sun hydraulics CORPORATION

Bluetooth® Embedded Amplifier

User Manual - Ver. 1.0

AmpSet Blue™
Configuration Without Wires

www.sunhydraulics.com

SARASOTA, FL USA | COVENTRY, UK | ERKELENZ, GERMANY | MERIGNAC, FRANCE | INCHEON, KOREA | SHANGHAI, CHINA | BANGALORE, INDIA

Index

3 Product Overview

4 Hints & Tips

6 Connection Diagram

8 Product Specification

9 Configuration

- 9 Parameter List
- 10 Before You Begin
- 10 Diagnostic Indicators
- 11 Getting Started
- 12 Home Screen
- 13 Help Screen
- 14 Details Screen
- 16 Password Information
- 19 Modes of Operation
- 20 Input Parameters
- 22 Output Parameters
- 24 Save & Load

26 Accessories

27 Notes

28 Sun Hydraulics Locations & Contact

Product Overview

The Sun Hydraulics Bluetooth Embedded Amplifier is a single-part, compact, low-profile coil and amplifier combination for use with the Sun proportional solenoid valves.

For ease of use during setup, configuration and diagnostics are now accomplished using Sun's new **AmpSet Blue™** app for safe, secure and reliable wireless Bluetooth® 4.0 connection. The app is downloadable free from the Apple App Store and the Google Play store. To find the app, search for "Sun Hydraulics."

The Embedded Amplifier provides current to the coil in proportion to 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.

- Easily configured using Sun's downloadable **AmpSet Blue** app
- Bluetooth® 4.0 wireless connection to the amplifier. NO cable required
- Microprocessor controlled for consistent, reliable performance
- Sealed to IP69K with Deutsch DT04-6P and IP65 with DIN 43650 A connectors
- Fully encapsulated for vibration, shock and environmental protection
- Power-up diagnostics (4 sec)
- LED indication of operational status
- 5-V user reference for local potentiometer / joystick
- Adjustable ramp-up and ramp-down times, independently set
- Programmable enable-input (optional)
- CE certified to latest standards, including the 30-V/m automotive standard per Directive 2009/19/EC.

Hints & Tips

Hints & tips for successful application of Sun Hydraulics electro-proportional products

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.
- Use Sun-provided cables and accessories to ensure compatibility and correct product operation.
- 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 **AmpSet Blue** 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.

Hints & Tips

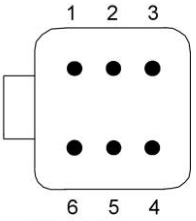
NEVER do the following:

- 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.

Connection Diagram

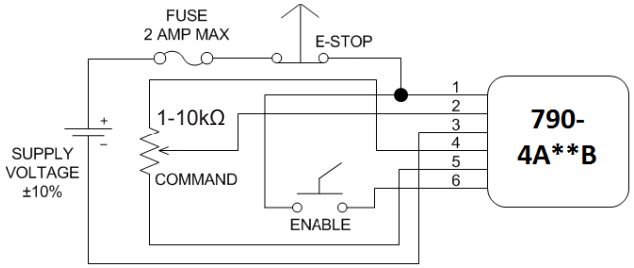
Embedded Deutsch Connector Face & Pin Out

Terminal	Function
1	+V Supply
2	Command Input
3	Supply Common
4	+5 V Reference
5	Command Common
6	Enable Input



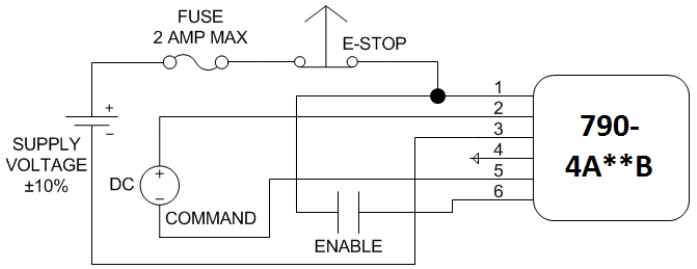
DT04-6P Connector
(view of connector pins)

Single Solenoid Joystick Control



The Amplifier can be operated with a joystick or potentiometer as shown. In this configuration, the +5V reference is used which requires the Amplifier maximum input to be set to 5V.

Single Solenoid PLC Control

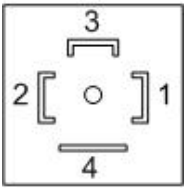


The Amplifier can be operated with an external DC signal as shown.

