

## mCore<sup>SDR</sup> Operations Manual



Thank you for purchasing mCore SDR (Security Data Router). Your device comes preconfigured and ready to install.

Prior to use, thoroughly read the instructions in this manual to connect and use this product correctly. Please retain this manual for future reference and make sure that this manual is available to all users. To ensure the safety and proper operation of the device and any connected equipment, installation or relocation should be performed by qualified personnel only.

<b>mCore<sup>SDR</sup></b>	<b>monico</b> SIMPLE SOLUTIONS. POWERFUL MONITORING.
IND. CONT. EQ. FOR HAZ. LOC. CL I, DIV 2, GP A, B, C, D Operating Temp. Code T5	<b>MONICO MONITORING, INC.</b> MADE IN THE U.S.A.
INPUT VOLTAGE: 8-48 VDC ( -40°C ≤ Tamb ≤ 65°C ) CURRENT: 200 mA normal to 1200 mA max INPUT VOLTAGE: 8-28 VDC ( -40°C ≤ Tamb ≤ 70°C ) CURRENT: 300 mA normal to 1200 mA max IP66/IP67	 <b>Intertek</b>
 See Instruction Manual  Voir Le Manuel D'instruction	
Conforms to UL STD 61010-1 & ISA STD 12.12.01 Certified to CSA STD C22.2 #s 61010-1 & 213	<b>www.monicoinc.com</b>
Manufacturing Location: 1001 E. Arapaho Rd. Richardson, TX 75081	

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## Section 1: Safety Precautions

**Thoroughly read and follow the safety precautions and operating instructions listed in this manual before using the product.**

- Do not use or mount the product in any manner or location not intended.
- After reading, retain this manual for future reference.
- This manual should be available for anyone operating, repairing or relocating the product.
- The product should be installed, repaired or removed by qualified personnel only.
- Do not disassemble or modify the product.
- Improper installation or repair may cause injury, damage, electric shock or fire.
- To ensure proper operation and avoid damage to the product, use appropriate tools along with recommended connectors and recommended wire gauge.
- Do not open or break the seal between the housing and the connector header.
- Do not operate a unit that has been damaged.
- Extended environmental conditions: wet location, outdoor use, ambient temperature - 40° C to +70° C (at or below 28 VDC input), and altitude up to 2000m.


## Section 1.1: Warnings

 **WARNING – EXPLOSION HAZARD. DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED.**


AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS BRANCER OU DÉBRANCHER LORSQUE LE CIRCUIT EST SOUS TENSION.

 **WARNING – EXPLOSION HAZARD. DO NOT DISCONNECT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS FREE OF IGNITABLE CONCENTRATIONS.**


AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS DÉBRANCHER SI LE CIRCUIT EST SOUS TENSION, À MOINS QUE LE MILIEU SOIT LIBRE DE SUBSTANCES INFLAMMABLES CONCENTRÉES.

 **WARNING – EXPLOSION HAZARD. DO NOT REMOVE OR REPLACE BATTERIES OR PLUG-IN MODULES (AS APPLICABLE) UNLESS POWER HAS BEEN DISCONNECTED OR THE AREA IS FREE OF IGNITIBLE CONCENTRATIONS.**

AVERTISSEMENT – RISQUE D'EXPLOSION. NE PAS RETIRER OU REMPLACER DES BATTERIES OU DES MODULES DE PLUG-IN (COMME APPLICABLES) À MOINS QUE LA PUISSANCE A ÉTÉ DÉCONNECTÉE OU LA ZONE EST LIBRE DE CONCENTRATIONS IGNITIVES.

 **WARNING – DO NOT REMOVE THE AMPSEAL CONNECTORS UNLESS THE EQUIPMENT NEEDS TO UNDERGO REPAIR OR MAINTENANCE. AFTER REPAIR OR MAINTENANCE HAS BEEN DONE, PLEASE CHECK THE BARE PINS ON THE EQUIPMENT TO ENSURE THERE IS NO DUST OR WATER PRESENT. IP RATING OF THE EQUIPMENT IS ONLY MAINTAINED WITH THE AMPSEAL CONNECTORS ATTACHED TO THE EQUIPMENT.**

AVERTISSEMENT - NE RETIREZ PAS LES CONNECTEURS AMPSEAL À MOINS QUE L'ÉQUIPEMENT NE SOIT RÉPARÉ OU ENTRETENU. UNE FOIS LA RÉPARATION OU L'ENTRETIEN EFFECTUÉE, VÉRIFIEZ LES BROCHES NUES SUR L'ÉQUIPEMENT POUR VOUS ASSURER QU'IL N'Y A PAS DE POUSSIÈRE OU D'EAU PRÉSENTE. LA CLASSIFICATION IP DE L'ÉQUIPEMENT EST UNIQUEMENT ENTRETENUE AVEC LES CONNECTEURS AMPSEAL ATTACHÉS À L'ÉQUIPEMENT.

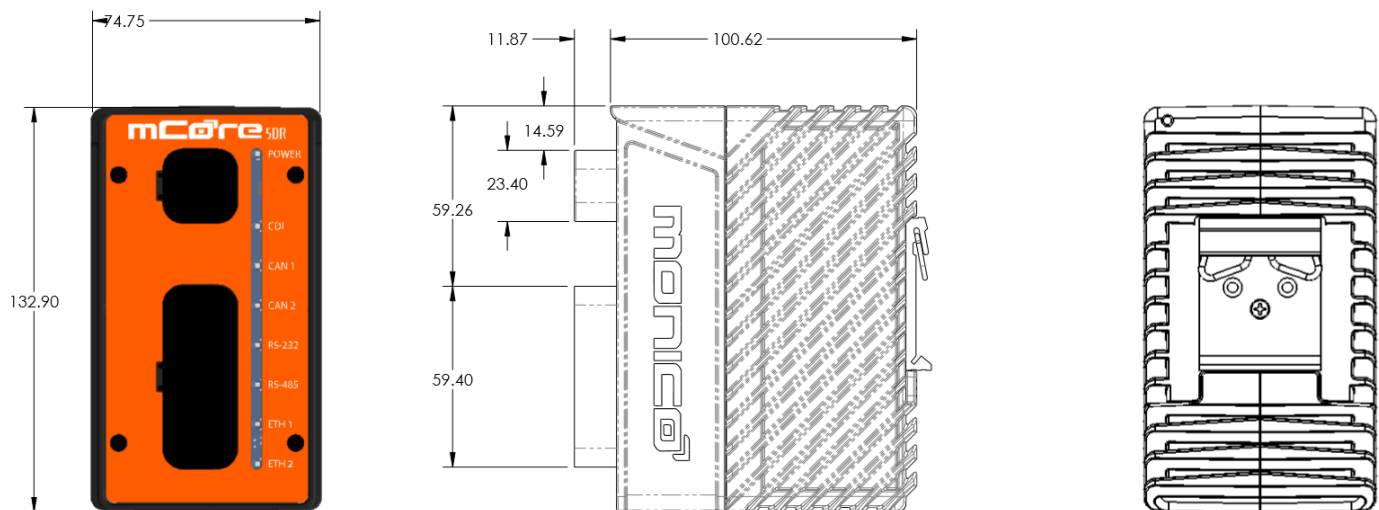
 **WARNING – TO MAINTAIN CLASS 1, DIVISION 2 RATING, THE UNIT MUST BE INSTALLED IN A TOOL-SECURED ENCLOSURE USING ONE OF THE NEC WIRING METHODS THAT IS OUTLINED IN THIS MANUAL.**

AVERTISSEMENT - POUR MAINTENIR L'INDICE DE CLASSE 1, DIVISION 2, L'UNITÉ DOIT ÊTRE INSTALLÉE DANS UN BOÎTIER SÉCURISÉ EN UTILISANT L'UNE DES MÉTHODES DE CÂBLAGE NEC DÉCRITES DANS CE MANUEL.

## Section 2: Introduction

mCore is designed for industrial applications requiring protocol translation between CDL (CAT® Data Link), SAE J1939, Modbus RTU, Modbus TCP, and OMF (OSIsoft® Message Format). Each unit comes to you preconfigured and ready to install.

The mCore is easy to mount, with two mounting options, and environmentally sealed to protect against dust ingress and temporary immersion in up to 1 meter (IP66 & IP67) of water. Designed specifically for heavy-duty industrial applications. The device displays LED indicating lights configured to provide positive confirmation of power, connectivity, and data transmit/data receive.



**Weight = 2.0 lbs. (.907 kg)**

## Section 2.1: LED Indicator Table

mCore LED Indicators							
	Solid Green	Blinking Green	Solid Amber	Blinking Amber	Solid Red	Blinking Red	LED Off
<b>Power</b>	Powered On, Booted Up, and Ready To Use		Powered On and Booting Up	Key-switch Has Initiated Shutdown or Software Upgrade In Progress	Final Shutdown Sequence and Initial Reboot		Unit Does Not Have Power
<b>CDL</b>		Good Communications	Actively Scanning CDL Bus for Responding Parameters	Indicates Responding Parameters During Scanning	Cable Not Connected, Wired Incorrectly, or CDL Device Is Powered Off		Protocol Not Configured
<b>CAN1</b>		Good Communications			Cable Disconnected or J1939 Device Is Powered Off		Protocol Not Configured
<b>CAN2</b>		Good Communications			Cable Disconnected or J1939 Device Is Powered Off		Protocol Not Configured
<b>Modbus Master (RS-485/232)</b>	Actively Polling But Receiving No Replies	Good Communications			Upon Bootup Only: No Activity On Bus, Cable Not Connected, or Incorrect Mapping For Slave Device	CRC Error	Protocol Not Configured
<b>Modbus Slave (RS-485/232)</b>	Will Be Temporarily Solid When Other Devices On The Network Are Being Polled	Good Communications	No Polls Being Received, Cable Not Connected, Master Device Powered Off, or Incorrect Registers Being Requested			CRC Error	Protocol Not Configured
<b>Ethernet 1</b>	Link Established But Not Actively Communicating	Good Communications			No Link Established or Cable Disconnected		
<b>Ethernet 2</b>	Link Established But Not Actively Communicating	Good Communications			No Link Established or Cable Disconnected		
<b>Factory Reset</b>		Factory Reset Is Complete (All Protocol LEDs)				Factory Reset Initiated (All Protocol LEDs)	

## Section 3: Installation

mCore is approved for Class I Div. 2 Group A, B, C, and D. In order to maintain this rating, the unit must be installed in a separate tool secured enclosure and comply with the one of the following NEC wiring methods:

1. Extra-hard usage cord – Section 501.140 of the NEC and Rule J18-160 of the CE Code Part I
2. Instrumentation tray cable (Type ITC or CIC) – Section 501.10(B) and 501.105(B)(6) of the NEC and Rule J18-152 of the CE Code Part I
3. Power-limited tray cable (Type PLTC) – Article 725 of the NEC
4. Tray cable (Type TC) installed per Article 336 of the NEC and Rule 12-2202 of the CE Code Part I.

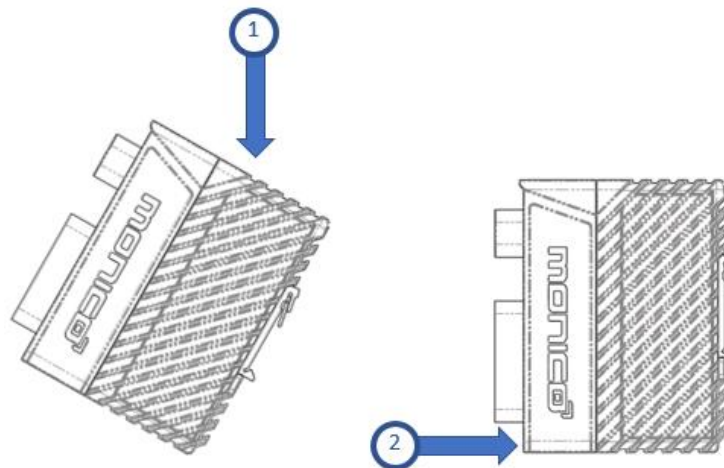


## Section 3.1: Mounting

### DIN Rail Mount:

The mCore unit should be mounted vertically on a horizontal DIN rail. Tilt the unit to a 45-degree angle and insert the top lip of the DIN rail bracket onto the DIN rail. While pushing down, attach the bottom lip to the DIN rail to snap the unit into place, as illustrated in Figure 1. A minimum of 1" of space should be maintained on all sides of the unit to ensure proper heat regulation. The device's mounting pad is shown below in Figure 2.

To remove the unit from the DIN rail, push down on the unit until the bottom lip is clear from the rail. Then pull out from the bottom. The unit should remove with ease.



**Figure 1**



**Figure 2**

### **Surface-Mount:**

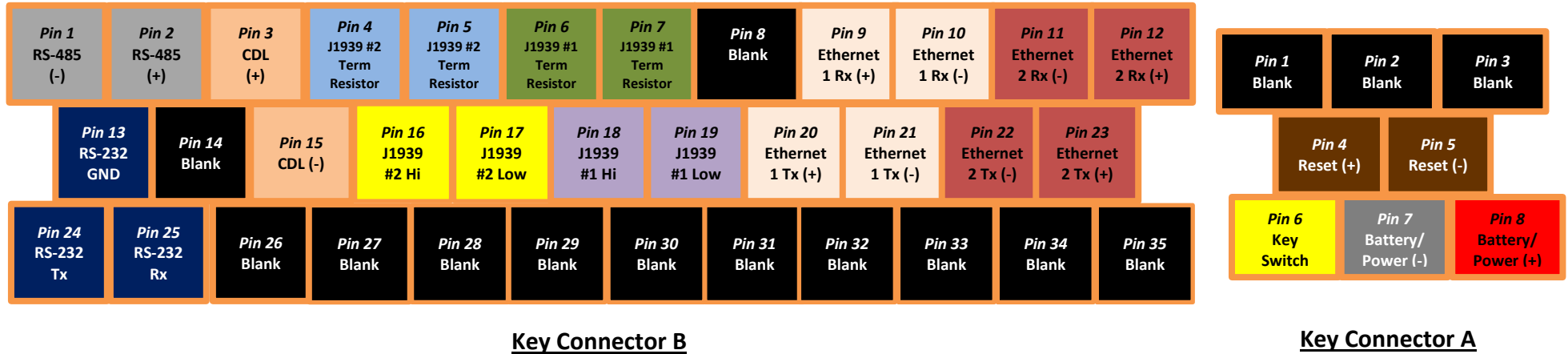
The unit should be mounted securely against a flat surface, using two ¼" fasteners (not provided), in a suitable location as close to the engine as possible. DO NOT mount directly to the engine block. The unit should be mounted, as shown in Figure 3, either horizontally or vertically. Horizontal is the optimal mounting orientation considering LED visibility and heat dissipation. However, other mounting orientations are acceptable.



**Figure 3**

## Section 3.2: Wiring

The unit should be connected to the desired ports according to the pinout below using the recommended connectors shown in [Section 4.1: Parts Table](#).



The above pinout is depicting the female header connectors and respective key orientations on your mCore that will mate to the male connectors. Monico recommends connecting mCore to the batteries when available so that mCore will be booted up before the engine is turned on so it can capture the startup process. mCore takes about 15 seconds to boot up. The mCore's power is supplied through Pins 6, 7, and 8 on Key Connector A, as shown in the Pin Out Guide above. Pin 7 will be connected to Battery/Power (-). Pin 6 is for a Key Switch to be able to power cycle the mCore without removing the connector. Pin 6 must be energized to allow mCore to boot up. When power is taken off of Pin 6, mCore will power down. If a Key Switch will not be inline with Pin 6, then connect Pin 6 with Pin 8 to Battery/Power (+).

Be sure to follow the AMPSEAL “How-to Instructions” located at:

- <https://laddinc.com/resources/how-to-instructions/ampseal-connectors/>
- <https://laddinc.com/resources/how-to-instructions/ampseal-16-contact-crimping/>

These instructions include steps for proper inserting, crimping, & removing of wires into the pin connectors. For proper hand crimping, an AMPSEAL 2119118-1 hand crimping tool (not included) must be used.

### Plugging In:

To connect power to the mCore, push the connector until you hear the click of the locking ear snapping into place. It may require a good amount of force as these connectors are waterproof and have a gasket that must be overcome.



### Unplugging In:

To disconnect power to the mCore, insert a small flathead screwdriver into the locking ear on the side of Key Connector A and pry outwards gently while pulling on the connector.

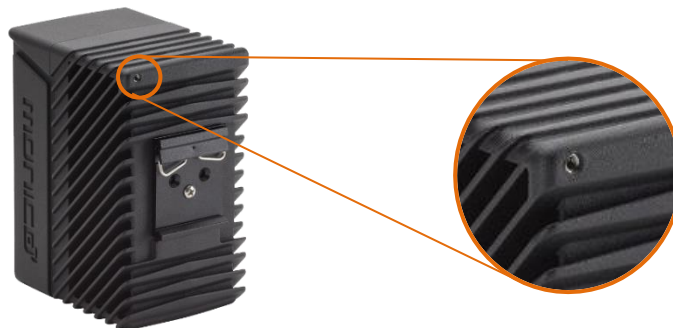
## Section 3.3: Grounding

After mounting and connecting mCore, the unit must be grounded in compliance with local and national electrical codes. It must be externally grounded using a customer-supplied ground wire before any power is applied. Contact the appropriate electrical inspection authority if you are uncertain that suitable grounding is available.

### Tools Required:

QTY: 1	Grounding Lug (included)
QTY: 1	6-Gauge Ground Wire (not included)
QTY: 1	Nut Driver (not included)
QTY: 1	Pliers or Crimping Tool (not included)

1. Use the Pliers or Crimping Tool to crimp the 6-Gauge Ground Wire to the Grounding Lug.
2. Connect the Grounding Wire to the mCore's Grounding Lug connection point, shown in Figure 4 below.
3. Place the Grounding Wire over the Grounding Lug and tighten these components using a nut driver. Tighten to 9.6 in-lbs.
4. Connect the other end of the wire to a reliable earth ground if possible. For most effective grounding, use the grounding standards listed below.



**Figure 4**






\*Safety guidelines for proper grounding are outlined in OSHA Standard 1926.962.

\*National standards for proper grounding are outlined in IEEE Standard 142.

