

# uSwitchCS™ Installation and Operating Manual



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## Introduction

uHaveControl specializes in innovative IOT solutions for controlling and monitoring your world and keeping you connected to it 24/7!

The **uSwitch Control Station (uCS)** is our third generation web based relay and I/O controllers. The company that invented the uSwitch in 2006 continues to advance its development. With infinite possibilities, uCS enables you to securely control or monitor anything, anywhere, anytime. With built-in WiFi, Ethernet, Network security AutoReboot, and Cloud integration the uCS can restart any network infrastructure/critical device securely whether, wired, wireless or cellular, anywhere in the world automatically when it locks up or stops communicating, preserving network, connectivity, and control/security operations, This saves you cost, unnecessary site visits and exposure, decreasing down-time and improving customer experience. uSwitch technology is currently deployed in the most demanding industrial, environmental monitoring, law enforcement, security, IOT, OEM and consumer applications throughout the world.


Simple to use, with no programming required, uSwitch automatically builds a secure and intuitive control system interface on multiple levels across many functional pages. uSwitch runs as a stand-alone system, through distributed environments over

your private network or the web.

Once connected, uCS can monitor, sense, report on, control and reboot any device or sensor over a local network or over the web whether on a remote outpost, in a vacation home or solar application halfway across the world. In addition to full mobile integration, uSwitch can be accessed from networked computers, iPads, Phones, or a myriad of smart devices providing unlimited control anywhere, anytime and from anyplace. With direct integration to Amazon Web Services (AWS), uCS Provides Over-The-Air (OTA) updates keeping itself up to date, keeping you on track, and supporting the latest technologies as they become available.

## uSwitchCS Features

- Connects to phones, computers, iPads and many other smart devices
- No programming required
- Minimal Footprint
- Minimal Power Consumption
- Flexible, **9-30 Vdc**, and fixed input models
- Independent and Isolated, **Removable Terminal Connectors**
- Over-The-Air (**OTA**) software updates for AWS secure servers
- **Built-in Wi-Fi** (IEEE 802.11 b/g/n) radio supports user configurable **Access Point, Repeater** and **Station/Client/Infrastructure** modes all under the WiFi security mode of your choice.
- Internal Micro antenna and External **SMA** antennas supported (2.4 GHz, 50 Ohm, omni directional)
- Default WiFi Transmission range 250 feet, and miles with specialized antennas
- Repeater mode adds input/output capabilities to your existing network while silently extending its range.
- WiFi security options: **WEP, WPA-PSK, WPA2-PSK, WPA-WPA2-PSK, WPA2-Enterprise, WPA3-PSK, WPA2-WPA3, WAPI-PSK, Open**
- Hard-wired network adapter for **Ethernet** connections supporting **Full/Half Duplex** and **10/100BASE-T**.
- Network Protocols **SSL/TLS, StartTLS, SMTP, NTP, HTTPS, HTTP, WS, WSS, TCP/IP, UDP, NAT, DDNS, mDNS, HTML, XML, MODBUS, MQTT, CGI, Web Sockets**
- **Built in Dynamic DNS (DDNS) Client** supporting **No-IP, Duck DNS, DynDNS, and Google Domains**
- **Static** and **Dynamic IP** support with **Port Forwarding**, and Virtual Port Addressing
- **mDNS** provides multicast auto discovery of all uSwitch devices on the LAN subnet
- Primary, Secondary and Tertiary DNS selection options
- up to 5 Independent **SSL SMTP** mail clients for secure, user defined, notifications deliverable on system events, user actions, schedules or hardware activity.
- Secure email and SMS alerts can be sent from I/O events, Watchdog Events, Scheduled Events and user initiated actions.
- Mail Clients for **STARTTLS** and **STARTSSL**
- Two dry contact relays (5A@120Vac, 3A@250VAC), (5A@120VDC, 3A@ 250VDC), MBTF (100K Cycles)
- Isolated Terminal Connector to both NO (normally open) and NC (normally closed) connections.
- **5Vdc** and **3.3Vdc** outputs for **I2C** and, **SPI** with expansion options
- Built-in, user configurable, web server providing a simple/intuitive interface or full OEM customization.
- Customizable Menus, Interface Colors/Controls/Icons/Buttons, Real-Time Data, Calibration/Timing ...
- **Built in Scheduler** runs off **NTP** servers or manually entered time
- Primary and Secondary NTP Server options as well as selectable update frequency
- **Real-Time Clock** supports **Time Zones** and **Daylight Savings**

- Scheduler supporting up to 8 timed events per entry (up to **20** days/and up to **300** Scheduled Events selectable per relay)
- Scheduler supports **Calendar, Weekday, Interval Timed** events, including Sunrise/SunSet option.
- Scheduler supports a **Periodic Pulse** (relay Settings) which generates a timed event on interval
- Multiple simultaneous logins, support segregated user accounts with specific account/control privileges
- Each device's **Security** password is **Unique** and a variety of hacking prevention techniques are deployed to prevent unintended access without proper account passwords and privileges when security options are fully deployed.
- Each Relay can have its own Independent, User Configurable, I/O Reset or Alarm event **Watchdog**
- Each Watchdog has 3 configurable ping URLs, or can use a hardware heart-beat for event for activation
- Multiple Relay Modes including user input mode (with or without momentary timers), external hardware trigger mode, schedule and watchdog modes, supporting both Latched and Unlatched operation
- Timed resets can be configured by putting a relay in **Periodic Mode** and then programming its reset interval in the Event Calendar
- User defined Relay Power-On States
- Digital inputs with state detection, rate detection (paddle sensors), counters with rollover, setpoints, triggers, cutoff filters, scaling, hysteresis and event notification options
- Internal inputs have a configurable hardware Pull-Up/Pull-Down and debounce option to meet your specific needs
- **Virtual Relays** provide **Peer-to-Peer communication** supporting remote relay control that can be latched, momentarily, driven from local relays, local inputs, or manually controlled by an operator. Remote devices can be driven using **Socket I/O** for your local network or via **Web Sockets** for communication outside the local network.
- Virtual Relays support event driven **Custom** Web Socket and I/O Messaging
- **Peer-to-Peer** communication is compatible across entire uSwitch hardware product line
- **ADC** inputs with limits, triggers and events
- ADC supports configurable Resolutions, Hardware Sampling Rates, Scaling, Offsets and Hysteresis
- User Customizable **Event Log**, can be enabled, disabled, downloaded and eMailed
- Expansion buses such as **i2c, and SPI**, support connection to offboard devices and sensors
- **I2C auto-discovery** supports up to 120 chainable devices and sensors
- Control and Configuration for Expansion devices is automatically generated based on Auto-Discovery software
- Supported expansion options include: **Relays/GPIOs/ADCs/Temp/Pressure/Humidity/Air Quality/Luminosity...**
- **HTML5 Graphs** Supported, User can interactively select and View Graphs of Analog Sensor Data, GPIOs and Relays
- Company, Product Name, Links to Website, Manuals, OEM Icons all user configurable for **Rapid OEM Integration**
- Manual and Marketing Literature in standard formats for rapid OEM Marketing and Support Documentation
- System **Backup and Restore** provides device preservation and rapid scaling to new devices
- Optional **A-Plug** converts relay output to switchable 120vDC outlets.
- Non-Conductive Case has flanges and through holes for easy mounting
- Independent Factory Restore, Communication Restore, and System Reset Buttons
- **Custom API** supports TCP, Web Sockets, CGI, and XML interfaces for quick integration with other products such as RTDs, control interfaces, or custom/cloud apps.
- All features programmable from Remote Apps through a simple XML/HTTP command Interface or via custom Cloud
- Fully Configurable user Interface including display color options, Company ICONS, menus and more!
- Content specific Help Screens and Documentation
- **Great Documentation! Great Support!**
-  **Proudly Developed, Manufactured and Supported from the USA!!!**



## About uSwitchCS

uSwitchCS (uCS) is the latest uHaveControl smart industrial controller. The uCS hosts a WiFi (802.11b/g/n) radio, an RJ45 Ethernet jack, two high power electro-mechanical relays, two GPIO(s), an Analog input, Real-Time Clock, 5 and 3.3 Vdc outputs, expansion port, embedded HTTP/HTTPS server, embedded mail client with/without SSL, a control application/Web server and boot loader supporting secure Over The Air (OTA) upgrades. The CS can be accessed over its own secure private WiFi Network, a user's private WiFi network or from any wired Ethernet or wireless network supporting the HTTP or HTTPS protocol, over VPNs, or on home/industrial/business networks. uCS may also be accessed or controlled from custom third-party applications via an easy to use API using XML or TCP. It can be used for access control and monitoring of security devices, lights, alarms, pumps, valves, gates, and supports a slew of sensors including proximity, temperature, pressure, humidity, luminosity, noise, air quality, etc.

Advanced functions include auto discovery of devices on its expansion bus(s), detecting network failures and restarting network infrastructure and utility devices without human involvement (even on full communication breakdown). This Watchdog mechanism automatically restarts servers, cell/satellite modems, switches, gateways, access points, computers, network cameras, etc. uCS relays can be wired in series with a device's power source to switch the power on and off automatically or manually. uCS relays can also be connected directly into a device's reset circuit, in which case the uCS does not power down the device, it simply forces a warm restart triggering a device or module's internal reset mechanism (reboot methods may have different effects and requirements in physical connection and setup).

