CONFIGURABLE

Simple, safe & fast setup via free Bluetooth app within a 30- foot-radius

RUGGED

Designed for extreme environmental conditions in the mobile hydraulic industry

UNIVERSAL

Use with any electro-proportional or solenoid-operated On/Off valves
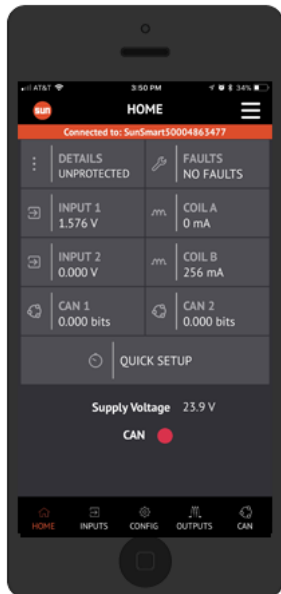

XMD-01/-02

SUN XMD USER MANUAL

Bluetooth®

XMD Mobile App

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TABLE OF CONTENTS

sunhydraulics.com/xmd-series

SUN XMD Series
Exceptional Sun performance at a competitive price

XMD Mobile Application Intended Use

The XMD Mobile app is designed to configure the Sun Hydraulics Bluetooth configurable XMD Amplifier for single and dual proportional output applications. For ease of use during setup and configuration, diagnostics are now accomplished using Sun's new XMD Mobile phone app for safe, secure and reliable wireless Bluetooth® 4.0 connection. The app is free to download from the Apple App store and the Google Play store. To find the app, search for "Sun Hydraulics" or "Sun XMD Mobile." Multiple features make the XMD Mobile app suitable for many simple and complex applications.

The XMD Amplifier provides current to the coil in proportion to the command signal. LED indicators provide a real-time operational overview of the unit's status. Once configured and saved, all settings are stored safely in the non-volatile permanent memory within the unit, even when power is removed.

XMD Features

SAE J1939 CAN Communication

The XMD Mobile App is able to receive and transmit custom CAN messages in addition to transmitting system and alarm information.

Quick Setup Profiles

Select between single- and dual-coil pre-defined profiles on typical pressure and flow configurations for fast, reliable solutions.

Diagnostic Mode

Allows technicians worldwide to access alarm and operational conditions on password protected devices without the ability to change the configurations.

Intelligent Visibility

The XMD Mobile app intelligently utilizes the limited space of mobile phones, and offers greater usability with the iPad and Tablet forms.
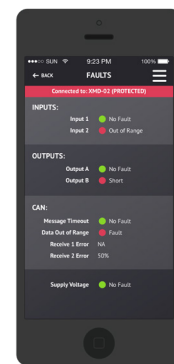
Input/Output Function Curves

Create a custom output curve for finely tuned joystick control or custom flow/pressure curves with the use of universal inputs and CAN-received messages.

CAN Capable Display
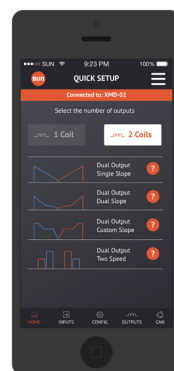
Quick Setup

Diagnostic Mode

Input / Output Curves

ALWAYS do the following:

- Read ALL product information/data sheets before starting
- Observe the set-up procedures in the product manual for best operational results
- Ensure that you are aware of the consequences of all adjustments on the electronics and hydraulics before you change settings
- Make sure you have the correct tools to do the intended job (compatible smartphone or tablet with latest version of the **XMD Mobile** app installed)
- Ensure that any recommended fuses and/or safety devices are fitted as required
- Keep high-voltage AC cables separate from low-voltage DC signal and supply cables
- Make sure the unit's supply voltage is within required specifications
- Check that the unit's supply voltage is correct, electrically clean and stable
- Isolate this unit from all other equipment before any form of welding takes place
- Check ALL wire connections to and from this unit to ensure NO short or open circuits are present
- Operate the units within specified temperature range for the best, most reliable performance
- Ensure that any unused wires/connections are terminated safely and not shorted together
- Isolate the Amplifier if any battery charging or battery boosting takes place on the installation
- Ensure all valve connectors are wired correctly, secured and connected to correct coils
- Follow and abide by all applicable health and safety standards - protect yourself and others

NEVER do the following:

- Attempt to use this unit if you are unsure of electrical or hydraulic connections or expected operation
- Operate this unit without the recommended power supply input fuse installed as recommended
- Arc weld or charge batteries with this driver unit connected as damage can occur
- Attempt to use this unit in areas where other AC or DC coils have not been fully suppressed
- Install Amplifiers in vicinity of AC products - e.g., VFD Amplifiers, motor starters, HV fuses, etc.
- Use a power supply that is not rated for the correct required output current under full load
- Allow wires to or from the unit to short circuit (to each other or chassis/cabinet)
- Attempt to use this unit in areas of intense Radio Frequency (RF) without adequate screening measures
- Disconnect or connect wires to or from this unit unless it is isolated from the power supply
- Use this unit in temperatures that exceed specifications as operation may be affected
- Start this unit without ensuring ALL work areas are clear of personnel
- Connect +5V reference to Supply Power or Ground as damage will occur

⚠️ **Please read and observe any precautions wherever this symbol is used in this document.**

In order to download the latest XMD Mobile App, search "Sun XMD Mobile" in the Apple App Store, Google Play, or follow the links on Sun's website:
**http://www.sunhydraulics.com/models/electronics/software/xmd-mobile-app**

The latest version of the XMD datasheet and XMD Mobile App User Manual can be found at
http://www.sunhydraulics.com/models/electronics/i-o-modules/xmd-series

1. After selecting the correct model number, select FULL DATA SHEET at the top of the product page to view the latest XMD Datasheet.
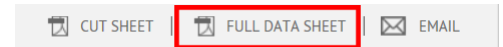
2. Select Additional Resources below the product image to find the latest XMD Mobile App User Manual.
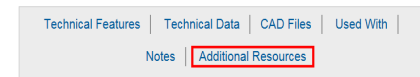
Compatible Devices

Android Compatibility:
Google Nexus 5+, Google Pixel series, Google Samsung (Most Android devices manufactured after 2014 such as Grand Prime+, Galaxy J5/J7, Galaxy S7/S8, Galaxy Tab S/S2/S3)
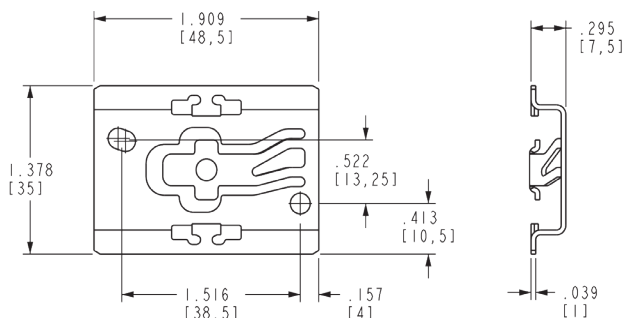Acer & Asus (Most Android tablets manufactured after 2014)

iOS Compatibility:
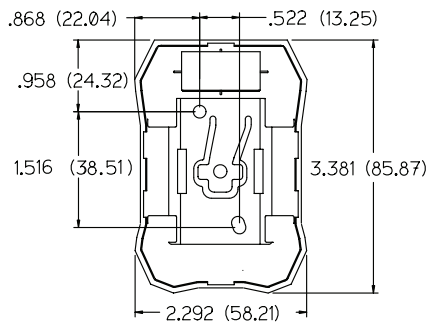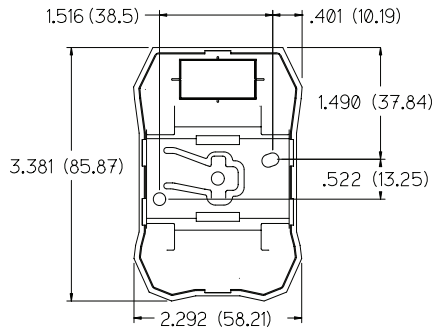iPhone 6, 6S, 7, 7S, 8 and X series
iPad Air & Air 2, iPad (2017), iPad Pro Series

Mounting Bracket Dimensions

NOTE: The XMD is compatible with standard 35mm DIN Rail. Use the bracket dimensions to source the proper DIN Rail size.

Installation Orientation

1. The controller should be mounted to a flat surface.

2. The bracket can be mounted horizontally or vertically.

3. Provide sufficient clearance from moving parts.

4. Do not mount in a location that will result in ambient temperatures greater than specified operational temperature limits.

NOTE: Dimensions are in inches (mm).

Patent Pending

IP69K (E₁₁) CE

XMD Installation

1. Mount the bracket to a flat surface using the included hardware, 2x #8-32 x 1/2 T18-8 stainless screws. Recommended torque is 22 in-lbf.

2. Once the location for the XMD is known, line up the bracket edges to the XMD and slide it into place until the release tab is secured over the retaining pin.
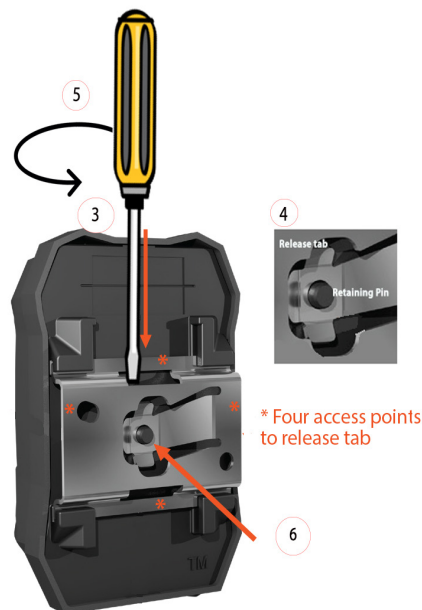
XMD Removal

3. Insert a small flathead screwdriver into 1 of 4 access points.

4. Slide the flathead tip of the screwdriver under the release tab.

5. Twist the screwdriver in order to raise the release tab over the retaining pin.

6. While applying pressure to the release tab, slide the controller off of the mounting bracket.
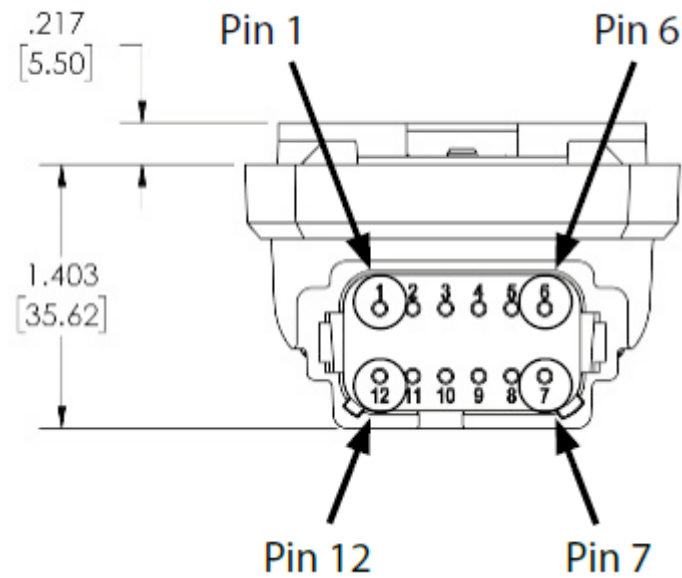

Release tab

Retaining Pin

* Four access points to release tab

Pin	Function
1	CAN_LO
2	CAN_HI
3	GND (Output & 5Vref)
4	XMD-01 No Connection XMD-02 PWM Output, Coil B
5	GND (Output & 5Vref)
6	PWM Output, Coil A
7	Supply GND
8	Supply PWR
9	Enable
10	+5Vref (250 mA max)
11	Universal Input 1
12	XMD-01 No Connection XMD-02 Universal Input 2

WARNING: Failure to install the unit per the specified wiring diagrams may cause damage to the unit.

