the data-bus and that module was removed, then the data-bus could cease to operate.

The data-bus shield must also be terminated properly. Using a wire, the shield should be connected to ground as close as possible to the battery ground. This termination connection to ground can be anywhere along the data-bus, but it must only be connected at **ONE** point. The shield should also connect to the shield pin of all data-bus devices (**NOT GROUND**).

Per the SAE J1939 specification, bus shielding is optional and may not be found on all systems.



Appendix A

maxAI 430i J1939 Engine and Transmission Parameters:

Message	PGN	SPN	Signal
CCVS	65265	84	Wheelbase Vehicle Speed
EEC1	61444	190	Engine Speed RPM
EEC2	61443	92	Eng. Percent Load at Current Speed
EF1_P1	65263	100	Engine Oil Pressure
ET1	65262	110	Engine Coolant Temp
HOURS	65253	247	Engine Total Hours Of Operation (Dedicated to Digital Gauge Central Down)
IC1	65270	105	Engine Intake Manifold Temp
LFE1	65266	183	Engine Fuel Rate
LFE1	65266	51	Throttle Position
LFE1	65266	185	Fuel Economy
TRF1	65272	127	Transmission Oil Pressure
TRF1	65272	177	Transmission Oil Temperature
VD	65248	244	Trip Distance (Dedicated to Digital Gauge Central Down)
VEP1	65271	168	Battery Voltage
LFC	65257	182	Current Fuel Consumption
ETC2	61445	523	Transmission Current Gear
AT1T1I1	65110	1761	DEF Level, Aftertreatment 1 SCR Catalyst Tank Level

Appendix B

All fault codes come from "Source Address 0" which is the engine ECM, or "Source Address 3" which is the Transmission ECM.

SPN	FMI	Signal
91	0-31*	Accelerator pedal os
100	0-31*	EngOilPress
105	0-31*	EngIntakeManifold1Temp
110	0-31*	EngCoolantTemp
157	0-31*	EngInjectormeteringRail1Press
158	0-31*	Keyswitch battery power
168	0-31*	Battery / power input
190	0-31*	EngSpeed
106	0-31*	Engine Intake Air Pressure
558	0-31*	Accelerator Pedal 1 Low Idle Switch
630	0-31*	Calibration Memory
631	0-31*	Calibration Module
639	0-31*	J1939 Network #1, Primary Vehicle Network
646	0-31*	Engine Turbocharger 1 Wastegate Drive
1188	0-31*	Engine Turbocharger Wastegate Actuator 1 Position
651	0-31*	Engine fuel 1 Injector Cylinder 1
652	0-31*	Engine fuel 1 Injector Cylinder 2
653	0-31*	Engine fuel 1 Injector Cylinder 3
654	0-31*	Engine fuel 1 Injector Cylinder 4
655	0-31*	Engine fuel 1 Injector Cylinder 5
656	0-31*	Engine fuel 1 Injector Cylinder 6
678	0-31*	ECU 8 Volts DC Supply
723	0-31*	Engine Speed 2
1079	0-31*	Sensor Supply Voltage 1 (+5V DC)
637	0-31*	Engine Timing Sensor
1347	0-31*	Engine Fuel Pump Pressurizing Assembly #1
676	0-31*	Engine Glow Plug Relay
2789	0-31*	Engine Turbocharger 1 Calculated Turbine Intake

Appendix C

Current maxAI 430i analog inputs supported:

Analog input	Type	Signal
1-5	Voltage	0-32V
1-5	Resistance	0-5,000 Ω

Appendix D

Gauge abbreviations:

Abbreviation	Gauge Type
Fuel1	Fuel Level
DEF Level	DEF Level
IntakeMan	Engine Intake Manifold Temperature
EngOil	Engine Oil Pressure
BrakeSec	Secondary Brake Pressure
BrakePri	Primary Brake Pressure
TransOil	Transmission Oil Pressure
EngCoolant	Engine Coolant Temperature
EngOil1	Engine Oil Temperature
AuxTemp1	
TransOil1	Transmission Oil Temperature
BatteryP1	Battery Voltage
VehSpeed	Vehicle Speed
EngSpeed	Engine Speed (RPM)
Ammeter	Ammeter
EnTripFuel	Trip Fuel Consumption
EngFRate	Current Fuel Economy

Troubleshooting Guide

- Cluster is not counting service hours or odometer traveled distance:

  Cluster is reading hour counter from J1939 Network, check command availability on vehicle and network communication.

- Cluster is displaying dashes on gauges:

  Check network communication and monitoring signal availability

- During Flashing process Tool is displaying a popup message “Cluster does not respond command to enter bootloader”:

1. Cluster is ready and waiting to receive firmware update, from previous suspended update task.
2. Cluster is not processing “Enter Bootloader Command” reset Cluster to then retry.

Or

3. Check USB Drivers properly installed and detected

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