Connection Diagram

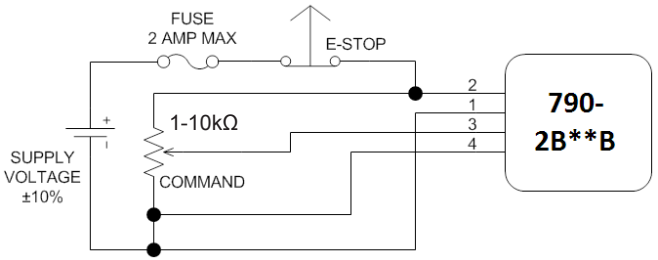
Embedded DIN Plug Face & Pin Out

Terminal	Function
1	Supply Common
2	+V Supply
3	Command Input
4	Command Common



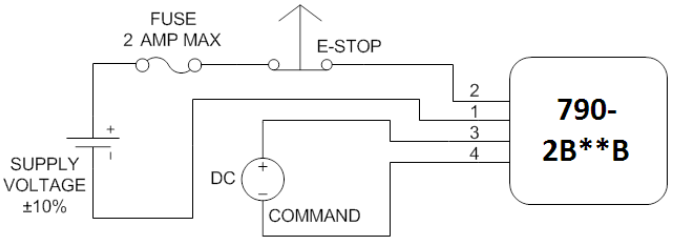
ISO/DIN 43650 A,
Form A Connector
(view of connector pins)

Single Solenoid Joystick Control



The Amplifier can be operated with a joystick or potentiometer as shown.

Single Solenoid PLC Control



The Amplifier can be operated with an external DC signal as shown.

Product Specification

User Interface

The Amplifier has a number of internal settings which allow each unit to be configured precisely for the application. Communication is via Bluetooth only and requires the Sun Hydraulics application, **AmpSet Blue**, available from the Apple App Store or the Google Play Store. The app allows the smart device to locate and pair with the Amplifier, then adjust all expected parameters of the proportional Amplifier through several clear, intuitive screens.

Supply voltage	**790-4A12B**: 11-18 V, 12 VDC Nominal **790-4A24B**: 18-32 V, 24 VDC Nominal
Supply current	Solenoid current + 25mA quiescent
Output current	**790-4A12V**: 12 V Coil, 1200 mA max. **790-4A24V**: 24 V Coil, 625 mA max.
Reference voltage	+5 VDC (4.6 VDC @ 250-mA max load)
Dither settings	33 - 500Hz in 1-Hz increments
Command input ranges	0-5 VDC, 0-10 VDC or 4-20 mA
Command input impedance	10 KΩ (V command) or 250 Ω (mA command)
Operating temperature	-4°F to +176°F (-20°C to +80°C)
Ramp Up time	0 - 65 seconds in 1-ms increments
Ramp down time	0 - 65 seconds in 1-ms increments
Enclosure	Glass-filled nylon, polyurethane-based potting material

Configuration

Parameter List

The following table is the parameter list for the Amplifier giving the name of the parameter, its type, and the limits/units for each item.

Parameter	Type	Limits	Default Settings	Units
MINIMUM INPUT	VARIABLE	0 to 10.0 V or 0 to 20 mA	0.2, 4	V, mA
MAXIMUM INPUT	VARIABLE	0 to 10.0 V or 0 to 20 mA	10, 20	V, mA
MINIMUM OUTPUT	VARIABLE	0 to 625 or 1200	5	mA
MAXIMUM OUTPUT	VARIABLE	0 to 625 or 1200	590 or 1150	mA
DITHER FREQ.	VARIABLE	Off, 33 to 500	140	Hz
RAMP UP TIME	VARIABLE	0.0 to 65.0	0	Seconds
RAMP DOWN TIME	VARIABLE	0.0 to 65.0	0	Seconds
INPUT ACTIVE	VARIABLE	Enable or Disable	Disable	
INPUT TYPE	VARIABLE	0-5 V, 0-10 V,4-20 mA	0-10 V	Volts
MODE	VARIABLE	Standard, Inverse, Two Speed	Standard	
COMMAND VALUE	MONITOR			V / mA
OUTPUT CURRENT	MONITOR			Amps
SUPPLY VOLTAGE	MONITOR			Volts
FAULT STATUS	MONITOR			Fault

Configuration

Before You Begin

In order to tune the user-adjustable parameters of Sun Hydraulics **AmpSet Blue**, a Bluetooth, low-energy (LE) smart device is necessary. The official list of Bluetooth smart devices is maintained at the following site:

www.bluetooth.com.