If a device's power load exceeds the max specifications of built-in relays, uCS relays can directly drive external high power relays expanding your options.

Supporting universal web, cloud and network interfaces, the uSwitchCS can be accessed and controlled using secure AWS IOT Core connections or a library of MQTT subscriptions from cloud servers, by its IPV4 network address on your local LAN, and from remote networks using NAT, Port-Forwarding, DDNS, Web Sockets CGI Scripts, ModBus and from industry standard browsers. This enables direct visibility and secure access from any connected network via industry standard interfaces, servers or your own custom APIs. The factory default IP address for the WiFi Access Point is 192.168.4.1, at default HTTP port 80, default gateway 192.168.4.1, subnet mask 255.255.255.0. For its Ethernet interface the default IPV4 address is 192.168.0.191.

For Custom applications the following communication protocols interfaces are available: XML, TCP Sockets, Web Sockets, CGI Scripts, MQTT, ModBus AWS IOT core libraries. Every feature available to the uSwitch for control, configuration, notification, etc, can be implemented by private OEM Applications.

uCS supports secure Peer-to-Peer (P2P) communication so that an event at one uSwitch (Controller) can trigger events at multiple satellite uSwitches (clients). For instance, a single push button or alarm input event on a master unit can trigger satellite uSwitches to generate alarms or open/lock down an entire campus or facility. Further such events can simultaneously send alerts to personnel or monitoring stations via secure eMail or SMS messages. P2P communication is daisy chainable to a virtually unlimited set of satellite clients. Further via the virtual relay interface customizable WebSocket Alarms from hardware events can be sent via webSoc,ets to your control interfaces anywhere on the internet,

The uSwitch can run with or without user accounts and passwords (without accounts is not advisable unless on a private network). Up to 24 independent user Accounts can be created. Each user account has configurable access levels, automatic logout periods. It is recommended that once provisioned and installed unique Passwords are enabled and passwords remain hidden to protect illegitimate access. Passwords should contain upper and lower case characters and integers. Users who enter an incorrect password multiple times will be prevented from access for several minutes and separate web sessions are maintained for each logged in user. The uCS operating System supports independent sessions for each logged in user.

## Installation Guidelines (Read before Installing)

Opening the uSwitchCS enclosure or tampering voids the warranty.

1. The uSwitch is **NOT** waterproof (do not install outdoors or in harsh environments without proper environmental enclosure).
2. If connecting a relay output to a power source, disconnect the power source prior to wiring to the terminal connector.
3. Installation by qualified personnel recommended
4. WiFi Devices are not designed to run in high radio emission environments or environments with strong magnetic fields/Power Solenoids/Transformers or in close proximity to other transmitters or antennas (for more details see FCC transmitter guidelines)
5. In certain environments data can be less reliable than wired Ethernet due to outside interference
6. Some units include an SMA Connector for an external antenna, in this case do not operate the unit without the antenna or with any antenna having a gain greater than or having a gain greater than the provided antenna
7. Must not be used for medical, lifesaving, or any purpose where a failure could cause injury, loss of life, property, or financial losses
8. Must be correctly wired. Incorrect wiring could result in damage to the uSwitch or connected devices
9. Relays on the uSwitch are not intended to support high power/high current devices
10. The uSwitch has removable terminal connectors. To make the best connection, remove the connectors and install wires directly on the connector before reattaching connectors to their female/male counterparts on the uSwitch

Antenna Connection - Do not locate the uCS within immediate proximity of microwave ovens or other radio/high emission devices such as access points, solenoids or radios that might cause interference or be interfered with. The CS should be installed in locations that will normally not be within one foot of human activity.

## uSwitchCS Quick Start Guide

1. uSwitchCS can be powered by a DC regulated power supply in the 9-30Vdc range. Connect the appropriate DC power supply to the + and - terminals in Figure 1 (regulated power supply recommended). The power supply should be rated to meet the operating current of the uSwitchCS (see appendix C for power specifications) along with any expansion modules that receive power from the uSwitch. As shown in the photo, the + terminal is closest to the outside edge; the - terminal is closest to the "Relay" connectors.

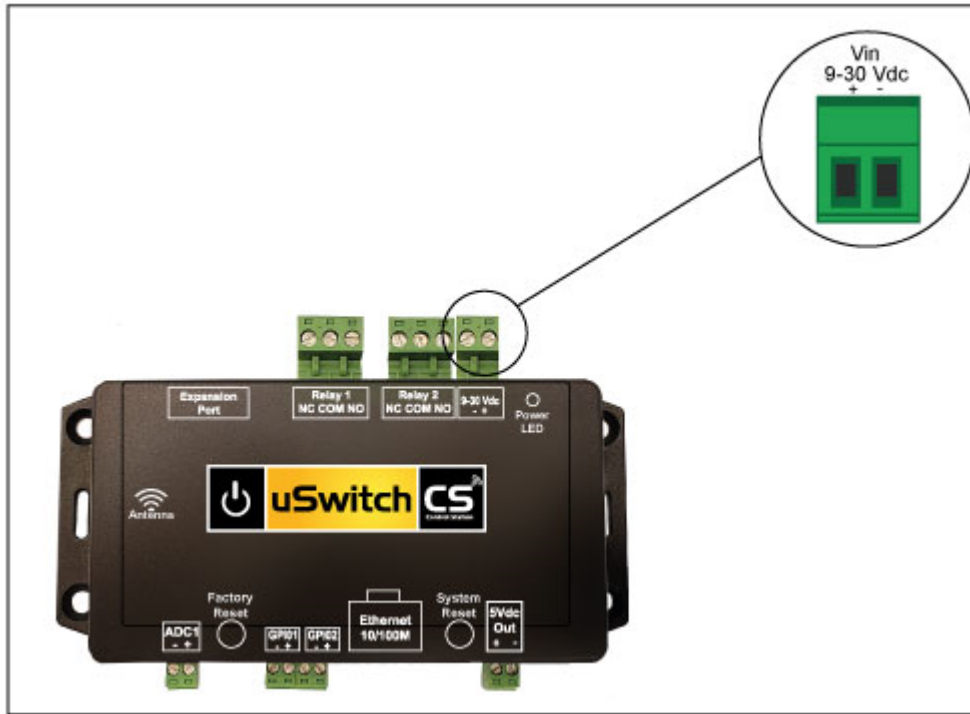




Figure 1

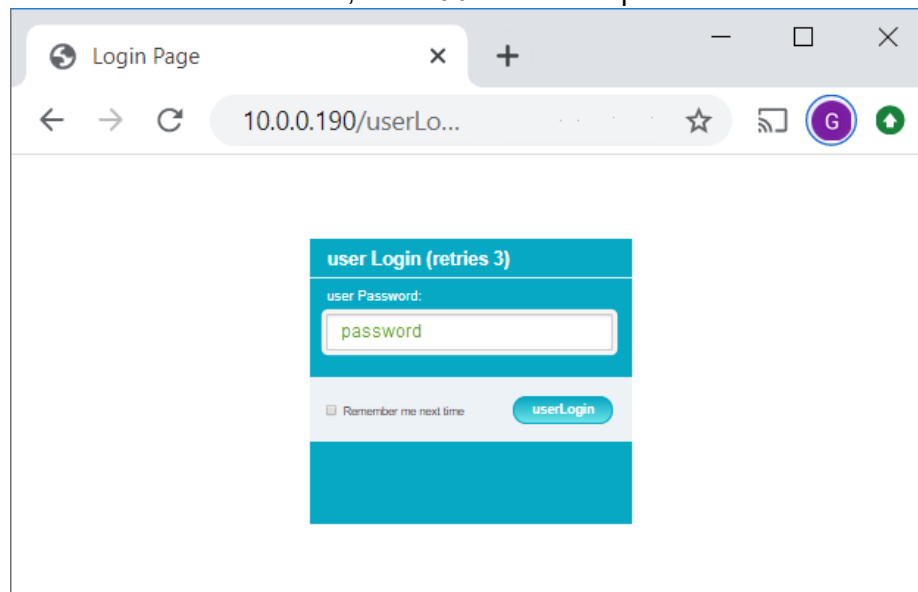
2. If the model being installed is a uSwitchCS XT(external antenna), the provided antenna should be screwed into the SMA receptacle  on the left hand side of the uSwitchCS by the antenna  icon. If no SMA antenna receptacle is present, the uSwitchCS has an internal antenna. When using an external antenna, the antenna should have a vertical orientation.

## Wireless Network Connection to the Access Point

1. The uSwitchCS supports multiple wireless modes. It can run as an Access Point (AP), a Station<sup>1</sup> or both combined (APStation). Running in **Station** or **APStation** mode enables the uSwitch connection to an external AP/Network Router making it a gateway to other networks which are connected to an external router or gateway. APStation mode allows the internal AP to simultaneously support other wireless devices such as other uSwitch Stations, wireless sensors/phones, etc. In this mode uCS acts as a universal bi-directional repeater for devices connected to the uSwitch internal AP through the external AP/gateway.
2. From the factory, uSwitch is configured in APStation mode with SSID for the Access Point set to “**uStationAP-XXXX**” (XXXX are the last 4 digits of the AP adapters MAC). Security is set to “Open” for initial connection (after initial connection, if the uSwitch is to continue to support an Access Point, it is recommended to enable WiFi Security for the uSwitch AP in its network settings). The uSwitch Access Point provides a DHCP server for easy first time connections, however we recommend devices be assigned static IP addresses for most reliable/consistent connectivity.