Pinout Notes

1. The XMD-01 has 1 universal input pin (pin 11) and the XMD-02 has 2 universal input pins (pins 11 and 12, respectively).

2. For optimal performance, the common ground for the input needs to be connected to either pin 3 or pin 5 on the controller.

3. The main power supply ground is isolated from the signal input, 5V ref and output drives.

4. The +5V reference, pin 10, is intended to source stable voltage to external equipment and must not be connected to +Supply Power or Ground, or permanent damage to the XMD will result.

Recommended Wiring Practices

1. For best grounding practices, isolate pin 7, supply ground, from pins 3 and 5, command, +5Vdc reference, and output grounds.

2. Use twisted or twisted shielded-pair cable for CAN per the applicable standard.

3. Confirm that the CAN network is properly terminated using 120-Ω resistors.

4. Check ALL wire connections to and from this unit to ensure NO short or open circuits are present.

5. Ensure that any unused wires/connections are terminated safely and not shorted together.

6. Never disconnect or connect wires to or from this unit unless it is isolated from the power supply.

Operational Specifications

Supply Voltage	9-32 V_{DC}
Supply Current	XMD-01: 3 A max
	XMD-02: 6 A max
Weight	0.3 lbs (0.136 kg)
Dimensions (L x W x H)	3.38 in x 2.30 in x 1.40 in (85.87 x 58.49 x 35.62 mm)
Enclosure	PBT, 30% glass-filled
IP Rating	IP69K
Certification	CE, E-Mark, E11 10R-05100024 2014/53/EU (Radio Equipment Directive), 2014/35/EU (Low Voltage Directive)

Communication

CAN	2.0B (Maximum voltage +32 V_{DC})
Baud Rates	125 kbit/s, 250 kbit/s, 500 kbit/s, 1 Mbit/s
Default Baud Rates	250 kbit/s
Protocol	SAE J1939

NOTES:
1) No HAZARDOUS LIVE parts are present in the equipment. Terminals are rated to 32 V_{DC} maximum.
2) Recommended supply voltage 12 V_{DC} or 24 V_{DC} with negative to earth. 6V_{DC} protection for engine cranking events.
3) Use twisted or twisted shielded-pair cable for CAN per the applicable standard.

Outputs

PWM Outputs	XMD-01 (1 PWM output)	0-3.0 Amps Peak -40℃ + 75℃ continuous per channel
	XMD-02 (2 PWM outputs)	0-2.7 Amps Peak + 75℃ + 85℃ continuous per channel
Current Regulation	± 1mA above 35 mA	
PWM Frequency	33 Hz - 5 kHz	
Dither Frequency	33 Hz - 500 Hz	
Dither Amplitude	0-25% of PWM Period	
Diagnostics	Open/short-circuit detection	
Flyback Protection	Integrated	
Ramp Time	0 - 65 seconds, 1-mS increments	
Reference Output	5 VDC, ± 0.1 V_{DC} (250 mA max.)	

Inputs

Universal Inputs	XMD-01 (1 universal input)	Maximum voltage on any input pin +32 V_{DC} and -0.7 V_{DC}
	XMD-02 (2 universal inputs)	
Input Types		
0-5 V_{DC}	0 to +5 V_{DC}	
0-10 V_{DC}	0 to +10 V_{DC}	
Resistive 0-100 KΩ	0 to 100 KΩ	
4-20 mA	Maximum allowable current: +22 mA (impedance Z = ~200 Ω)	Active circuit protection above 22 mA and limited to 32 V_{DC}
Digital	0 to +Supply, not to exceed 32 VDC (impedance Z = ~10 Ω)	Low is active when the input is <2 V_{DC}, high is active when the input is >3 VDC. A debounce time of 200 ms is fixed in device firmware.
Frequency 60 Hz - 10 kHz	Duty Cycle range: 5% to 95% at 5V input	Amplitude minimum of 5V_{DC} above ground. Amplitude maximum of 32 V_{DC} above ground.
PWM 60 Hz - 10 kHz	Range: 5% to 95% at 5V_{DC} Range: 2.5% to 97.5% at >10V_{DC}	Frequency range: 60 to 10 kHz. Amplitude minimum of 5 V_{DC} above ground. Amplitude maximum of 32 V_{DC} above ground.

Environmental

Operating Temperature	-40°C to +85°C (-40°F to +185°F)	Vibration	33.3 Hz 6.8g Peak (Spec: S-367 Section 11.0)
Storage Temperature	-60°C to +120°C (-76°F to +248°F)	Shock	49g Peak (Spec: S-367 Section 12.0)
EMC/EMI	EN 55024, EN 55032, EN 13309, EN/ISO 14982, ISO 13766, ISO 16750-2, J1113-4/11/12/13/26, ISO 1142-2/10, CISPR 25, FCC 15B, ICES-003, UNECE REG 10.5, EN 61326-1:2013, EN 301 489-1 V2.2.0, EN 301 489-17, EN 12895		

Patent

Patent Number	Patent Pending

Power LED Operation		
Mode of Operation	**Status**	**Description**
Normal Operating mode, no faults	[green solid]	Solid Green On
Supply Voltage Below 9 VDC	[red solid]	Solid Red On
Supply Voltage Above 32 VDC	[red blink]	Blink / Red - 1 blink ON/ pause OFF 500 mS

Comm / Fault LED Operation		
Mode of Operation	**Status**	**Description**
Normal Operating mode, Off		Off
Connected to mobile phone app / Configuration Mode	[green blink]	Blink/Green - 1 blink 125 mS On/ Off 500 mS
Receiving CAN messages	[green 2 blinks]	Blink/Green - 2 blinks 125 mS On/ pause Off 500 mS
CAN Message Timeout	[red 2 blinks]	Blink / Red - 2 blinks 125 mS On/ pause Off 500 mS
Coil Short, ON Red	[red solid]	On/Red
Coil Open	[red 3 blinks]	Blink/Red - 3 blinks 125 mS On/ pause Off 500 mS
Command % out of range	[red 1 blink]	Blink/Red -- 1 blink On/ pause Off 500 mS

⚠ If the equipment is used in a manner not specified by the manufacturer, the protection by the equipment may be impaired.

⚠ This unit is intended only for connection to vehicle electrical systems and voltage above the identified ratings should never be connected to the unit.

⚠ This equipment has not been investigated as a safety-rated component and shall not be relied upon as a safety device. Separate emergency stop equipment must be integrated on the machine in accordance with the machinery directive. The operator of the equipment shall always be in sight of the controlled machine and be prepared to use emergency stop equipment if any malfunction occurs.

The Sun logo acts as the Home button.

The Navigation Bar will display the Share Configuration and Help screen options. (See page 20 for additional information)

Details provides the model code, serial number, Bluetooth ID, Firmware Version and Date Code for the XMD. This screen also gives the ability to change the password for the XMD.

Faults will display any fault conditions for the Inputs, Outputs, CAN and Supply Voltage.

Quick Setup displays the ability to select the number of outputs (1 or 2 Coils) and the type of I/O curve displayed. (See pages 23 through 30 for additional information)

HOME

Connected to: SunSmart50004863477

DETAILS UNPROTECTED	FAULTS NO FAULTS
INPUT 1 1.576 V	COIL A 0 mA
INPUT 2 0.000 V	COIL B 256 mA
CAN 1 0.000 bits	CAN 2 0.000 bits

QUICK SETUP

Supply Voltage   23.9 V

CAN ●

HOME   INPUTS   CONFIG   OUTPUTS   CAN

Outputs will display the Ouputs screen where PWM settings for frequency are established, along with Coil A and B Dither Amplitude and Ramp Up/Down settings. (See page 17 for additional information)

Config will display Enable/Dis-able settings for Coil A and Coil B, including Input Type, minimum/maximum settings for Input Signal and Output Current, and the abil-ity to add a point to the I/O curve. (See page 16 for additional information)

Inputs will display the Inputs screen where Input types can be chosen, and Alarm High and Low values can be established. (See page 15 for additional information)
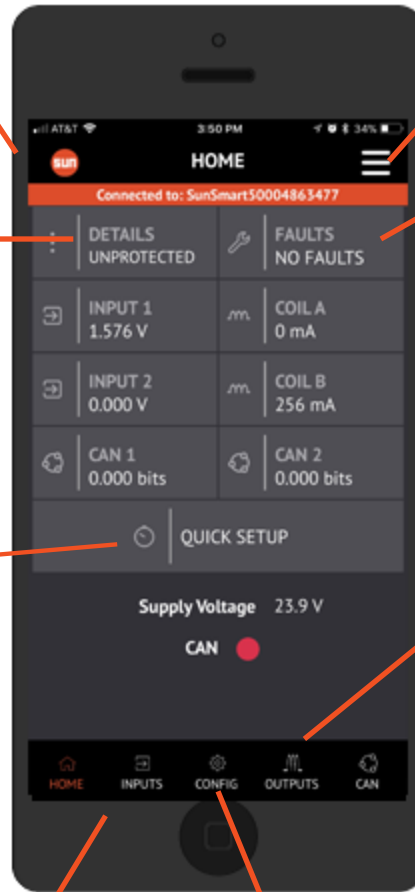
Description

In Diagnostic mode, any user with the XMD Mobile app can monitor the driver details, fault codes, input values and output values in real time without the need for a password. However, the user is limited to **read-only** parameters and cannot make changes without first entering the correct password.

Home Screen

The Home screen will display when you enter Diagnostic mode.

The Details screen provides information about the Amplifier:

- model code
- serial number
- Bluetooth ID
- firmware version
- date code

The Bluetooth ID by default is the serial number. When not in Diagnostic mode, this can be changed to any name with 11 characters (no blank spaces). After this is changed, the device will reboot to reflect the new Bluetooth ID.

The Faults screen displays any existing faults for:

- inputs
- outputs
- supply power
- communication

This screen is accessible using the Diagnostic mode with or without a password.

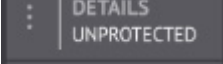See additional information in the Faults section.
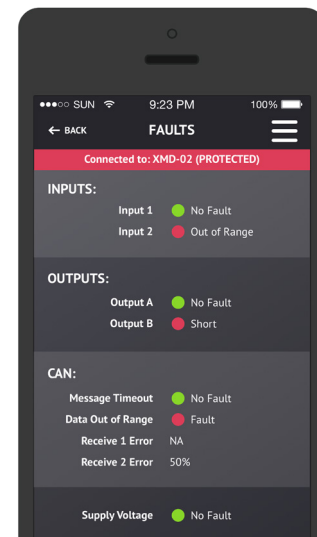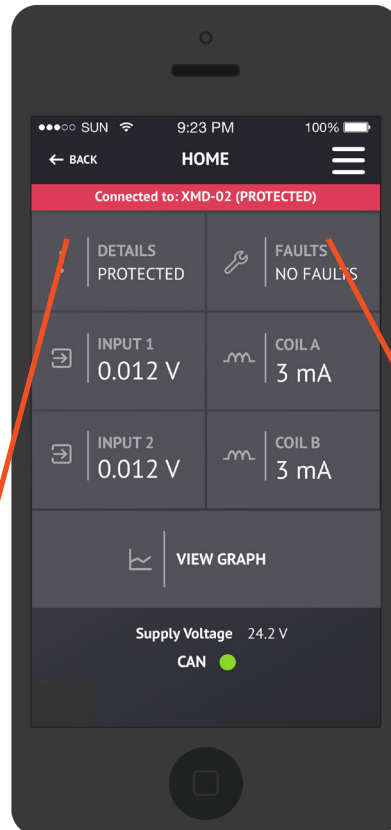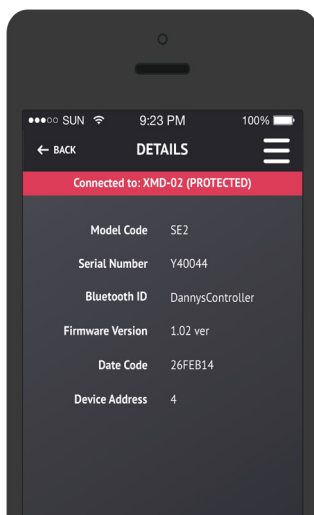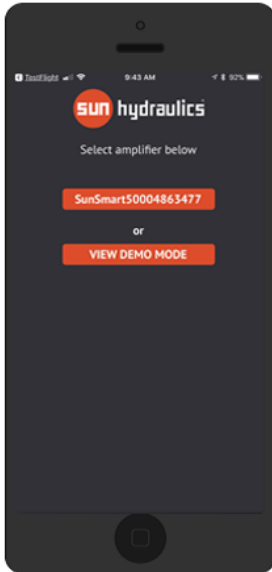
Establishing a Password

When the app is first opened and a device is connected, the Home screen will be displayed. If the device is NOT password protected, the device settings could be changed inadvertently. It is strongly recommended that a password be assigned to a device to protect from unauthorized changes.