The Amplifier has a number of internal settings which allow each unit to be configured precisely for the application. Bluetooth communication requires the Sun **AmpSet Blue** application, available free from the Apple App Store or Google Play.

Diagnostic Indicators

The **AmpSet Blue** Amplifier has two indicator LEDs labeled ACTIVE and POWER/STATUS.

The **ACTIVE LED is amber** in color and varies in brightness to provide visual indication of the current being supplied to the coil (brighter amber = more output current).

The **POWER/STATUS LED** will light **blue** when power is applied to the unit and is within the specified supply voltage range, and will flash blue when connected to a smart device.

The **POWER/STATUS LED** will flash **red** when a coil open circuit or short circuit is detected, when an analog command input is out of range or wrongly configured, and when the supply voltage drops below 8 VDC.

The **POWER/STATUS LED** will remain **red** if the amplifier is not connected to the **AmpSet Blue** app.

LEDs provide real-time operational status

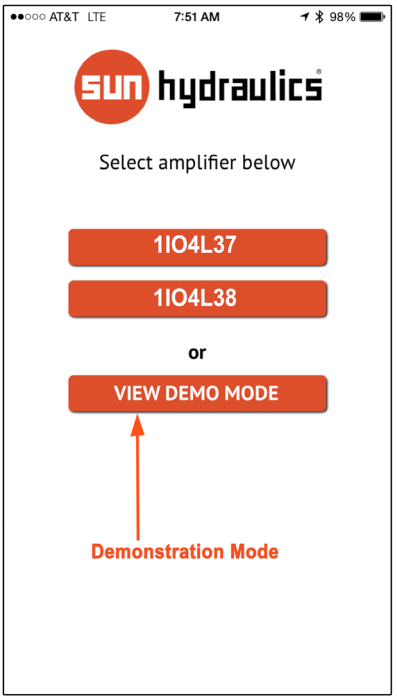
AmpSet Blue™
Configuration Without Wires

Configuration

Getting Started

The Bluetooth Embedded Amplifier must be powered up, indicated by the blue LED, to communicate with the smart device. After you have downloaded and installed the free **AmpSet Blue** application, click the Sun Hydraulics logo on your smart device to start the application.

You will be presented with the Start-Up screen shown below. You may either select the serial number of the coil (unless it has been renamed) to connect to the Amplifier or select the Demo Mode to tour the application without needing to connect to an amplifier.



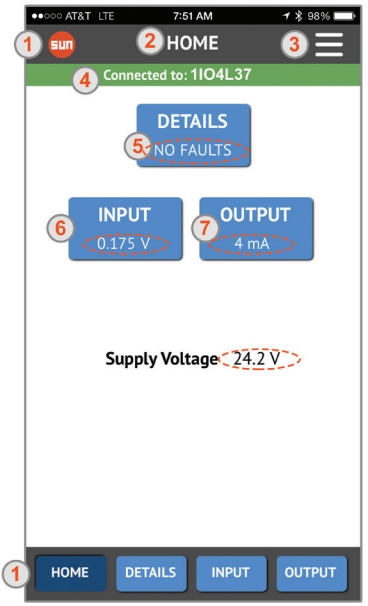
Configuration

Home Screen

Once you are connected to the Amplifier, the POWER/STATUS LED on the paired device will flash blue and the Home Screen is displayed:

1. Product Home Page
2. Current Page
3. Menu Screen
4. Connected Device Name
5. Device Information
6. Adjust Input Parameters
7. Adjust Output Parameters

Live Parameters



Home Screen Composition

DETAILS
Device information.

INPUT
Displays the actual command signal.
The Input parameter is a monitor only.

OUTPUT
Output displays the current being supplied to the output. The Output parameter is a monitor only.

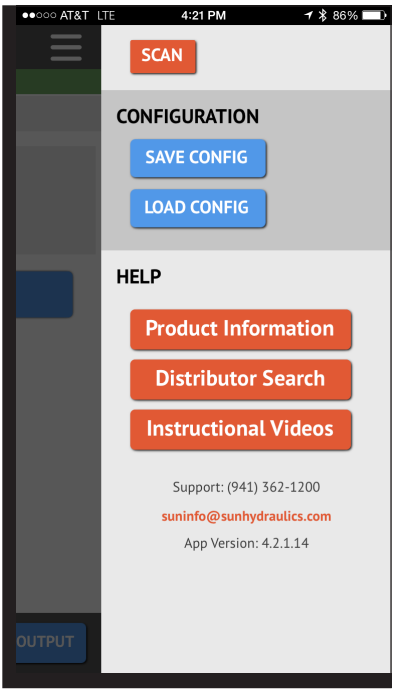
SUPPLY VOLTAGE
Supply Voltage displays the module's power supply input and is an aid to troubleshooting. This parameter is a monitor only.