It is important when attempting to connect to the uSwitch for the first time from an external device that the uSwitchCS starts in Access Point/Station mode (factory default). Holding the factory reset button for four (4) seconds will always restore a uSwitchCS to Access Point mode and restore the factory network and wireless settings (ensuring return to default startup connection settings so user can re-establish communication).

3. To connect to the uSwitch for the first time from your wireless device, scan for available wireless devices, set your WiFi SSID to the uSwitch's SSID, **uStationAP-xxxx** (xxxx is last 4 digits of the uSwitch MAC address). Select **Open** for the WiFi security option<sup>7</sup>.
4. Make sure your device has DHCP enabled so the uSwitch can automatically assign an IP address to your device once it is detected.
5. After connecting to the uSwitch network, enter the URL: <http://192.168.4.1> in the address bar of your device's browser. If user Logins are required, The 'user Login' screen below will appear, if not you will be logged in automatically. (For secure connections you will need to change to **HTTPS** mode from the **Port and System Settings** menu).
6. If the password screen below is enabled, enter **admin** as the password.



7. Similarly to step 5, instead of entering the IPV4 address in the browser you can enter the uSwitch's mDNS host name. To do this use <http://uSwitchCS-XXXXXX> (xxxxxx may be found as the host name on the network settings page).

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<sup>1</sup> Station Mode also known as Infrastructure Mode

Control Center	uHaveControl™ Control Center		
Relay Settings	---- Device Status ----	--- Control ---	-- Options --
Digital Input Settings	Relay_1 (Off) Relay State: Off Manual: Idle	Off	Pulse 15 Seconds
Virtual Relay Settings	Relay_2 (Off) Relay State: Off Manual: Idle	Off	Pulse 15 Seconds
ADC Settings	GPIO1 (Counter) Count: Max=250.00, Rollover Count (none)	0 Count	Reset GPIO1 Counter
Watchdog Settings	GPIO2 (Rate) Limits: Min=50.00, Max=250.00	14.00 Count	Reset GPIO2 Counter
Network Settings	FactoryReset (Switch) Clear 12 Mins, 24 secs	Clear	
Date Events	ADC0	3.12 mV	
Event Schedule	Temperature	72.12 °F	
Security Settings	Pressure	29.59 InHg	
SMTP/Email Settings	Humidity	29.00% RH	
Time/Date Settings	APStation Connected /	03/03/20 10:15:08 AM	
Log Settings			
System Information			
Firmware/File Downloads			
Option Boards			
System/Menu Settings			
User Manual			

[uSwitchCS by uHaveControl™](#)

**uSwitch upon Network Connection from AP  
Connecting as a Station or to Ethernet**



1. You now have established a connection to the uSwitch's wireless network. The next step is to provision the uSwitch itself onto your local, private network. Provisioning enables you to login to the uSwitch, indirectly, from your network or the Internet, and allows the uSwitch to send encrypted email or SMS notifications, that can be accessed from the internet, connect to Network Time Servers (NTP), mail (SMTP) servers and implement watchdogs that that can detect and restart your network or other devices on lockup detection.
2. To provide outside network access on WiFi, put the uSwitchCS onto your network ibly either **APStation** mode (default) or just **Station** mode or if a hard-wired Ethernet connection is used change the networking mode to **Ethernet** (note: Currently Ethernet Mode and WiFi Modes are mutually exclusive).

Note: In **Station** mode other client wireless devices will not connect to the uSwitch directly (although the uSwitch can still talk to them from your wired or wireless network if it is set up as the gateway). In Station mode, the same steps below are followed but **Station** mode is chosen as the "Networking Mode" instead of **APStation** mode.

3. To change network Adapter types, select the "Network Settings" menu.
4. You should now see the 'Network Settings' page below (if you are going to connect the uCS via WiFi continue to step 5, or for hard-wired Ethernet jump to step 21).

Control Center		uHaveControl™ APStation Config <span>Help</span>	
Relay Settings	Networking Mode	APStation <span>▼</span>	
Digital I/O Settings	WiFi Access Point (AP) Settings		
Analog I/O Settings	SSID [31]	uStationAP_AE61	
Virtual Relay Settings	Security Options	Open <span>▼</span>	
Relay Watchdogs	Passphrase [31]	uSwitchCS	
Event Calendar	IP-MAC[C0:49:EF:92:AE:61].[15]	192.168.4.1	
Network Settings	AP Primary DNS [15]	192.168.4.1	
Port Forwarding	Broadcast SSID	Enable <input checked="" type="checkbox"/>	
User Account Settings	NAT/Repeater (Sets DHCP Server)	Enable <input checked="" type="checkbox"/>	
User Access Privileges	DHCP Server	Enable <input checked="" type="checkbox"/>	
Port & System Settings	WiFi Station (Client) Settings		
Notification Settings	Available SSIDs	NETGEAR60 <span>▼</span>	
Event Log	SSID (chan:11, Pwr -67 dB).[31]	NETGEAR60	
Time/Date Settings	Passphrase [31]	myPrivatePassphrase	
User Interface Settings	DHCP Client	Enable <input type="checkbox"/>	
Modbus TCP/IP Settings	IP(Static)-MAC: [C0:49:EF:92:AE:60]	192.168.0.190	
Backup & Restore	Radio Channel - Auto if Unknown (Current:11)	Auto <span>▼</span>	
Software Update	Region	United States <span>▼</span>	
About	Radio Tx Power	16 dBm <span>▼</span>	
Graphs	Bandwidth (currently HT20)	HT20 <input checked="" type="checkbox"/>	
User Manual	Network Settings (TCP/UDP)		
	Gateway [15]	192.168.0.1	
	Subnet Mask [15]	255.255.255.0	
	Host Name [31]	uSwitch_EF92AE61	
	Primary DNS (Static).[15]	192.168.0.1	
	Secondary DNS (Static).[15]	8.8.8.8	
	Tertiary DNS (Static).[15]	8.8.4.4	
	MTU (Max 1500 Bytes)	1500	
	<span>Save Changes</span>		<span>Reset Entries</span>
	uSwitch by uHaveControl™		

## Wireless Network Connection to a Station

- From the network Settings page, change the “**Networking Mode**” setting to **APStation** or **Station** mode. Changing the “**Networking Mode**” forces an immediate page update (wait for the page to fully update before making new changes). After an update to **Station** mode the page will include Station settings (as below).

Control Center	uHaveControl™ Station Config <span style="float: right; border: 1px solid black; padding: 2px;">Help</span>	
Relay Settings	<u>Networking Mode</u>	Station <span style="font-size: small;">▼</span>
Digital I/O Settings	WiFi Station (Client) Settings	
Analog I/O Settings	<u>Available SSIDs</u>	NETGEAR60 <span style="font-size: small;">▼</span>
Virtual Relay Settings	<u>SSID (chan:11, Pwr -63 dB), [31]</u>	NETGEAR60
Relay Watchdogs	<u>Passphrase [31]</u>	myPrivatePassphrase
Event Calendar	<u>DHCP Client</u>	Enable <input type="checkbox"/>
Network Settings	<u>IP (Static)-MAC: [C0:49:EF:92:AE:60]</u>	192.168.0.190
Port Forwarding	<u>Radio Channel - Auto if Unknown (Current:11)</u>	Auto <span style="font-size: small;">▼</span>
User Account Settings	<u>Region</u>	United States <span style="font-size: small;">▼</span>
User Access Privileges	<u>Radio Tx Power</u>	16 dBm <span style="font-size: small;">▼</span>
Port & System Settings	<u>Bandwidth (currently HT20)</u>	HT20 <input checked="" type="checkbox"/>
Notification Settings	Network Settings (TCP/UDP)	
Event Log	<u>Gateway [15]</u>	192.168.0.1
Time/Date Settings	<u>Subnet Mask [15]</u>	255.255.255.0
User Interface Settings	<u>Host Name [31]</u>	uSwitch_EF92AE61
Modbus TCP/IP Settings	<u>Primary DNS (Static) [15]</u>	192.168.0.1
Backup & Restore	<u>Secondary DNS (Static) [15]</u>	8.8.8.8
Software Update	<u>Tertiary DNS (Static) [15]</u>	8.8.4.4
About	<u>MTU (Max 1500 Bytes)</u>	1500
Graphs		
User Manual		
<span style="border: 1px solid black; padding: 5px 15px; color: white; font-weight: bold;">Save Changes</span>		<span style="border: 1px solid black; padding: 5px 15px; color: white; font-weight: bold;">Reset Entries</span>
uSwitch by uHaveControl™		

- After the page updates in the **WiFi Station (Client) Settings** section, select the SSID from the “Available SSIDs” list box. If the network you are looking for is not discovered or is hidden, you can manually enter it in the **SSID** text box directly below the SSID list box.
- the ‘**Passphrase**’ field enter the passphrase for the selected WiFi network (if this is unknown, get it from a network administrator).