**For configuration and/or installation assistance, please contact Monico Support  
Phone: 281-350-8751 ext.1 Email: [support@monicoinc.com](mailto:support@monicoinc.com)**

## Section 4: Parts

### Section 4.1: Parts Table

<b>Connection Parts (AMPSEAL*)</b>		
<b>Item</b>	<b>Description</b>	<b>AMPSEAL Part Number</b>
	<b>Plug, 8 Pin, Key Connector A</b>	<b>776286-1</b>
	<b>Plug, 35 Pin, Key Connector B</b>	<b>776164-1</b>
	<b>Sealing Plug**</b>	<b>770678-1</b>
	<b>Backshell, 8 Pin</b>	<b>2138529-1</b>
	<b>Backshell, 35 Pin</b>	<b>776463-1</b>
	<b>Connector</b>	<b>770854-1</b>

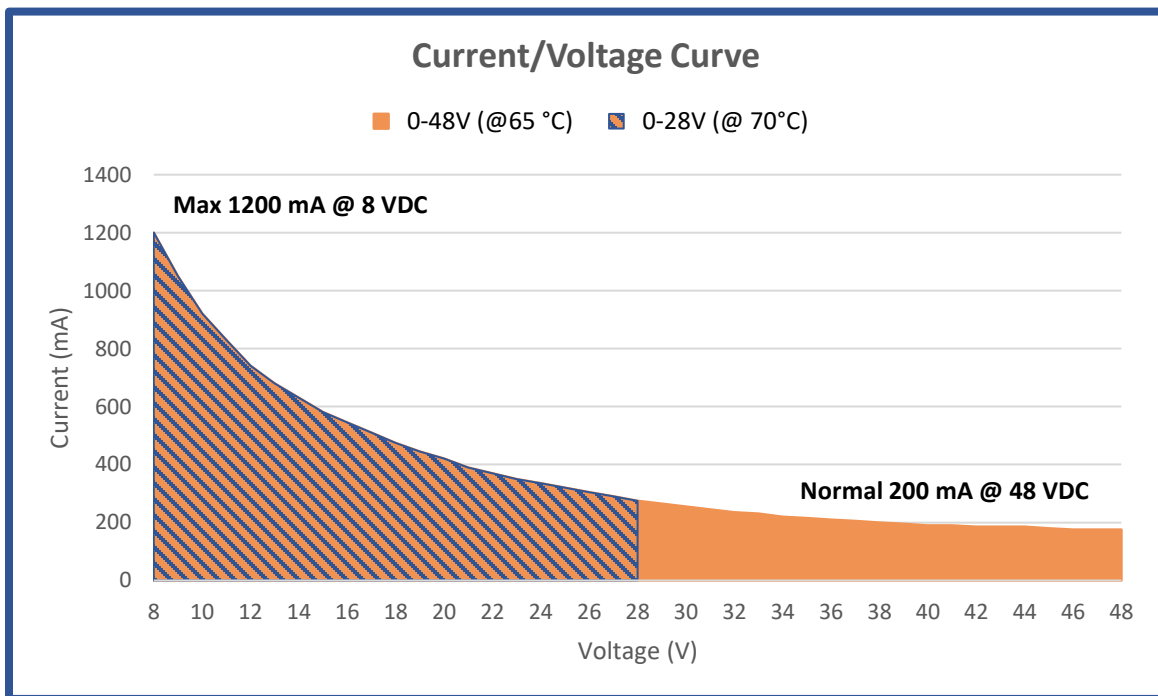
*\* Connectors are AMPSEAL brand; available through LADD Industries*

*\*\* Only needed if Connector Seal was punctured due to mis-wiring or pins no longer being used. This will re-seal the connector against water ingress.*

## Section 5: Power Requirements

The input voltage requirements are 8 – 48 VDC for operating temperatures between -40°C and +65°C. The input voltage requirements are limited to 8 – 28 VDC for operating temperatures between -40°C and +70°C. The mCore has internal reverse polarity protection, but will not operate under reverse polarity conditions.

**\*\*User is required to install a 2 Amp fast blow fuse rated for at least 50VDC (or the maximum voltage of the supplied power) to protect against short circuit.\*\***



## Section 6: Quick Start Guide

The mCore has a web-based UI (User Interface) for configuring the unit that can be accessed using a web browser. Unless your mCore has been provisioned with a unique configuration for your application, Ethernet 1 and 2 will be set to DHCP. On the bottom of the mCore will be a sticker with useful information and a QR code.

The label will contain the following:

- Serial Number
- MAC-1 Address
- MAC-2 Address
- Username
- Password

The QR code will take you to the Monico website with a specific link for your mCore's serial number. This webpage is intended to show relevant information to your specific mCore such as what is seen on the label in case the sticker is destroyed for whatever reason. Additional features will be added in the future. Note: This QR code feature is a work in progress. If the provided link does not work, please contact Monico Support for assistance.



## Section 6.1: Connecting To The User Interface

5. Plug the mCore's Ethernet 1 or 2 directly into your computer or network switch using an ethernet cable.
6. Locate the Serial Number written on the label sticker on the bottom of the mCore.
7. Open an internet browser and using the example below as a guide, enter your serial number.

Example: If the mCore serial number is mc-1234-5678, you would enter, without quotes, "http://mc-1234-5678.local" (https can also be used).

- If you previously changed the IP address to be static, enter the IP address by itself or use the serial number method as shown above. Both methods will work in this instance unless the Unit Name has been changed in which case the serial number will not connect you to the UI (User Interface). To connect to a static IP address, you will need to make sure your computer's IP address is setup properly. See [Section 6.2](#) for how to change your computer's IP address.

8. You should now see the mCore Login page.

- Default Username is: admin
- Default Password is unique per mCore and will be on the label sticker on the bottom of themCore.

**\*Note:** We recommend that the user change the password after the first login to a secure password. See [Section 6.3: Change Password](#) for how to do this. It is recommended to use a minimum of 8 characters in length and utilize a combination of capitalized letters, special characters, and numbers. Should the password be forgotten, you can reset mCore back to the password listed on the label sticker by performing a Factory Reset. See [Section 15](#) for instructions.

9. To change the IP address and related settings, click the Ethernet 1 (LAN) button in the left menu toward the top. The following screen will appear. Change the IP address and Subnet to the desired settings. Click the Store Changes button in the center menu at the bottom right.

The screenshot displays the mCore SDR web interface. On the left is a navigation menu with categories: Network, Protocols, Internal Tags, Customer Logging, and ACL Configuration. Under Network, 'Ethernet 1 (LAN)' is selected. The main content area is titled 'Ethernet 1 (LAN)' and contains a 'Port Settings' tab. The settings are as follows:

Setting	Value
Port Name	LAN
Initialization	Static
IP(v4) Address	192.168.10.220
Subnet	255.255.255.0 (24bits)
Speed	Auto

At the bottom right of the settings area is an orange button labeled 'STORE CHANGES'.

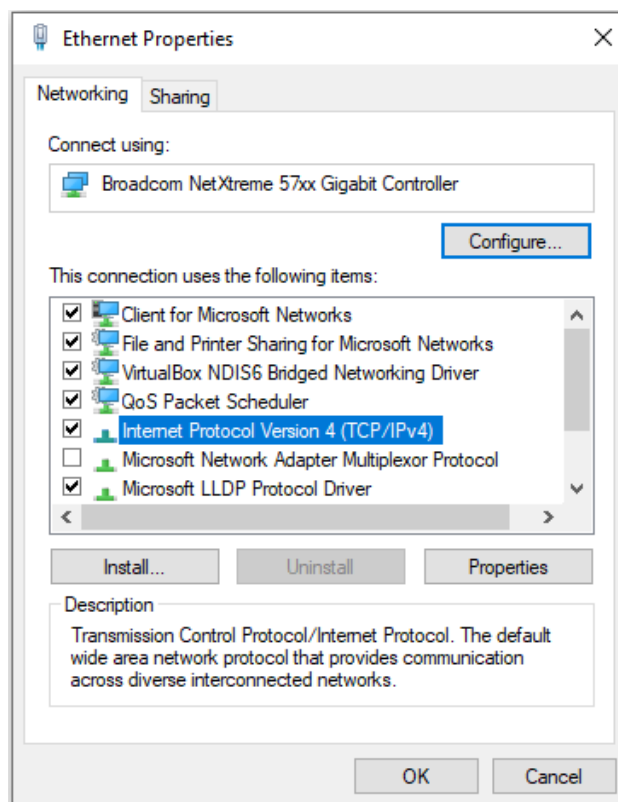
10. Continue to Ethernet 2 (WAN) port in the left menu if applicable for your application or leave it as is.

11. The next setting is the Gateway in the left menu. Most sites are set to a default of xxx.xxx.xxx.1 as compared to the IP address. Ask your network administrator to be sure.

## Section 6.2: Setting Computer's IP Address

The section is only needed if connecting to an mCore that previously had its IP address set to be static instead of DHCP. You will need to change your computer's IP address to be on the same subnet.

1. Select Start, then select Settings > Network & Internet > Ethernet.
2. Select Change Adapter Options.
3. Select the Ethernet adapter from the list, and Right Click, select Properties.



4. Select Internet Protocol Version 4 (TCP/IPv4), click Properties.
5. Select Use the following IP Address.
6. Enter an IP Address where the last number is different from mCore's, then hit Tab.
7. Enter a Subnet Mask. Typically it is: 255.255.255.0. Then hit Tab.
8. Leave the Default Gateway blank.

Internet Protocol Version 4 (TCP/IPv4) Properties

General

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

☐ Obtain an IP address automatically

☒ Use the following IP address:

IP address: 192 . 168 . 10 . 2

Subnet mask: 255 . 255 . 255 . 0

Default gateway: | . . .

☐ Obtain DNS server address automatically

☒ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

☐ Validate settings upon exit

Advanced...

OK Cancel

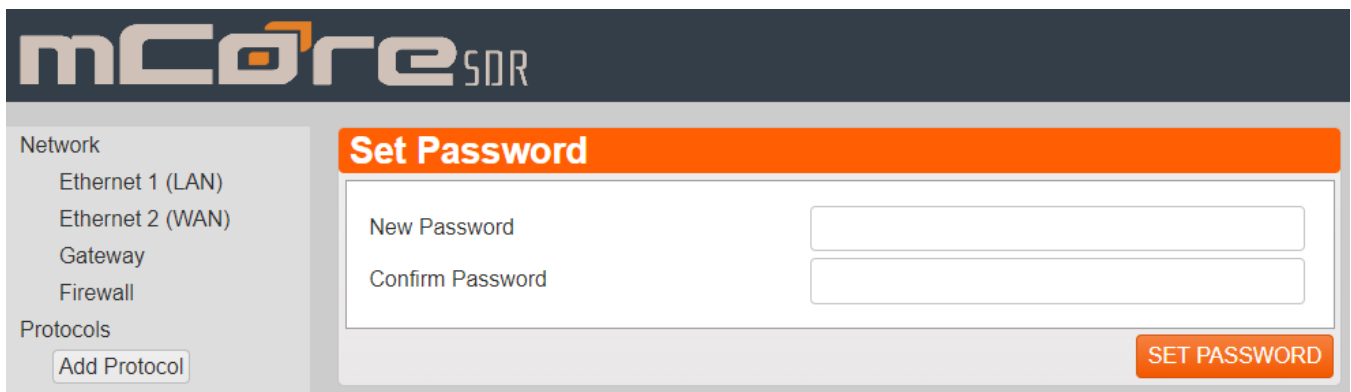
9. Click OK to save, then Close to save.

## Section 6.3: Change Password

1. To change the password, click the Account button in the top right, then click Set Password.



2. The following screen will appear. Enter the new password in each box. Click the Set Password button in the center menu when done.



3. The password has now been changed but will not take effect until you either reboot or Sign Out and then log back in.

## Section 6.4: Account Sign Off

Account Sign Off allows you to log off the mCore and requires you to re-enter your login username and password to log back in.

1. To Sign Off, click the Account button in the top right, then click the Sign Out button as shown in the following picture.



2. After clicking the Sign Out button, a pop box will appear. Click Ok to continue.
3. Once you have clicked Ok, you will be signed out and brought back to the Login screen.

## Section 7: Web Server

The Web Server, located in the left menu towards the top, provides the following functions: the setup of mDNS and LLMNR support for connecting to the mCore, enable or disable SSL and HTTP redirect, allows the user to upload and use their own SSL certificate, and allows the user to give the mCore an external IP address and name for connecting remotely.

### Section 7.1: mDNS/LLMNR Support

mDNS and LLMNR give the user the ability to connect to the mCore's UI (User Interface) via a web browser using its Unit Name/Serial Number or IP Address. The mCore will come with the Unit Name set to the mCore's serial number. For the following example assume the serial number is mc-1234-5678. In your browser's address bar, type in the following without the quotes: "http://mc-1234-5678.local" or "https://mc-1234-5678.local". This will take you to the Login page. If you are unable to connect, contact Monico Support.

1. The Unit Name will show as Default out of the box, which is the mCore's serial number. To change the Unit Name, click the Web Server button in the left menu toward the top. The following screen will appear.

2. Enter the new name in the Unit Name box. Click the Store Changes button in the center menu when done.

The screenshot shows the Monico Web Server configuration page. On the left is a navigation menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Web Server, Firewall), Protocols (CDL, SAE J1939, Add Protocol), Internal Tags, Customer Logging (Define Logs, Export Logs), and ACI Configuration. The 'Web Server' option is highlighted. The main content area is titled 'Web Server' and contains a 'Port Settings' tab. Below the tab are several configuration fields: 'Unit Name' (text box with 'default'), 'Enable SSL' (checkbox checked), 'Enable HTTP Redirect' (checkbox unchecked), 'SSL Certificate' (button 'Select file...'), 'External IP' (text box), and 'External Name' (text box). At the bottom right of the main area is an orange 'STORE CHANGES' button.

3. To activate the changes, you will have to click the Commit All Changes button in the left menu towards the bottom. It will show a pop box. Click Ok to continue. mCore will reboot and the new Unit Name will now be active.



## Section 7.2: SSL and HTTP Redirect

1. By default, SSL will come enabled. Since the Enable HTTP Redirect is not checked, you will be able to access the UI via both http and https. To disable, uncheck the Enable SSL box. When done, click the Store Changes button in the center menu.

The screenshot shows the Monico Web Server configuration page. On the left is a sidebar menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Web Server (highlighted), Firewall), Protocols (CDL, SAE J1939, Add Protocol), Internal Tags, Customer Logging (Define Logs, Export Logs), and ACI Configuration. The main content area is titled 'Web Server' and contains a 'Port Settings' tab. Below the tab are several configuration fields: 'Unit Name' (text box with 'default'), 'Enable SSL' (checkbox checked), 'Enable HTTP Redirect' (checkbox checked), 'SSL Certificate' (button 'Select file...'), 'External IP' (text box), and 'External Name' (text box). At the bottom right of the main area is an orange 'STORE CHANGES' button.

2. If you want your computer to always go to HTTPS, you can check the Enable HTTP Redirect check box. So if you enter HTTP:// to connect to mCore's UI (User Interface), you will be redirected to HTTPS://. When done, click the Store Changes button in the center menu.
3. To activate the changes, you will have to click the Commit All Changes button in the left menu towards the bottom. It will show a pop box. Click Ok to continue. mCore will then reboot.
4. Reconnect to the mCore using either (without quotes):  
"https://UnitName.local" that was setup in [Section 7.1](#) or  
"https://mCore's\_IP\_Address".

## Section 7.3: Upload SSL Certificate

SSL connections require a certificate that proves to the web browser that the unit to which you are connecting is what it claims to be. This is to avoid, for example, your sending a password to another device that is pretending to be your mCore. You can either provide your mCore with a certificate file manually using the Certificate setting, or you can allow it to generate its own. If you provide a certificate, the file you provide must contain both the certificate itself and the associated private key. If these are in separate files, you can combine them by simply concatenating them into a single text file. If allow the mCore to generate its certificate, it will sign this certificate using its own copy of the Monico Local Root certificate. This means that downloading the Monico Local Root and installing on your PC as a Trusted Root will allow your web browser to accept any certificate created by an mCore device.

1. To upload a SSL Certificate, click the Web Server button in the left menu toward the top. The following screen will appear.

The screenshot shows the Monico Web Server configuration page. On the left is a navigation menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Web Server, Firewall), Protocols (CDL, SAE J1939, Add Protocol), Internal Tags, Customer Logging (Define Logs, Export Logs), and ACI Configuration. The 'Web Server' option is highlighted. The main content area has an orange header 'Web Server' and a 'Port Settings' tab. Below the tab are several settings: 'Unit Name' (text field with 'default'), 'Enable SSL' (checkbox checked), 'Enable HTTP Redirect' (checkbox checked), 'SSL Certificate' (button 'Select file...'), 'External IP' (text field), and 'External Name' (text field). At the bottom right is an orange 'STORE CHANGES' button.

2. Next to the SSL Certificate label in the center menu, click the Select file button. A pop up window will appear. Navigate to the SSL file and then click Open.

3. When done, click the Store Changes button in the center menu.
4. To activate the changes, you will have to click the Commit All Changes button in the left menu towards the bottom. It will show a pop box. Click Ok to continue. mCore will then reboot.

## Section 7.4: External IP and External Name

The External IP and External Name fields can be used to specify additional data to be included in an automatically generated certificate's Subject Alternate Name field. They are not used if you provide a certificate yourself, but if you are allowing the mCore to generate its own certificate, you can use these fields to ensure that the name by which you refer to the unit is considered valid by a web browser. If, for example, you are accessing the mCore via a cell router than exposes it to the Internet using an IP address, you should enter that address as the External IP. If you use a name to refer to that IP address, either via your own DNS infrastructure or perhaps a hosts file, you can include that name as the External Name. The automatically generated certificate will already include the unit's name, the unit's name followed by .local, and any static IPs allocated to Ethernet 1 or Ethernet 2. If the unit name is left at default, the serial number of the unit will be used.

1. To change the External IP and/or External Name, click the Web Server button in the left menu toward the top. The following screen will appear.

The screenshot shows the Monico Web Server configuration page. On the left is a navigation menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Web Server, Firewall), Protocols (CDL, SAE J1939, Add Protocol), Internal Tags, Customer Logging (Define Logs, Export Logs), and ACI Configuration. The 'Web Server' option is highlighted. The main content area has an orange header 'Web Server' and a 'Port Settings' tab. Below the tab are several settings: 'Unit Name' with a text box containing 'default'; 'Enable SSL' and 'Enable HTTP Redirect' both with checked checkboxes; 'SSL Certificate' with a 'Select file...' button; 'External IP' with an empty text box; and 'External Name' with an empty text box. At the bottom right of the main area is an orange 'STORE CHANGES' button.