Configuration

Menu Screen

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

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



The Configuration Tab on the Menu screen allows you to save your current configuraion or load an existing configuration.

- **Save Config** button allows you to name and store your active settings.
- **Load Config** button allows you to load saved settings for use on another amplifier.

The Help Tab on the Menu screen (shown below) provides valuable links directly to Sun's website, without needing to exit the application.

- **Product Information** tab instantly links you to the Product Page with up-to-date information about the product you are using.
- **Distributor Search** tab 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** tab allows you to view informative videos on relevant topics and products.

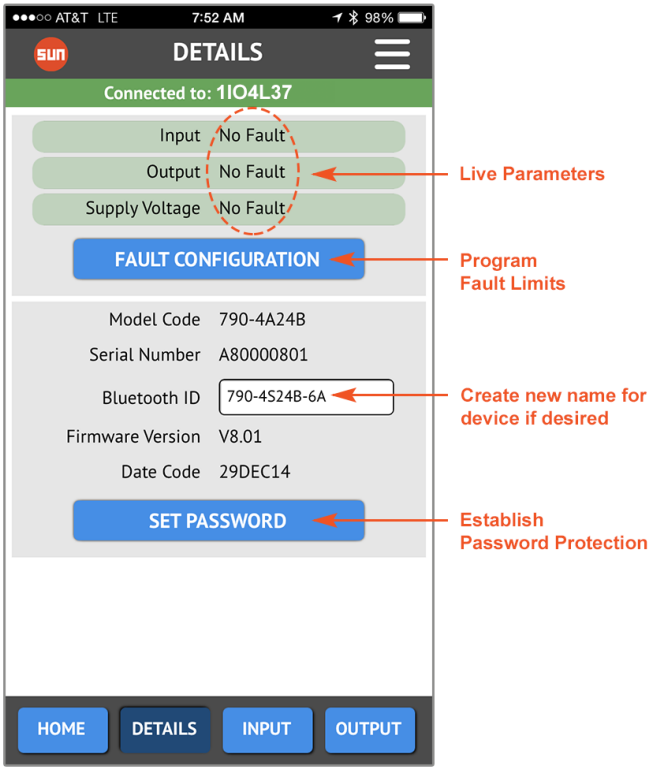
Contact information for Sun Hydraulics and the application version information are also located on the Help Page.

Configuration

Details Screen

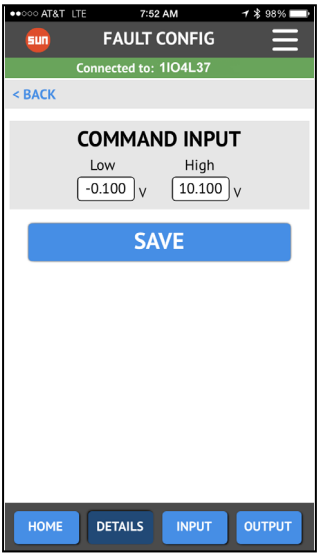
This screen provides information about the Amplifier: current fault status, access to fault configuration, model code, serial number, Bluetooth name, firmware version, datecode, and the ability to establish password protection.

The Bluetooth ID by default is the serial number but can be changed to any name.

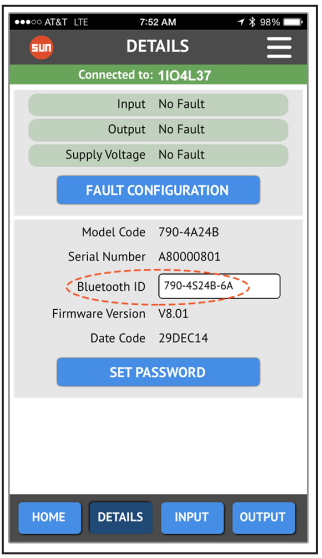


Configuration

Details Screen



Fault Configuration
This screen allows you to change the fault range for the input type. The POWER/ STATUS LED will flash red when out of the set range.



Optional Bluetooth ID
You may create a Bluetooth ID using this field. The ID that you create must not include any blank spaces, but you can use an underscore. After you change this field, the device will reboot to reflect the new Bluetooth ID.