8. In the **IP** field enter an unused IP address on the WiFi network (this address **must be outside the DHCP lease range of any DHCP Server** on your network). Permanent use of DHCP as a connection mechanism is never recommended for a uSwitch. DHCP servers may randomly reassign IP addresses which will affect established NAT/port forwarding settings and your ability to connect to a previously assigned DHCP address..
9. If the Radio Channel to the AP is unknown, select the **Auto** option, otherwise specify the channel used by the AP.
10. In the **“Region”** list box, select a region that matches the area of your deployment. Ignoring or not correctly entering the region may result in unpredictable WiFi behavior or WiFi operation outside of allowed range.
11. The WiFi Tx Power should be set to the minimum power that works well in your environment. We recommend a max setting of 15 dBm. Setting to maximum values can result in unnecessary power usage, noise and can cause unnecessary interference with other wireless networks.

## Network Settings

12. In **Network Settings** update the **“Gateway”** to point to your gateway (usually the IP address of your AccessPoint/modem/router). When the gateway field is not programmed correctly you can still directly access the uSwitch but there will be issues when your uSwitch tries to access external devices such as NTP servers, Mail servers, Remote File Servers or any URLs specified by the Watchdogs or if Websockets are used.
14. Enter the **Subnet Mask** for your LAN (matching the LAN SubNet on your router)
15. Now program the **DNS** server fields. The DNS fields available to program here depend on the selected 'Network Mode'. You only program these addresses if you intend to use URL(s) for the watchdog, use NTP Servers, send Emails or allow remote (out of network) access by the uSwitch or if using Websockets for Virtual Relays..
16. **MTU** (Maximum Transmission Unit) for network communication. It is recommended that **MTU** is only modified if you have communication issues (Never set MTU higher than 1500).
17. Click **‘Save Changes’**. Saving changes may take a few minutes to propagate through your network, during that time frame you may lose the connection from your browser and will have to reconnect.
18. If the browser doesn't reconnect after 30 seconds, re-enter the URL/Network address (such as <http://xxx.xxx.xxx.xxx>) in the browser address bar and try again. The address entered must match the IP addresses assigned to the uSwitch.

A secondary benefit of choosing **APStation** mode is when network connectivity is lost through the gateway, for any reason, a link will still exist to the uSwitch via its internal AP. In **Station** mode the uSwitch will only be accessible if the gateway/router is online and your device has an established connection through the router on your private network.

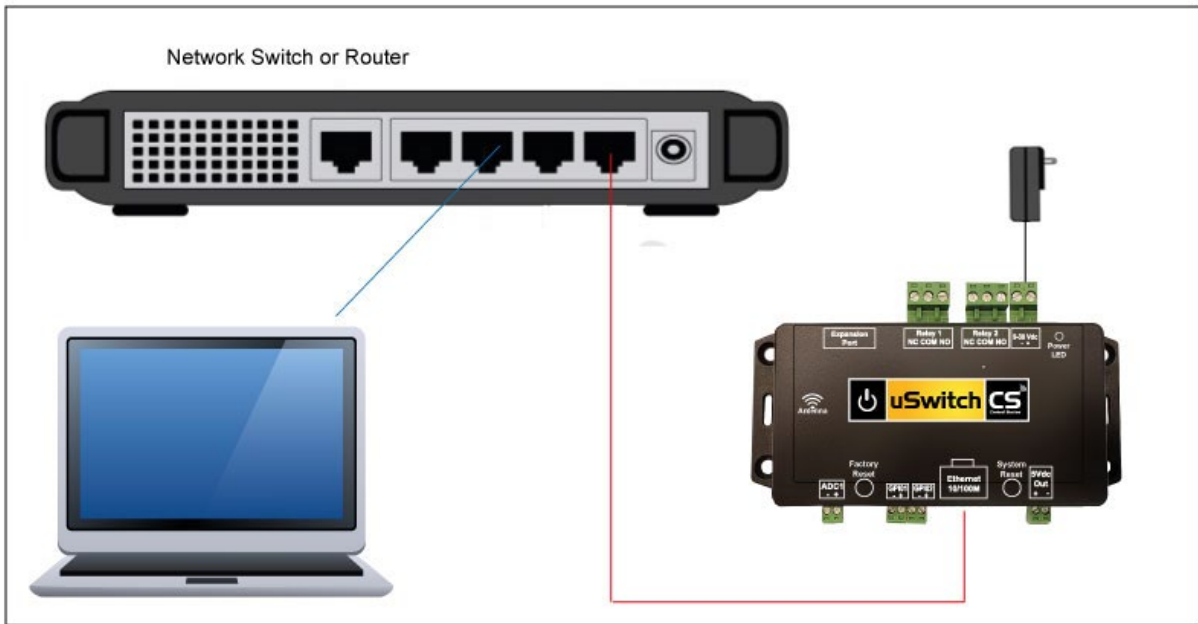
19. Connect your browser back onto your network and access the uSwitch via the IP assigned in step 9 if a wireless connection, or step 21 if a hard-wired Ethernet connection. Once you connect to the uSwitch through your router and you have correctly provisioned it onto your network you can access it both locally, from smart devices on the LAN, and remotely if your network supports outside access (see NAT/Port Forwarding).
20. If your network interface has firewalls or restricts ports, you will have to establish exceptions for ports and addresses used by the uSwitch.
21. If network settings are mis-programmed and you cannot re-establish a connection, hold the factory reset pin in for four (4) seconds. After four seconds the original uSwitch AP settings will be restored and you can re-start setting up the uSwitch per step 5 of **Wireless Network Connection to the Access Point** above.

## Hard Wired Ethernet Connection

22. From the network Settings page, change the “**Networking Mode**” setting to ‘**Ethernet**’. Changing the “**Networking Mode**” forces an immediate page update. After the page update has completed the **Ethernet** page below is displayed.

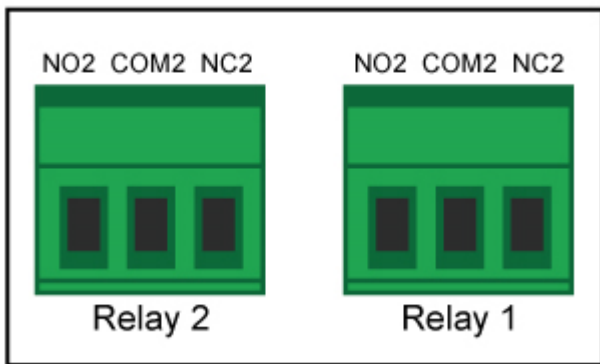
Control Center	uHaveControl™ Ethernet Config <span>Help</span>	
Relay Settings	Networking Mode	Ethernet ▼
Digital I/O Settings	Ethernet Adapter Settings	
Analog I/O Settings		
Virtual Relay Settings	DHCP (Auto Acquire IP)	Enable DHCP <input type="checkbox"/>
Relay Watchdogs	IP(Static)-MAC: [C0:49:EF:92:AE:63]	192.168.0.191
Event Calendar	Full/Half Duplex	Enable <input type="checkbox"/>
Network Settings	100Base-T/10Base-T	Enable <input type="checkbox"/>
Port Forwarding	Network Settings (TCP/UDP)	
User Account Settings		
User Access Privileges	Gateway [15]	192.168.0.1
Port & System Settings	Subnet Mask [15]	255.255.255.0
Notification Settings	Host Name [31]	uSwitch_EF92AE61
Event Log	Primary DNS (Static) [15]	192.168.0.1
Time/Date Settings	Secondary DNS (Static) [15]	8.8.8.8
User Interface Settings	Tertiary DNS (Static) [15]	8.8.4.4
Modbus TCP/IP Settings	MTU (Max 1500 Bytes)	1500
Backup & Restore		
Software Update		
About		
Graphs	<span>Save Changes</span>	<span>Reset Entries</span>
User Manual	uSwitch by uHaveControl™	

23. It is recommended that you uncheck the DHCP option and enter an unused IP address on your network in the IP address text box (this address must be outside the lease range used by your network’s DHCP server). Permanent use of DHCP connections is never recommended. DHCP servers can randomly reassign IP addresses which will affect any established port forwarding settings and connections to old DHCP addresses.
24. If your network supports Full-Duplex mode, check the **Full-Duplex** box, for a 100BASE-T network similarly check its box.
25. If your network interface has firewalls or restricts ports, you will have to establish exceptions for ports and addresses used by the uSwitch.
26. Finally, connect a CAT5 Ethernet cable between the uSwitch Ethernet port and an Ethernet port on the network switch/router. Connect your browsing appliance to the network the uSwitch is on. (See diagram below). Alternatively, you can connect the uSwitchCS directly to the Ethernet port of your computer (using a crossover/null-modem cable).
27. If network settings are mis-programmed and you cannot re-establish a connection, hold the factory reset pin in for four (4) seconds. After four seconds the original uSwitch AP settings will be restored and you can re-start setting up the uSwitch per step 5 of **Wireless Network Connection to the Access Point** above.
28. Now proceed with the **Network Settings** in step 13 above.  
(whether wired or wireless all Configurations Menus apply to both networking options)

