

μVD - MICRO VALVE DRIVER

OPERATION AND INSTALLATION MANUAL

Kar-Tech
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BG

INDEX

Description.....	1
Installation.....	1
Before applying power	1
Figure 1: MICRO Valve Driver wiring diagram	2
Configuration and Calibration Jumper Settings Tables	3
Jumper Location Detail	4
System Calibration Using On Board Jumpers	5-6
System Calibration Using Optional Gate.....	7-14
Wiring Chart	16
Wiring Analog Inputs	16
Routine Maintenance	17
Maintenance Precautions	17
Troubleshooting.....	17
Troubleshooting chart.....	18
Error code chart	19
Parts List	20
Specifications	21

DESCRIPTION:

KAR-TECH's MICRO VALVE DRIVER is a state of the art microprocessor based system for controlling electro-hydraulic proportional valves.

There are 2 proportional outputs available, controlled by the levels present on 2 analog inputs. Each output is designed with short circuit and overload protection.

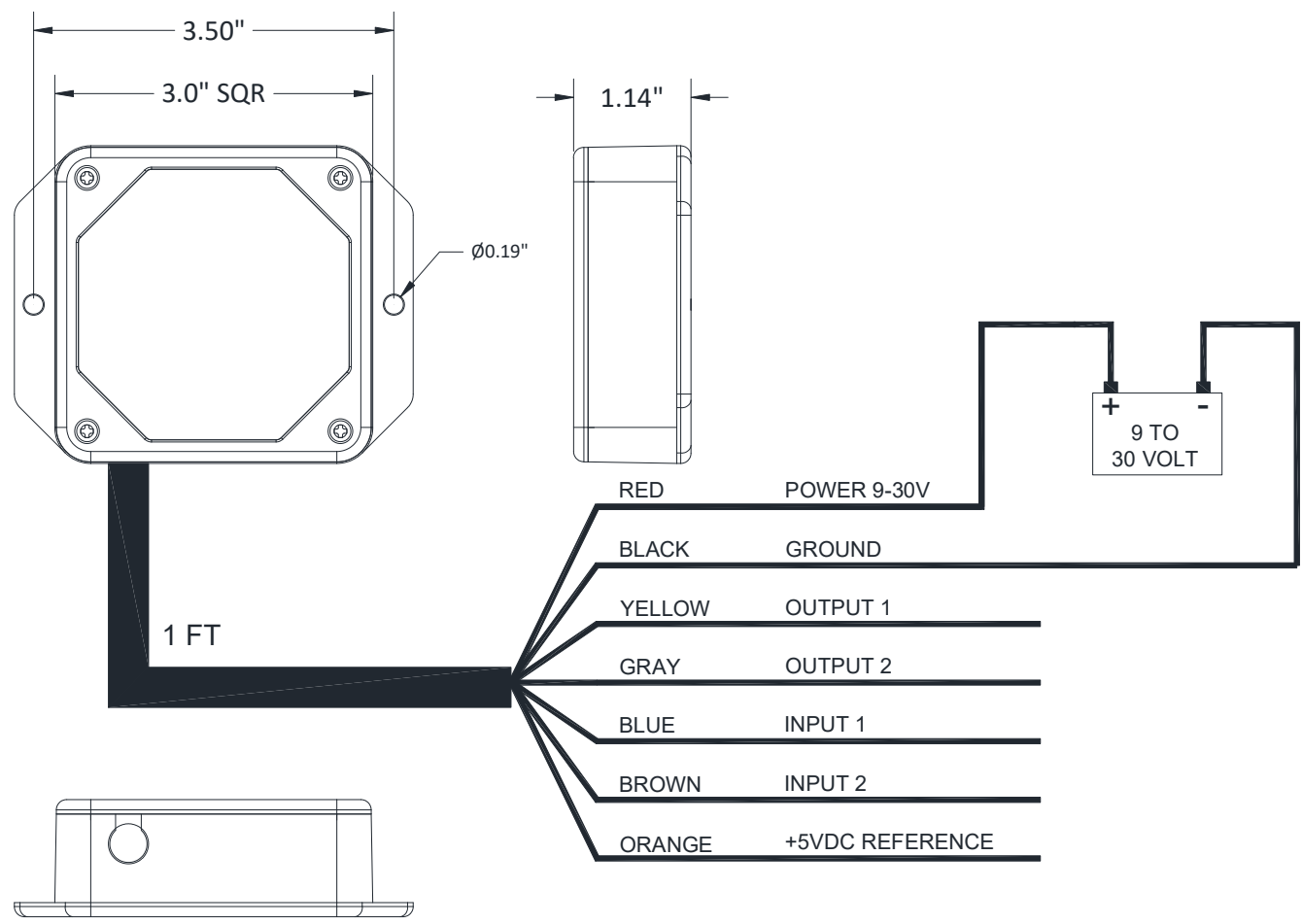
The Micro Valve Driver also has 2 LEDs displaying the system status. The green LED will blink when power to the system is applied. The red LED will blink if there are any faults on any of the inputs or outputs. Each output is monitored for no-load or broken wire conditions. If a fault condition occurs, count the number of blinks of the red LED, and then refer to the ERROR CODE section in this manual for additional information.