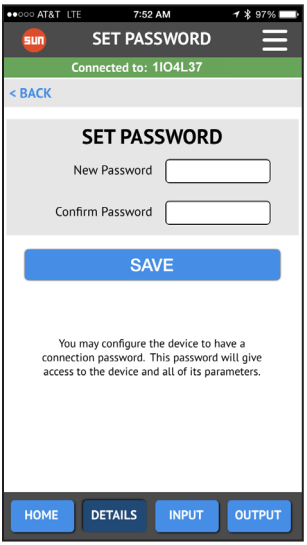
Configuration

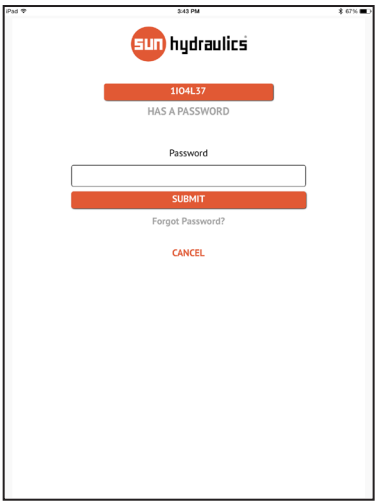
Details Screen / Password

Set Password

The Amplifier can be configured with an optional password for added protection. We strongly recommend that all configurations are password protected.

Password protection prevents unauthorized access to the Amplifier, and for added safety, a connection time-out feature is activated by a period of non-use, preventing the user from leaving the application open and paired.





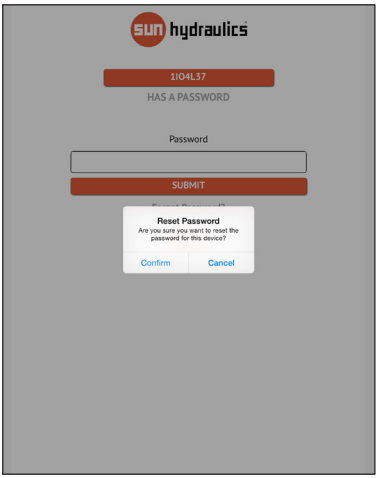
Password Login

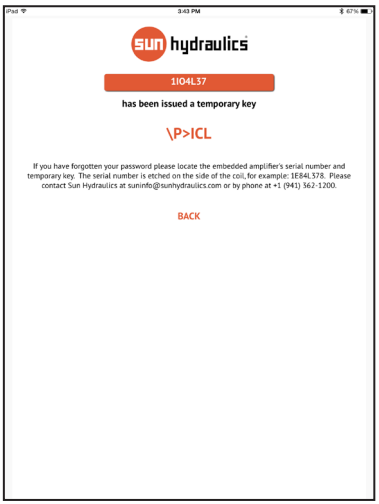
If you established password protection, you will be presented with this screen when logging in. If the proper password is not entered, the app will not allow access to configure the amplifiers.

Configuration

Details Screen / Password

Forgot Password
In the event you have forgotten your password, simply click “Forgot Password” on the login screen. This will bring you to the Reset Password screen. Click ‘Confirm’ to issue a Temporary Key which, along with the Amplifier’s serial number, will allow you to obtain a new password.





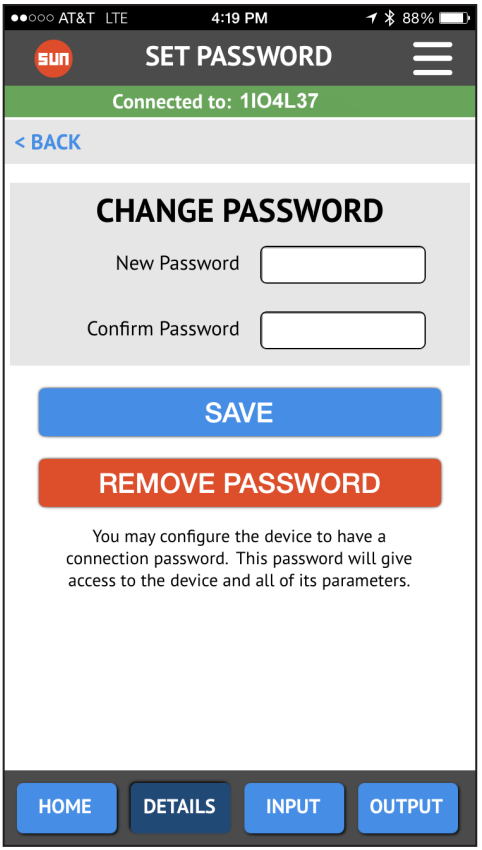
Temporary Key
Once you have obtained the Temporary Key and the Amplifier’s serial number, please contact Sun Hydraulics at suninfo@sunhydraulics.com or by phone at
+1 (941) 362-1200
and ask for Tech Support.