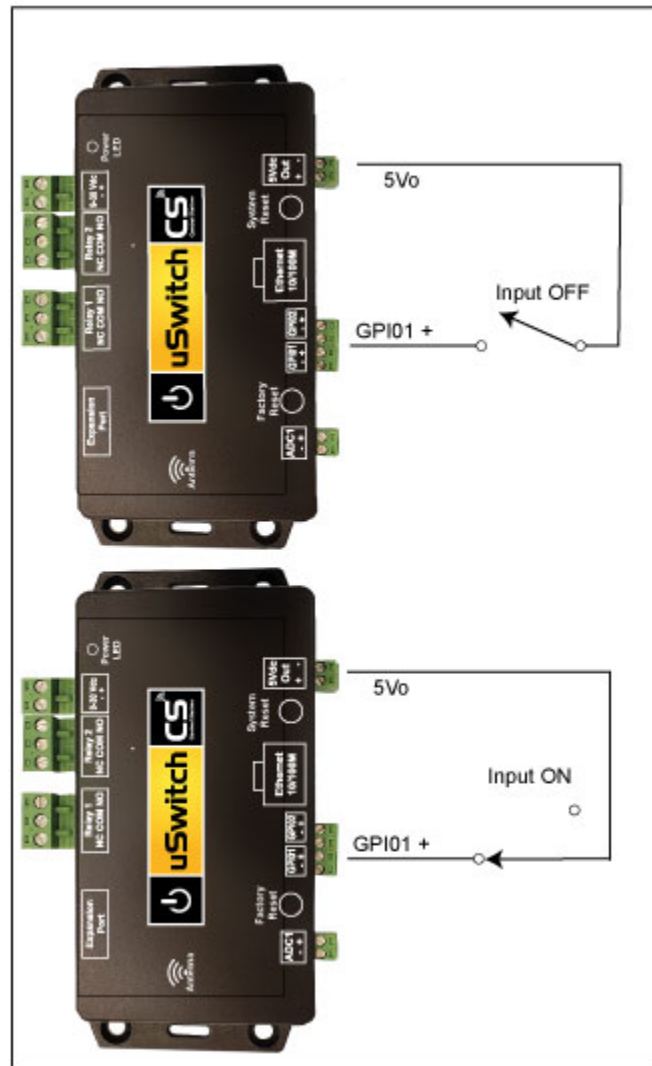
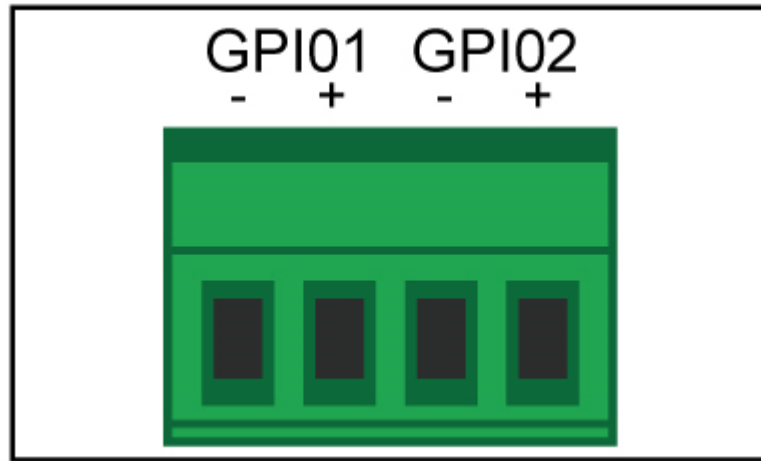


## Relay Connection

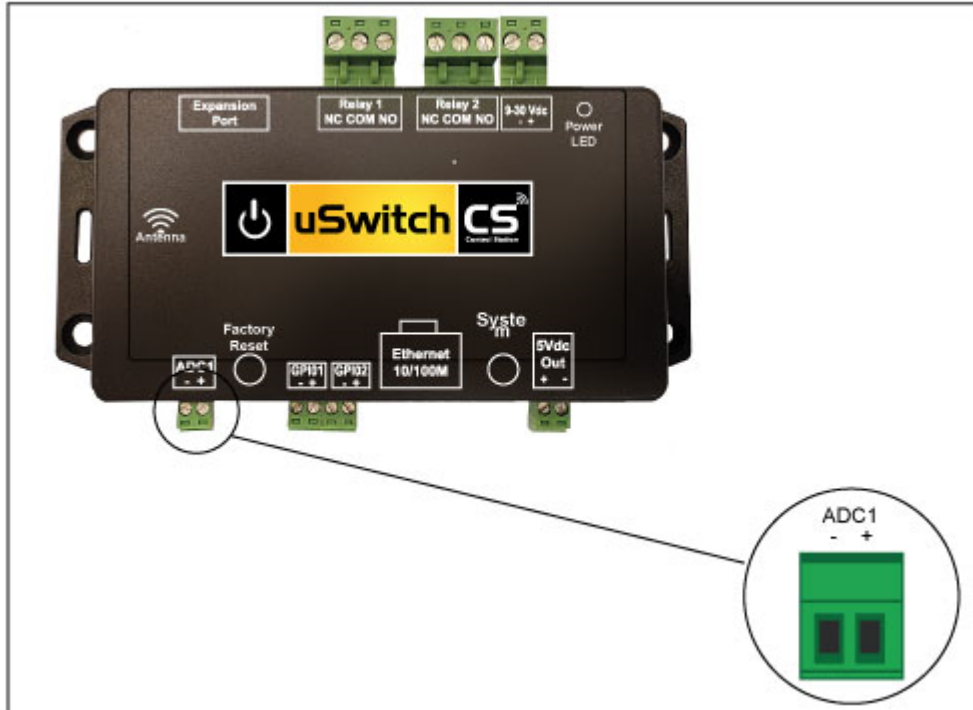
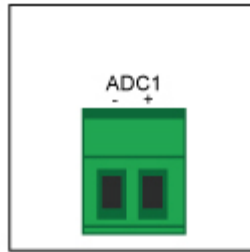
When connecting to the relay contacts make sure any current or future load does not exceed the maximum load rating for the relays (per spec. in Appendix B).



# GPIO Connections

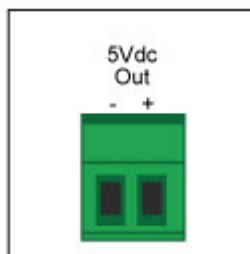


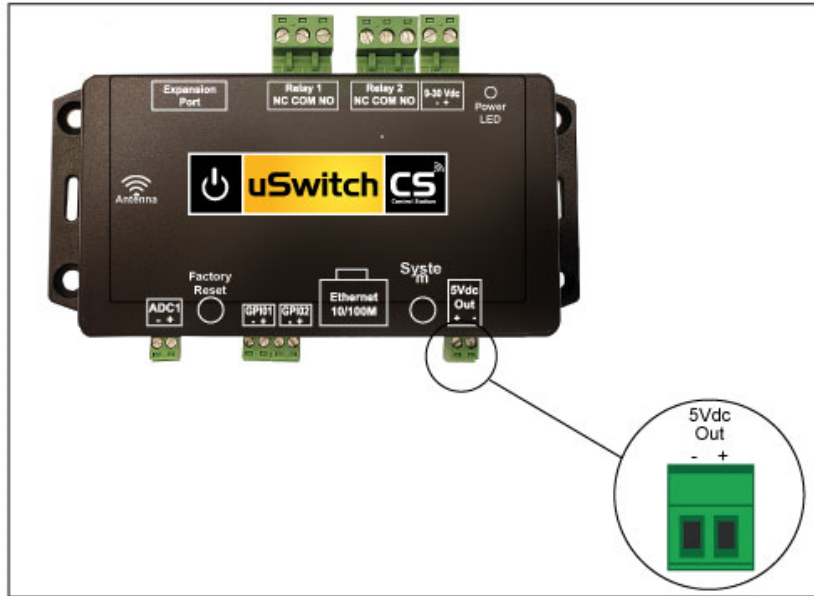
## Analog to Digital input Connection



## Expansion Port Connections

### 5Vdc Power Output





## Control Center (Home Page of User Interface)





The **uHaveControl Control Center** is the uSwitch Interface for network browsers. It is accessed via standard Internet browsers from the local network by specifying the local IP in the URL or from a remote network by specifying the uSwitch's static or dynamic address and forwarded port or a DDNs mapped URL. The Control Center provides clickable buttons to control relays and displays the current state of them. Digital and analog inputs and other operational or event information is also displayed on the control Page. This page is configurable from the uSwitch Menu. Navigating from the **Control Center** page to any other page is done by clicking on a menu field on the left side of the page. Menu items can be removed or added from this menu to meet usage needs. When user accounts are enabled menus are available based on user access level which is also user configurable. The **Control Center** and other menus are accessible without a password when the checkbox, **Login Requires Password**, is unchecked in the **Account Settings** page. This is the default setting for the uSwitch. If passwords are required, three basic accounts are initialized. The **admin** account has full control and administration privileges, the **staff** account has full control and viewing privileges, usage, and the **User** account has viewing only privileges. The default password for Admin is **admin**, the default password for Staff is **control**, and the default User password is **guest**. An admin can set up 23 different user accounts with different access privileges.