INSTALLATION:

1. Refer to the WIRING CHART in this manual for wiring connections.
2. To install the Micro Valve Driver control, use the 2 mounting holes provided on the control enclosure. Please take extra caution not to damage internal components while installing the unit.
3. When installing the unit, the main power should run from the battery, through a 10 amp fast blow fuse. Use 18 gauge or heavier wire.
4. All connections must be properly insulated to protect against shorts.

BEFORE APPLYING POWER:

1. Check power and ground for correct polarity.
2. Check wiring harness for possible shorts before connecting control to output devices (i.e., valves, relays) by checking each mating pin terminal.
3. Read the rest of this manual.



Micro Valve Driver wiring diagram

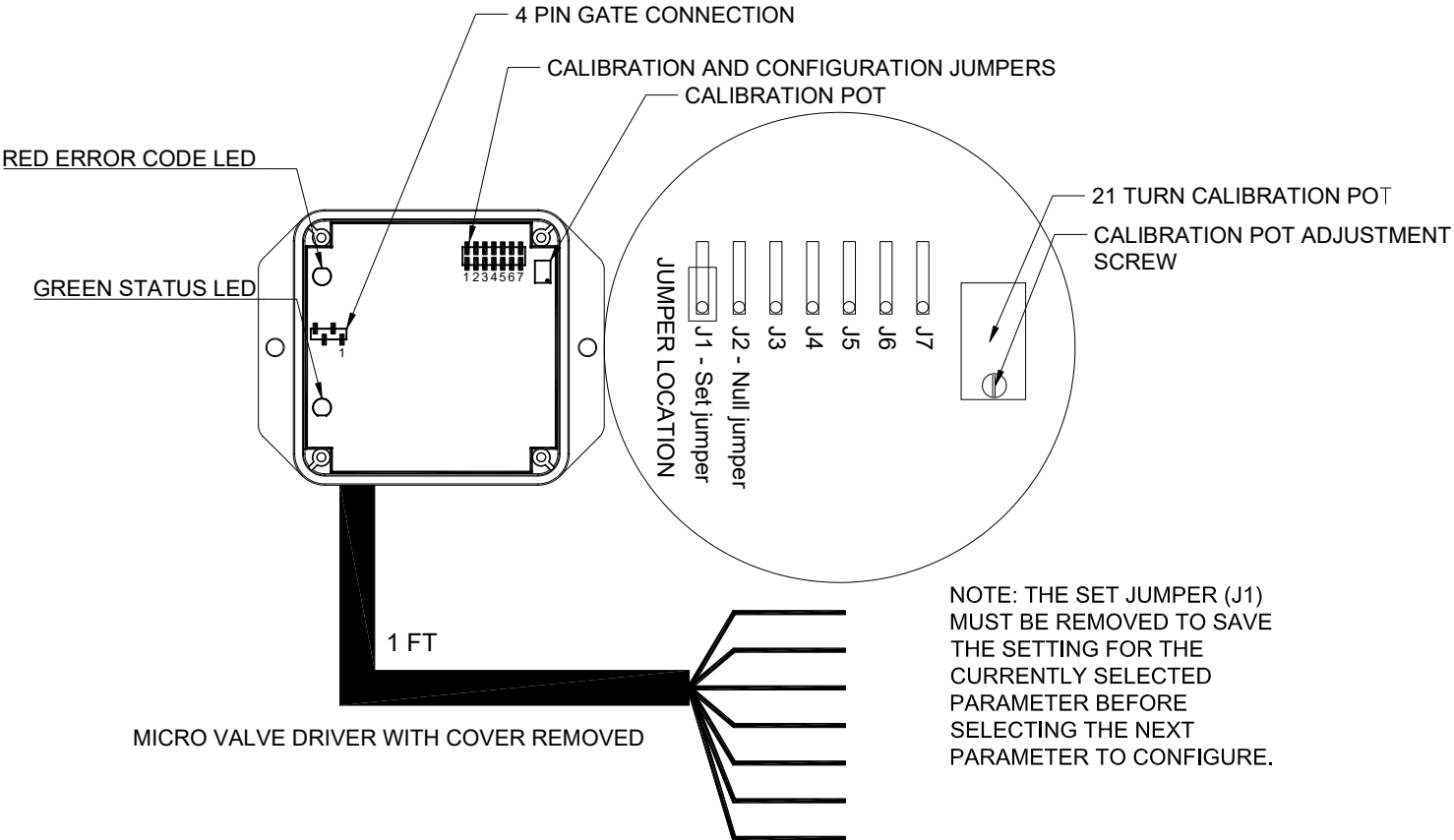
Table 1: Configuration Jumper Settings

Configuration Option	Jumpers to Install	Number of red LED blinks	Number of green LED blinks
1 Input / 1 Output	J1 and J3	1	1
1 Input / 2 Output	J1 and J4	1	2
2 Input / 2 Output	J1, J3, and J4	1	3
Soft start	J1 and J5	1	4
Bump Complementary Default Mode	J1, J3, and J5	1	5
Bump Complementary Step Down Mode	J1, J4, and J5	1	6
Bump Independent Mode	J1, J3, J4, and J5	1	7

Table 2: Calibration Jumper Settings

Output Parameter	Calibration Jumpers to Install	Number of red LED blinks	Number of green LED blinks
Output 1 Minimum	J1 and J6	2	1
Output 1 Maximum	J1, J3, and J6	2	2
Output 1 Ramp Up Time	J1, J4, and J6	2	3
Output 1 Ramp Down Time	J1, J5, and J6	2	4
Current Regulated Output 1	J1, J3, J5, and J6	2	5
PWM Output 1	J1, J4, J5, and J6	2	6
Bump Step Output 1	J1, J3, J4, and J6	2	7
Bump Time Output 1	J1, J3, J4, J5, and J6	2	8
Output 2 Minimum	J1 and J7	3	1
Output 2 Maximum	J1, J3, and J7	3	2
Output 2 Ramp Up Time	J1, J4, and J7	3	3
Output 2 Ramp Down Time	J1, J5, and J7	3	4
Current Regulated Output 2	J1, J3, J5, and J7	3	5
PWM Output 2	J1, J4, J5, and J7	3	6
Bump Step Output 2	J1, J3, J4, and J7	3	7
Bump Time Output 2	J1, J3, J4, J5, and J7	3	8
Output Frequency	J1, J6, and J7	4	1
Reset to Factory Setting	J1, J3, J4, J5, J6, and J7	4	4

MICRO VALVE DRIVER