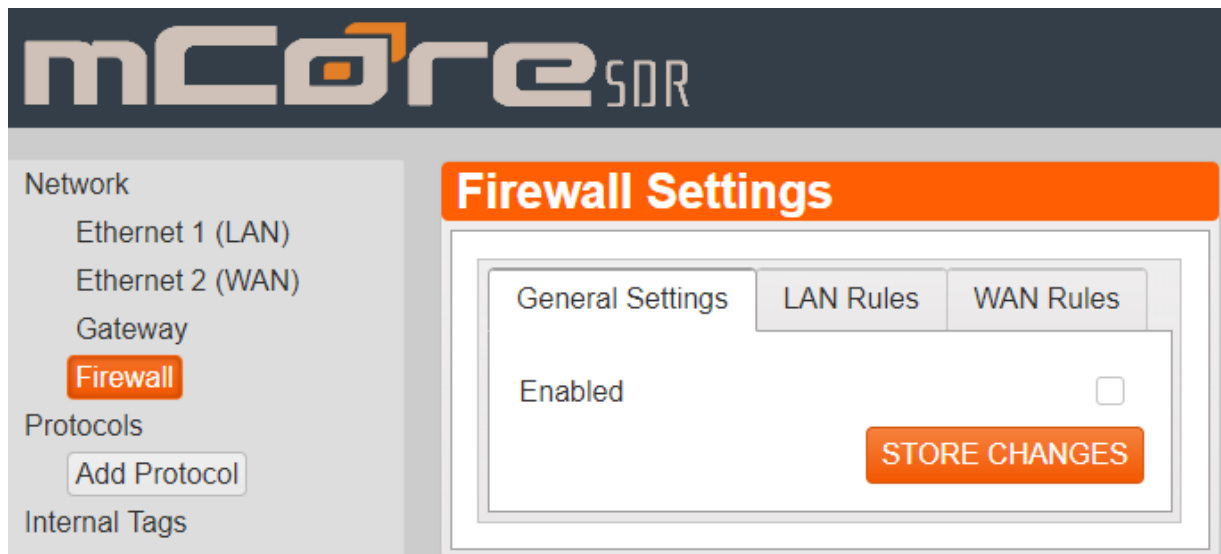
2. Enter or edit an External IP and/or External Name in their respective boxes.

3. When done, click the Store Changes button in the center menu.
4. To activate the changes, you will have to click the Commit All Changes button in the left menu towards the bottom. It will show a pop box. Click Ok to continue. mCore will then reboot.

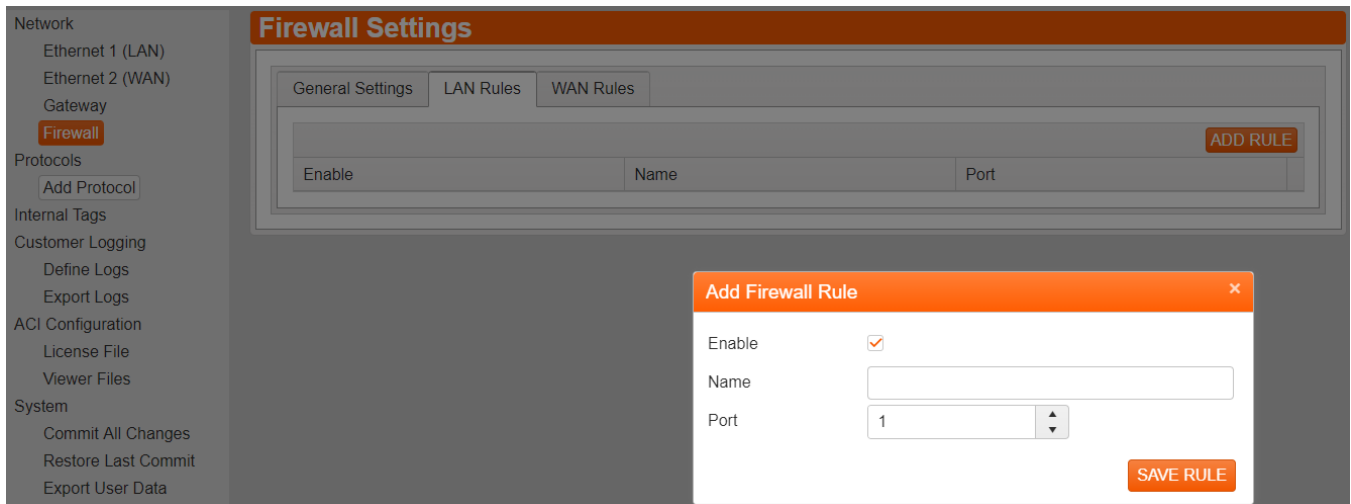
## Section 8: Firewall

The mCore's Firewall give the user the ability to limit inbound connections. This is done by limiting what ports can be accessed on the mCore. Once the Firewall is enabled, no incoming connections will be allowed unless you enter a new rule in the Firewall section to allow the connection to a specific port. For example, Modbus TCP usually runs on port 502. If the Firewall is enabled, but no rule entered to allow port 502, then the Modbus TCP communications will not work. The port must be opened on LAN and/or WAN port, depending which network it is on.

1. To Enable the Firewall, click the Firewall button in the left menu towards the top. The following screen will appear. Click the check box and then click Store Changes in the center menu.



2. To enter a new rule, click the LAN rules tab in the center menu. Then click the Add Rule button in the top right of the center menu. The following screen will appear.

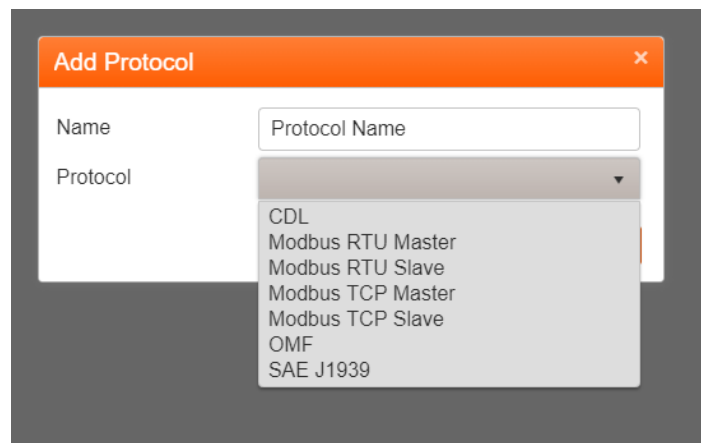


3. The Enable check box should be defaulted to checked, if not, check it. Enter a name for the rule and then enter the Port number that you would like allowed an incoming connection to.
4. When done, click the Save Rule button in the bottom right.
5. Repeat Steps 2 through 4 to add any additional rules required. Follow the same steps for entering rules in the WAN tab as well.
6. Once you are done entering all rules and ready for them to take effect, click the Commit All Changes button in the left menu towards the bottom. A pop up box will appear. Click Ok to continue. mCore will then reboot with the rules now taking effect.

## Section 9: Protocols

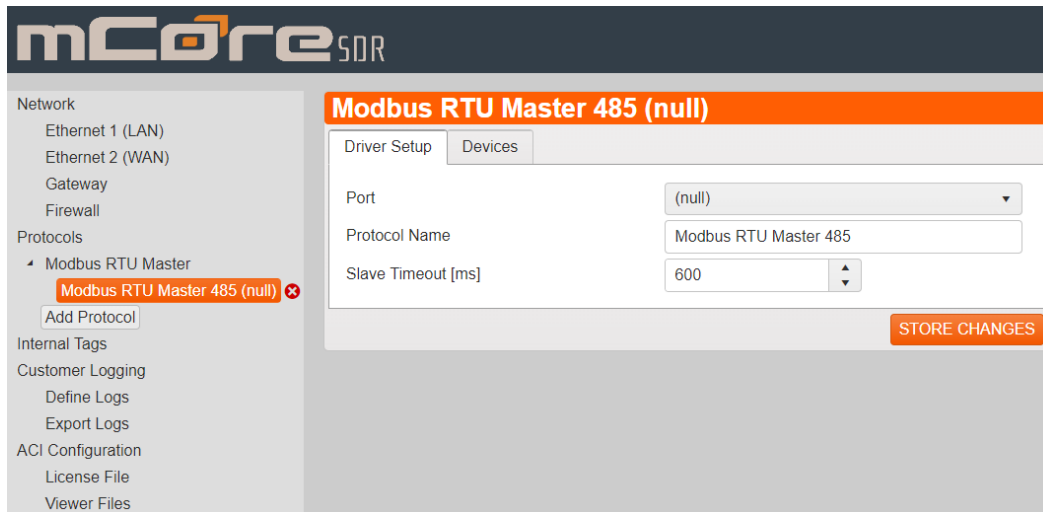
### Section 9.1: Adding A Protocol

1. To add a protocol, click the Add Protocol button under the section Protocols in the left menu and the following pop up box will appear. Name the protocol and select the protocol from the drop-down menu. Once named and the protocol selected, click Add Protocol.





2. Once you've clicked Add Protocol, the protocol will show up under the Protocols section in the left menu.



3. Click the name or the arrow beside the protocol name to expand list and select the next level that appears. This will take you to the protocol setup section. Refer to the relevant protocol sections that follow this section for further setup instructions.

## Section 9.2: CDL

Most mCore units will come with CDL already mapped out, but the following will demonstrate how to do setup.

1. After adding the Protocol per the Add Protocol section, click the second level of the protocol.

The screenshot shows the mCore SDR web interface. On the left is a sidebar with a tree view of protocols: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Firewall), Protocols (CDL, Modbus RTU Slave, OMF, SAE J1939), Internal Tags, and Customer Logging. The 'CDL (CDL)' protocol is selected and highlighted in orange. The main content area is titled 'CDL (CDL)' and has three tabs: 'Driver Setup' (active), 'Traffic Logs', and 'Devices'. The 'Driver Setup' tab contains the following fields: Port (dropdown menu set to 'CDL'), Protocol Name (text field set to 'CDL'), Units (dropdown menu set to 'US Units'), Gateway MID (text field set to '0x7F'), Pending Limit (spin box set to '5'), Collect Fault Data (checkbox checked), Boot Poll Delay (spin box set to '5,000'), and Fault Code Request Period [ms] (spin box set to '1,000'). A 'STORE CHANGES' button is located at the bottom right of the configuration area.

2. mCore automatically scales and converts the CDL data to the units of your choice. Choose between US Units (psi, °F, etc.) or Metric (kPa, °C, etc.).
3. The Pending Limit is essentially a communications speed regulator. Some older CDL ECMs need to be talked to slower to communicate well. The range is 1 – 8. Default is set to a 5. If communications seem to drop out or become erratic, try lowering the pending limit.
4. Collect Fault Data turns on the ability to receive fault information. This is set to On as default.

5. Boot Poll Delay is the amount of time mCore will wait after being booted up before it starts communicating over the CDL bus.
6. Fault Code Request Period is how frequent mCore checks for Faults.
7. Click the Store Changes button when done.
8. Click the Devices tab. The following screen will appear. To add a parameter to an existing or blank CDL configuration, click the Add Parameter button located in the center menu. A blank parameter screen will appear on the right side.

**CDL (CDL)**

Driver Setup Traffic Logs **Devices**

CDL

- CDL
  - Parameters
    - Add Parameter
    - CDL\_1\_NumberOfEngineRatingMapsAvailable
    - CDL\_2\_EngineRatingMapInUse
    - CDL\_3\_DetonationLevel
    - CDL\_4\_NumberOfDetonationSensors
    - CDL\_5\_EngineConfiguration
    - CDL\_6\_OxygenSensorStatus
    - CDL\_7\_RemoteFaultReset
    - CDL\_8\_IgnitionTimingCalibration

Parameter

Direction

Auto Assign MID

Manual MID

Keep Alive

Source Parameter

Data Refresh Timeout [ms]

ADD PARAMETER

9. Click the top down down box labeled Parameter. This will contain a search box as well as a scrollable list containing all available CDL parameters in the driver.

**CDL (CDL)**

Driver Setup Traffic Logs **Devices**

CDL

- CDL
  - Parameters
    - Add Parameter
    - CDL\_1\_NumberOfEngineRatingMapsAvailable
    - CDL\_2\_EngineRatingMapInUse
    - CDL\_3\_DetonationLevel
    - CDL\_4\_NumberOfDetonationSensors
    - CDL\_5\_EngineConfiguration
    - CDL\_6\_OxygenSensorStatus
    - CDL\_7\_RemoteFaultReset
    - CDL\_8\_IgnitionTimingCalibration
    - CDL\_9\_InletManifoldTemperature

Parameter

Direction

Auto Assign MID

Manual MID

Keep Alive

Source Parameter

Data Refresh Timeout [ms]

ADD PARAMETER

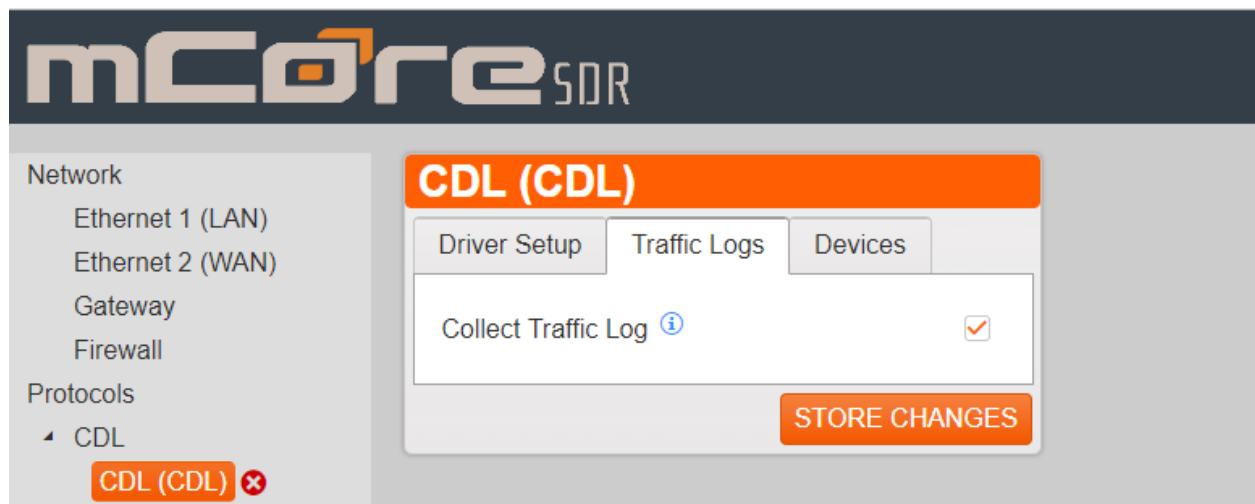
Monico ID	Name
1	CDL_1_NumberOfEngineRatingMapsAvailable
2	CDL_2_EngineRatingMapInUse
3	CDL_3_DetonationLevel
4	CDL_4_NumberOfDetonationSensors
5	CDL_5_EngineConfiguration
6	CDL_6_OxygenSensorStatus
7	CDL_7_RemoteFaultReset
8	CDL_8_IgnitionTimingCalibration
9	CDL_9_InletManifoldTemperature

10. Choose the desired parameter and click the Add Parameter button in the bottom right.
11. Repeat Steps 1 through 3 until you've added all desired CDL parameters you wish to monitor. Once done, you must click the Commit All Changes button in the left menu towards the bottom for the changes to take effect.

### Section 9.2.1: CDL Traffic Log

This is a diagnostics tool for Monico Support staff should the need arise. If asked to get a CDL Traffic Log, follow the steps below for how to enable the Traffic Log. To export the Traffic Log, see [Section 12.6](#).

1. Click the check box next to Collect Traffic Log, then click the Store Changes button.



## Section 9.3: Modbus Setup

1. After adding the Protocol per the Add Protocol section, click the second level of the protocol.

The screenshot shows the mCore SDR web interface. On the left sidebar, under 'Network', there are links for Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, and Firewall. Under 'Protocols', there is a link for 'Modbus RTU Master' and a highlighted link for 'Modbus Master 485 (null)'. Below this is an 'Add Protocol' button. Further down are 'Internal Tags', 'Customer Logging' (with 'Define Logs' and 'Export Logs' sub-links), and 'ACI Configuration' (with 'License File' and 'Viewer Files' sub-links). The main content area has a title bar 'Modbus Master 485 (null)'. Below it are two tabs: 'Driver Setup' (active) and 'Devices'. The 'Driver Setup' tab contains three fields: 'Port' with a dropdown menu showing '(null)', 'Protocol Name' with a text input field containing 'Modbus Master 485', and 'Slave Timeout [ms]' with a numeric input field containing '600'. A 'STORE CHANGES' button is located at the bottom right of the form.

2. Choose the desired port, either 485 or 232 depending on the application.

The screenshot shows the mCore SDR web interface with the same sidebar as the previous image. The main content area now has a title bar 'Modbus Master 485 (RS-485)'. The 'Driver Setup' tab is active. The 'Port' dropdown menu is open, showing three options: '(null)', 'RS-232', and 'RS-485'. The 'Protocol Name' field now contains '(null)' and the 'Slave Timeout [ms]' field remains at '600'. The 'STORE CHANGES' button is still present at the bottom right.

3. Once the port is chosen, other settings will appear. Make sure these settings match the settings of the device(s) that mCore will be communicating with. Click Store Changes button at the bottom right when you are done.

The screenshot shows the mCore SDR web interface. On the left is a navigation menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Firewall), Protocols (Modbus RTU Master, **Modbus Master 485 (RS-485)** with a close icon, Add Protocol), Internal Tags, Customer Logging (Define Logs, Export Logs), and ACI Configuration (License File, Viewer Files). The main content area is titled 'Modbus Master 485 (RS-485)' in an orange header. Below this are two tabs: 'Driver Setup' (active) and 'Devices'. The 'Driver Setup' tab contains the following configuration fields: Port (dropdown menu set to RS-485), Baud Rate (dropdown menu set to 9600), Data Bits (input field set to 8 with up/down arrows), Stop Bits (input field set to 1 with up/down arrows), Parity (dropdown menu set to None), Protocol Name (text field containing 'Modbus Master 485'), and Slave Timeout [ms] (input field set to 600 with up/down arrows). At the bottom right of the configuration area is an orange 'STORE CHANGES' button.

- Click the Devices tab, then click the Add Devices button. A similar screen to below, depending on the Modbus protocol, will appear. When you are done, click the Add Device button at the bottom right. If you have multiple devices, repeat this step.

**Modbus Master 485 (RS-485)**

Driver Setup | **Devices**

Modbus Master 485  
Add Device

Device Name:

Enable Device: ☒

Drop Number:

Word Order [LONG]:

Word Order [REAL]:

Disable Multiple Word Writes [FC 16]: ☐

Disable Multiple Bit Writes [FC 15]: ☐

Disable Single Word Writes [FC 6]: ☐

Disable Single Bit Writes [FC 5]: ☐

Max Coil Register Request [FC 1]:

Max Discrete Input Register Request [FC 2]:

Max Holding Register Request [FC 3]:

Max Input Register Request [FC 4]:

Max Write Coil Registers [FC 15]:

Max Write Registers [FC 16]:

Ping Holding Register:

Polling Delay Minimum [ms]:

Comms Insertion Delay [ms]:

**ADD DEVICE**



- Once the device is added, a Add Group button will appear under the Add Device button. Click Add Group. The following will appear. Here you will choose the data type (word, real/float, or long), the direction (read or write), the function code (currently only function codes 3 and 4 are supported), and the starting address of the Modbus Register. Scaling Normal versus Scaling Reverse reverses the math operation. Contact Customer Support for more information if needed. Click Add Group in the bottom right when done.