Configuration

Details Screen / Password

Change Password

Once you have established a password, you may change it using the Change Password screen on the Details page.
Enter your new password, then re-enter the new password for confirmation. Click SAVE to save your new password.
You may also remove a password on this screen.

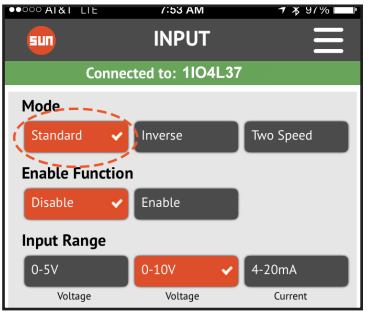


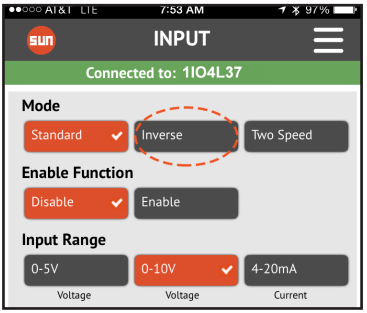
Configuration

Modes of Operation

Standard

The Standard mode is most commonly used for general applications of proportional valves. With the Amplifier in Standard mode, increasing the command value will increase the output proportionally.



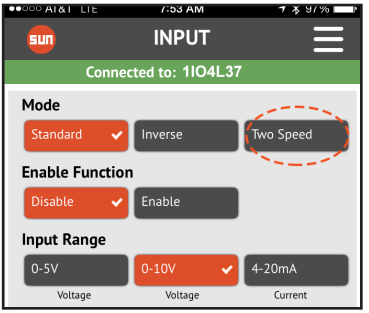


Inverse

Inverse mode works inversely from Standard mode.With minimum command, the ouput will be at the maximum. As the command value increases, the output will decrease proportionally.

Two Speed

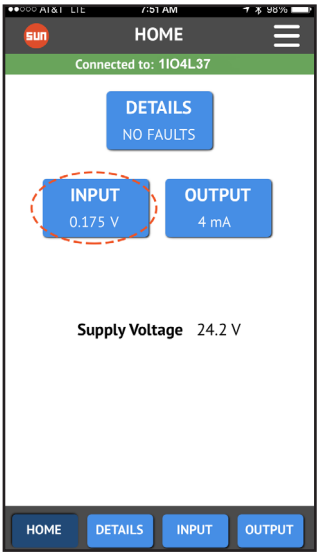
In Two-Speed mode, when the command input switch is closed, the Amplifier will output the minimum programmed output current. This would effectively be low speed or pressure. When the command input is switched, the Amplifier outputs the maximum programmed current, resulting in either high speed or high pressure, depending upon the proportional valve being controlled.

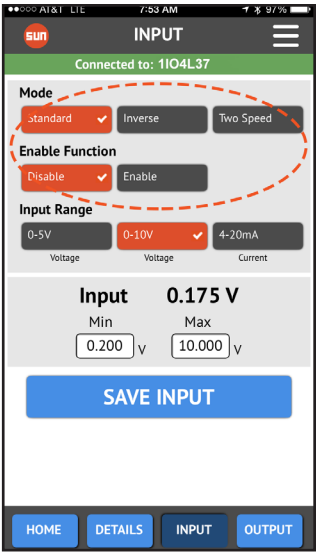


Configuration

Input Parameters

The INPUT button allows the user to adjust the command input parameters. The value below the word INPUT is a live parameter.

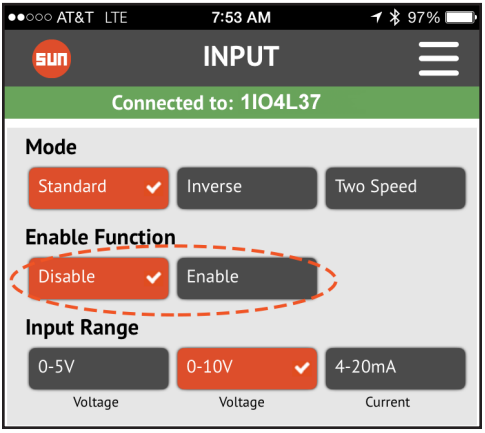




Input Screen
You may change the modes of operation on this screen, enable or disable the enable function, or change the input range. You can also change the Min and Max input parameter.