Configuration & Calibration Using the Jumpers -

The μ VD can be configured and calibrated using the on-board jumpers. Refer to the jumper detail drawing on page 3 and 4 for the location of these jumpers.

To configure the μ VD, first apply power to module. The green LED will flash when the unit is on. Then install the jumpers for the desired configuration as shown in table 1 on page 3. The red and green LED should start to blink as described. Remove set jumper (J1) to save. The LEDs will stop blinking.

Changing the configuration jumper settings at any time immediately changes the μ VD configuration. **Warning: when any of the input/output pairs are initially made active by installing any of the configuration jumpers, if an input voltage is present on the input(s) when the configuration jumper is installed, the corresponding output(s) will immediately come on. Ensure that the outputs are not connected to the equipment when performing μ VD configuration.**

Note: when the 1 Input/ 2 Output configuration is chosen, the input voltage range for analog input 1 is divided into a high side and a low side corresponding to the high side and low side from the center voltage of a joystick . The high side input corresponds to proportional output 1 and the low

side corresponds to proportional output 2.

The individual output parameters can also be calibrated using the jumpers along with the 21 turn calibration pot. To set the individual parameters, install the jumper or jumpers to select the desired parameter as shown in table 2 on page 3. The red and green LED should start to blink as described. Then turn the adjustment screw on the calibration pot CW to increase or CCW to decrease the currently selected parameter. When the parameter has been adjusted to the desired level, **simply remove the set jumper (J1) and the new value will be saved.** The LEDs will stop blinking. Note: when calibrating μ VD parameters using the calibration jumpers, the currently selected parameter will not change until the calibration pot adjustment screw has been turned one full turn in either the clockwise or counterclockwise direction.