The screenshot shows the mCore SDR web interface. On the left is a navigation menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Firewall), Protocols (Modbus RTU Master, **Modbus Master 485 (RS-485)**), Internal Tags, Customer Logging (Define Logs, Export Logs), ACI Configuration (License File, Viewer Files), and System (Commit All Changes). The main content area is titled "Modbus Master 485 (RS-485)" and has two tabs: "Driver Setup" and "Devices". Under "Devices", there is a "Modbus Master 485" section with "Add Device" and "Device 1" (which has a red 'x' icon). Below "Device 1" is an "Add Group" button. To the right of this section are configuration fields: "Group Name" (text input), "Poll Frequency [ms]" (spinner set to 1,000), "Data Direction" (dropdown set to "Device to mCore"), "Function Code" (dropdown), "Data Type" (dropdown set to "Long"), "Group Start Address" (spinner set to 1), and "Scaling" (dropdown set to "Normal"). An "ADD GROUP" button is at the bottom right. A note at the bottom states: "Live View is not available until changes are committed."

6. The button Add Parameter will appear under the Add Group button in the top left as shown. Here you can start mapping out the individual registers starting at the number specified at the group settings in the above step. If this was a Slave application, the Source Data Pool drop down menu would be where you choose the parameter from a different protocol to map out. The UI (User Interface) will count for you as you add registers. The Gain and Offset allow you to apply scaling if needed. If you need to skip a large number of registers in your mapping, start a new group. If a small skip is needed, create an internal tag with a meaningless value to use as a filler tag to skip unneeded registers. When you are done, click the Add Parameter button in the bottom right.

The screenshot shows the Monico configuration interface for a Modbus Master 485 (RS-485). On the left, a sidebar contains a tree view with categories like Network, Protocols, Internal Tags, and Customer Logging. Under Protocols, 'Modbus Master 485 (RS-485)' is selected and highlighted with a red box. The main panel has two tabs: 'Driver Setup' and 'Devices'. The 'Devices' tab is active, showing a tree view with 'Device 1' expanded. Under 'Device 1', there are buttons for 'Add Group' and 'Add Parameter'. The 'Add Parameter' button is highlighted with a red box. To the right of the tree view, a form for 'Modbus Master 485' is visible. It contains fields for 'Label', 'Address' (set to 400001), 'Gain' (set to 1), 'Signed' (checkbox), 'Offset' (set to 0), and 'Source Data Pool' (a dropdown menu with 'Select a data pool'). An 'ADD PARAMETER' button is located at the bottom right of the form.

7. Repeat steps 5 and 6 until you have added all registers. If talking to multiple devices, repeat steps 4 through 6. Once done, you must click the Commit All Changes button in the left menu towards the bottom for the changes to take effect.

## Section 9.4: SAE J1939 Setup

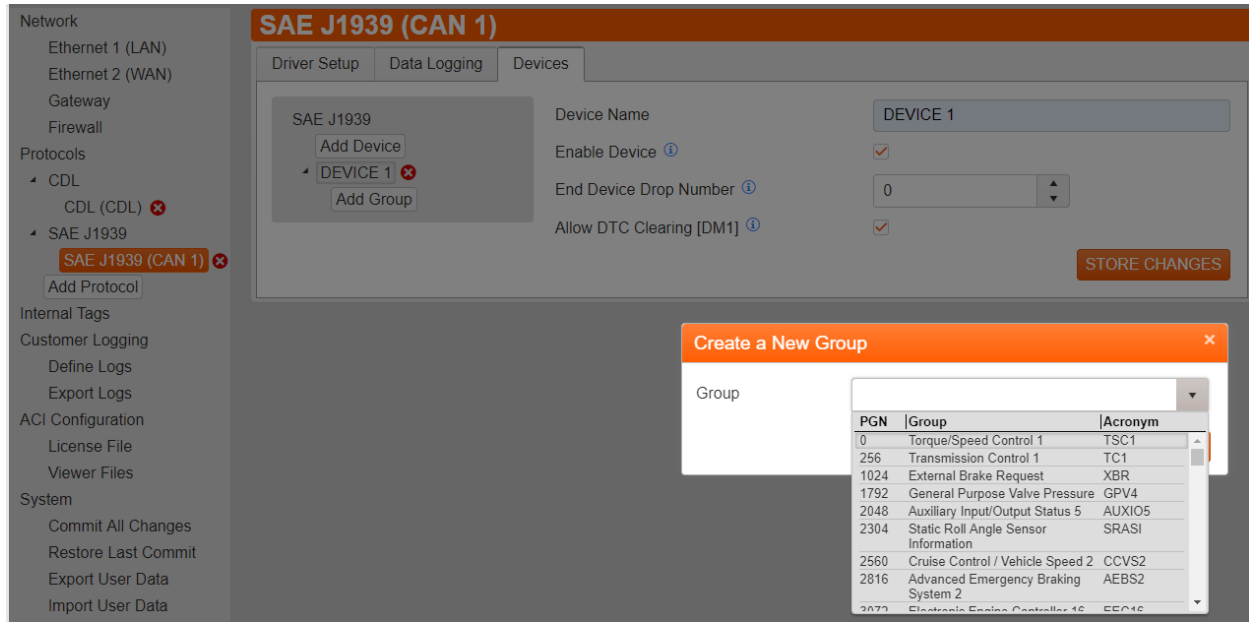
1. After adding the Protocol per Section blah, click the second level of the protocol. Here you will select which CAN port, 1 or 2, you are physically wired into. Also, you can also edit the mCore's Source Address and Alternate Source address. Click Store Changes in the bottom right when done.

The screenshot shows the mCore SDR web interface. On the left is a navigation menu with sections: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Firewall), Protocols (SAE J1939, SAE J1939 (null) with a red 'x' icon, Add Protocol), Internal Tags, and Customer Logging (Define Logs, Export Logs). The main content area is titled 'SAE J1939 (null)' in an orange header. Below this are three tabs: Driver Setup (active), Data Logging, and Devices. The Driver Setup tab contains fields for Port (a dropdown menu showing '(null)'), Protocol Name (a text field with 'SAE J1939'), Baud Rate (a dropdown menu showing '250000'), mCore Source Address (a text field with '5' and up/down arrows), and Alternate mCore Source Address (a text field with '222' and up/down arrows). An orange 'STORE CHANGES' button is in the bottom right corner.

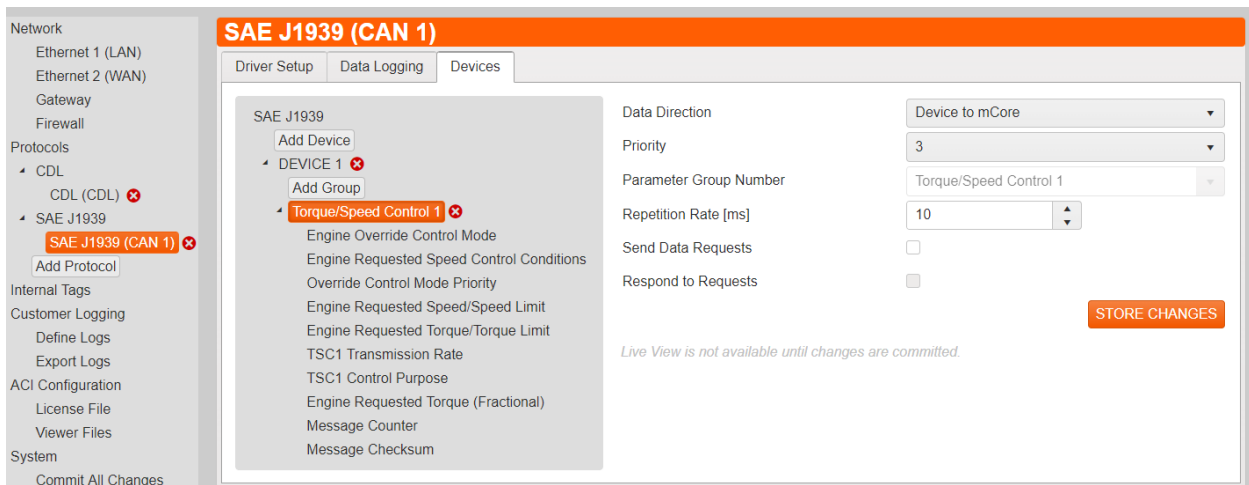
2. Click the Devices tab, then click the Add Device button. Here you can name the device, change the device drop number, and allow DTC clearing. When done, click the Add Device button in the bottom right.

The screenshot shows the mCore SDR web interface with the 'SAE J1939 (CAN 1)' configuration page. The left navigation menu is similar to the previous screenshot, but the 'SAE J1939 (CAN 1)' option is highlighted with a red 'x' icon. The main content area has an orange header 'SAE J1939 (CAN 1)'. Below it are three tabs: Driver Setup, Data Logging, and Devices (active). The Devices tab shows a list of devices on the left with 'SAE J1939' and an 'Add Device' button. On the right, there are configuration options: Device Name (a text field with 'DEVICE 1'), Enable Device (a checked checkbox), End Device Drop Number (a text field with '0' and up/down arrows), and Allow DTC Clearing [DM1] (a checked checkbox). An orange 'ADD DEVICE' button is in the bottom right corner.

- Next click the Add Group button that appeared under device name. A pop-up window will appear. Click the drop-down menu to view the PGN list or use the search bar to find the PGN you are looking for. You can search by description, PNG number, and PGN Acronym. Once you are done, click Add Group.



- Next, you'll see the PGN in the list. Here you can change the data direction for outbound or inbound, change priority, repetition rate, and select if send data requests or respond to requests is needed. Click the Store Changes button when done.



### Section 9.4.1: J1939 Traffic Log

This is a diagnostics tool for Monico Support staff should the need arise. If asked to get a J1939 Traffic Log, follow the steps below for how to enable the Traffic Log. To export the Traffic Log, see [Section 12.6](#).

1. Click the check box next to Traffic Log, enter a name in the Log File Name box, and we recommend to leave the Max File Log Size at the default value, but could need it increased for special applications.
2. Click the Store Changes button when done. You must then click the Commit All Changes button in the left menu towards the bottom for the change to take effect.

**mCore SDR**

Network  
Ethernet 1 (LAN)  
Ethernet 2 (WAN)  
Gateway  
Firewall

Protocols  
CDL  
CDL (CDL) ✖  
SAE J1939  
**SAE J1939 (CAN 1) ✖**  
Add Protocol

Internal Tags

**SAE J1939 (CAN 1)**

Driver Setup | Data Logging | Devices

Traffic Log ⓘ ☒

Log File Name ⓘ

Max File Log Size [B] ⓘ

**STORE CHANGES**

## Section 9.5: OMF

OMF (OSIsoft® Message Format) is a data transfer protocol developed to allow individual devices to send data to the PI Server directly without the need for an intermediary device.

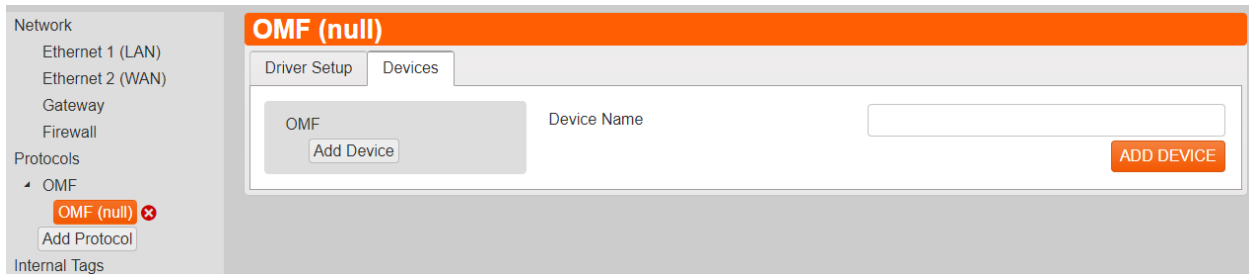
1. After adding the Protocol per the Add Protocol section, click the OMF protocol add in the left menu, then click the 2nd level. The following screen will appear.

The screenshot displays the Monico configuration interface. On the left is a sidebar menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Firewall), Protocols (OMF), Internal Tags, Customer Logging (Define Logs, Export Logs), ACI Configuration (License File, Viewer Files), and System (Commit All Changes, Restore Last Commit, Export User Data, Import User Data, Clear User Data, Export System Logs, Update Firmware). The 'OMF' protocol is selected under Protocols, and 'OMF (null)' is highlighted. Below it is an 'Add Protocol' button. The main area is titled 'OMF (null)' and has two tabs: 'Driver Setup' and 'Devices'. The 'Driver Setup' tab is active, showing fields for: Port (dropdown set to '(null)'), Protocol Name (text field 'OMF'), Pi Server (dropdown set to 'MonicoLive Server'), Pi Server IP Address (text field '13.91.243.166'), Pi Server Producer Token (empty text field), Pi Server Port Number (spin box set to '5,464'), Data Compression (checkbox checked), Data Transmission Efficiency (spin box set to '2' with an info icon), and Max Buffer Size (spin box set to '2,147,483,648' with an info icon). A 'STORE CHANGES' button is at the bottom right. A red 'CHANGED' indicator is at the bottom left of the sidebar.

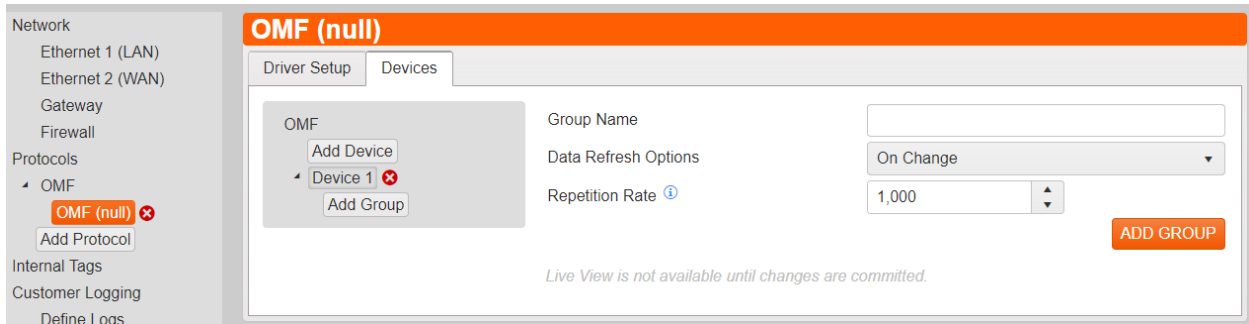
2. Set the Port based off which Ethernet port will have network access to the PI Server you intend to connect to.
3. If you will be using the MonicoLive Server, leave that default selection alone. If you are using a customer owned server, click the dropdown and select Customer Supplied PI Server. You can then fill in the IP address for that server.

4. If you are using a Customer Supplied PI Server, enter the PI Server Port Number. If you are using MonicoLive, it will be filled in and un-editable.
5. The PI Server Producer Token is a security code for the data to be able to get into the PI Server. If you are using MonicoLive we will either fill this in before shipping or email this to the customer for them to put in onsite. If this is a Customer Supplied PI Server application, contact your PI administrator to get a Producer Token.
6. Data compression is set to default ON. We recommend using compression but can be turned off if desired. The amount of data sent will increase by magnitudes of 200% or more potentially.
7. Data Transmission Efficiency is a setting that will help reduce data usage. This is applicable when using cell modems and satellite connections. We recommend starting at 2 and working your way up until you are happy with the performance. Ranges from 2 - 10.
8. Max Buffer Size is the amount of space allocated on the unit to buffer data in the event that the network cable is disconnected or cell modem drops out. mCore will continue to retrieve data and store it until the connection is re-established. We recommend leaving this setting at the default unless your application will be doing a lot of logging. Once the connection is back, mCore will send the stored data. Depending on how long the connection was down and the speed of the connection, will determine how long it will take to backfill the data to the PI Server.
9. Click the Store Changes button in the center menu when done.

10. Click Devices Tab in the center menu. Then click the Add Device button. You will see the following screen. Name the device and click Add Device.



11. Next you will see a Add Group button appear under the Add Device button. Click Add Group. You will see the following screen.



12. Here you will start adding groups which will contain your tags. After naming the group you will choose between sending this group and all the tags in the group at a fixed Timed Interval (i.e. every 30 seconds) or On Change.

13. The Repetition Rate is dependent on the Data Refresh Option chosen. For Timed Interval this is the time between each data transmission sent for that group. For example, if 2 minutes go by with Repetition Rate set to 30,000ms or 30 s, you will have sent all tags in that group 4 times in a 2 minute span.

For On Change, the Repetition Rate is how often mCore will look at the data and check to see if it has changed an equivalent or greater amount than the Threshold specified per parameter. The Threshold is set in future steps.

14. Click Store Changes when done.



15. Next click Add Parameter in the center menu. The following screen will appear. Choose from the Source Data Pool drop down menu the tag previously created from other protocols that you would like to send to the PI Server. The Label will autofill with the same name as the Source Data Pool but can be changed if desired. A description is not required, but can be added. The threshold is used as plus or minus the data value.

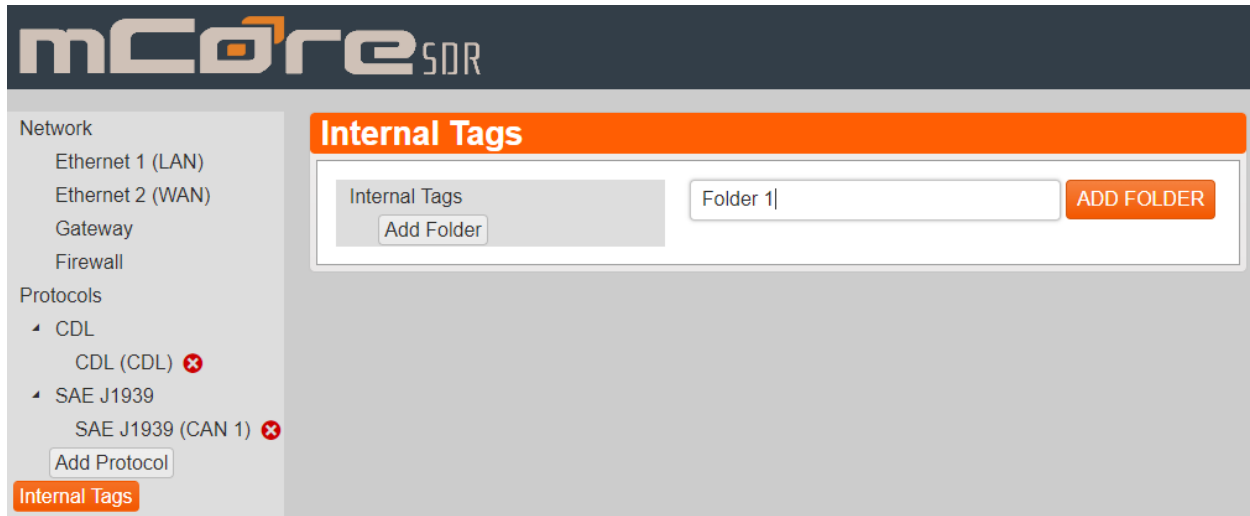
For example: if the value is 10 and the threshold is 5, that means only values that are either  $\geq 15$  or  $\leq 5$  will trigger the entire group to send all data values. If there is only 1 tag per group, then only that tag's value gets sent. If there are 10 tags in the group, then 1 tag exceeding its threshold will trigger all 10 tags' values to be sent at the same time.