	uHaveControl™ Control Center <span style="float: right; border: 1px solid green; padding: 2px;">Info</span>		
	Control	Main Control	Sub Control
Relay Settings	Relay(1)-i(Watchdog) <small>Reboots[1], Faults[1] Fault: 25:16.</small>	Off	Force Reboot <small>5 Seconds</small>
Digital I/O Settings			
Analog I/O Settings			
Virtual Relay Settings	Relay(2)-i(On) <small>Manual: Idle On</small>	On	Pulse <small>15 Seconds</small>
Relay Watchdogs			
Event Calendar			
Event Times	GPIO(1)-i (Off/On) <small>On 3 days, 18 hours, 12 mins, 51 secs</small>	On	
Network Settings			
Port Forwarding	GPIO(2)-i (Off/On) <small>Off</small>	Off	
Security & Port Settings			
Notification Settings	vIn(1)-i <small>Below Min. 3.75</small>	1.28 Vdc	
Log Settings			
Time/Date Settings	Temp1-e <small>Range 67.75..76.25</small>	70.29 F	
Application Settings	Humidity1-e <small>Above Max. 22.60</small>	32.65 RH	
Software Update	Pressure1-e <small>Range 27.00..31.00</small>	30.26 inHg	
About	Lux1-e <small>Range 100.00..250.00</small>	235.93 Lux	
User Manual			
	System Status	Time Unavailable (NTP)	WiFi: AP Station (NAT) (RSSI:-47 dBm Strong)
			Logged in 8 secs
	uSwitchCS by uHaveControl™		

**Control Page-uSwitchCS**

The **Control Center** is divided into three columns. **Operation**, the first column shows assigned device names or registers and modes of operation and status. The second column, **Main Control** displays the device's control if it is a relay, or current calibrated reading of any sensor, or Digital/Analog input or register. The **Sub Control**, third column shows extra options that may be available to a device if enabled. For the above Control Screen, the first row is a watchdog relay and the second row is a user controlled relay, with a user enabled optional pulse button. Clicking on a user controlled relay forces the relay to change states thus switching the signal on the Common(C) Relay Terminal between the Normally Open(NO) and Normally Closed(NC) relay terminals. At the same time, user specified state names and state colors will reflect the desired state of the relay as configured. User customization for relay text, colors and any other configuration is done from the **Relay Settings** menu below. The green button labeled **Info** on the top page of this page provides operating details or info to the operator.

## Relay Settings Menu

The Relay Settings Menu configures on board relays or any relays discovered on the expansion bus. All configuration pages have a field description column on the left, and data entry fields to the right (hovering over a fields description may reveal additional details). Detailed full page help is available by clicking the green **Help** button (top right after Page Title on all config pages). If all devices do not fit on a single configuration page, a fwd , and bkwd  button is displayed on the bottom **Prev/Next** field. Clicking  advances to the next page of devices and clicking  moves to the previous page.

Control Center	uHaveControl™ Relay Settings		Help	Logout
Relay Settings	Relay Name [15]	Relay1-i	Relay2-i	
Digital I/O Settings	Relay Address	0x0-0	0x0-1	
Analog I/O Settings	Operating Mode	Event	Resettable	
Virtual Relay Settings	Event	GPIO1-i		
Relay Watchdogs	Latching	<input type="checkbox"/>		
Event Calendar	Off State Text [15]	Off	Off	
Event Times	On State Text [15]	On	On	
Network Settings	Off State Color	Red	Red	
Port Forwarding	On State Color	Green	Green	
User Account Settings	Power Up State		Off	
User Access Privileges	Momentary Time (sec)		30	
Port & System Settings	Invert Output	<input type="checkbox"/>		
Notification Settings	Add to Control Center	Enable <input checked="" type="checkbox"/>	Enable <input checked="" type="checkbox"/>	
Event Log	Add Sub Control		Pulse Button <input type="checkbox"/>	
Time/Date Settings	Notification Event	None	None	
User Interface Settings	Data Logging	None	None	
Modbus TCP/IP Settings				
Backup & Restore				
Software Update				
About				
Graphs	Save Changes		Reset Entries	
User Manual	uSwitch by uHaveControl™			

### Relay Configuration Page for uSwitchCS



## Relay Name [15](text string)

User assigned name for the relay. Used in all references to the relay (default is RelayX-i, X is consecutive integers, i for Internal, or x if relay is on an external expansion module). The relay name is used whenever it is displayed or an email, or notification is sent that references it. Descriptive names should be assigned that describe it's function (the number in square brackets after 'Relay Name' represents the maximum number of characters that the field can contain).

## Relay Address (text string, Read-Only Field)

Physical address of the relay. Address zero is reserved for on board relays. Expansion bus relays are added to relay setting pages if they are detected. Expansion port relays use their bus address combined with an index number from the automated discovery process.

## Operating Mode (custom select box)

Operating Mode dropdown provides the following options: **Toggle**, **Resettable**, **Clearable**, **Momentary**, **Scheduled**, **Event**, **Watchdog**, **Periodic Pulse** and **Slave**. Modes fall into two Categories: user and automated modes. User modes are **Toggle**, **Resettable**, **Clearable**, and **Momentary** and require human or API interaction. An initial change to a relay in a user mode is forced by an operator clicking on a relay button from the Control Center or from a Remote API command. Automated modes are controlled by either an **I/O Event**, a **Scheduled** event, a **Watchdog** event, a **Periodic Pulse** (which can be a periodic reset pulse) or when commanded from another device in **Slave** mode (Automated mode ignores API Commands). The Default mode is user mode **Toggle**.

## Operating Modes

1. **Toggle** - Relay changes to opposite state when bclicked by operator or commanded from an API (Sub Control button supports timed pulse).
2. **Resettable** - A momentary, if clicked after activation and prior to timer expiration, timer resets to full momentary time, countdown restarts
3. **Momentary** - Relay changes to activated state when clicked by operator, returns to idle state when momentary timer expires. Clicking a **Momentary** button once activated, but prior to timer expiration has no effect (subcontrol supports Pulse button)
4. **Clearable** - A momentary, if clicked after activation and prior to timer expiration, relay returns to its idle state, timer is cleared

## Automated Modes

5. **Scheduled** - Relay controlled by schedule, scheduled events are configured in **Event Calendar/Event Times** menus.
6. **Event** - in Event mode, the Event selection box provides a list of hardware triggering options. Trigger options include any on board I/Os and any expansion I/Os that were auto-discovered including relays, gpio's and adcs.
7. **Watchdog** - Relay is driven by a watchdog event (either address pings or an external heartbeat from an I/O device) configured in the Relay Watchdog menu. In this mode the watchdog will automatically detect non-responsive devices and reboots them by de-energizing then energizing their power circuit.

**Warning:** when a uSwitch relay is inline with power to a device that supports its own network connectivity, the selected relay cannot be in **Toggle**, or **Slave** modes. Breaking communication in either of these two cases disables communication indefinitely because turning power back on requires communication that no longer exists. For this reason a relay may only be in **Watchdog**, **Momentary**, **Event**, **Schedule** modes, if it powers up or down a network device that breaks its own network connection. These modes restore power to network devices regardless of network connectivity.

8. **Periodic Pulse** - This mode is programmed from the event Calander and will periodically cycle the relay and is used mostly for a periodic reset pulse.
9. **Slave** - Relay receives TCP commands from a "Master" unit and changes state as commanded.

### **Event** (List box)

a list of all hardware devices/sensors that can trigger this relay. Only functional when the relay's operating mode is set to **Event**.

## Latching - (Event Mode Only)

If latching mode is checked and the relay changes state from its idle (non-triggered) state on a hardware event, the relay locks into the trigger state. When the hardware trigger resets the relay can only be reset back to its idle-state by outside intervention (clicking the relay or a remote command.)

### I/O Trigger Specific Modes when Latching Option Selected

If the I/O's Event Trigger is set to **ANY** state the relay follows the trigger (Latching option ignored)

#### Latching Off

I/O event trigger **Low**

Each time the I/O goes **Low** (from the High state) the relay changes to the opposite state (GPIO goes High has no effect).

I/O trigger **High**

Each time the I/O goes **High** (from the Low state) the relay changes to the opposite state (GPIO goes Low has no effect).

#### Latching On

I/O event trigger **Low**

When the selected I/O is in the **High** state the relay is forced Low and latches. When the Trigger is not in the Low state, the relay acts as if there was no latching and is controlled by the user.

I/O event trigger **High**

When the selected I/O is in the **High** state the relay is forced High and latches. When the Trigger is not in the High state, the relay acts as if there was no latching and is controlled by the user.

### ADC Trigger Modes and Latching Option

If the ADC Event Trigger is set to ANY state the Relay will follow the ADC (Latching ignored)

#### Latching Off

ADC event trigger **Low**

Each time the ADC goes into **Low** range the relay changes to the opposite state (ADC goes into **High** range no effect)

ADC event trigger **High**

Each time the ADC goes into **High** range the relay changes to the opposite state (ADC goes into **Low** range no effect).