Select the appropriate device to be connected to, and the Home screen will display.

Select [DETAILS UNPROTECTED] and the screen below and to the left will

appear.
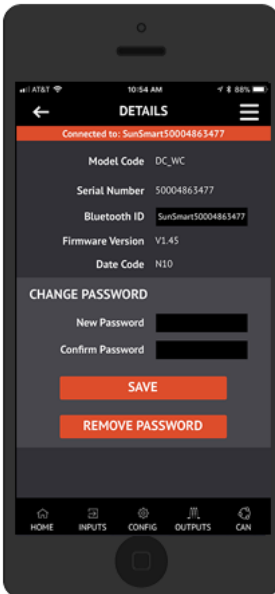
Establish a password for the device and retype the same password.

Next, touch the top right menu icon and select Scan. This returns the app to the Scanning page.

Once the app recognizes the device, the final screen below and to the left will be displayed.
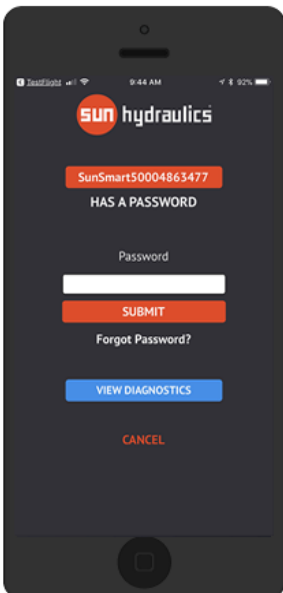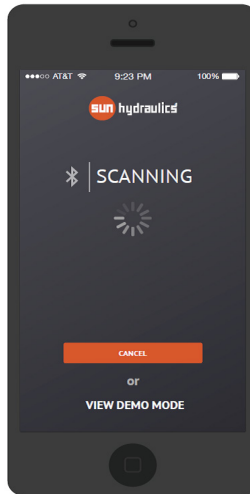
Now, in order to enter the Home screen, the established password must be entered.

Otherwise, touch View Diagnostics. This will take you to the Diagnostic Mode home screen, which is READ ONLY.

Opening the Application

The XMD Amplifier must be powered up, indicated by the green Power LED, to communicate with the smart device. After you have downloaded and installed the free XMD Mobile app, click the Sun Hydraulics logo on your smart device to start the application. You will see "Scanning" as displayed on the screen to the right after you accept the Sun Hydraulics Disclaimer.
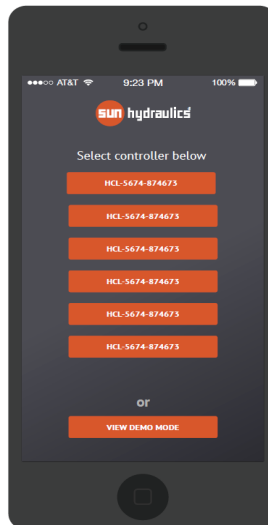
The next screen to appear is the Start-Up screen.

You may either select the serial number of the XMD controller (unless it has been renamed) to connect to the Amplifier or select Demo Mode to tour the basic look and feel of the app.

If required, enter the password for the specific controller chosen.

If the amplifier is protected via a password, users can still access the input and output real time values, device details and fault information by selecting Diagnostic Mode. While in Diagnostic Mode, users will not have access to proprietary settings or have the ability to make changes to the device. Diagnostic Mode is a READ ONLY mode.

Relevant Field Information

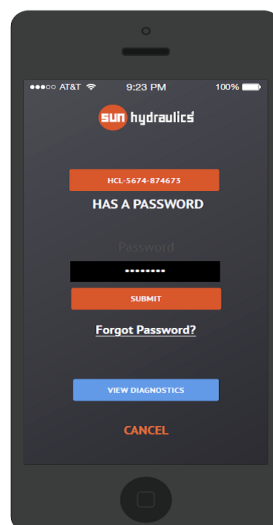The application searches for nearby Sun bluetooth-enabled devices

Select a discovered device in order to view or change amplifier settings.

You are not connected to a device while in Demo Mode and therefore will not experience the full functionality. This is intended to mimic the look and feel of the app only.

User-defined password protection for tamper-proof systems.

Diagnostic mode offers real-time access to diagnostics and input/output information without write access.

Quick Setup Screen
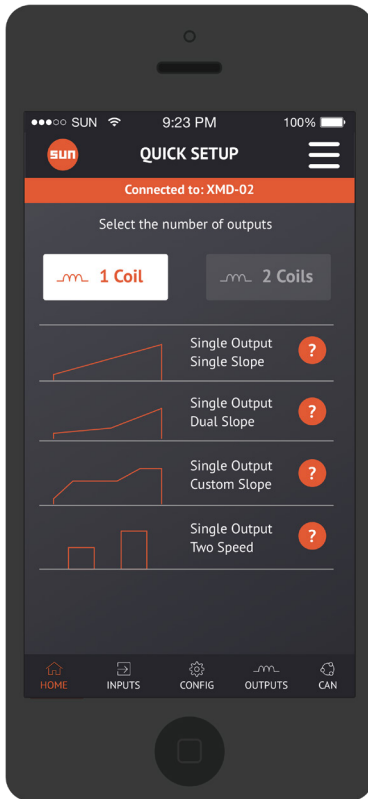
Relevant Field Information

Select Quick Setup from the Home screen and the page shown on the left will appear.

Quick Setup Profiles are pre-configured for simple setup.

By clicking on the selected profile, the app will configure the inputs and outputs automatically. To gain more information about the pre-configured settings, touch the question mark associated with the profile.
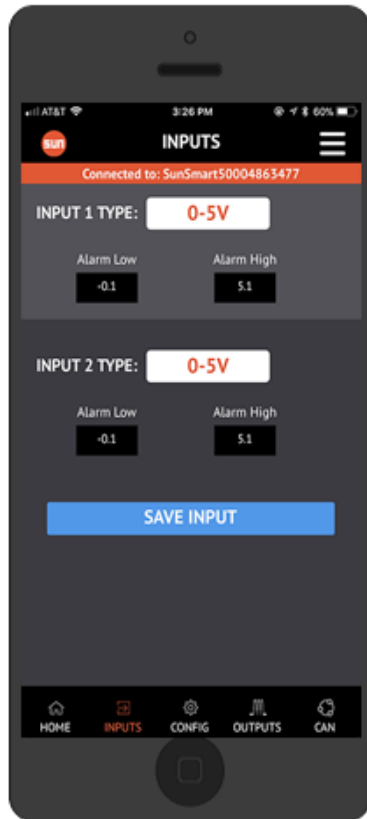
These configurations are designed for Sun's $24V_{DC}$ coils.

Simply change the output current for any other coil current requirements.

Example: When selecting Single Output, Single Slope, the following Configuration and I/O pages will be available to review:
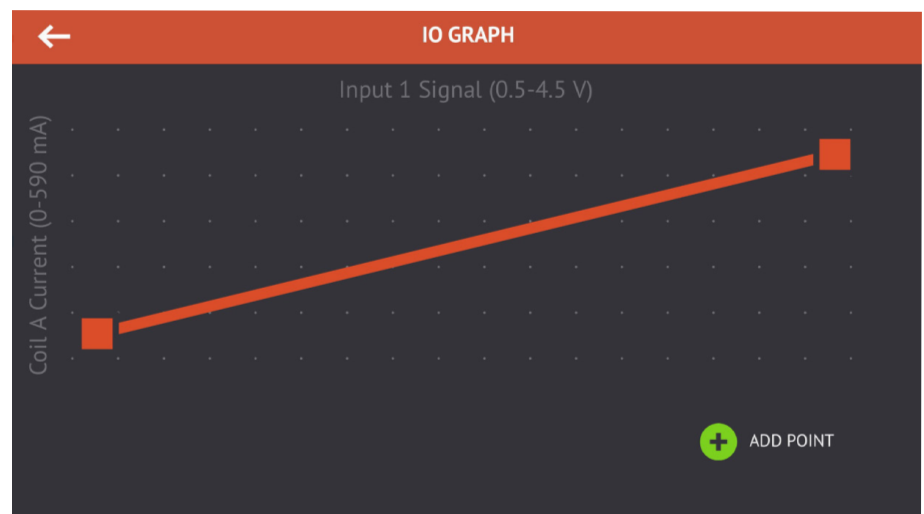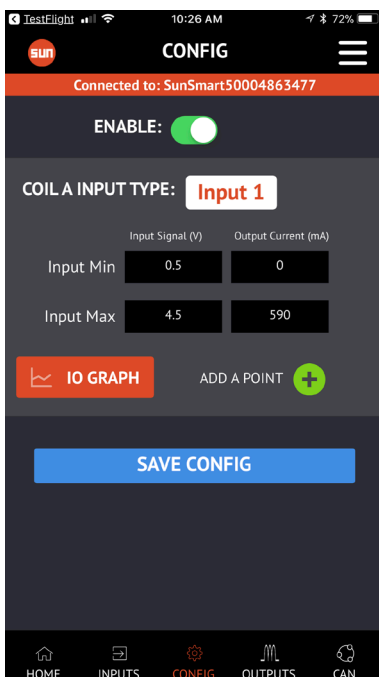
The Input page assists in selecting your Input types and configuring the alarm low and alarm high settings.

NOTE: The Alarm High and Low values displayed here are the default values. These values can be configured to meet the application need.
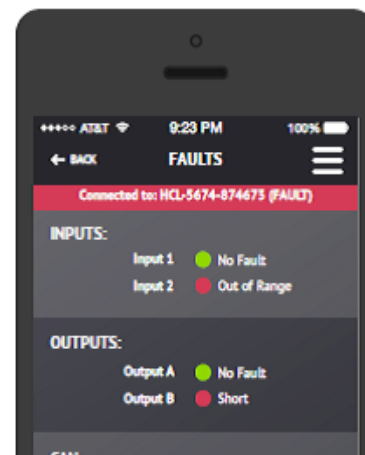
Relevant Field Information

The available input types are software configurable in the XMD Mobile app Inputs page. They are available for the XMD-01 and XMD-02 configurations:

- $0-5V_{DC}$
- $0-10\,V_{DC}$
- 4-20mA
- Digital
- Resistive (0-100 kΩ)
- PWM (60 Hz - 10 kHz)
- Frequency (60 Hz -10 kHz)

If your configured input comes into the controller at a value lower than what is entered in the Alarm Low field or higher than what is entered in the Alarm High field, then the "out of range" fault will be triggered for that particular configured input.