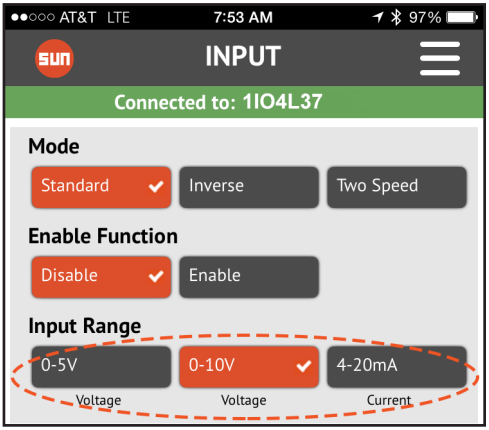
Configuration

Enable Function



Select **Enable** to only output current when the enable signal is active. Select **Disable** to output current regardless of the status of the enable signal.

Input Range

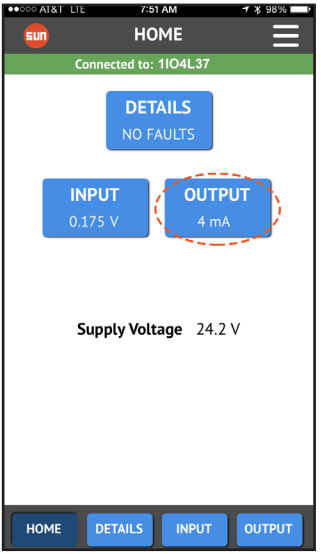


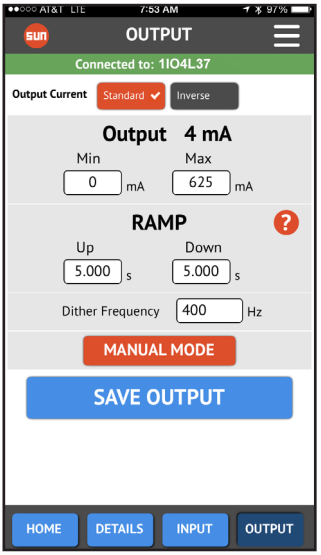
Input Range changes the Amplifier input to either voltage or current command type.

Configuration

Output Parameters

The OUTPUT button allows the user to adjust the output parameters. The value below the word OUTPUT is a live parameter.



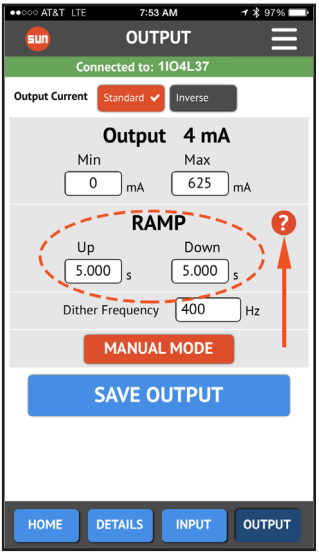


Output Screen

You may invert the output on this screen. The Min/Max output current parameter may be changed for deadband tuning. The output can also have a ramp applied to the rising and falling current. The dither frequency may also be changed to maximize valve performance. Manual mode allows the user to manually control the output directly.

Configuration

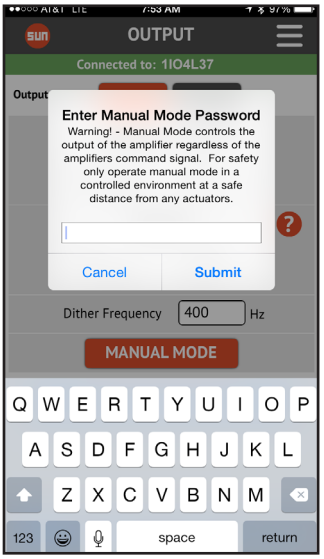
Output Parameters



Ramp
The output may have a ramp applied to the rising and falling current. Click the question mark icon to reveal the formula used to calculate ramp time.

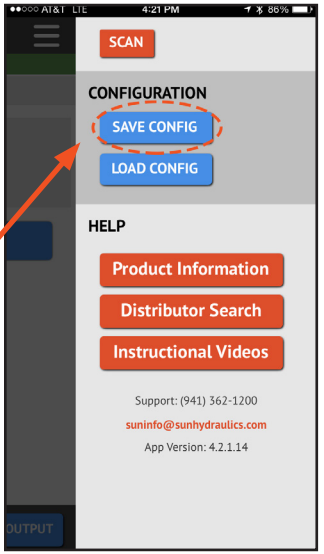
Manual Mode
Manual mode allows the user to manually control the output directly without a command signal present. If a command signal is present it will be ignored.
Note: This allows the user to control the valve and associated functions directly and can be very dangerous if precautions aren't taken.