#### Latching On

ADC event trigger **Low**

Each time the ADC is in **Low** range the relay is forced **Low** and latches. When the ADC is in **High** Range (exits latching range), the relay is controlled by user

ADC event trigger **High**

Each time the ADC is in **High** range the relay is forced **High** and latches. When the ADC is in **Low** Range (exits latching range), the relay is controlled by user

### Off StateText (text string)

String displayed on screen or in notifications to specify Off State (default is "Off")

### On State Text (text string)

String displayed on screen or in notifications to specify On State (default is "On")

### Off State Color (color select-box)

Color of Relay displayed on screen to specify Off State (default is "Yellow")

### On State Color (color select-box)

Color of Relay displayed on screen to specify On State (default is "Green")

### **Power Up State** (custom select box)

Set initial state of relay when uSwitch first powered on. For input driven events or watchdog mode this value is not forced as it could force the device into inappropriate states (in these cases the input or watchdog takes over immediately on startup). Options are **Off**, **On**, **Last**. Depending upon the relay's operating mode Power-Up options may be limited, disabled, or predefined state (if in scheduled mode the relay will track the scheduled assignment).

1. **Off** - Relay de-energized on uSwitch power up (NO Terminal connected to Common (c) Terminal).
2. **On** - Relay energized on uSwitch power up (NC Terminal connected to Common (c) Terminal).
3. **Last** - Relay returns to its last operational state prior to shutdown (default state).

### **Momentary Time** (integer)

The number of seconds loaded into the countdown timer for all momentary options (default 30 seconds).

### **Invert Output** (checkbox)

When checked, relay polarity is opposite state of **Event or Slave Modes** (default unchecked)

### **Add Sub Control** (checkbox)

Places override control button for the relay on the Control Page subject to current operating mode.

**User Modes:** places a **Pulse** button in the Sub-Control column. Clicking the Pulse button pulses the relay for the time specified in the pulse time field (acts as momentary but time can be changed in Control Center menu)

**Watchdog Mode:** places a **Force Reboot** button in the Sub-Control column. Clicking the **Force Reboot button** forces a full reboot. Upon completion of the reboot cycle the relay watchdog resumes normal operation.

### **Add to Control Center** (checkbox)

Display this relay on the Control screen. Relays that are not displayed continue to function as configured or as driven by remote API commands.

### **Notification Event** (selection box)

When Notifications are enabled the relay generates emails and SMS texts as specified by notification event.

### **Data Logging** (selection box)

If enabled relevant relay events are written to the event log.

### **Next Relay or Prev Relay** (button)

Advances the Relay Configuration Page to the next or previous page of Relay(s) to configure when all Relays do not fit on a single screen. The number of relays displayed per page is set on the User Interface Menu.

### **Save Changes** (page submit button)

Every Setting menu has a **Save Changes** button (bottom left). After completing changes, click **Save Changes** to accept them and store them in permanent memory. Saving changes can take several seconds to update the page, but the page should return with all changes saved and active. Network/Browser driven communication can result in communication errors and lost data. Users should always verify any changes after the page is saved. In the event of a lost change, Re-enter the change and select **Save Changes** again.

### **Reset Entries** (button)

Most configuration menus include a **Reset Entries** button on the bottom right. Clicking the **Reset Entries** restores factory default settings for all fields on the page. This feature enables restoration to a known starting point.

## Digital I/O Settings

This page enables a user to customize all digital inputs that are on the uSwitchCS or its expansion bus. User can configure whether and how each input is displayed, how it is calibrated and processed and event triggering properties.

Control Center	uHaveControl™ Digital I/O Settings		Help	Logout
Relay Settings	Input Name [15]	GPIO1-i	GPIO2-i	
Digital I/O Settings	Operating Mode	Toggle	Rate	
Analog I/O Settings	Off State Text [15]	On	On	
Virtual Relay Settings	On State Text [15]	Off	Off	
Relay Watchdogs	Off State Color	Green	Green	
Event Calendar	On State Color	Red	Red	
Event Times	Measurement Units [15]		Count	
Network Settings	Termination Load	Pull-Up	Pull-Up	
Port Forwarding	Debounce Time (ms)	20	20	
User Account Settings	Min. Event Time (sec)	0	0	
User Access Privileges	Target		300.00	
Port & System Settings	Tolerance		6.00	
Notification Settings	Triggering Event	Any	Any	
Event Log	Target Zone Color		Yellow	
Time/Date Settings	Decimal Places		2	
User Interface Settings	Scale		1.000	
Modbus TCP/IP Settings	Offset		0.000	
Backup & Restore	Rollover/Cutoff		40.00	
Software Update	Add to Control Center	Enable <input type="checkbox"/>	Enable <input type="checkbox"/>	
About	Notifications	Enable <input type="checkbox"/>	Enable <input type="checkbox"/>	
Graphs	Data Logging	None	None	
User Manual	Next GPIO			
Save Changes		Reset Entries		
uSwitch by uHaveControl™				

### Input Name [15] (text string)

User assigned name for the input. Used in all references to the input (default is GPIOx-i, where x is the index, and 'i' signifies internal, if on an expansion device it will be 'x'). The input name is used whenever an email, or notification is sent that identifies it, and will be displayed on the Control page. The user should assign meaningful names that describe its usage.

### Operating Mode (custom select box)

Operating Mode selects how GPIO is processed and displayed. When the mode is set to **Toggle** it operates as a digital input. In **Counter** mode it maintains a running count incremented each time the **triggering event** occurs. If set to **Rate** mode output reflects a frequency rate based on an **Event-Time**, **Scale** and **Offset** fields (acting like a paddle counter). **Rate** mode may be used for digital encoders such as flow sensors and traffic meters.

**Off StateText** (text string)

Text assigned to the GPIO in its low state.

**On State Text** (text string)

Text assigned to the GPIO in its high state.

**Off State Color** (color select box)

Background color when displaying a Low value if **On/Off** mode, or a below limit value if in **Counter/Rate** mode for readings below its target rate.

**On State Color** (color select box)

Background color when displaying a High value in **On/Off** mode, an above limit value if in **Counter/Rate** mode, for readings above target rate.

**Measurement Units** (text string, Rate mode only)

Enter the units of measurement for calibrated readings. The default is count. Units should be known such as vDC, PPH, GPH.

**Termination Load** (custom select box)

Selects whether the GPIO's internal resistor is **Pulled Up** to V+, **Pulled Down** to V- or left **Floating**. For a dry contact a **Pull-Up** is recommended. For an input that applies or removes power, **Pull-Down** recommended (default is **Pull-Up**).

**Debounce Time (ms)** (integer)

This millisecond value determines the minimum time for a change of state to be recognized on GPIO. This value is a function of the sensor and may vary as needed. Debounce time is applied to input before its status changes in all Operating Modes (default is 20 ms).

**Min. Event Time (sec)** (integer)

**Rate Mode** (select box)

The time period required to calculate a frequency. This rate time period is divided into smaller sub-frames. Once a full **Event Times** worth of sub-frames has been acquired a meaningful rate is calculated. Each sub-frame reading is put into a FIFO. When a new sub-frame starts, the oldest frame is discarded, implementing a real-time frequency encoder (default **Min.Event Time** is 1 Minute).

**Counter Mode** (integer) - When non-zero, input events trigger after the event has been in its trigger-state for a period greater than **Min. Event Time** (filters spurious events).

**Target** (integer)

In **Rate** mode **Target** and **Tolerance** values establish normal operating range and limits (after calibration using **Scale** and **Offset** values). When input rises above the **Target** plus the **Tolerance** an above limit event is generated, when it falls below **Target** minus the **Tolerance**, a minimum event trigger is generated. **Tolerance** should be large enough so that triggers used for controls have a healthy operating range (preventing oscillation). When a reading is within the **Tolerance** limit it is considered on **Target**. In **Counter Mode**, the **Target**, plus **Tolerance** will establish the Maximum trigger limit.

**Tolerance** (integer)

The operating margins around the **Target** value for triggers (establishes the Hysteresis).

**Triggering Event** (custom select box)

This selection box specifies the event trigger (**Low, High, Any**). **Rate** mode supports events when the input goes above/below the target zone, or on a zone transition. **Counter** mode supports the Max limit trigger only.

**Target Zone Color** (color select box, rate mode only)

Sets the color for **Rate** mode readings when in target range (also known as hysteresis zone).

**Decimal Places** (decimal number, **Rate** and **Counter** modes only)

The number of digits after the decimal point for calibrated readings.

**Scale** (m value, decimal number, rate and counter modes only)

The scale multiplier is used to convert **Rate** readings into calibrated **Measurement Units**. The uSwitch calibrates a **Rate** or **Count** by using the linear equation  $Y=mX+b$ . If  $m=1$  and  $b=0$  the raw count equals the calibrated reading (factory default for scale is  $m=1$ , offset is  $b=0$ ).

**Offset** (b value, decimal number, rate mode only)

The Offset is the starting point of the reading when the count is 0 (factory default is 0).

**Rollover/Cutoff** (integer, counter mode only)

**Counter mode:** resets the counter to zero each time **Rollover** is reached. When 0 no rollover (default =0)

**Rate Mode:** **Cutoff** filter to limit microbursts at cutoff rate during any Rate sub-frame.

**Add to Control Center** (checkbox)

When checked, the input will be displayed on the Control-Page. If unchecked it will not appear on the Control-Page, however input always functions as configured whether or not it is displayed.

**Notifications** (checkbox)

The Notification selection box will generate an email or text when the specified trigger event occurs.

**Data Logging** (selection box)

If enabled relevant input events are written to the event log.

**Next/Prev GPIO >>**

Advances to the next or previous available GPIO Page when not all GPIOs are displayed on the current page.

## Analog I/O Settings

This page configures all analog input channels that are on the uSwitchCS or on its expansion bus. The user can configure whether and how an analog input is displayed, how it is calibrated/processed and the properties that trigger events.