16. Click Add Parameter when done.
17. Repeat Steps 11 through 15 until you've added all tags and groups desired. Click Commit All Changes in the left menu toward the bottom when done and ready to start feeding data to the PI Server.

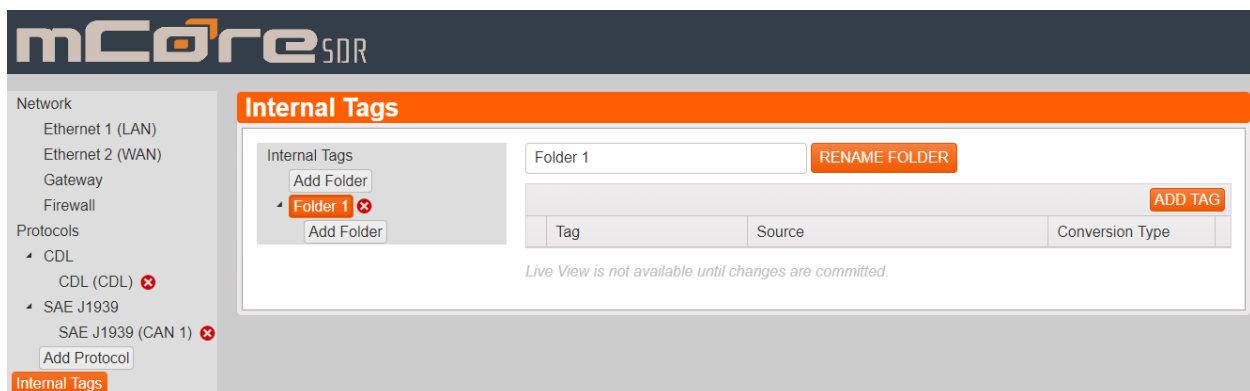
Note: The most efficient mapping method when using On Change is 1 parameter per 1 group. This keeps each tag independent and will only send 1 data point when triggered versus all tags in the entire group.

## Section 10: Internal Tags

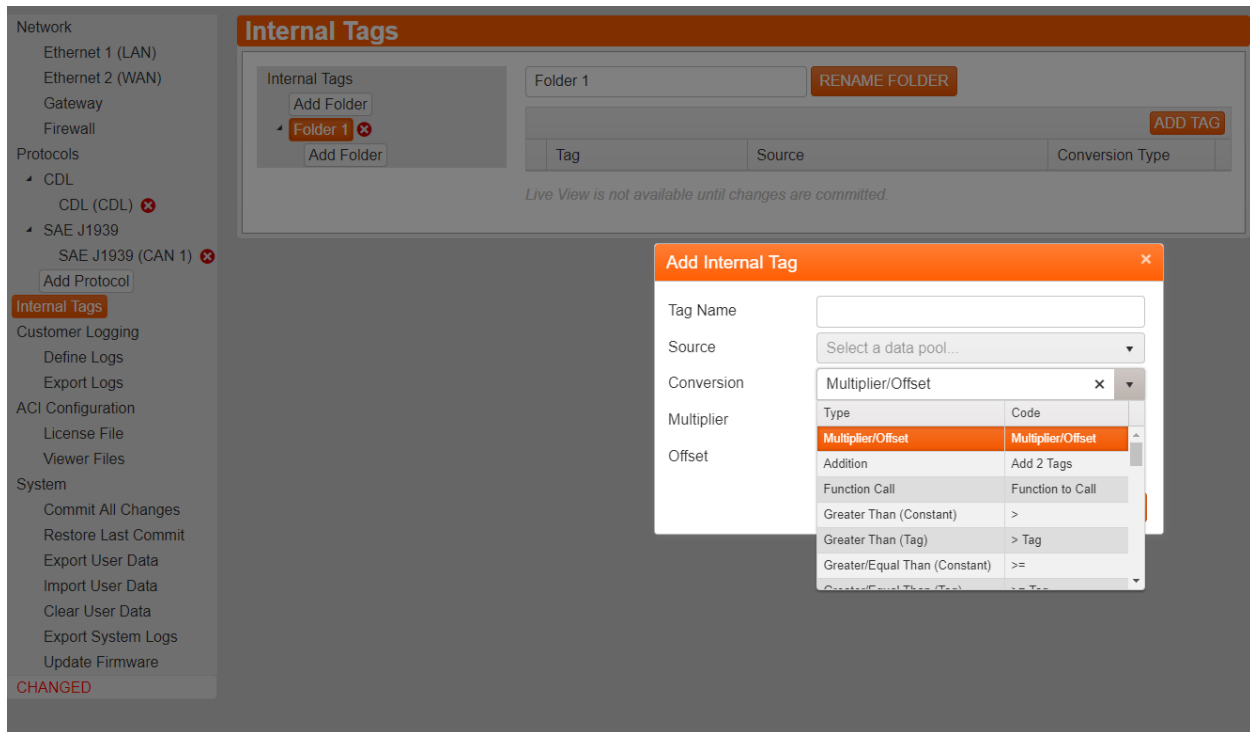
1. Click the Internal Tags button in the left menu. The following screen will appear. Click Add Folder and input a name for the folder. This will serve as an organizational tool. Click the orange Add Folder button to the right of the name box to save and create the folder.



2. The following screen will appear where you can start adding tags. Click the Add Tag button located to the right of the screen.



- Once you've clicked Add Tag, the following pop up will appear. Click the Conversion drop down menu to see all the different functions that can be used including: multiplier/offset for scaling and unit conversion, add 2 tags together, etc. When done, click the Store Changes button in the pop-up window.



Note: See [Section 8.1: Function Table](#) for examples and full list of functions. Contact Customer Support if you have questions about any of the functions.

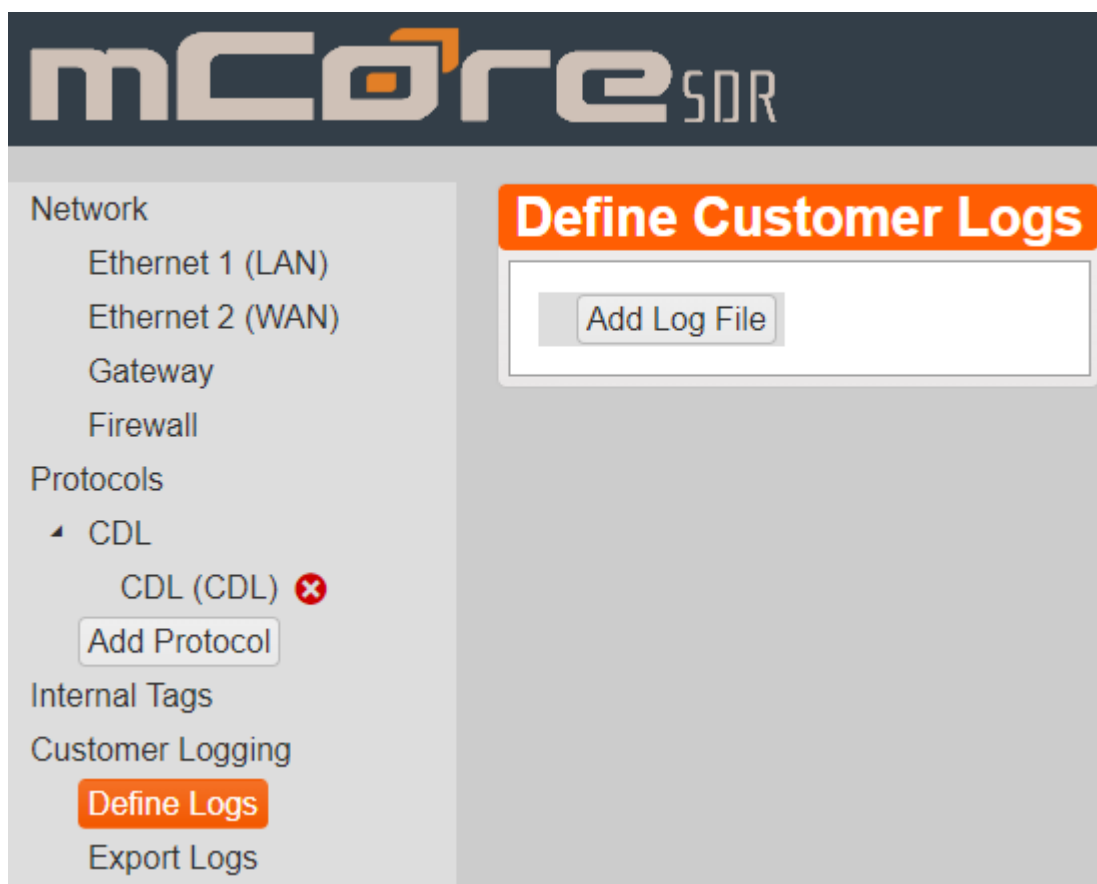
- Once you've stored that change, you will see the internal tag in the folder's line up. Repeat Step 3 to add as many internal tags as desired.

## Section 10.1: Function Table

Label	Function	Label	Function
Multiplier/Offset	$(m * \text{Tag1}) + o$	Bitwise AND (Constant)	$\text{Tag1} \& k$
Reverse Multiplier/Offset	$(\text{Tag1} - o) / m$	Bitwise AND (Tag)	$\text{Tag1} \& \text{Tag2}$
Addition (Constant)	$\text{Tag1} + k$	Bitwise OR (Constant)	$\text{Tag1}   k$
Addition (Tag)	$\text{Tag1} + \text{Tag2}$	Bitwise OR (Tag)	$\text{Tag1}   \text{Tag2}$
Subtraction (Constant)	$\text{Tag1} - k$	Bitwise XOR (Constant)	$\text{Tag1} \wedge k$
Subtraction (Tag)	$\text{Tag1} - \text{Tag2}$	Bitwise XOR (Tag)	$\text{Tag1} \wedge \text{Tag2}$
Find Percentage (Constant)	$\text{Tag1} / k * 100$	Bitwise Shift Left (Constant)	$\text{Tag1} \ll k$
Find Percentage (Tag)	$\text{Tag1} / \text{Tag2} * 100$	Bitwise Shift Left (Tag)	$\text{Tag1} \ll \text{Tag2}$
Take Percentage (Constant)	$\text{Tag1} * k / 100$	Bitwise Shift Right (Constant)	$\text{Tag1} \gg k$
Take Percentage (Tag)	$\text{Tag1} * \text{Tag2} / 100$	Bitwise Shift Right (Tag)	$\text{Tag1} \gg \text{Tag2}$
Remainder (Constant)	$\text{Tag1} \% k$	Reverse Bits	n/a
Remainder (Tag)	$\text{Tag1} \% \text{Tag2}$	Reverse Bytes	n/a
Greater Than (Constant)	$\text{Tag1} > k$	Reverse Words	n/a
Greater Than (Tag)	$\text{Tag1} > \text{Tag2}$		
Greater Than or Equal (Constant)	$\text{Tag1} \geq k$		
Greater Than or Equal (Tag)	$\text{Tag1} \geq \text{Tag2}$		
Less Than (Constant)	$\text{Tag1} < k$		
Less Than (Tag)	$\text{Tag1} < \text{Tag2}$		
Less Than or Equal (Constant)	$\text{Tag1} \leq k$		
Less Than or Equal (Tag)	$\text{Tag1} \leq \text{Tag2}$		
Data Match (Constant)	$\text{Tag1} = k$		
Data Match (Tag)	$\text{Tag1} = \text{Tag2}$		
Data Mismatch (Constant)	$\text{Tag1} \neq k$		
Data Mismatch (Tag)	$\text{Tag1} \neq \text{Tag2}$		
Logical Inverse (NOT)	$! \text{Tag1}$		
Logical AND (Tag)	$\text{Tag1} \&\& \text{Tag2}$		
Logical OR (Tag)	$\text{Tag1}    \text{Tag2}$		
Invert Bits	$\sim \text{Tag1}$		

## Section 11: Customer Logging

1. Click the Customer Logging button in the left menu. This will bring you to the following screen.



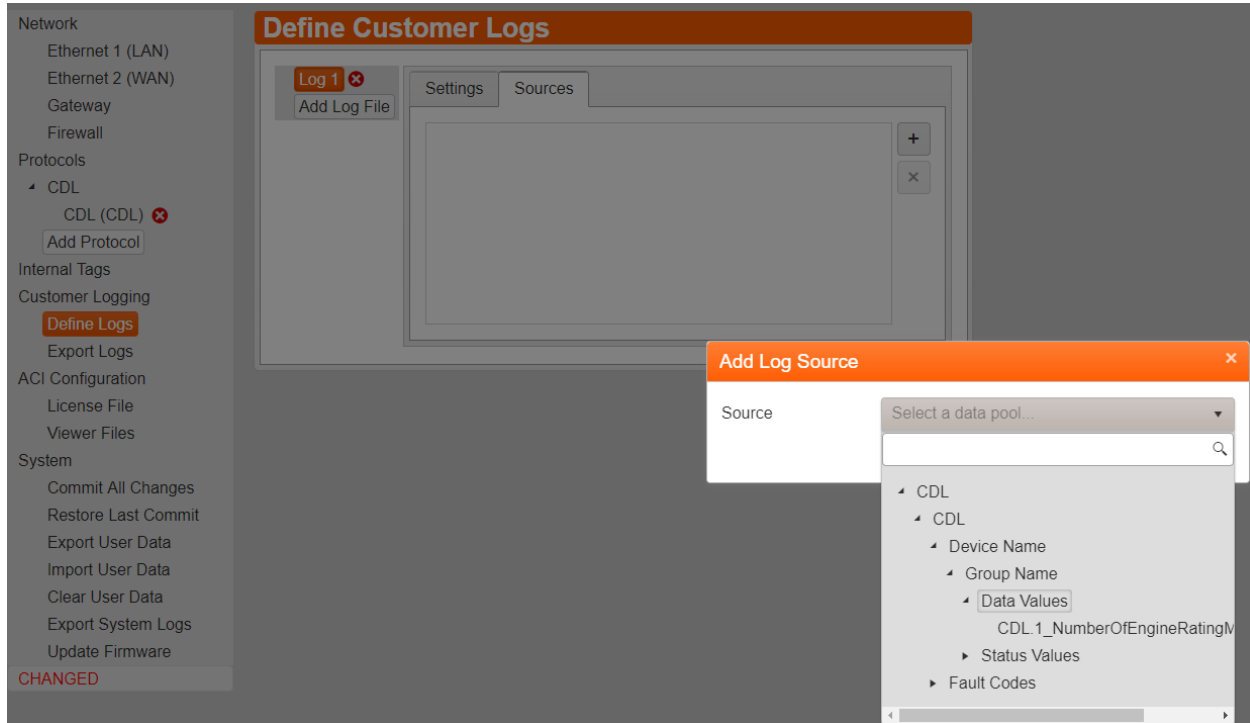
2. Click the Add Log File button. Here you can name the log file and adjust the logging settings. The Period is how often, in milliseconds, mCore will record the values of all tags listed for logging. The Samples Per File is the number of samples mCore will keep in one file before it creates and start saving to another file. The Log Files To Keep is the number of total files to save. These files will be overwritten once the last file is full. This means if you have 10 log files, once #10 is full, #1 will be overwritten and the logging will continue. Click Add when done.

The screenshot shows the 'Define Customer Logs' window with the 'Settings' tab selected. The left sidebar contains a tree view with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Firewall), Protocols (CDL, CDL (CDL) with a red 'x' icon, Add Protocol), Internal Tags, and Customer Logging (Define Logs, Export Logs). The main area has a tabbed interface with 'Settings' and 'Sources'. The 'Settings' tab contains four fields: 'Log File Name' (text input), 'Period [ms]' (spin box set to 10,000), 'Samples Per File' (spin box set to 10), and 'Log Files To Keep' (spin box set to 10). An 'ADD' button is located at the bottom right of the settings area.

3. When you click add, the Sources tab will appear. Click the Sources tab. This is where you will add the tags you want to log. Click the + in the top right to add a tag.

The screenshot shows the 'Define Customer Logs' window with the 'Sources' tab selected. The left sidebar is identical to the previous screenshot. The main area now shows the 'Sources' tab, which is empty except for a large '+' button in the top right corner and a small 'x' button below it. The 'Log 1' button with a red 'x' icon is visible in the top left of the main area.

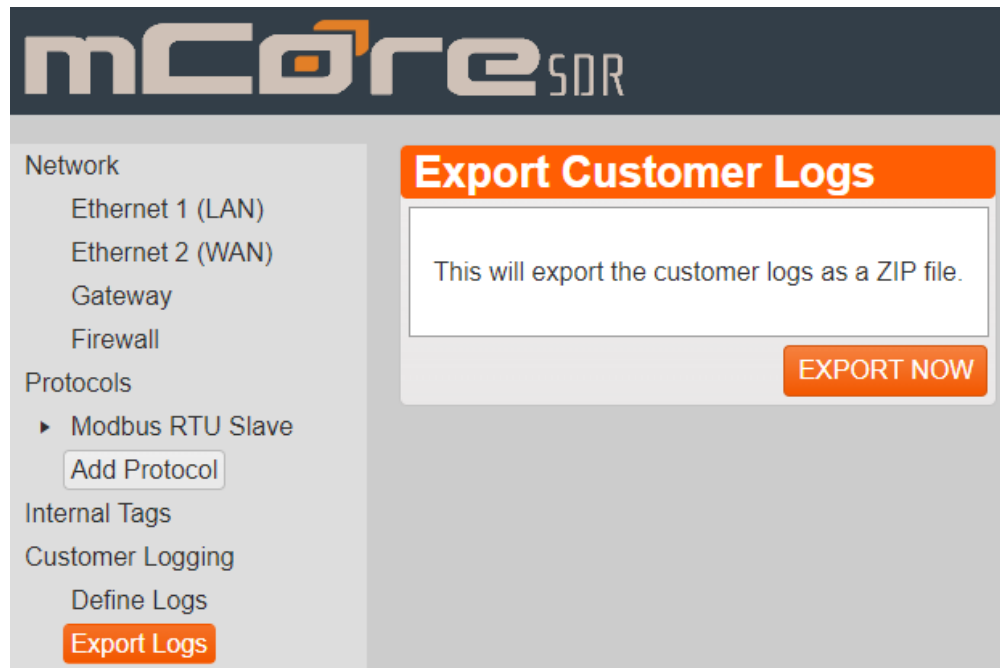
- The following pop up box will appear. You can either use the search bar or navigate through the tree structure to find the tag you want to add. Click the Add button in the pop-up box after selecting the desired tag.