Manual Mode password is HMTWCKEGVS.

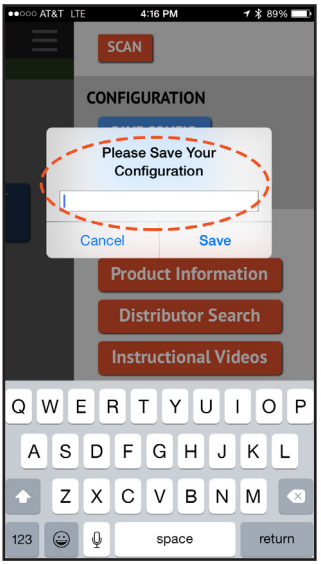


Configuration

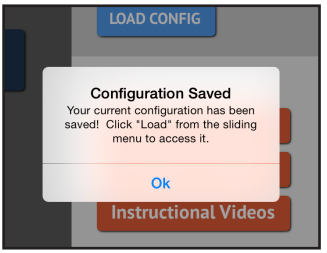
Save & Load



Save Your Configuration
To save your current configuration for use on other amplifiers, go to the Menu Screen and click on "Save Config."



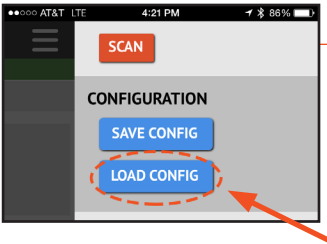
Type in the name of the configuration you want to save.



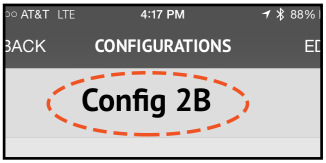
You will see a message confirming that your configuration has been saved.

Configuration

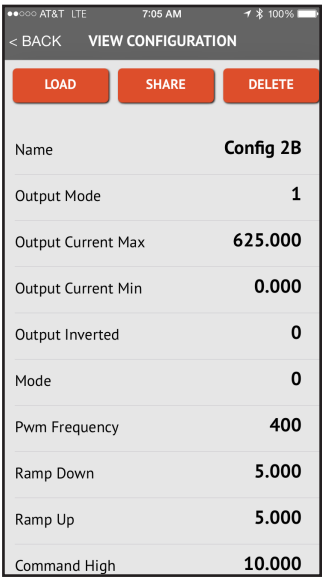
Save & Load



Load a Saved Configuration
To load a saved configuration for use on other amplifiers, go to the Menu Screen and click on “Load Config.”



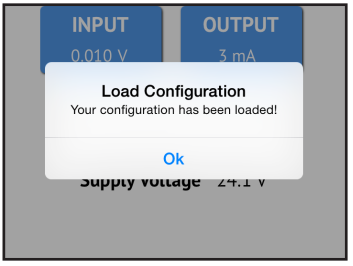
Click on the name of the configuration you want to load.



You can then review the settings of the configuration you’ve chosen before loading. You then have the option to load the file, share it via email or text, or delete the saved config file.

When loading configurations from text or email, you must open the email or text from within your smart device, and the app will launch automatically. The configuration will then be available from within the app.

When you click “Load,” you will be asked to confirm that you want to load the configuration.



Click “Load.”

Another dialog will appear to confirm that your saved configuration has been loaded.

Accessories

Cables

Deutsch cable assemblies are for use with Sun's Bluetooth Embedded Amplifier and equipped with a Deutsch DT06-6S connector.

- Meets or exceeds AWM 54661 and AWM LL54185
- PVC jacket 18 AWG, 6-conductor with drain, foil, and braided shield
- Rated for 105° C (221° F) and 300V

Image	Description	Model Code	Operating Specifications
	DT06-6S Cable	991-706-003	Deutsch Mating Cable Assembly, 3m length
	DT06-6S Cable	991-706-006	Deutsch Mating Cable Assembly, 6m length

Terminal	Function	Wire Color
1	+V Supply	Brown
2	Command Input	Black
3	Supply Common	Blue
4	+5V Reference	Red
5	Command Common	Green/Yellow
6	Enable	White
-	Shield Drain	Bare

Notes

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