Input Default Values

Input Type	Range	Default Error Low	Default Error High
0-5V	0-5	$-1.1\,V_{DC}$	$5.1\,V_{DC}$
0-10V	0-10	$-0.1\,V_{DC}$	$10.1\,V_{DC}$
4-20mA	4-20	3.8 mA	20.5 mA
PWM	0-100	-1%	101%
Frequency	60-10000 Hz	59 Hz	10,100 Hz
Resistive	0-100000 Ω	-1 Ω	100,100 Ω
Digital	0 to +Supply	None	None

The Configuration Tab assigns the input values to the output values for coil A and coil B. Using this configuration method, the user can create a single output, directional output or two independent outputs based on one or two different inputs.
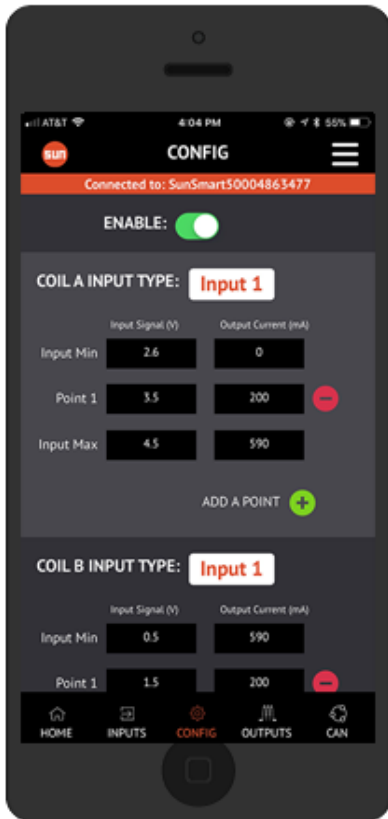
Relevant Field Information

Enable
Select Enable to only output current when the Enable switch is active. When Enable is not selected, outputs will be fully functional when power and command signal are applied to the XMD amplifier.
Ensure Pin number 9 is activated if Enable is selected.

Coil A and B Input Types
Coil A and B can be mapped to one of five different input types:
- Universal Input 1
- Universal Input 2
- CAN message 1
- CAN message 2
- Not Used

The universal inputs are configured on the Inputs menu tab while the CAN messages are configured in the CAN menu tab.

I/O Curve
The I/O Curve button allows the user to visually manipulate the relationship between the input and the output. The default is a linear relationship but offers multiple points in order to create non-linear functions or multiple speed settings.

Adding a Point
When the Add A Point + icon is selected, a point will be added to the curve. The next point will be half of the next input value minus the previous input value while the output value remains the same as the previous output value.
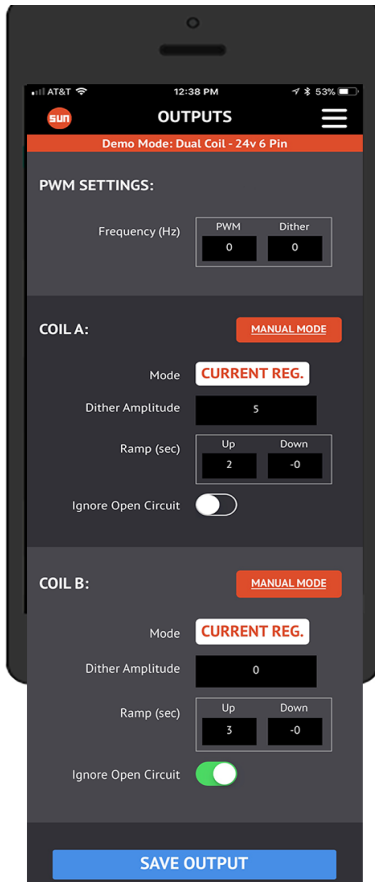
Example:	Coil A Input Type: Input 1	Input Signal	Output Current
	Input Min	0	0
	Point 1	2.5	200
	Input Max	5	590
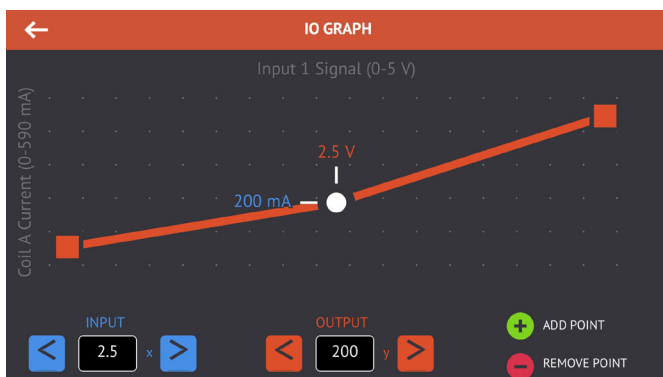
In this view, the user can select and adjust a point using the touch screen feature or simply manually enter the value. When a point is selected, the user can delete that point or add another point.

The Output page defines the output to both Coil A and Coil B.

Relevant Field Information

The **PWM** and **Dither** frequencies are global variables meaning that they apply to both Coil A and Coil B. The XMD amplifier is capable of using a high frequency PWM and superimposed low frequency dither.

Current Regulation Mode monitors the current to the coil automatically and will adjust the ouput in order to maintain a constant current to the coil regardless of a change in coil resistance or supply voltage. Current Regulation Mode is recommended for electro-proportional valves.

Duty Cycle Mode does not have any current regulation and simply outputs a fixed duty cycle. This mode is recommended for LEDs and solenoid on/off valves.

Dither Amplitude applies to Coil A and B independently. The maximum value is 25% of the PWM period.

A **Ramp** can be added to the output for soft shift applications. Click the question mark icon to reveal the formula used to calculate ramp time. The range is from 0 to 65 seconds using 1 millisecond increments. Ramps will work when the Enable is activated. When the Enable is de-activated, the device will ramp down to the minimum output value and then turn the output off.

When **Ignore Open Circuit** is checked, the controller will ignore an open circuit and prevent an error trigger.
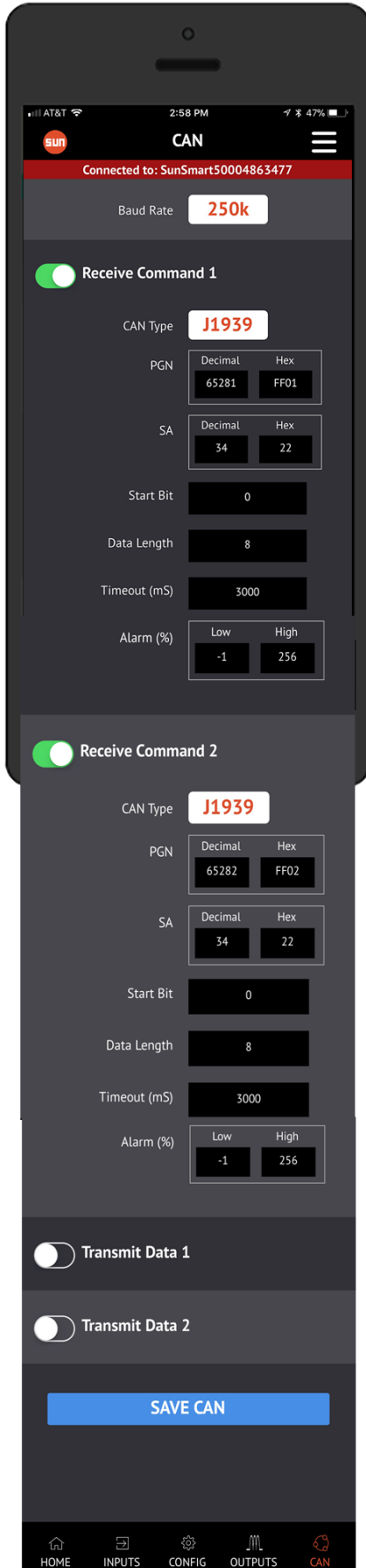
Manual Mode allows the user to manually control the output directly without a command signal present. If a command signal is present it will be ignored.

NOTE:
This allows the user to control the valve and associated functions directly and can be very dangerous if precautions aren't taken.

Manual Mode password is **HMTWCKEGVS.**
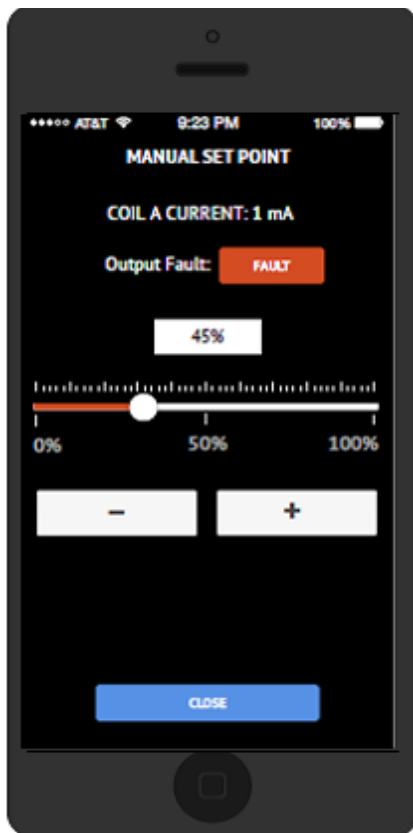
The XMD Mobile app is able to receive and transmit custom CAN messages in addition to transmitting system and alarm information. When selecting a Receive or Transmit message, the GUI will expand to allow the user to input the critical information.

The universal inputs are converted into CAN messages when the Transmit Input 1 and 2 values are selected. Using the available configuration fields, the values can be transmitted and sent using a custom message format by specifying the PGN, Priority, Data Length and Start Bit.

Received Command 1 and Received Command 2 are user defined values determined from a SAE J1939 message by specifying the PGN, Source Address, Data Length and Start Bit. This value can then be used as a command value in the Configuration window of the XMD Mobile App.

The analog input values and driver details are transmitted using predefined values. Refer to the CAN Transmit Messages table on page 18. The transmit messages can be broadcasted on the CAN bus by specifying the PGN, Source Address and Priority.

It is the user's responsibility to understand and abide by the SAE J1939 Specification.

Relevant Field Information

The **Baud Rate** is a global value and pertains to all of the CAN communication.

Parameter Group Number (**PGN**) is a value that defines the message purpose and can be used to send messages on the network or to request messages from other source addresses.

Source Address (**SA**) is an 8-bit field that specifies the address of the device that sent the message (1 through 256).

Start Bit is the bit that alerts the receiving computer of the arrival of a character (1 through 63).

Data Length indicates the number of bits the data field contains (1 through 63).

Timeout (in milliseconds) is the length of time assigned before a CAN message will fail to send (1 to 65535 mS).

Alarm (%) allows the establishment of a Low and High percentage at which notifications will be shown.

Priority designates the order in which messages will be sent (3-7).

Transmission Rate (**Tx Rate** in milliseconds) is the nominal rate at which the PGN message will be transmitted (1 to 65535 mS).