- Repeat Step 4 to add all desired tags to be logged. You must then click the Commit All Changes button in the left menu towards the bottom for the change to take effect.

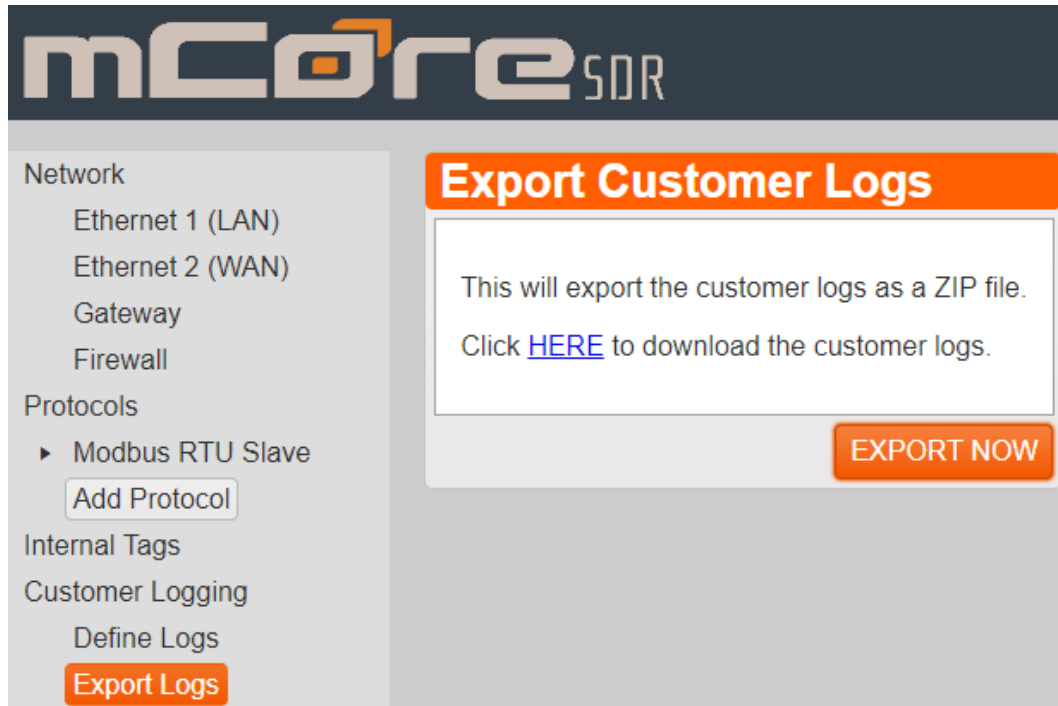
## Section 11.1: Export Customer Logs

1. Click Export Logs in the left menu under the Customer Logging Section. The following screen will appear.





2. Click the Export Now button in the bottom right. The following Click Here blue link will appear. Click this link. A pop-up box will appear asking where you want to save the zip file and what to name it. Click



3. Once the file is saved, navigate to the location that you saved the zip file on your computer. Most Windows computers will automatically unzip files for you if you double click on the zip file. If this does not work, try right clicking the file and selecting Extract All. This will pull all files out of the zip file and put them in the same folder/directory that you saved the zip file in.

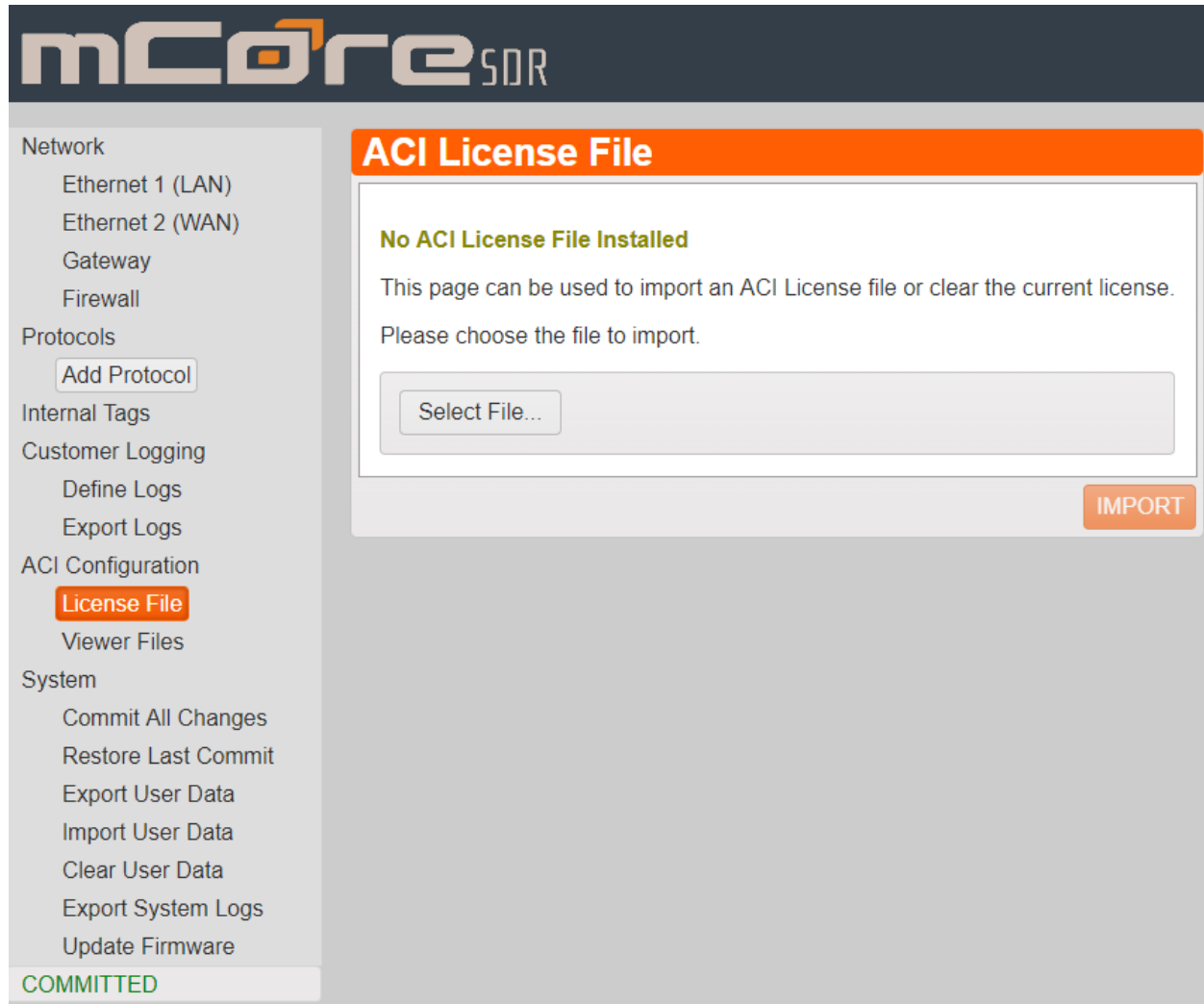
## Section 12: ACI Configuration

Monico has partnered with ACI to provide the hardware for running eRCM Express Compressor Modeling software. This program communicates with a PLC over Modbus and runs the modeling software using compressor and engine data. The communication is done with Modbus TCP over Port 552.

### Section 12.1: Adding License File

1. Find the ACI Configuration section in the left-hand menu. Click License File. The following screen will appear. This screen will tell you if a license file is installed, what the name of the file is if one is installed, and whether or not it matches the MAC address of the mCore. The License files are unique per mCore and cannot be used in other mCores.

2. To add a License file from your computer, click the Select File button. A pop up will appear with File Explorer. Navigate to where the License File is located on your computer, select it, then click Open in the bottom right.



3. Once the file has finished uploading, click the Import button in the center menu towards the bottom right. A pop up will appear. Click Ok to continue.

## Section 12.2: Viewer File(s)

1. Click Viewer Files under ACI Configuration in the left menu. The following screen will appear.

Slot	Status	Action	Clear	Active
Slot 1	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active
Slot 2	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active
Slot 3	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active
Slot 4	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active
Slot 5	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active
Slot 6	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active
Slot 7	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active
Slot 8	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active
Slot 9	Not Used	Select File...	CLEAR	<input type="checkbox"/> Active

RESET STORE CHANGES

2. Click one of the Select File buttons. A pop up will appear with File Explorer. Navigate to where the Viewer File is located on your computer, select it, then click Open in the bottom right.

- The Viewer File will then appear in the screen shown below. Click the check box next to the Viewer File that you want to be active. Multiple Viewer files can be present at one time but only one can be set to active at a time. However, if only 1 file is uploaded and clicked to be Active, it will not be able to be set to inactive until at least a 2nd Viewer file is uploaded.

Slot	Label	Select File...	Done	CLEAR	Active
Slot 1	1-Stg	Select File...	✓ Done	CLEAR	<input checked="" type="checkbox"/> Active
Slot 2	2-Stg	Select File...	✓ Done	CLEAR	<input type="checkbox"/> Active
Slot 3	Not Used	Select File...		CLEAR	<input type="checkbox"/> Active
Slot 4	Not Used	Select File...		CLEAR	<input type="checkbox"/> Active
Slot 5	Not Used	Select File...		CLEAR	<input type="checkbox"/> Active
Slot 6	Not Used	Select File...		CLEAR	<input type="checkbox"/> Active
Slot 7	Not Used	Select File...		CLEAR	<input type="checkbox"/> Active
Slot 8	Not Used	Select File...		CLEAR	<input type="checkbox"/> Active
Slot 9	Not Used	Select File...		CLEAR	<input type="checkbox"/> Active

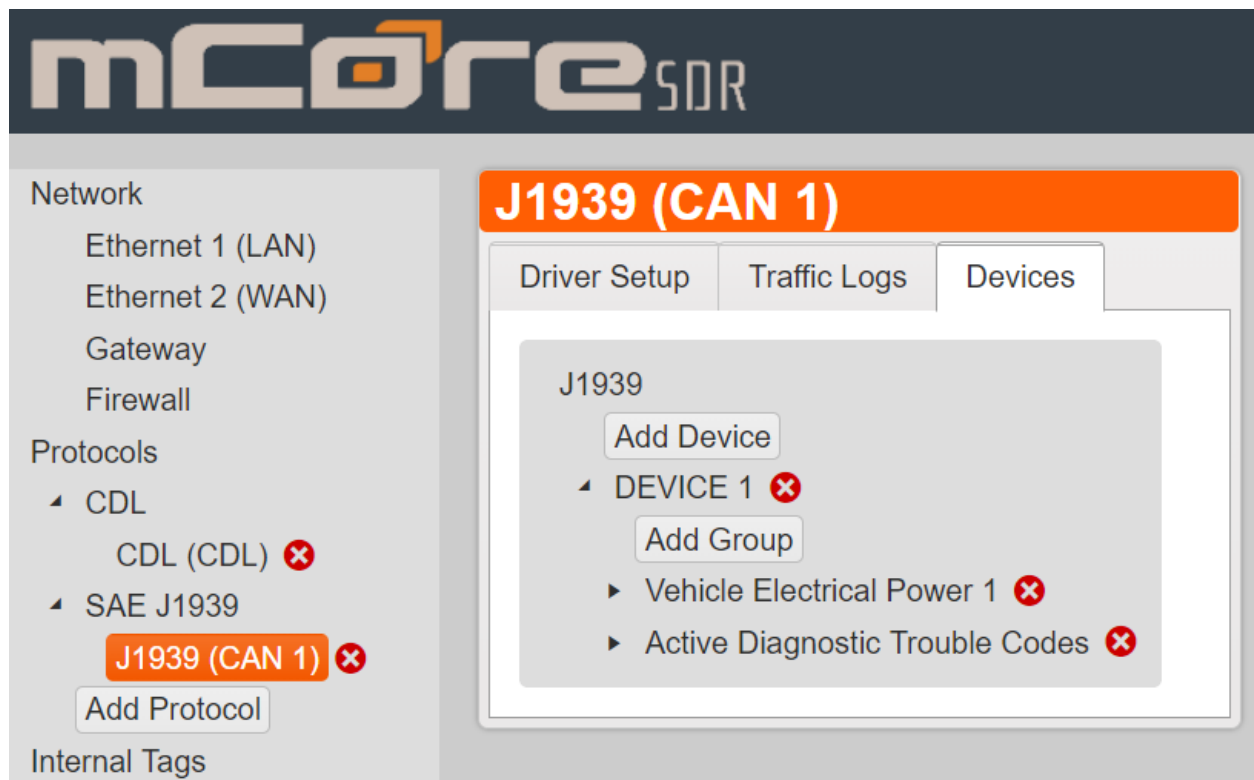
RESET STORE CHANGES

- Once you've clicked a check box to set a Viewer file active, click the Store Changes button in the bottom right. A pop up will appear asking if you are sure you want the recently selected Viewer file to be active. Click Ok to continue. mCore will now be fully setup for ERCM Express and will now start running calculations.

## Section 13: Live Data Viewer

Live Data Viewer is a tool used to view live data either when connected to mCore locally or remotely using an internet browser. Once you've added a group with mapped out parameters and committed all changes, you can view live data. Refresh rates are typically between .5s to 1s.

1. To view live data, select any protocol in the left menu. Click the secondary level to show the center menu, then click the Devices tab as shown below.



- Next click the group, in this example the PGN name, that contains the parameters you would like to see data for. See example below.

- Click the Show Live Data button in the center menu toward the bottom. A table of the parameters and values will appear. See example below.
- To stop watching live data, click the Hide Live Data button in the center menu.

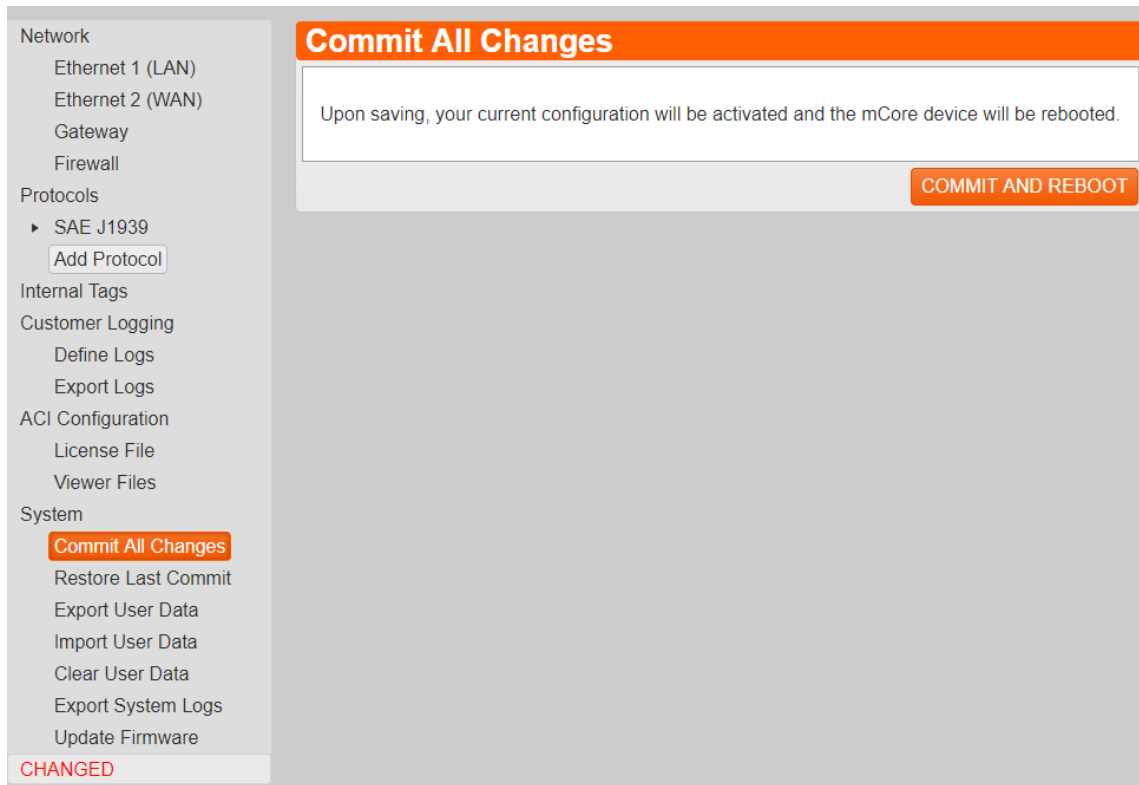
Name	Data Value
SLI Battery 1 Net Current	130
Alternator Current	255
Charging System Potential (Voltage)	3276.750049
Battery Potential / Power Input 1	24.35
Key Switch Battery Potential	3276.750049

## Section 14: System Functions

### Section 14.1: Commit All Changes

The Commit All Changes button will implement the changes made to the configuration and reboot the mCore to activate the new changes. This is the final step to configure an mCore. Please double check your IP Address settings prior to clicking the Commit All Changes button.

1. Once you've made your changes, click the Commit All Changes button in the left menu toward the bottom. The following screen will appear. Click the Commit and Reboot button in the center menu. A pop-up box will appear warning the user that the mCore will repeat and lose communications. Click Ok to continue.