To restore all of the μ VD parameters to the default factory settings perform the following steps:

1. Install all six jumpers shown on table (Configuration and Calibration).
2. Red LED and green LED should both be blinking 4 times.
3. Remove set jumper (J1).
4. The LEDs will stop blinking.

At this point the μ VD will power

up with the factory calibration settings. When any of the inputs and outputs is then made active by installing the configuration jumpers, the inputs and outputs will initially have these factory settings. The factory calibration settings for 1 Input/ 1 Output or 2 Input/ 2 Output configurations are:

Analog Inputs

Min. - 0.5V

Max. - 4.5V

Proportional Outputs

Min. - 400mA

Max. - 1400mA

Ramp times - 0 Sec.

Freq. - 75Hz

The factory calibration settings for the 1 Input/ 2 Output configurations are:

Analog Input

Low Side - 0.5-2.25V

High Side - 2.75-4.5V

Proportional Outputs

Min. - 400mA

Max. - 1400mA

Ramp times - 0 Sec.

Freq. - 75Hz

Note: When returning the μ VD to factory settings, any calibration adjustments that had previously been made will be lost.

SYSTEM TROUBLESHOOTING USING OPTIONAL GATE:

The Kar-Tech GATE connects to the controller thru the RS232 diagnostic port.

Note: To prevent electrical shorts and damage turn Controller power off. Plug gate to the controller then turn power on to the controller.

The GATE creates a Wi-Fi access point which allows you to connect to any device with Wi-Fi and web browser such as smart phones, pads or personal computers. It supports Google Chrome, Internet Explorer, Firefox and IOS Safari and allows user to configure, diagnose and troubleshoot the system.



Gate Diagnostic Tool

The GATE's POWER LED will start to blink if the battery is low. Charge the GATE as soon as possible after seeing low battery indicator using a Kar-Tech cable.

After being plugged in, the GATE will turn off after 1 minute if no μ VD or Wi-Fi is connected. If the μ VD or Wi-Fi is connected, the GATE will turn off after 5 minutes of no Wi-Fi and μ VD connection otherwise it will stay on.

The Gate is a very useful tool for configuring and calibrating the control system. The μ VD module application allows the user to configure the control as a 1 Input/ 1 Output control, a 1 Input/ 2 Output control, or as a 2 Input/ 2 Output control. The user can then also calibrate the parameters for the proportional outputs and analog inputs.

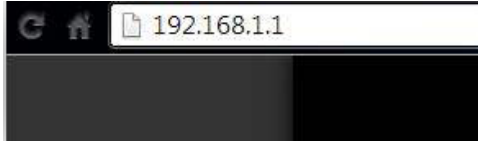
Connect the Gate interface to the 4-pin serial connector on the CVD control board; see the figure below for the location of the 4-pin serial connector. Place the ridge of the connector toward the top of the enclosure (side opposite of wires).



ACCESSING THE CONTROL PANEL

1. Turn off power to the μ VD.

2. Plug in the GATE to the μ VD.
3. Turn on the power to the μ VD. The power LED on the GATE will turn on at this point
4. Use your device and look for the available WiFi networks. A network under the name of "KTMVD21037" should be available at this point. Connect to the network, the password is 210379A1.
5. Once the connection is established, open a web browser on your device. Kar-Tech recommends using Chrome browser.
6. Enter the address <http://192.168.1.1> in the address bar



Address Bar

7. The following options are available from the main screen.



Main Screen

CALIBRATION & DIAGNOSTICS

To set inputs and outputs to match valves and joysticks, tap the CALIBRATION & DIAGNOSTICS button. A password is required to gain access to this section. The password is 1262.

After entering the password, the following screen will appear:



Calibration & Diagnostic

If the “Check Serial Link” message is flashing in the middle of the screen, check the connection to the 4-pin serial connection of the μ VD control board and the connection to the Gate.

The lower portion of the screen under Proportional Outputs label shows the three possible configuration choices for the μ VD: 1 Input/ 1 Output (1-1), 1 Input/ 2 Output (1-2), or 2 Input/ 2 Output (2-2). Soft start, PWM mode for each output, and three Bump modes are also available. Select

the desired configuration by tapping the box to the left of the desired choice then press SAVE. A checkmark will appear in the box to the left of the currently selected configuration.