CAN Transmit Messages

Transmit 1
PGN - User Defined 0-65535
SA - User Defined 0-256
Direction - Transmit
Type - Extended

Start Position	Length	Description
1.1	16	Coil 1 Current unsigned
3.1	16	Coil 2 Current unsigned
5.1	1	Coil 1 Open unsigned
5.2	1	Coil 1 Short unsigned
5.3	1	Coil 2 Open unsigned
5.4	1	Coil 2 Short unsigned
5.5	1	Enabled unsigned
5.6	1	Low Voltage unsigned
5.7	1	Universal 1 Out of Range unsigned
5.8	1	Universal 2 Out of Range unsigned
6.1	1	CAN Message Timeout unsigned
6.2	1	CAN Value Out of Range unsigned

Transmit 2
PGN - User Defined 0-65535
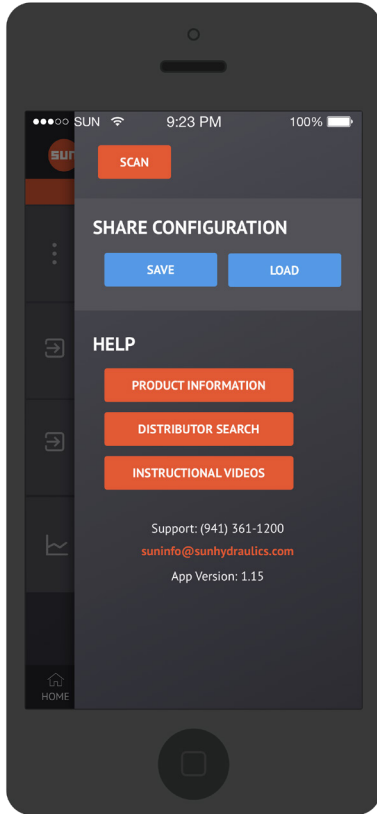**SA - User Defined 0-256**
Direction - Transmit
Type - Extended

Start Position	Length	Description
1.1	16	Universal Input 1 unsigned integer
3.1	16	Universal Input 2 unsigned integer
5.1	16	Supply Voltage unsigned integer

⚠ The user is responsible for abiding by the SAE J1939 specification when transmitting and receiving messages.

Relevant Field Information

Should you require any assistance while programming the amplifier, select the menu icon in the upper right corner of the device's screen.

The **Scan** button re-initiates the scan function to find all amplifiers within range.

The **Share Configuration** tab on the Menu screen allows you to save your current configuration or load an existing configuration.
- **Save** allows you to name and store your active settings.
- **Load** allows you to load saved settings for use on another amplifier.

When Load is selected, the saved configurations can be seen, as shown below. Touch the name of the configuration to be loaded:

The parameters of the chosen configuration will be visible then as shown on the left.

Options for chosen configurations are:
- Load
- Share (via Email or Text)
- Delete

To Share a configuration, follow these steps:
1. Touch Save, and name your configuration. The named configuration will be displayed on the Configurations page.
2. Touch the configuration name, and the View Configuration page will display.
3. Touch Share, and the options will appear for sending via email or text. Choose the appropriate sending mode.
4. Address the email or text and send.
5. Emails or texts that share configurations must be opened from within the smart device for the app to launch automatically. The configuration will then be available from within the app.
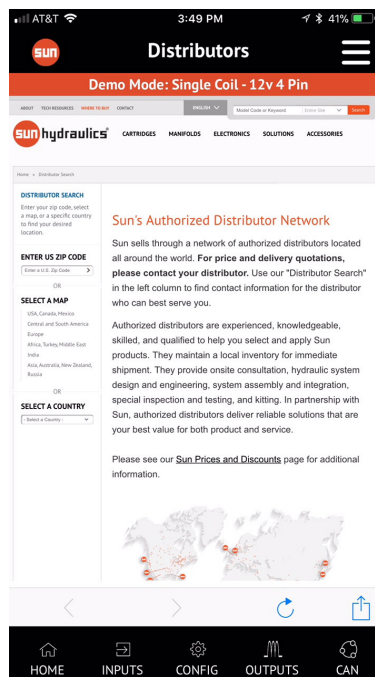
Relevant Field Information

The **Help** tab on the Menu screen provides valuable links directly to Sun's website without needing to exit the application.
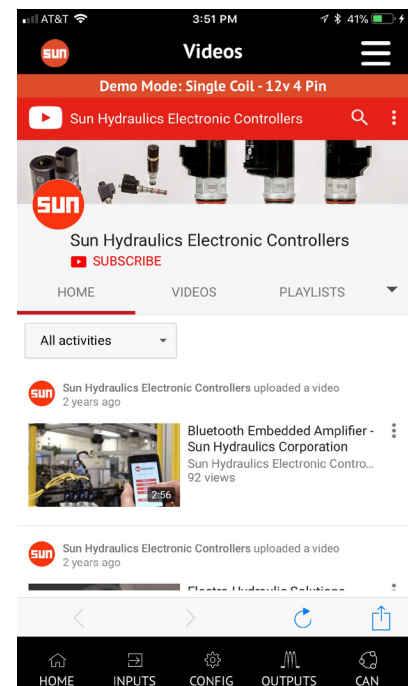
- **Product Information** instantly links you to the Product Page with up-to-date information about the product you are using.
- **Distributor Search** directs you to the local distributor in your area. Simply enter your US zip code, select a country from the dropdown list, or select a map to quickly locate the distributor in your area. Sun's value-added distributors offer local service, support and inventory.
- **Instructional Videos** presents informative videos on relevant topics and products.
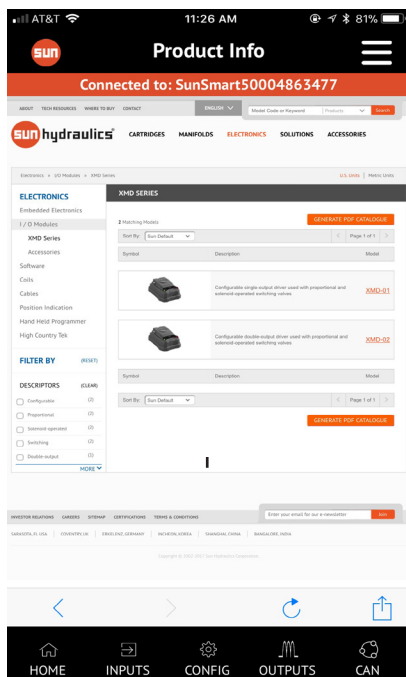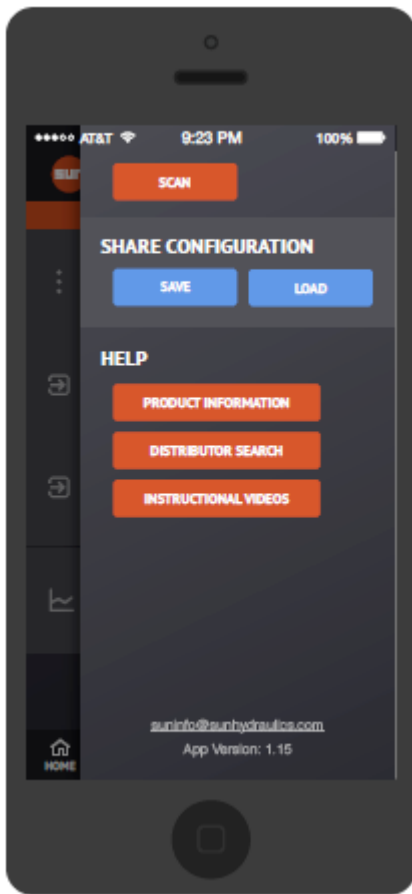
**Product Information**   **Distributor Search**   **Instructional Videos**

Relevant Field Information

The Faults page displays the status of the inputs, outputs and CAN traffic.

It is important to pay attention to the fault fields when setting up an application in order to prevent unnecessary faults. The quick setup profiles have already accounted for industry standard fault settings and do not require further adjustment.
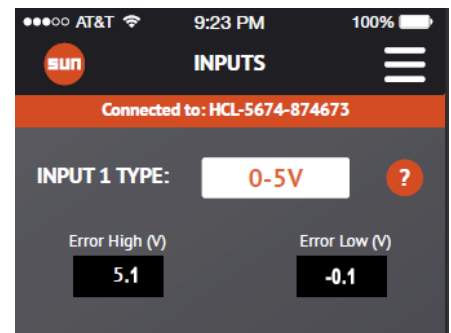
When a fault occurs, the banner turns red to signify an error is present. Each fault is determined by either user-editable fields or hardware-specifc settings, outlined in the tables below:
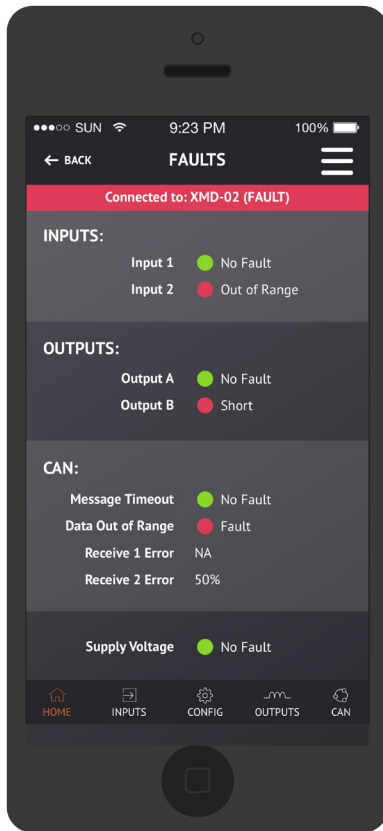
INPUT FAULTS

Input 1: No Fault/Out of Range
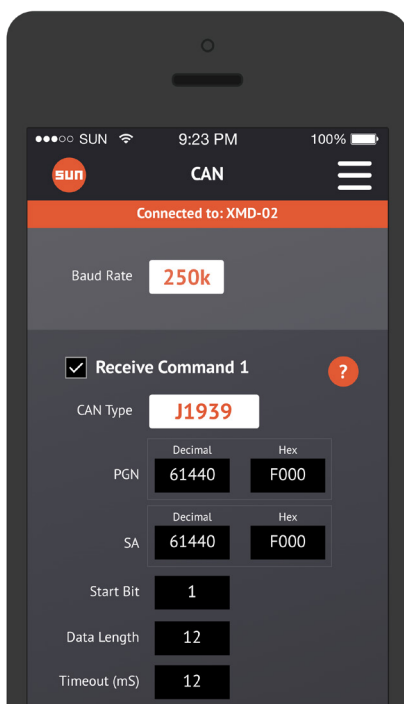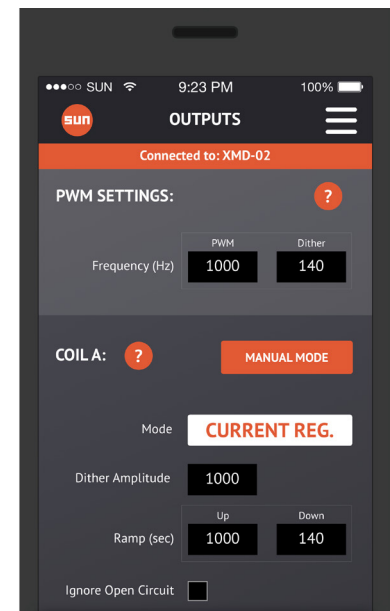Input 2: No Fault/Out of Range

*Out of Range means the input value has exceeded the Error High and Error Low values.

OUTPUT FAULTS

Output 1: No Fault/Open/Short
Output 2: No Fault/Open/Short

*Short Circuits are factory determined. However, by selecting Ignore Open Circuits, a fault will not occur if an open circuit occurs. Open circuit errors can occur if overdriving a coil using current regulation mode. Be sure to configure the coil settings according to the manufacturers' recommended settings.