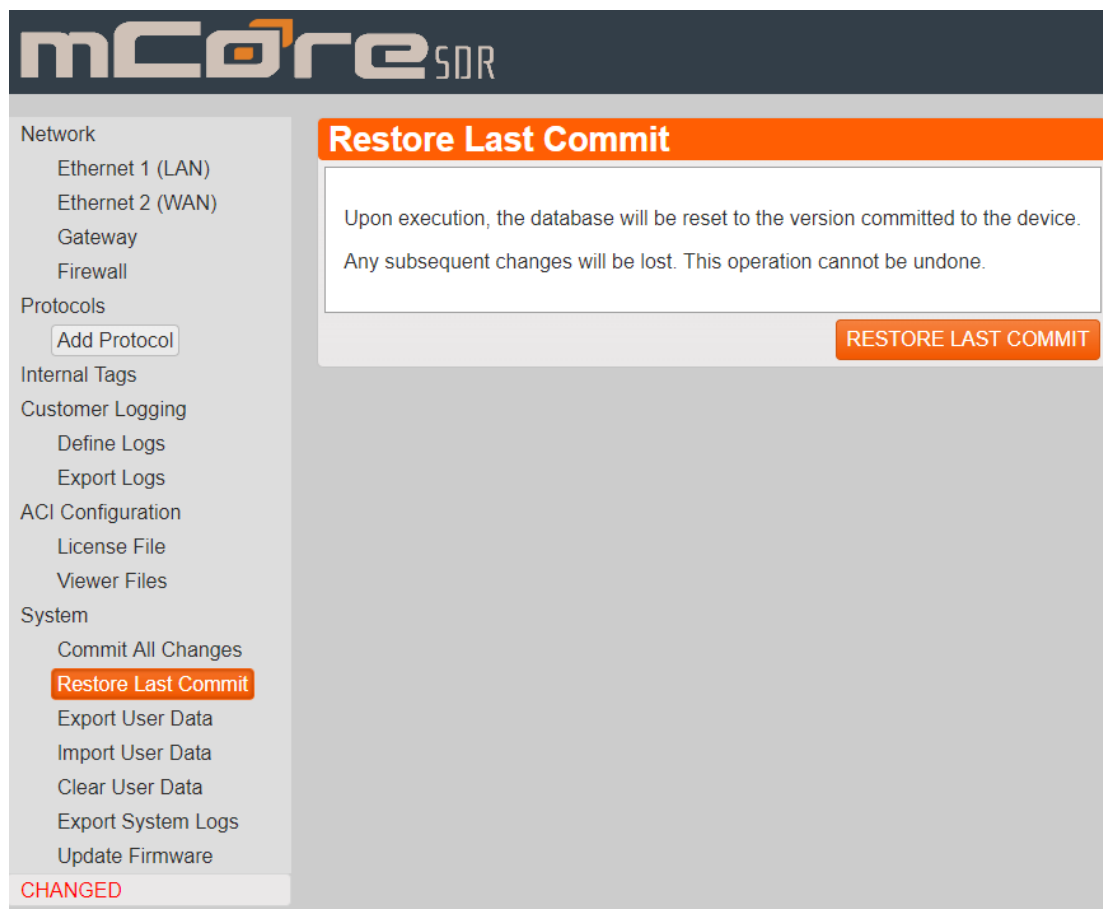
2. Once you've clicked Ok, mCore will reboot and all changes will take effect.



## Section 14.2: Restore Last Commit

Restore Last Commit is essentially an undo button. It allows the user to go back to the last Committed configuration. Anything entered, changed, and/or stored will be lost and reset to what was Committed last.

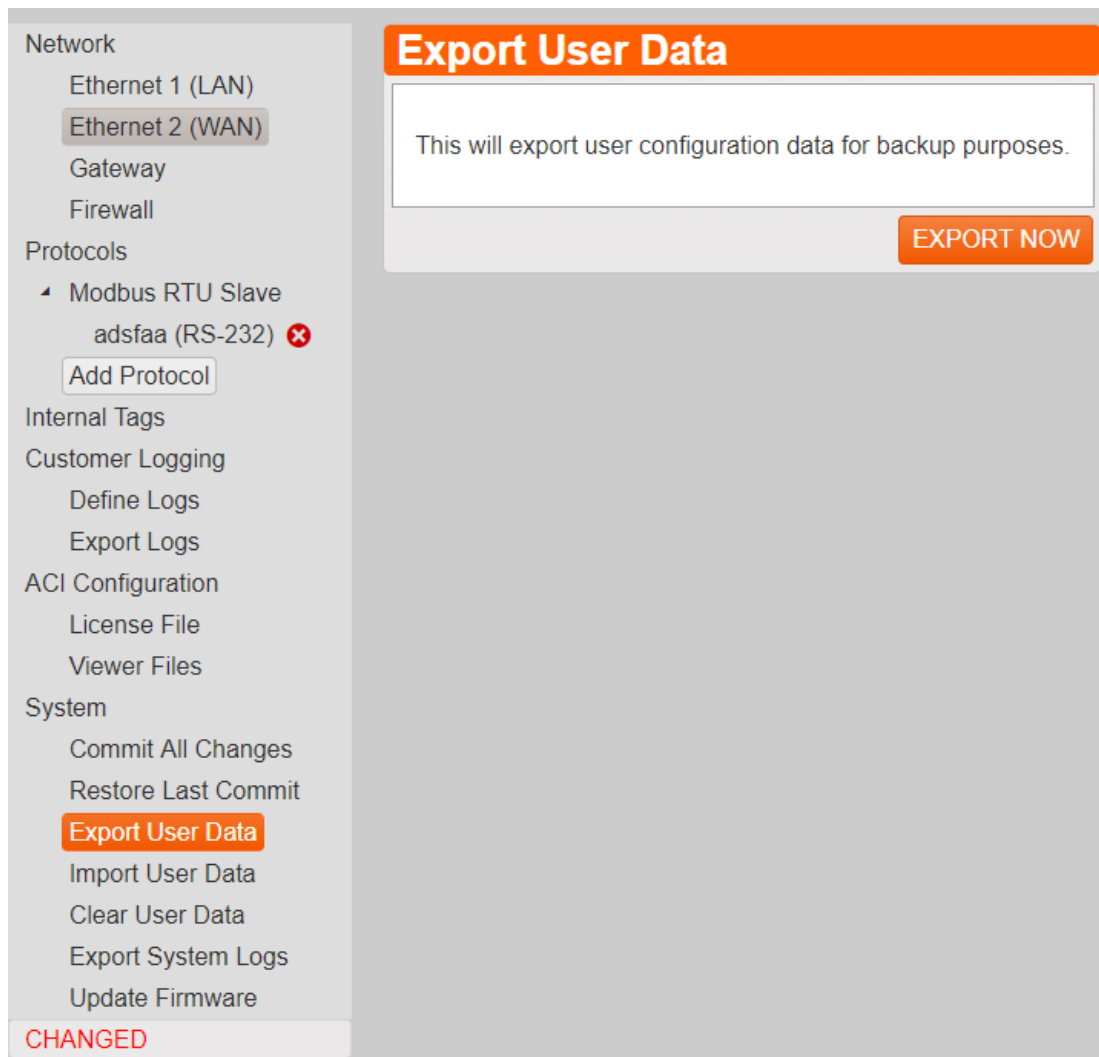
1. To Restore Last Commit, go to the left menu and towards the bottom. Click the Restore Last Commit button. A pop-up box will appear. Click Ok to continue.



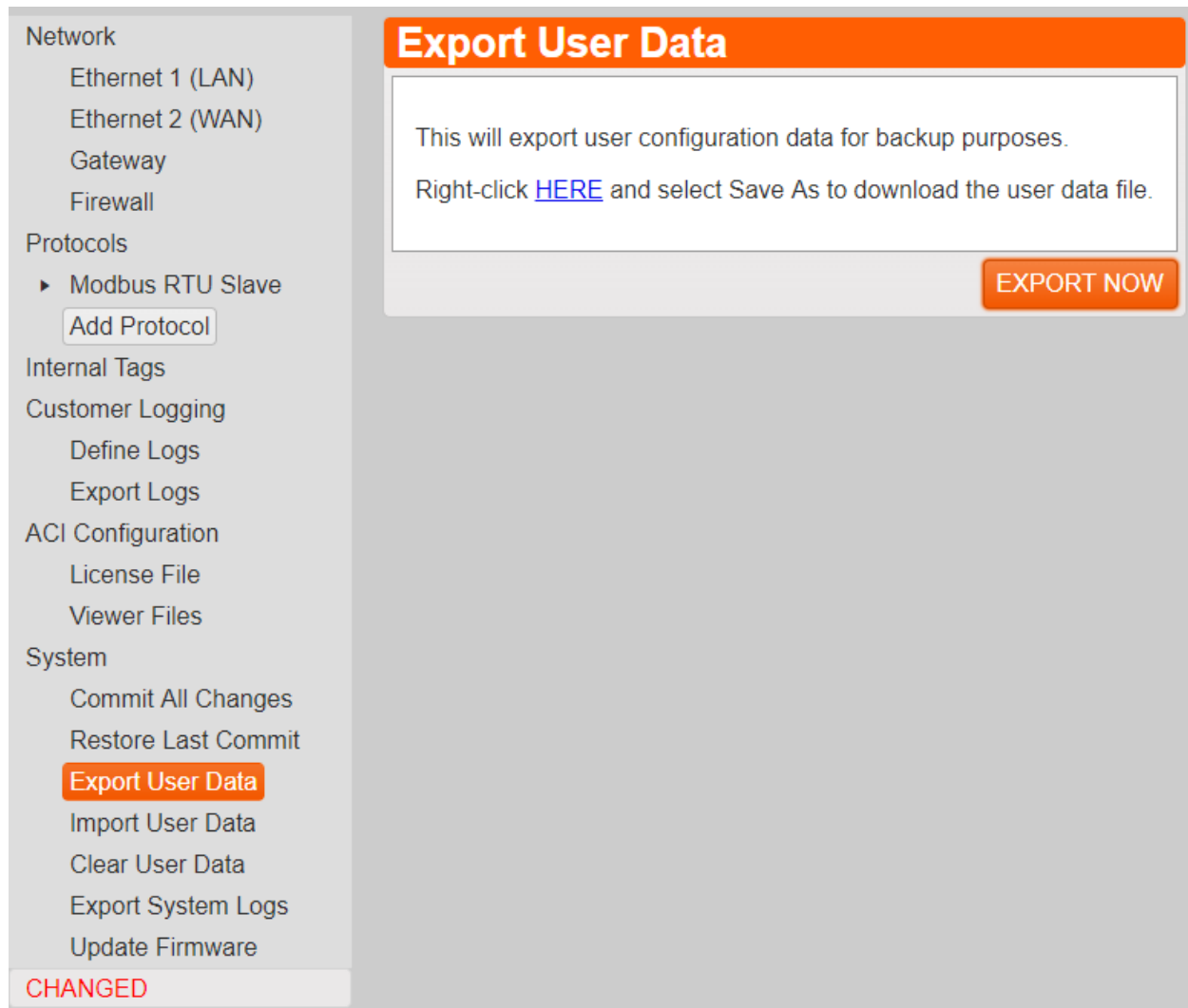
## Section 14.3: Export User Data

Exporting User Data will give the customer the ability to create a backup of their mCore's configuration/settings, share their setup for troubleshooting purposes, or even use it to setup another mCore that is being used for an identical application.

1. Click the Export User Data button in the left menu toward the bottom. The following screen will appear.



2. Click the Export Now button in the center menu. The following screen will appear.

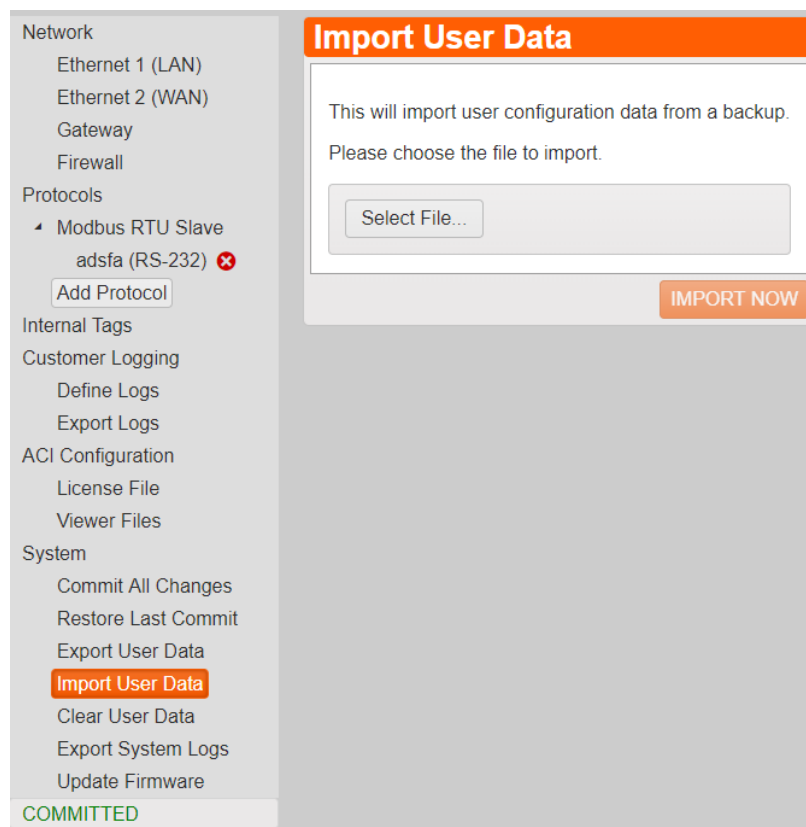


3. Click the blue link labeled “Here”. A pop-up box will appear asking where to save the User Data file and what you want to name it. Click Save when done.

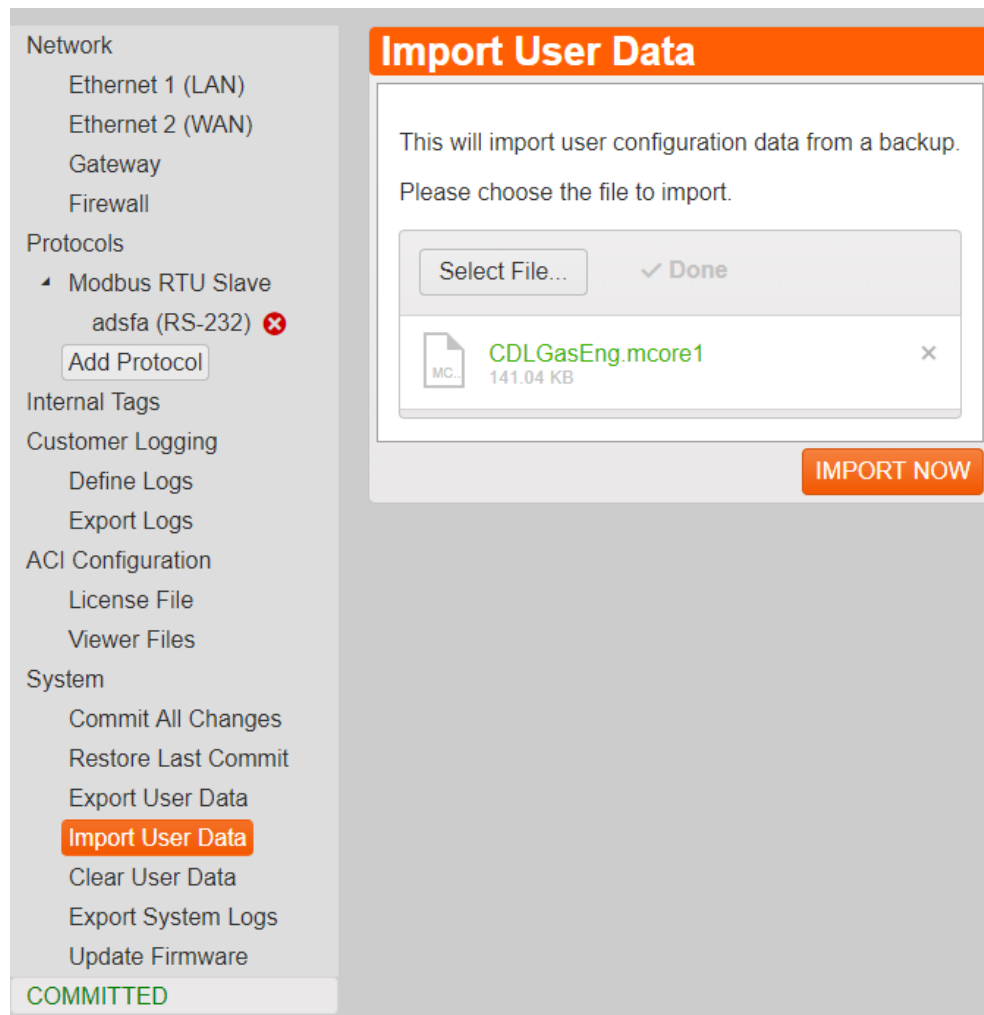
Note: Keep in mind if this file is to be used on another mCore on the same network, the IP address and related network information of the old mCore will be in this User Data file. So before clicking Commit All Changes in the new mCore, check the IP credentials to make sure they are different from the previous mCore. If this is a replacement unit, then the IP credentials can stay as they are.

## Section 14.4: Import User Data

1. User Data is the configuration database that contains all the settings in the UI (User Interface). The user can import User Data files that were either saved as a backup previously or import User Data files sent with changes. Typical changes would include parameter mapping changes like for Modbus registers or even adding an entire protocol can be done quickly by being sent an already done User Data file and importing it.
2. The User Data file you would like to import must be saved to a location on your computer or on a reachable network drive. Click the Import User Data button in the left menu toward the bottom. The following screen will appear.



3. Click the Select File button in the center menu. A pop-up box will appear. Navigate to the saved User Data file, select it, then click Open. User Data files are the file type “.mcore1” on the end of the file.
4. Once the file is uploaded, it will show up in the center menu as shown below. Click the Import Now button at the bottom right. A pop up will appear asking if you want to continue with the change. Click Ok to continue.

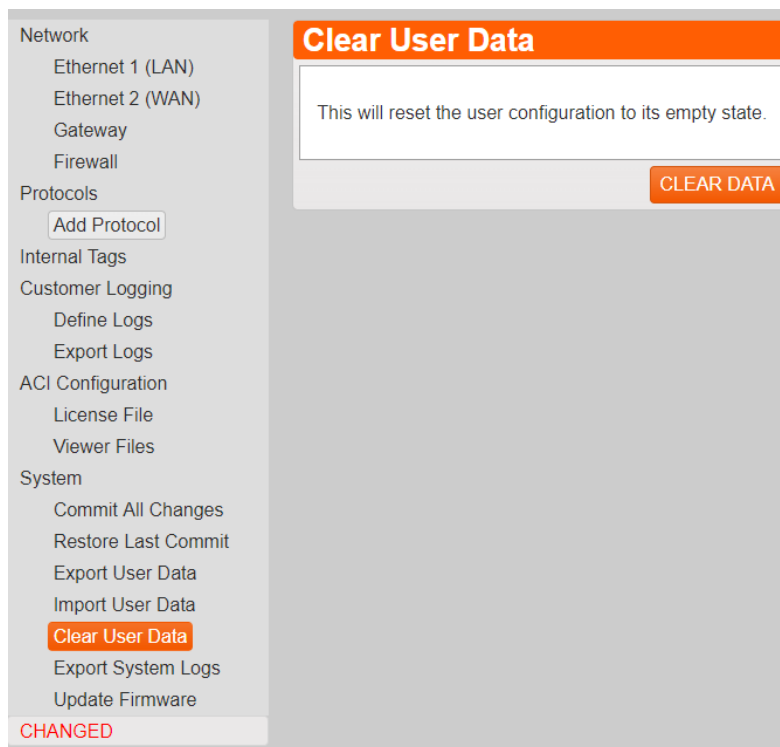


5. It may take up to about 10 seconds for the file to import and show all the information on the screen. Once it is done, you will see your new changes present. Double check your network settings after every User Data import. Since it copies all settings, it could have incorrect IP address settings copied from an office computer that are incompatible with the site network where the mCore is installed.
6. Once you've verified all the new settings, click the Commit All Changes button in the left menu toward the bottom. A pop-up box will appear asking if you want to continue with the changes and reboot the mCore so all the changes can take effect. Click Ok to apply the new changes.
7. After clicking Ok, the mCore will reboot and take around 15 to 20 seconds to reboot. If the UI (User Interface) does not come back to the Login page after 30 seconds, refresh your browser page by clicking the Refresh button. It is typically located either to the right or left of the address bar depending on the browser.