Note: when the 1 Input/ 2 Output configuration is chosen, the input voltage range for analog input 1 is divided into a high side and a low side corresponding to the high side and low side from the center voltage of a joystick . The high side input corresponds to proportional output 1 and the low side corresponds to proportional output 2.

Soft Start

When Soft Start is checked the analog inputs will behave like digital inputs. That is when the voltage at the inputs is above 2.5V the corresponding output will turn on.

Bump Modes

When one of the three bump modes is selected the outputs are automatically set to PWM. The modes are described below.

Bump Complementary Default Mode. When this mode is enabled, activating input 1 (>2.5V) will make output 1 increase bump step amount. Continuing to hit input 1 will keep making output 1 increase until max is reached. However if input 2 is activated (>2.5V) output 1 will turn off. Continuing to hit input 2 will increase output 2

bump step amount up to max. Then if input 1 is activated output 2 will turn off. Note: if it is desired to have 2 inputs control only one output, set the max for output 2 to 0%. Then input 1 and 2 will only control output 1.

Bump Complementary Step Down Mode. When this mode is enabled, activating input 1 (>2.5V) will make output 1 increase bump step amount. Continuing to hit input 1 will keep making output 1 increase until max is reached. Activating input 2 (>2.5V) will then decrease output 1 by bump step amount. Continuing to hit input 2 will decrease output 1. Once output 1 is 0% then output 2 will increase with each activation of input 2 until max is reached. Then activating input 1 will decrease output 2. Hitting both inputs together will turn off both outputs. Note: if it is desired to have 2 inputs control only one output, set the max for output 2 to 0%. Then input 1 and 2 will only control output 1.

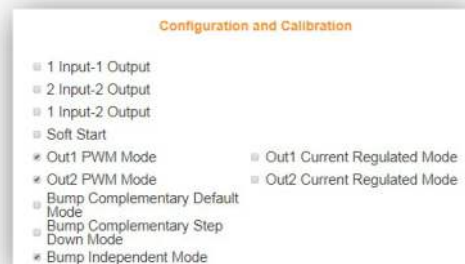
Bump Independent Mode. When this mode is enabled, hitting input 1 with >5.0V makes output 1 increase bump step amount. Continuing to hit input 1 at >5.0V will keep making output 1 increase until max is reached. Hitting input 1 between 2 & 3V makes output 1 decrease bump step amount until 0% is reached. Hitting input 2 with >5.0V makes output 2 increase bump step amount. Continuing to hit input 2 at >5.0V will keep making output

2 increase until max is reached. Hitting input 2 between 2 & 3V makes output 2 decrease bump step amount until 0% is reached.

Bump Step Value and Bump Time can then be adjusted for each output from second drop down box. Bump Step Value is the amount in percent that the output will increase or decrease when input is activated. Bump Step Time is the time in milliseconds that it takes the output to increase or decrease one step when input is held. To disable the output increasing or decreasing when input is held set this to 0.

After Configuration is Selected

When one of the seven configuration options has been selected, the current status of the inputs and outputs that have been made active is displayed.



After configuring the number of inputs and outputs, the CALIBRATION section on the bottom of the screen can be used to calibrate the parameters for the active inputs and outputs. There are two pull down lists to choose from in this section. The

first (on the left) is a list of the currently inputs and outputs that can be calibrated. Tap on the down arrow to the right of “Prop Out 1” to expand the list as shown.

The screenshot shows a calibration window. At the top, there are two dropdown menus: 'Prop Out 1' and 'Min Current'. Below them, the 'Current Value' is displayed as '400 mA'. There is a 'New Value' input field which is currently empty. At the bottom of the window, there are two orange buttons: 'Save' and 'Factory Settings'.

Choose which input or output to calibrate from this list. The currently selected input or output is then displayed next to the down arrow.

Next choose which parameter to calibrate for the currently selected input or output by expanding the pull down list next to the second down arrow (to the immediate right of the first list), and selecting the desired parameter.

The currently selected parameter will be displayed below the two pull down lists. To change the currently selected parameter setting, enter the new value in box. After the new value has been entered, tap the SAVE button to save the new value. Tap the HOME button to exit the CALIBRATION & DIAGNOSTIC section.