CAN FAULTS

Message Timeout:

Data Out of Range

Receive 2 Error: No Fault/Out of Range
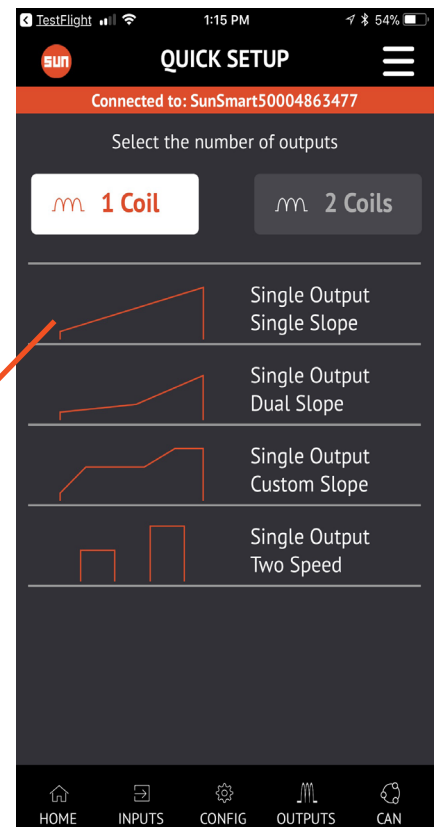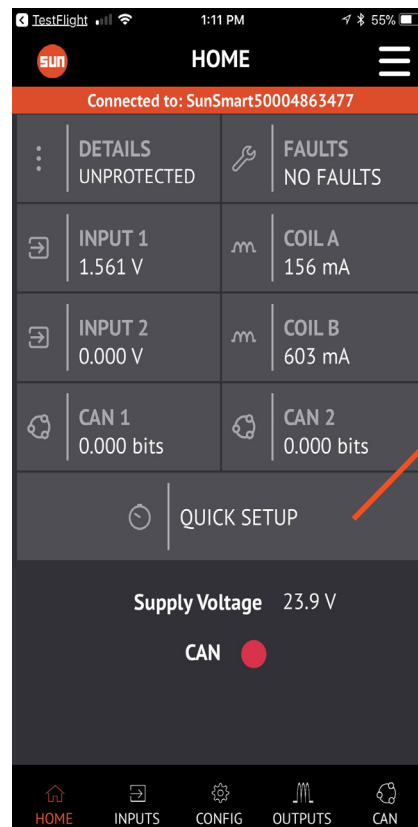Receive 2 Error: No Fault/Out of Range

*Out of Range means the input Value has exceeded the Alarm High/Low values.
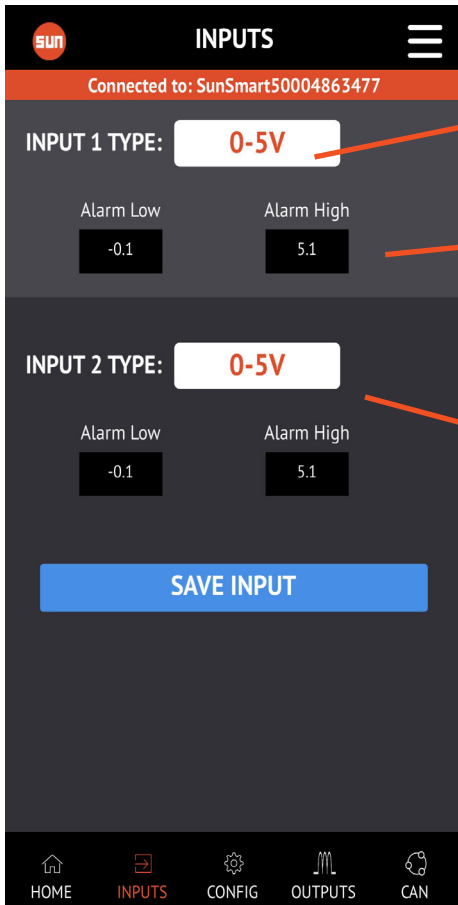
Single Output Single Slope

The Single Output Single Slope Quick Setup configuration is designed to offer a fast solution for open-loop control of single direction motors, flow control valves, pressure control valves, hydraulic fan control, and others using an XMD-01 or XMD-02. The example to the right is a reference with regard to the default configuration of this example.
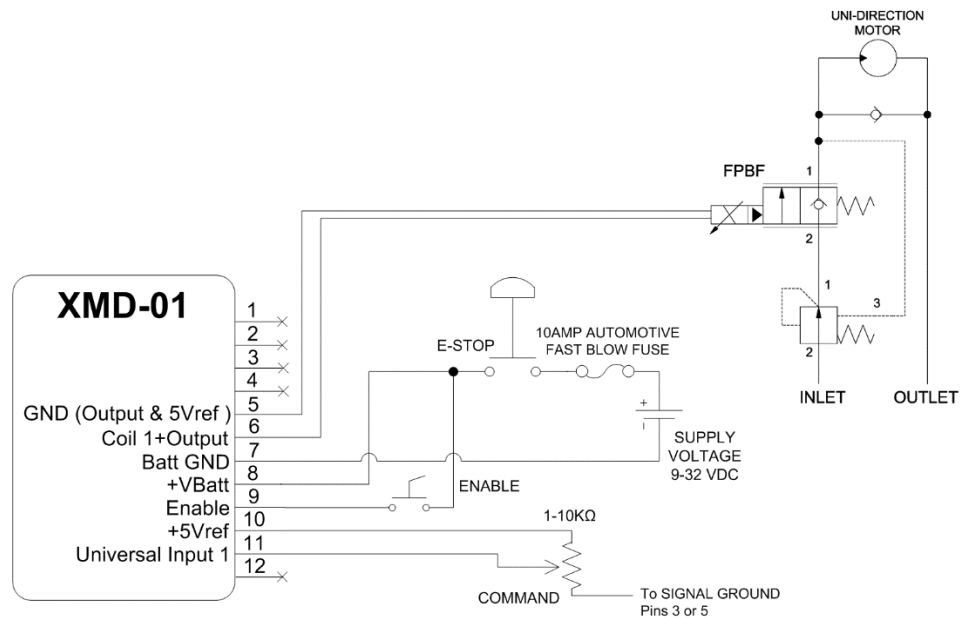
To access the quick setup profile, select the Quick Setup button on the home page of the XMD Mobile app and then select Single Output Single Slope. Once selected, confirm changes, and the app will automatically configure the XMD for a single output configuration.

Single Output Single Slope, cont.

INPUTS

Connected to: SunSmart50004863477

INPUT 1 TYPE: 0-5V

Alarm Low   Alarm High
-0.1   5.1

INPUT 2 TYPE: 0-5V

Alarm Low   Alarm High
-0.1   5.1

SAVE INPUT

HOME   INPUTS   CONFIG   OUTPUTS   CAN

The app will automatically update the device to select 0-5V$_{DC}$ as the signal command type.

Default Alarm Levels

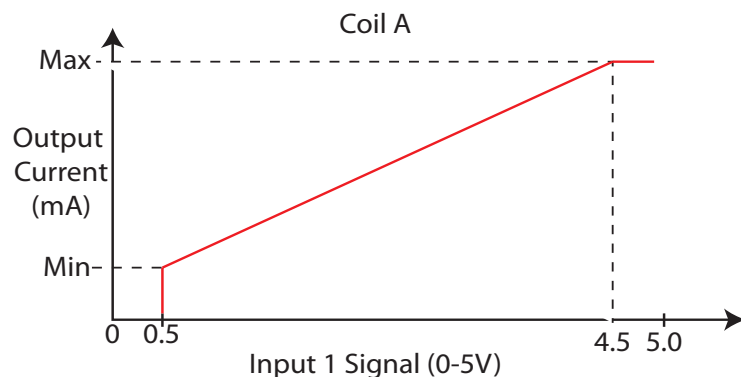Input 2 is not used for the XMD-02 in this configuration.

NOTE: When Digital is selected for the Input type, there is a hard-coded 200 mS debounce when the switch is activated or deactivated.

For this default configuration, Input 1 is selected for Coil A only. For the XMD-02, Coil B Input Type will be defined as "Not Used" because Coil B is not used in this configuration.
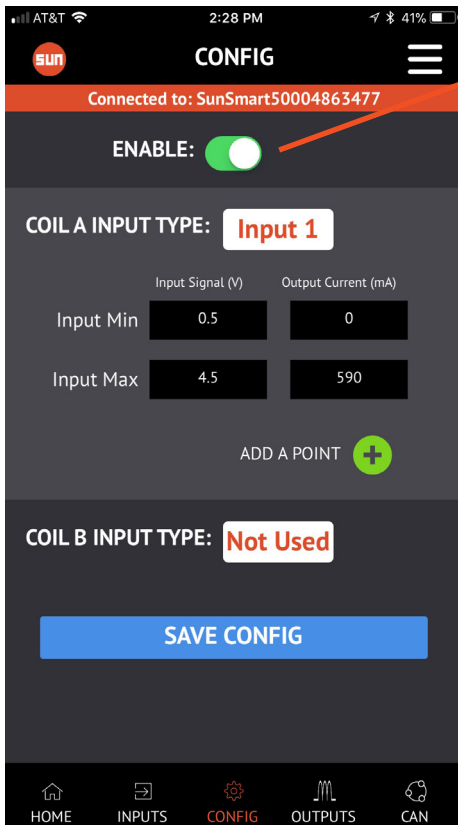
Enable switch must be active in order to operate Coil A. When either enabled or disabled, there will be a hard-coded 200 mS debounce.

CONFIG

.ıll AT&T 🛜   2:28 PM   ⚡ ⁂ 41% 🔋

Connected to: SunSmart50004863477

ENABLE: ⬤

COIL A INPUT TYPE: Input 1

Input Signal (V)   Output Current (mA)

Input Min   0.5   0

Input Max   4.5   590

ADD A POINT ➕

COIL B INPUT TYPE: Not Used

SAVE CONFIG

HOME   INPUTS   CONFIG   OUTPUTS   CAN

Single Output Single Slope default settings

Coil A

Max ⌐ - - - - - - - - - - - - - - - - -

Output Current (mA)

Min ⌐ - -

0   0.5   4.5   5.0

Input 1 Signal (0-5V)

Coil A Input Type: Input 1	Input Signal (V)	Output Current (mA)
Input Min	0.5	0
Input Max	4.5	590
Coil B Input Type: Not Used		

The outputs are defaulted for best performance using Sun's electro-proportional valves. Ramp times are defaulted to zero for this profile but can be easily added. Simply set a value in the ramp up and ramp down times for either Coil A or Coil B for smooth speed transitions and soft shift applications.
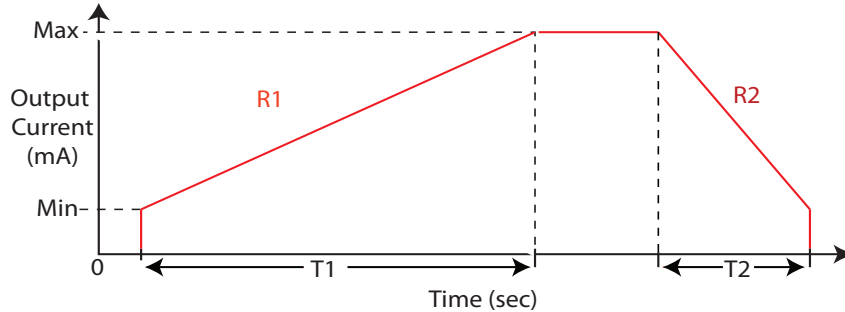
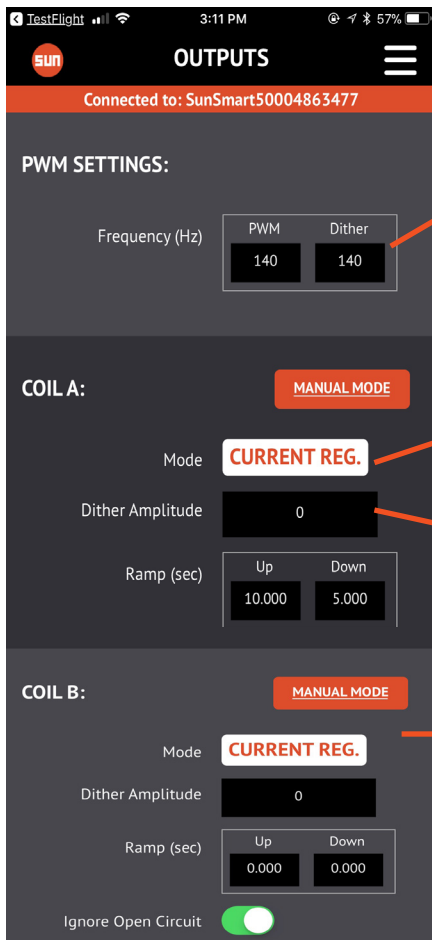$$R1 = \frac{Max - Min}{(Ramp\ Up\ Time)} \qquad\qquad R2 = \frac{Max - Min}{(Ramp\ Down\ Time)}$$

$$T1 = \frac{Max - Min}{(R1)} \qquad\qquad T2 = \frac{Max - Min}{(R2)}$$

Example: Calculate R1 and R2 if the Ramp Up time for Coil A was 10 seconds and the Ramp Down time for Coil A was 5 seconds.