## Section 14.5: Clear User Data

Clear User Data is a quick way to clear out the settings/configuration of the mCore to an empty state. This will remove all protocols, tags, and reset the IP credentials back to a factory reset of 192.168.10.220 on Ethernet 1 and DHCP for Ethernet 2.

1. Click Clear User Data in the left menu toward the bottom. The following screen will appear.

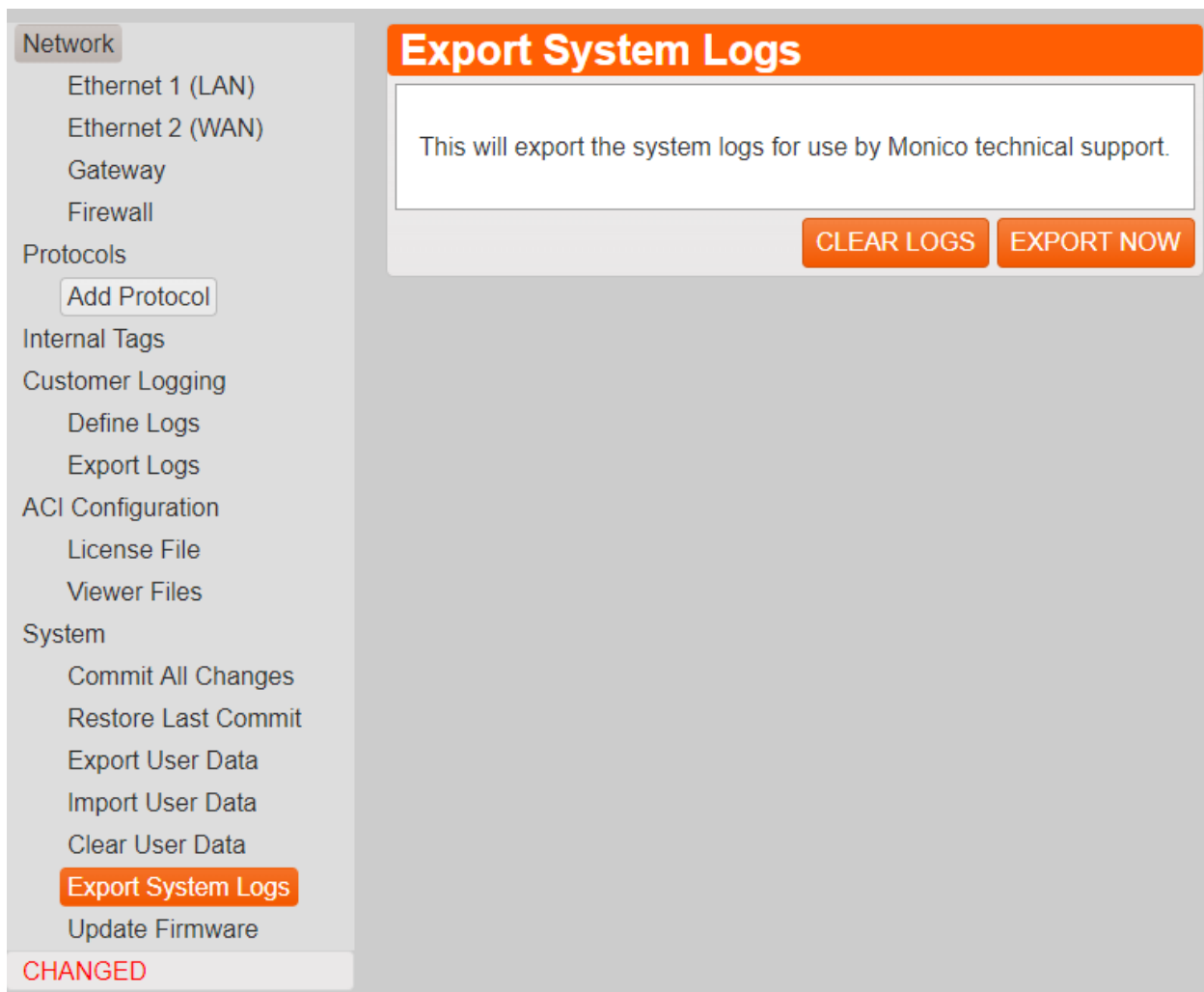


2. Click Clear Data in the center menu. A pop-up box will appear asking if you want to continue with clearing mCore. Click Ok to continue.
3. After you've clicked OK, it will take a few seconds and then all protocols will be gone and all settings reset to factory defaults. The first thing to do before continuing with making a new configuration is to change the IP credentials back to useable settings as they have now been reverted back to factory defaults.

## Section 14.6: Export System Logs

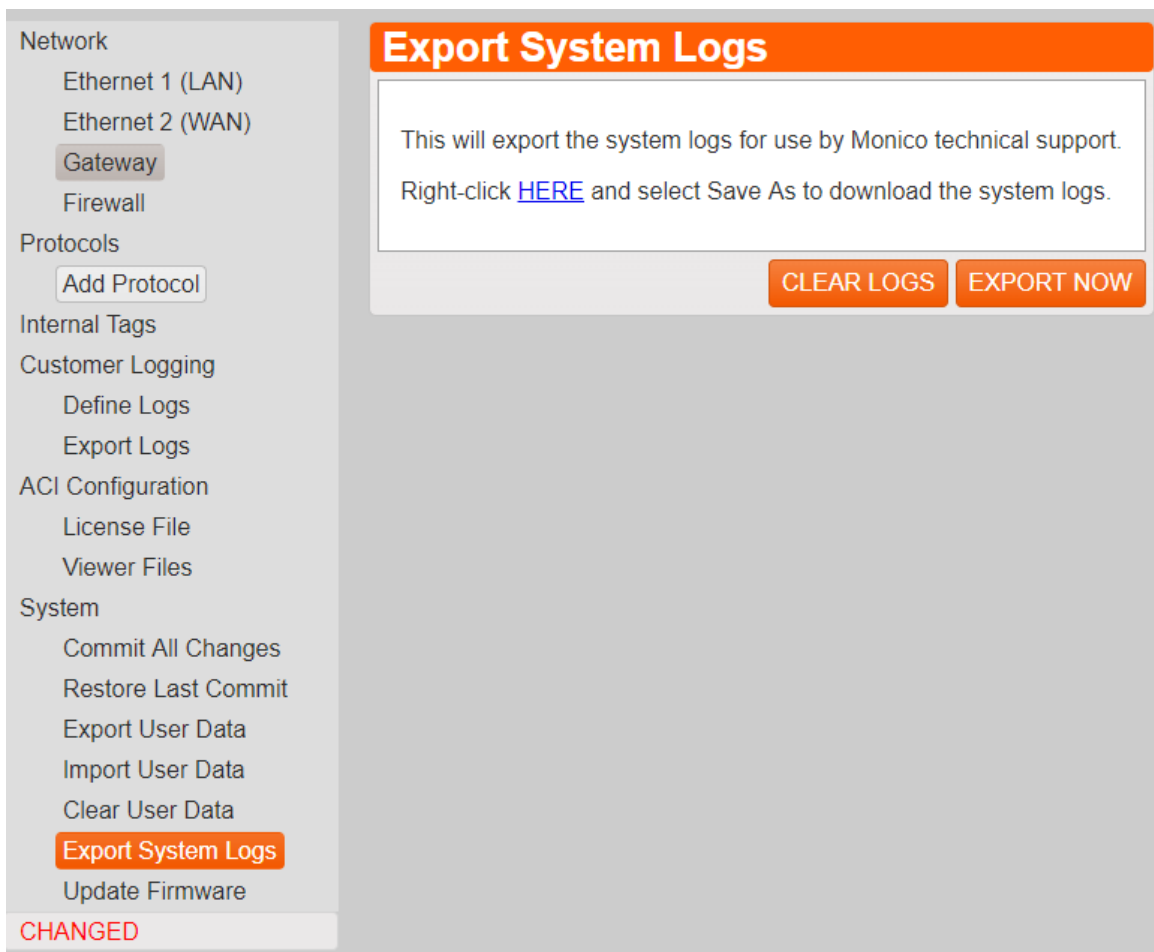
System logs are what we call Traffic Logs of RAW data at the driver level. The current protocols that support this feature are SAE J1939 and CDL. The logs are enabled by selecting the Traffic Logs tab under the protocol and enabling the logs by clicking the check box. See the respective protocol section in this manual for how to steps for enabling Traffic Logs. Allow mCore to run for at least 5 minutes after enabling Traffic Logging and mCore rebooting before attempting to Export System Logs.

1. Click the Export System Logs button in the left menu toward the bottom. The following screen will appear.





2. Click the Export Now button in the middle menu. The following screen will appear. Click the blue hyperlink labeled “HERE”. A pop-up box will appear asking where you want to save the log file and what to name it. Click Save.
  - a. If multiple sets of logs are needed over an extended time frame, you will need to delete the old logs before each run to obtain traffic logs. Make sure to have already backed up the current log files before doing this step. To do this, click the Clear Logs button. Click Ok to continue.



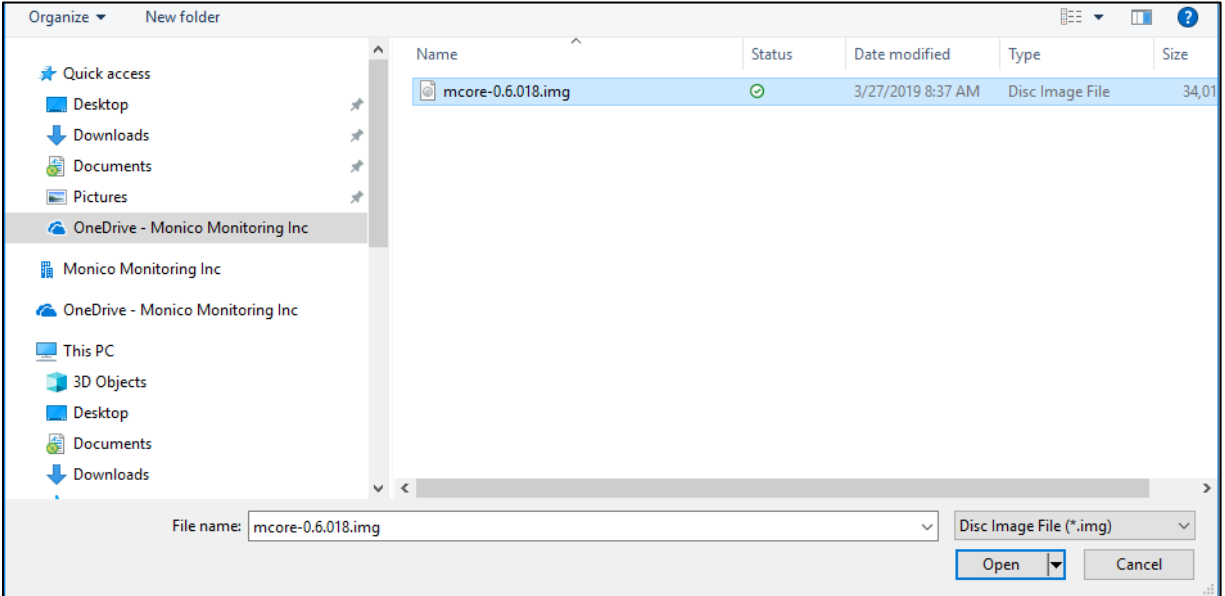
3. Once you’ve saved the log to your computer, send them to support@monicoinc.com. These log files are encrypted as they contain proprietary information. We will decrypt, analyze the logs, and reply back. Please contact us at 281-350-8751 ext.1 if you need more rapid assistance.

## Section 14.7: Update Firmware

1. From the System menu select Update Firmware.

The screenshot displays the Monico web interface. On the left is a navigation menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Firewall), Protocols (CDL, Modbus TCP Slave, OMF, Add Protocol), Internal Tags, Customer Logging, ACI Configuration (License File, Viewer Files), and System (Commit All Changes, Restore Last Commit, Export User Data, Import User Data, Clear User Data, Update Firmware). The 'Update Firmware' button in the System menu is highlighted. On the right, a modal dialog box titled 'Update Firmware' contains the text: 'This will update the firmware installed on the mCore. Please choose the firmware image to install.' Below the text is a 'Select File...' button. At the bottom right of the dialog is an orange 'UPDATE NOW' button. At the bottom left of the interface, a green status bar reads 'COMMITTED'.

2. Select the file that want you to upload. All firmware updates will have the suffix .img in the filename i.e. mcore-0.6.018.img. After selecting the file, click Open to begin the upload process.

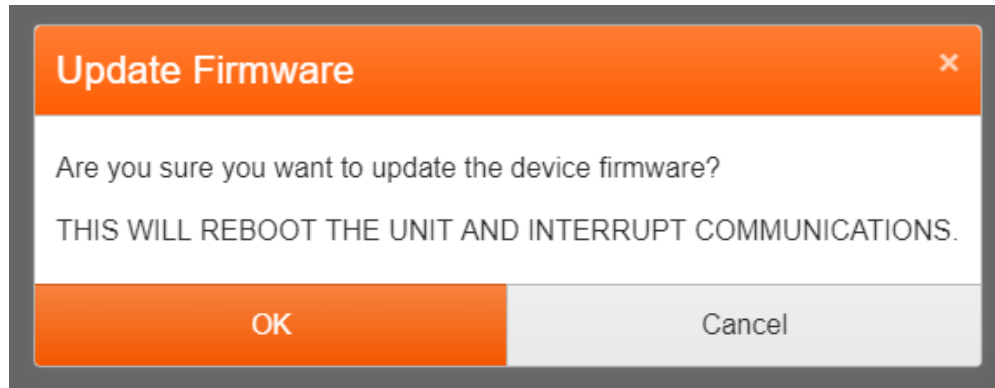


3. Once the file has completed the upload 100%, click UPDATE NOW to begin the upgrade process.

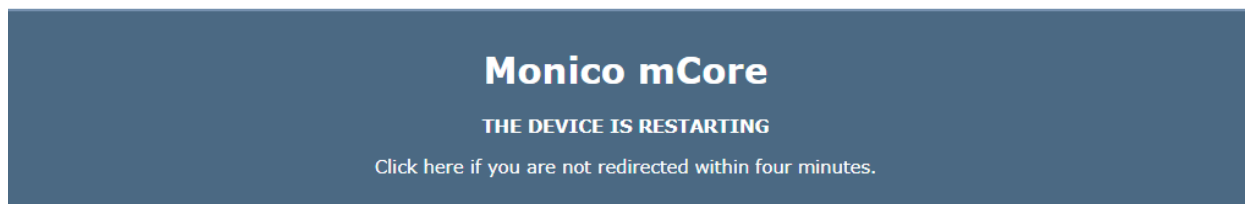
The screenshot displays the Monico web interface. On the left is a navigation menu with categories: Network (Ethernet 1 (LAN), Ethernet 2 (WAN), Gateway, Firewall), Protocols (CDL, Modbus TCP Slave, OMF, Add Protocol), Internal Tags, Customer Logging, ACI Configuration (License File, Viewer Files), and System (Commit All Changes, Restore Last Commit, Export User Data, Import User Data, Clear User Data, Update Firmware). The 'Update Firmware' button in the System section is highlighted. At the bottom left of the menu, the status 'COMMITTED' is shown in green. The main content area features an orange header 'Update Firmware'. Below the header, a message states: 'This will update the firmware installed on the mCore. Please choose the firmware image to install.' A file selection interface shows a 'Select File...' button and a 'Done' button with a checkmark. Below this, a file named 'mcore-0.6.018.img' (33.21 MB) is listed with an 'IMG' icon and a close 'x' button. At the bottom right of the dialog, an orange 'UPDATE NOW' button is visible.

4. You will then be prompted with a warning that you are about to upgrade your firmware. Click OK to continue.

DO NOT REMOVE POWER WHILE THE mCORE IS UPDATING FIRMWARE.



5. While the firmware upgrade is in progress, you will see the following message. It will take approximately four (4) minutes for the upgrade to complete, at which time the mCore will automatically reboot and the screen will refresh back to the initial landing page.



## Section 15: Factory Reset

mCore can be reset to a Factory state should the need arise. A Factory Reset will put the IP address for Ethernet 1 and 2 to DHCP. The Username and Password will be reset to the defaults as listed on the label sticker on the bottom of the mCore. All protocols and other settings will not appear after initial reboot. To get the previous configuration back, click the Restore Last Commit button. Contact Monico Support should you have questions or need assistance with performing this reset.

1. Power off the mCore.
2. To perform a Factory Reset, use a 4" piece of wire (18 gauge is recommended) with both ends stripped back by an 1/8" and push the wire through the waterproof gasket at Pins 4 and 5 on the Power Connector - Key Connector A until you button out. The pin out is shown in [Section 3.2](#).
3. While maintaining contact with the wire on Pins 4 and 5, power on the mCore. The Power LED will briefly go Solid Red then go Solid Amber. All LEDs below the Power LED will be flashing Red then go flashing Green. Once you see flashing Green, the unit has been reset.
4. Remove the wire and the mCore will reboot automatically.
5. Seal the pierced gasket holes for Pins 4 and 5 with the provided sealing plugs to restore the waterproof connection. Simply push them into the pin holes. See [Section 4.1](#) for a picture and part number of the sealing plug.
6. To reconnect, open an internet browser and type in the serial number of the mCore followed by .local. For example, if the mCore serial number is mc-1234-5678, you would enter, without quotes, "http://mc-1234-5678.local". The username and password has also been reset back to the default as shown on the label sticker on the bottom of the mCore.