Note: The Min and Max values for the Analog Inputs are entered in

Volts. The Min and Max values for the Proportional Outputs are entered in Milliampere or percent (if PWM), the ramp times are entered in Seconds, and the frequency is entered in Hertz.

Tapping the Factory Settings button will restore the μ VD to the default factory settings that it was shipped with. Any changes made using the Calibration procedure will be lost. The factory settings will disable both inputs and both outputs. When either of the Analog Inputs or Proportional Outputs is made active for the first time, they will be assigned the default factory parameters. **Warning: when any of the input/output pairs are initially made active, if an input voltage is present on the input(s) when the configuration box is checked, the corresponding output(s) will immediately come on. Ensure that the outputs are not connected to the equipment when performing μ VD configuration.**

The default factory parameters for 1 Input/ 1 Output or 2 Input/ 2 Output configurations are:

Analog Inputs

Min. - 0.5V

Max. - 4.5V

Proportional Outputs

Min. - 400mA

Max. - 1400mA

Ramp times - 0 Sec.

Freq. - 75Hz

The default factory parameters for the 1 Input/ 2 Output configuration are:

Analog Input

Low Side - 0.5-2.25V

High Side - 2.75-4.5V

Proportional Outputs

Min. - 400mA
 Max. - 1400mA
 Ramp times - 0 Sec.
 Freq. - 75Hz

The default factory parameters for PWM outputs are:

Min. - 0%
 Max. - 100%
 Ramp times - 0 Sec.
 Freq. - 75Hz

The default factory parameters for Soft Start are:

Proportional Outputs

Min. - 400mA
 Max. - 1400mA
 Ramp times - 0 Sec.
 Freq. - 75Hz

The default factory parameters for Bump Modes are:

Bump Step - 10%
 Bump Time - 0 ms

The allowable limits for these parameters are:

Analog Inputs:

Min. - 0V
 Max. - 5V

Proportional Outputs

Min. - 0mA
 Max. - 5000mA
 Ramp times - 0-30 Sec.
 Freq. - 30-500Hz

PWM Outputs

Min - 0%
 Max - 100%
 Ramp times - 0-30 Sec.
 Freq. - 30-500Hz

Bump Mode

Bump Step - 100%
 Bump Time - 0-30 Sec.

Note that the Max. value for each

proportional output must be at least 300mA greater than the Min. value to maintain stable output.

The μ VD can also be configured to function as a ramp card. Simply configure the module for 1 Input/ 1 Output or 2 Input/ 2 Output operation. Then calibrate the minimum input voltage to 0V and the maximum input voltage to 5V, and calibrate the proportional output(s) minimum and maximum values and ramp times as desired. A switch input can then be used to switch between the min and max output values.

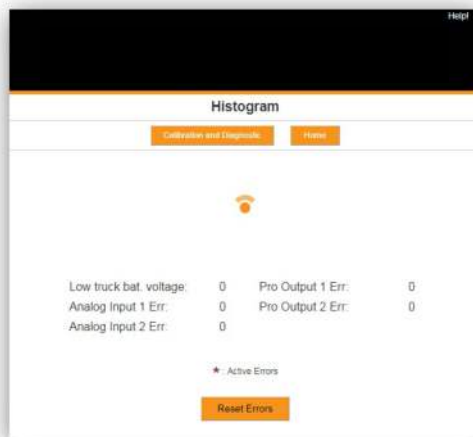
Note: The maximum input value that the μ VD will recognize and that can be configured is 5V. The module can however accept voltages higher than 5V on the analog inputs. Any input higher than 5V will be read as an input of 5V.

Warning: when switching a voltage greater than 15V onto the analog inputs, a 5.1k or 4.7k ohm resistor **must** be installed in series between the switch and the input to avoid damaging the μ VD.

HISTOGRAM

Tap the HISTOGRAM icon on the MAIN screen. This will take the user to a screen that shows which error codes are active and how many times the specific error code has been active. This feature can be used to troubleshoot machine wiring and other problem areas. A star to the left of an error indicates that

error is currently active. The number to the right of each error shows how many times that error has been active. Press the RESET button to reset all the error code counts to zero. This operation should be performed after installation of the system on the equipment. The password to reset is 1262. Press Home to return to main screen.