$$R1 = \frac{590\ mA - 0\ mA}{(10\ sec)} = 59\ mA/sec \qquad\qquad R2 = \frac{590\ mA - 0\ mA}{(5\ sec)} = 118\ mA/sec$$

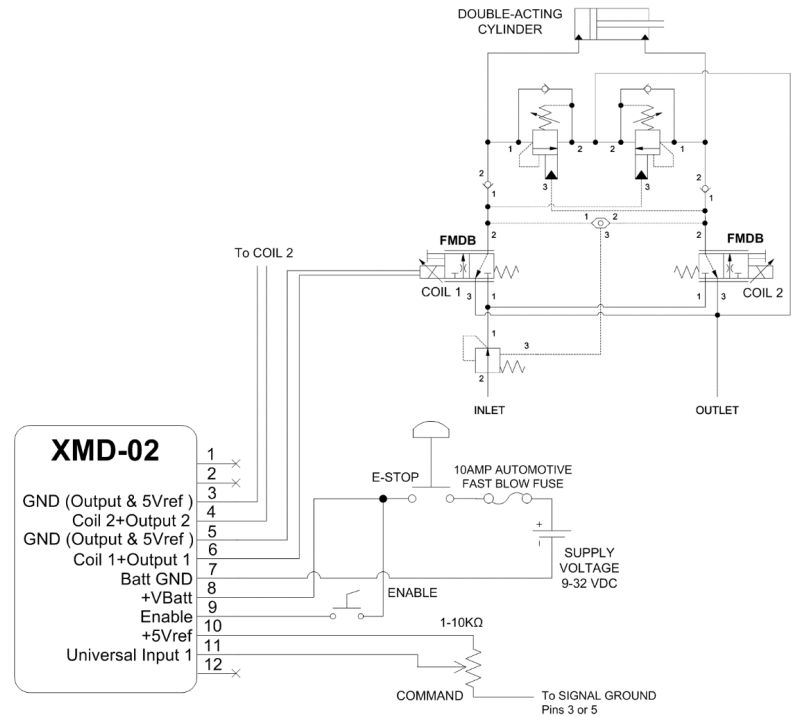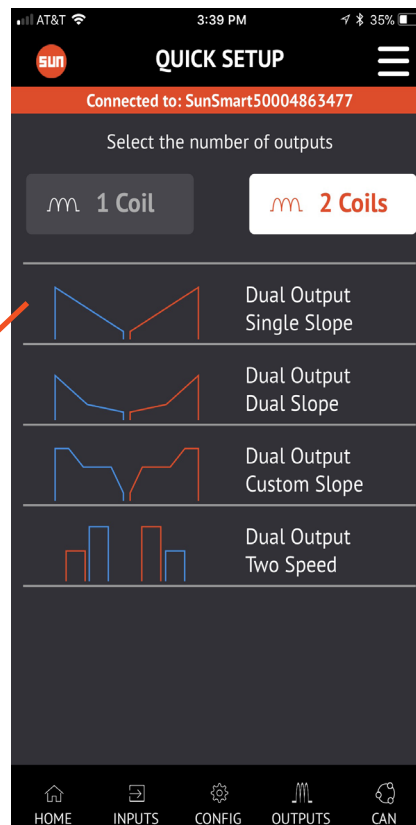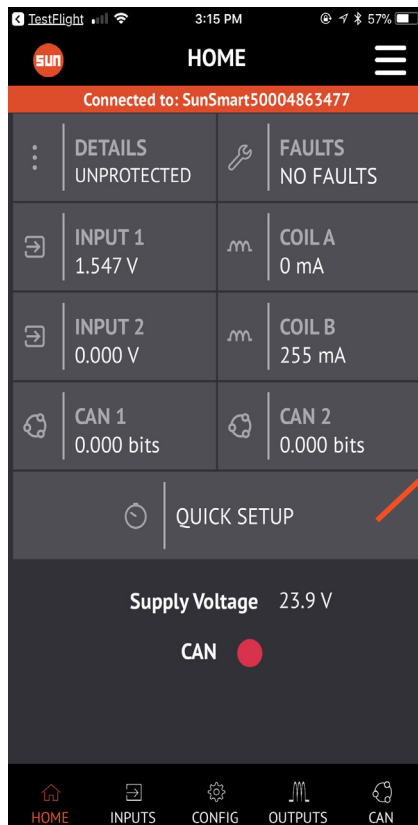## Outputs

For Sun Electro-proportional and solenoid switching valves, use 140 Hz for both the PWM and Dither values.

Current Regulation mode for precise current control.

For Sun Electro-proportional and solenoid switching valves, use 0 dither amplitude.

Coil B is not active for the single output quick setup profile.
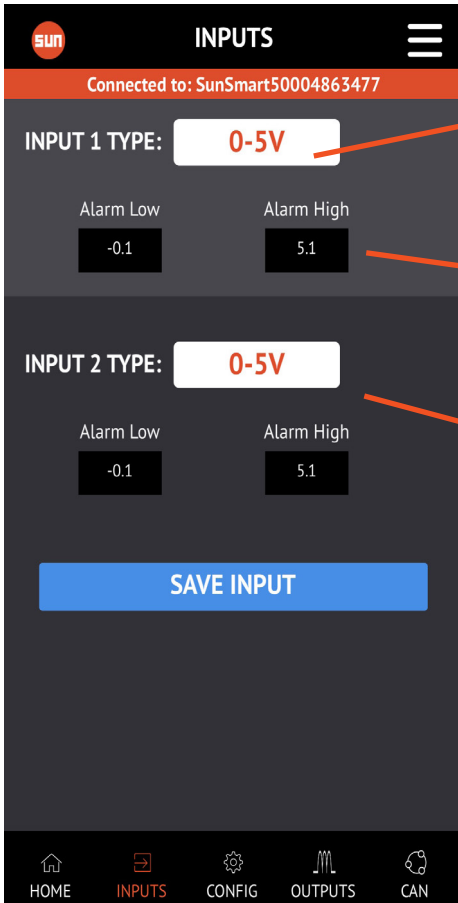
Dual Output Single Slope

The Dual Output Single Slope Quick Setup configuration is designed to offer a fast open-loop solution for direction and speed control of bi-directional cylinders and motors using an XMD-02. This example assumes a joystick or potentiometer will be used to control the speed and direction of a hydraulic actuator. The example below is a reference with regard to the default configuration of this example.

To access the quick setup profile, select the Quick Setup button on the Home page of the XMD Mobile app and then select Dual Output Single Slope. Once selected, confirm changes, and the app will automatically configure the XMD for a dual output configuration.

Dual Output Single Slope, cont.

INPUTS

Connected to: SunSmart50004863477

INPUT 1 TYPE: 0-5V

Alarm Low: -0.1
Alarm High: 5.1

INPUT 2 TYPE: 0-5V

Alarm Low: -0.1
Alarm High: 5.1

SAVE INPUT
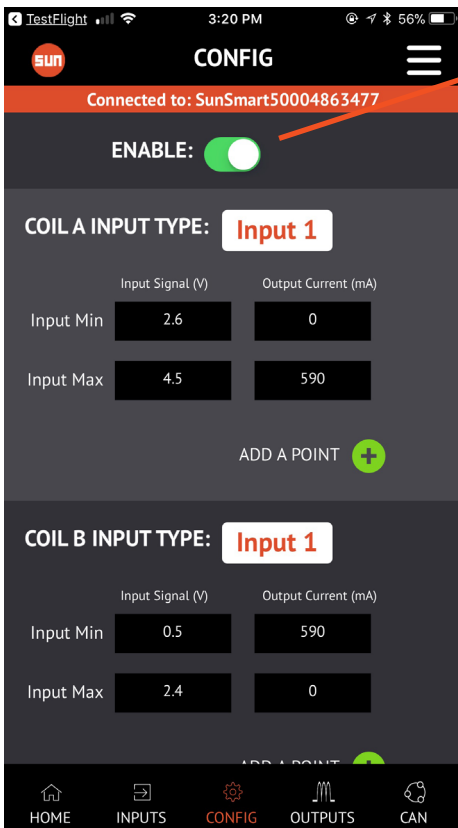
HOME   INPUTS   CONFIG   OUTPUTS   CAN

The app will automatically update the device to select 0-5V$_{DC}$ as the signal command type.
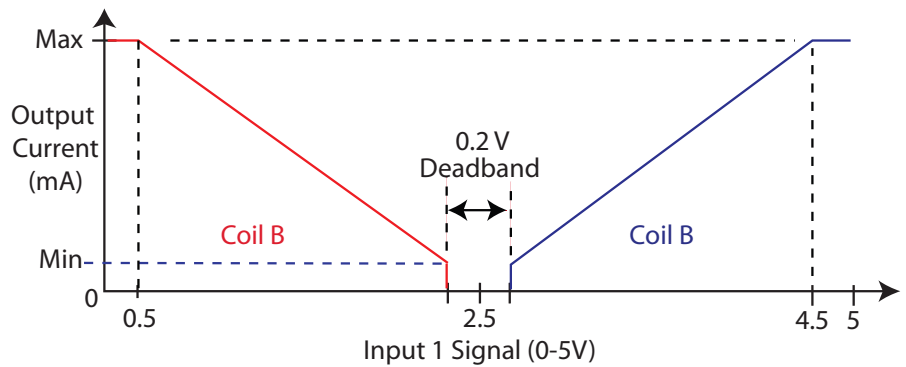
Default Alarm Levels

Input 2 is not used for the XMD-02 in this configuration.

For this default configuration, Input 1 is selected for both Coil A and Coil B since both coils are being controlled from the same input.

Enable switch must be active in order to operate the outputs.

TestFlight   3:20 PM   56%

CONFIG

Connected to: SunSmart50004863477

ENABLE: ⬤

COIL A INPUT TYPE: Input 1

	Input Signal (V)	Output Current (mA)
Input Min	2.6	0
Input Max	4.5	590

ADD A POINT ➕

COIL B INPUT TYPE: Input 1

	Input Signal (V)	Output Current (mA)
Input Min	0.5	590
Input Max	2.4	0

ADD A POINT ➕

HOME   INPUTS   CONFIG   OUTPUTS   CAN

Dual Output Single Slope default settings

0.2 V Deadband

Coil B   Coil B

Output Current (mA): Max ... Min ... 0

Input 1 Signal (0-5V): 0.5   2.5   4.5 5

Coil A Input Type: Input 1	Input Signal (V)	Output Current (mA)
Input Min	2.6	0
Input Max	4.5	590
Coil B Input Type: Input 1	**Input Signal (V)**	**Output Current (mA)**
Input Min	0.5	590
Input Max	2.4	0

Dual Output Single Slope, cont.