Histogram Page

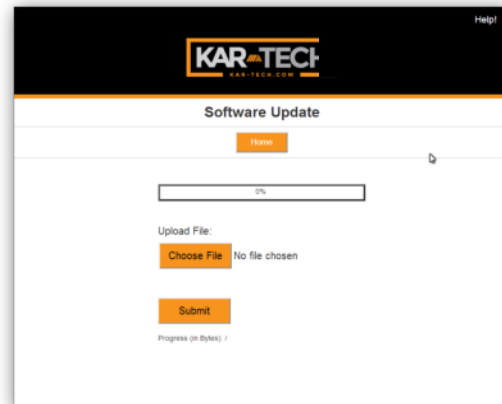
SOFTWARE UPDATE

The password to gain access to the software update page is 1262.

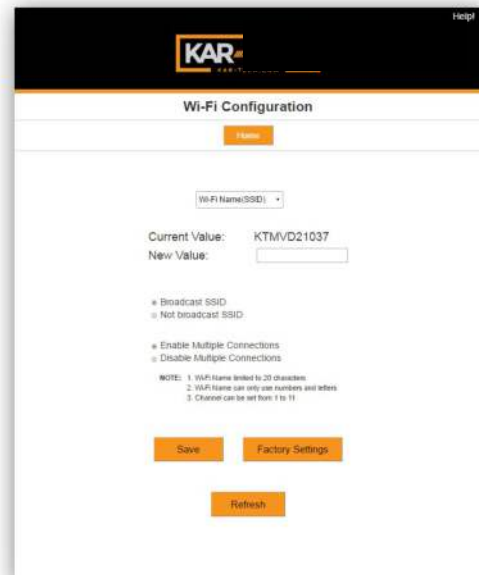
Use the Choose File button to select new software on your device with which to program the μ VD. Kar-Tech will have provided software in the .kar format. Once the file is selected, press the SUBMIT button to upload the file. Note: This feature does not work on Apple mobile or tablet products.

Note: Do not turn the μ VD or the

GATE off during the upload process.



Software Update Page



Gate Configuration Page

GATE CONFIGURATION

The password to gain access to the gate configuration page is 1262.

This page allows you to change the name (SSID) of the Wi-Fi network you are connecting to. Factory settings will rename the

Wi-Fi to its original name.

If Broadcast SSID option is selected, the Wi-Fi name (SSID) is public and it will be visible to any other Wi-Fi devices. Otherwise, the Wi-Fi name (SSID) is hidden and it would require manual connection to the network.

If Enable Multiple Connections is selected, multiple connections up to 4 devices could be connected to the GATE. However, only one of the connected devices can use the GATE. If Single connection is enabled, only one device can be connected to the GATE.

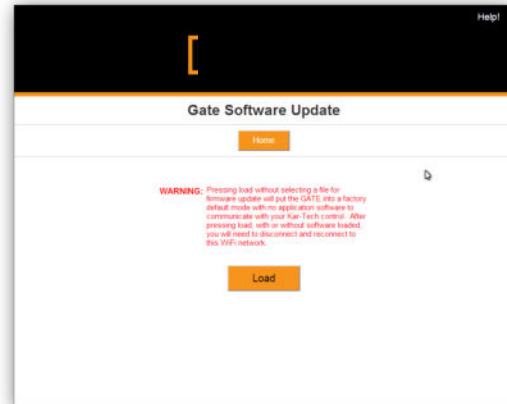
NOTE: A reconnect to the new Wi-Fi connection is needed after each change. It is advised to keep a note of the Wi-Fi name in case if Not Broadcast SSID option is selected. Forgetting the Wi-Fi name after selecting this option will require the GATE to be sent to KAR-TECH for RESET.

GATE UPDATE

The password to gain access to the gate update page is 1262.

This page was designed to upload software that changes the product that the GATE interface works with.

Once the LOAD button is pressed the application on the GATE will be **deleted**.



Gate Update Page

1. Select LOAD
2. Disconnect then reconnect to "KTMVD21037" network
3. Press HOME button
4. Screen below should be shown:

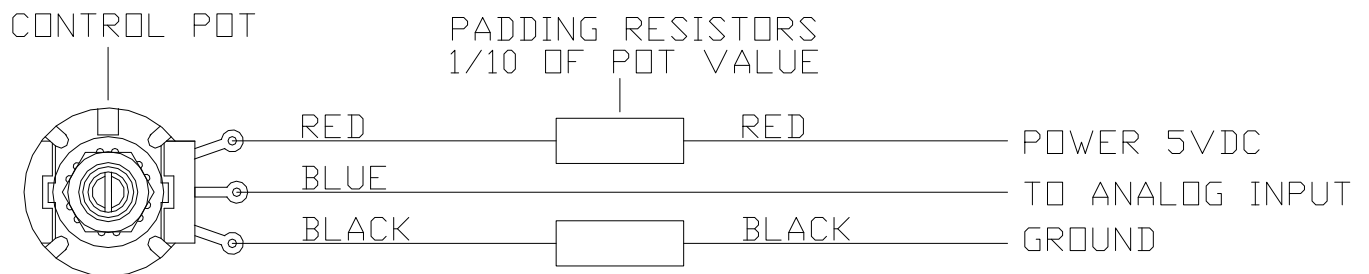


5. Press Gate Software Update
6. Using Browse select proper .gat file
7. Press Submit
8. File will upload and say Success! When complete
9. Disconnect then reconnect to "KTMVD21037" network
10. Press HOME button
11. Update complete

Note: the GATE is not a precision measurement instrument. There may be some delays.

WIRING CHART

<u>WIRE COLOR</u>	<u>FUNCTION</u>
RED	POWER (9 to 30 VDC)
BLACK	GROUND
BLUE	ANALOG INPUT 1
BROWN	ANALOG INPUT 2
YELLOW	PROPORTIONAL OUTPUT 1
GRAY	PROPORTIONAL OUTPUT 2
ORANGE	+5VDC REFERENCE

WIRING ANALOG INPUTS

ROUTINE MAINTENANCE:

1. Inspect electrical wiring for wear points or other damage. Repair as required.
2. Inspect all connections for looseness or corrosion. Tighten and/or "seal" as necessary.

MAINTENANCE PRECAUTIONS:

When performing any inspection or maintenance work on the MICRO VALVE DRIVER system, always exercise care to prevent injury to yourself and others or damage to the equipment. The following are general precautions that should be closely followed in carrying out any maintenance work.

1. Do not have hydraulic power available to the valves when performing electrical tests.
2. Never operate or test any function if any person is in an area where they could be hurt, hit or squeezed by the hydraulic equipment.
3. Turn power off before connecting or disconnecting valve coils or other electrical loads.

TROUBLESHOOTING:

This section provides basic operator level troubleshooting for the MICRO VALVE DRIVER system. If, after following these instructions, the system still does not function, check the hydraulic system, and then contact your KAR-TECH representative for further instructions or servicing.

TROUBLESHOOTING CHART

PROBLEM	SOLUTION
1. No functions work	1. Check that control power is on. 2. Check vehicle wiring for power into the system. 3. Check status and error code LEDs for system status. 4. Check for proper grounding of vehicle's electrical circuit. 5. Check vehicle's hydraulic system.
2. Certain functions do not work	1. Check the wiring connection from the system to the valve coil or the output function that does not work. 2. Check status and error code LEDs for system status. 3. Check vehicle's hydraulic system. 4. Check vehicle's electrical system.
3. Function operates intermittently	1. Check for loose connections. 2. Check status and error code LEDs for system status. 3. Check vehicle's hydraulic system.

ERROR CODE CHART

Count the number of blinks of the red LED on the μ VD control module.

<u>ERROR CODE</u>	<u>PROBABLE CAUSE</u>
1	Low Battery
2	Analog Input 1 Problem
3	Analog Input 2 Problem
4	Faulty Circuit to Proportional Output 1
5	Faulty Circuit to Proportional Output 2

PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>
210373A	MICRO VALVE DRIVER MODULE
020-510-2326	USB TO 4 PIN SERIAL CONNECTION CABLE
210379A	OPTIONAL GATE DIAGNOSTIC TOOL
055-038-0021	CONNECTOR, JUMPER WITH HANDLE

Note: For operation with negative ground vehicles only.

WARNING:

The **KAR-TECH** MICRO VALVE DRIVER must be operated in compliance with all applicable safety regulations, rules, and practices. Failure to follow required safety practices may result in death or serious injury.

The information, specifications, and illustrations in this manual are those in effect at the time of printing. **KAR-TECH** reserves the right to change specifications or design at any time without notice.

SPECIFICATIONS

Power supply voltage	9V to 30V
Operating temperature.....	-20°C to +70°C
Storage temperature.....	-40°C to +85°C
Analog Inputs	0.5V to 4.5VDC
Proportional outputs.....	5.0 Amp. MAX (Protected)
Vibration.....	3G to 200Hz
Shock.....	100G