The outputs are defaulted for best performance using Sun's Electro-proportional valves. Ramp times are defaulted to zero for this profile but can be easily added.
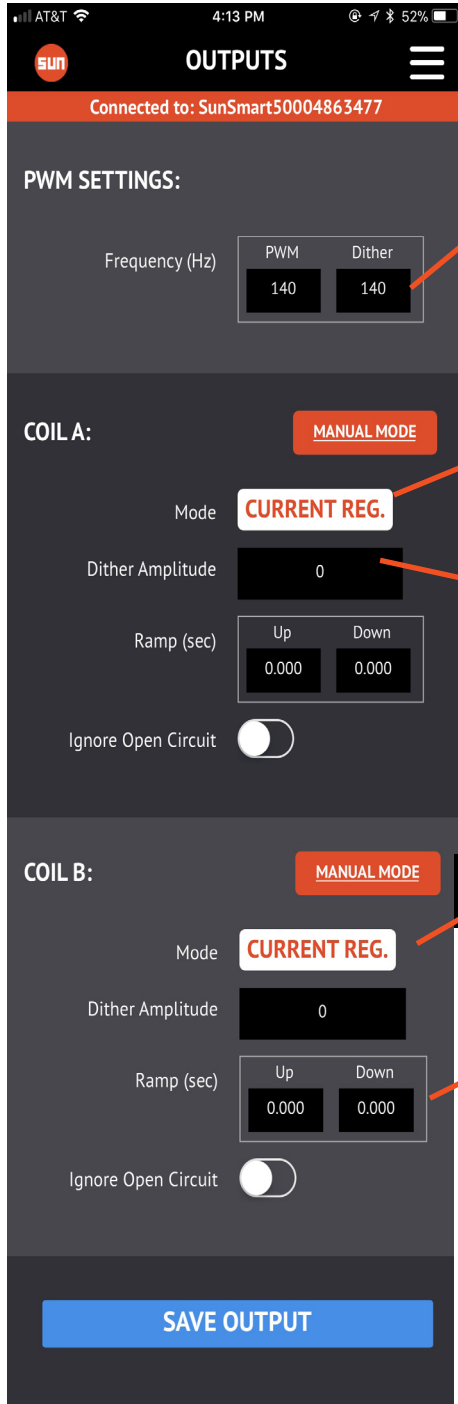

For Sun Electro-proportional and solenoid switching valves, use 140 Hz for both the PWM and Dither values.

Current Regulation mode for precise current control.

For Sun Electro-proportional and solenoid switching valves, use 0 dither amplitude.

Coil B is active for a dual output configuration.

Add ramp times for Coil A and Coil B by simply setting a value in the ramp up and ramp down times for smooth speed transitions and soft shift applications.
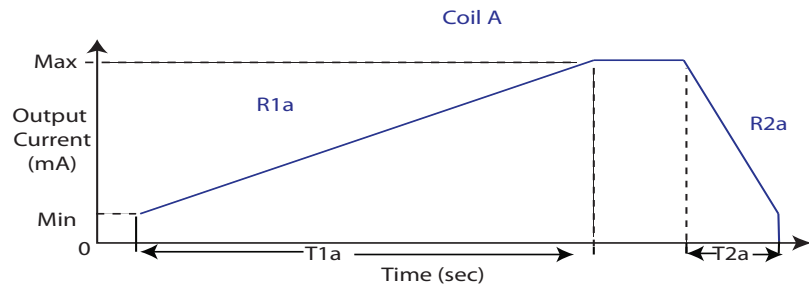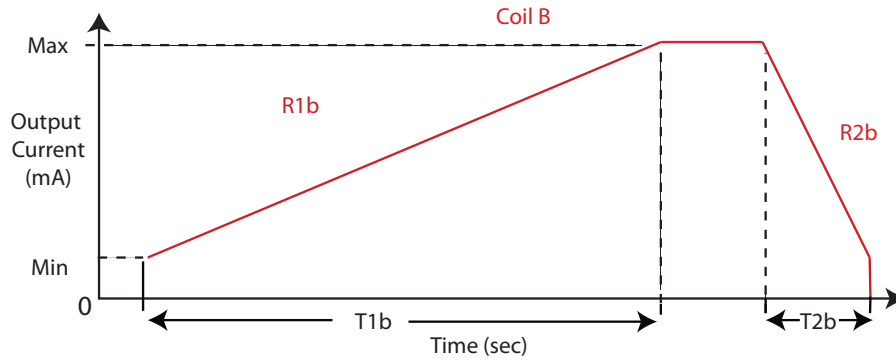

$$R1a = \frac{MaxA - MinA}{(Ramp\ Up\ Time\ A)} \qquad R2a = \frac{MaxA - MinA}{(Ramp\ Down\ Time\ A)}$$

$$T1a = \frac{MaxA - MinA}{(R1a)} \qquad T2a = \frac{MaxA - MinA}{(R2a)}$$
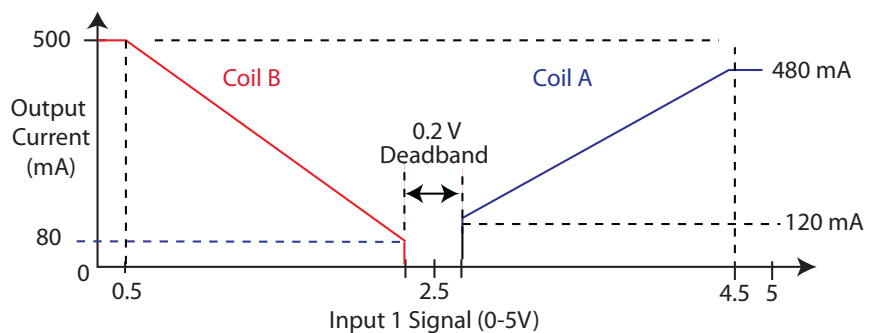
Dual Output Single Slope, cont.

Coil B graph with Output Current (mA) vs Time (sec), showing R1b ramp up and R2b ramp down, with T1b and T2b time segments.

$$R1b = \frac{MaxB - MinB}{(Ramp\ Up\ Time\ B)} \qquad R2b = \frac{MaxB - MinB}{(Ramp\ Down\ Time\ B)}$$

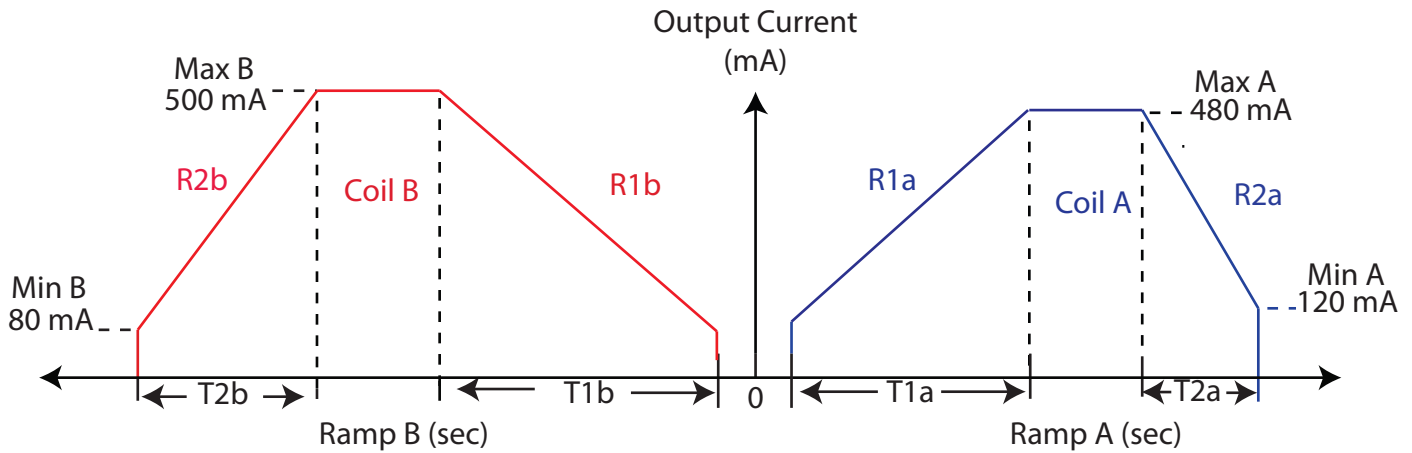$$T1b = \frac{MaxB - MinB}{(R1b)} \qquad T2b = \frac{MaxB - MinB}{(R2b)}$$

Example: Calculate the ramp up and ramp down times for Coil A and Coil B provided the example configuration.
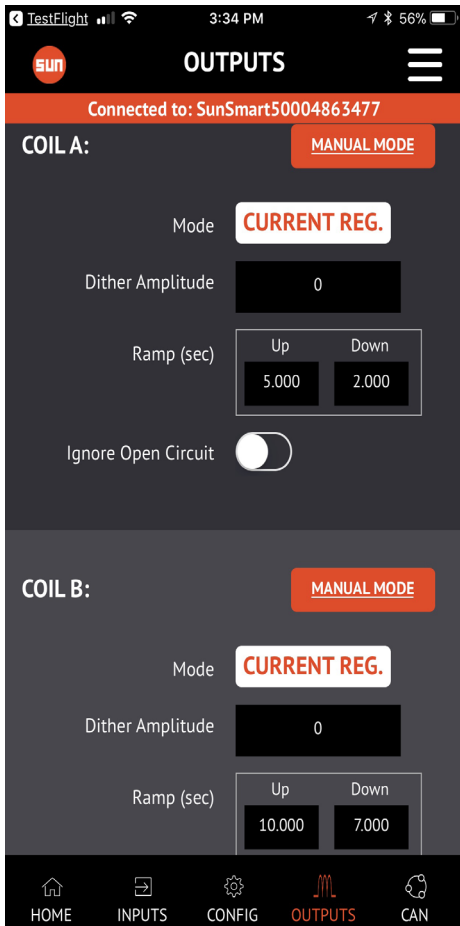
Coil A Input Type: Input 1	Input Signal (V)	Output Current (mA)
Input Min	2.6	120
Input Max	4.5	480
Coil B Input Type: Input 1		
Input Min	0.5	500
Input Max	2.4	80
	Ramp Up	**Ramp Down**
Coil A Ramp (sec)	5	2
Coil B Ramp (sec)	10	7

Graph of Output Current (mA) vs Input 1 Signal (0-5V), showing Coil B (red) decreasing from 500 to 80 between 0.5 and 2.5, a 0.2 V Deadband, and Coil A (blue) increasing from 120 mA to 480 mA between 2.5 and 4.5.

Dual Output Single Slope, cont.

COIL A Calculations

$$R1a = \frac{MaxA - MinA}{(Ramp\ Up\ Time\ A)} = \frac{480 - 120\ mA}{(5\ sec)} = 72\ \text{mA/sec}$$

$$R2a = \frac{MaxA - MinA}{(Ramp\ Down\ Time\ A)} = \frac{480\ - 120\ mA}{(2\ sec)} = 180\ \text{mA/sec}$$

$$T1a = \frac{MaxA - MinA}{(R1a)} = 5\ sec$$

$$T2a = \frac{MaxA - MinA}{(R2a)} = 2\ sec$$

COIL B Calculations

$$R1b = \frac{MaxB - MinB}{(Ramp\ Up\ Time\ B)} = \frac{500 - 80\ mA}{(10\ sec)} = 42\ \text{mA/sec}$$

$$R2b = \frac{MaxB - MinB}{(Ramp\ Down\ Time\ B)} = \frac{500\ - 80\ mA}{(7\ sec)} = 60\ mA/sec$$

$$T1b = \frac{MaxB - MinB}{(R1b)} = 10\ sec$$

$$T2b = \frac{MaxB - MinB}{(R2b)} = 7\ sec$$

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