Control Center		uHaveControl™ Analog I/O Settings	Help	Logout
Relay Settings	Sensor Name [15]	<input type="text" value="ADCin1-i"/>		
Digital I/O Settings	ADC Address (uSwitch)	<input type="text" value="0x0-0"/>		
Analog I/O Settings	Power On A/D	Enable ADC <input checked="" type="checkbox"/>		
Virtual Relay Settings	Below Range Color	<input type="text" value="Yellow"/>		
Relay Watchdogs	Target Range Color	<input type="text" value="Green"/>		
Event Calendar	Above Range Color	<input type="text" value="Red"/>		
Event Times	Measurement Units [15]	<input type="text" value="Vdc"/>		
Network Settings	Hardware Sample Count	<input type="text" value="32"/>		
Port Forwarding	Max Voltage (0-Max Vdc)	<input type="text" value="30"/>		
User Account Settings	Target	<input type="text" value="5.50"/>		
User Access Privileges	Tolerance	<input type="text" value="1.25"/>		
Port & System Settings	Triggering Event	<input type="text" value="Any"/>		
Notification Settings	Decimal Places	<input type="text" value="2"/>		
Event Log	Scale	<input type="text" value="0.010"/>		
Time/Date Settings	Offset	<input type="text" value="0.000"/>		
User Interface Settings	Min. Event Time (secs)	<input type="text" value="0"/>		
Modbus TCP/IP Settings	Add to Control Center	Enable <input type="checkbox"/>		
Backup & Restore	Notifications	Enable <input type="checkbox"/>		
Software Update	Data Logging	<input type="text" value="None"/>		
About				
Graphs				
User Manual	<b>Save Changes</b>		<b>Reset Entries</b>	
uSwitch by uHaveControl™				

### Sensor Name [15](text string)

Users assigned name for the sensor. The **Sensor Name** is used whenever an email, or notification for the input is generated. The user should assign meaningful names that describe its usage.



### **ADC Address** (Device Name) (Read-Only field)

Physical address of the Analog input on uSwitch. Address zero is reserved for uSwitch internal ADCs. Sensor inputs are added if they are detected on the expansion bus. Sensors on the expansion bus use their bus address combined with an index via the automated discovery process.

### **Power On A/D** (checkbox)

This field is used to enable/disable the onboard Analog to Digital Converter (ADC). The internal ADC has a hardware processor that runs continuously on input channels which generates heat and dissipates power. When the ADC is not being used it should be disabled to minimize power consumption. ADC power usage is relevant in battery and solar applications (default is disabled).

### **Below Range Color** (color select box)

Background color used when the sensor value is below the Target zone.

### **Target Range Color** (color select box)

Background color when the sensor value is operating within its Target zone.

### **Above Range Color** (color select box)

Background color used when the sensor value is above the Target zone.

### **Measurement Units** (text string)

This text field sets the units of measurement corresponding to calibrated readings.

### **Hardware Sample Count** (custom select box, not all devices support this field)

Represents the ADC's internal hardware sampling rate. Increasing the sampling rate filters out noise and spikes. If an input is slow to change then a high sampling count makes sense. If data is more erratic and spikes are not to be filtered out use a lower value. Default value is 32 samples per reading. Range is selectable between 1-64 readings per sample.

### **Max Voltage** (custom select box)

Specifies the full voltage range for the uSwitchCS' analog input. For maximum resolution, select the lowest value that exceeds the maximum voltage output by the sensor. Supported input voltage ranges are 0-11.0, 0-15.0, 0-22.0, 0-30Vdc.

### **Target** (decimal number)

**Target** and **Tolerance** values establish operating range and limits (tolerance may also be considered hysteresis). When readings rise above **Target** plus the **Tolerance** a max trigger event is generated, if a reading falls below **Target** minus **Tolerance** a minimum event trigger occurs. **Tolerance** should be such that any triggers used for controls have a large enough margin to prevent oscillation (small **Tolerance** margins may result in oscillation and unstable results). When a reading is inside the **Tolerance** ranges it is considered on **Target**.

### **Tolerance** (decimal number)

Represents the operating margin around the **Target** for triggering events

### **Triggering Event** (rate mode only)

This selection box specifies the trigger (**Low, High, Any**) that generates an event. Events are generated when the sensor's value goes above/below its limits, or crosses a limit boundary.

### **Decimal Places** (rate mode only)

The number of Digits after the decimal point to display the calibrated readings. (default=2).

### **Scale** (m value, decimal number)

The scale multiplier is used to convert ADC readings into calibrated **Measurement Units**. The uSwitch calibrates a count by using the linear equation  $Y=mX+b$ . If  $m=1$  and  $b=0$  the raw count equals the measurements count. The factory default value for the scale (m) is 1 and the offset(b) is 0.

### **Offset** (b value, rate mode only)

The Offset is the starting point of the reading when its value is 0. The factory default is 0.

**Min. Event Time (secs)** (integer)

When non-zero, input events only trigger after the event has been in its trigger-state for a period of time greater than the **Min. Event Time**. The Settling Time prevents spurious events from triggering (default is zero) and oscillation.

**Add to Control Center** (checkbox)

When checked, the sensor will be displayed on the Control-Page. If unchecked it will not appear on the Control-Page, however, it will function as configured via its other settings regardless of whether it is displayed and may be used to trigger events.

**Notifications** (checkbox)

When checked email and SMS text messages for the ADC will be generated as specified.

**Data Logging** (selection box)

If enabled relevant ADC events are written to the event log.

**Next/Prev ADC >>**

Advances to the next or previous available ADC Page, when not all ADCs are displayed on the current page.

# Virtual Relay Settings

A Virtual relay enables a uSwitch to drive peer remote uSwitch relays (Slaves) on other uSwitch devices anywhere on the local network or over the Internet. Slave relays can be commanded from a Virtual Button on the uSwitch Control Page or synchronized with a local Relay, GPIO or ADC. This feature enables a single Master uSwitch to control a network of remote uSwitches. This mechanism enables a single button, or event to instantaneously lock-down/open/alarm an entire campus or facility without the need for activation on each site. To command virtual Devices on the local network only the **Virtual Relay Protocol** on the **Port & System Settings Page** should be set to "TCP/IP". To command devices anywhere on the web the Master must have a gateway open to the internet (station/ethernet modes) and the **Virtual Relay Protocol** on the **Port & System Settings Page** must be set to use **WEB Sockets**. With WEB Sockets other uSwitches acting as WEB Socket Servers or other programmed servers can react to events generated at a uSwitch. Virtual Relays can be programmed to send customizable web Socket commands via the Virtual Relay Name and On/Off State text fields.

Control Center			
<b>uHaveControl™ Virtual Relay Settings</b> <span style="float: right;"><a href="#">Help</a> <a href="#">Logout</a></span>			
Relay Settings	Virtual Relay Name [15]	Virtual1	Virtual2
Digital I/O Settings	Operating Mode	Disabled	Disabled
Analog I/O Settings	Communication Mode	TCP/IP Socket	TCP/IP Socket
Virtual Relay Settings	Off State Text [15]	Low	Low
Relay Watchdogs	On State Text [15]	High	High
Event Calendar	Custom Output String	Enable <input type="checkbox"/>	Enable <input type="checkbox"/>
Network Settings	Off State Color	Red	Red
Port Forwarding	On State Color	Green	Green
User Account Settings	Power Up State	Off	Off
Menu Access Privileges	Momentary Time (sec)	30	30
Port & System Settings	Total Slave Devices	1	1
Notification Settings	Slave IP1 [15]	not used	not used
Event Log	Slave IP2 [15]	not used	not used
Time/Date Settings	Slave IP3 [15]	not used	not used
User Interface Settings	Slave IP4 [15]	not used	not used
Modbus TCP/IP Settings	Slave IP5 [15]	not used	not used
Backup & Restore	Slave IP6 [15]	not used	not used
Software Update	Slave IP7 [15]	not used	not used
About	Slave IP8 [15]	not used	not used
Graphs	Slave Link(s)	N/A Disabled Mode	N/A Disabled Mode
User Manual	Slave Port	9760	9760
	Slave Relay(s)	1	2
	Add Sub Control	Pulse Button <input type="checkbox"/>	Pulse Button <input type="checkbox"/>
	Notifications	Enable <input type="checkbox"/>	Enable <input type="checkbox"/>
	Data Logging	None	None
	Next Virtual Relay		
<a href="#">Save Changes</a>		<a href="#">Reset Entries</a>	
uSwitch by uHaveControl™			

### **Virtual Relay Name [15]** (text string)

User assigned name for the virtual relay. Used in all references to it (default is Virtualx, where x is the index). This name is for notifications when showing a device's state. Users should assign meaningful names describing the virtual relay's usage.

### **Operating Mode** (custom select box)

This pulldown provides the following options: **Disabled, Toggle, Resettable, Clearable, Momentary, Relay, GPIO**. Settings are similar to the Relay Settings page, with the exception that a new (Virtual) button is created on the Control Center and that a Virtual button will act as the operator's control for all assigned remote controlled relays. If the mode specified refers to a local **Relay**, then remote slave relays are synchronized to the local relay and all local relay properties are used. This means if the local relay is in watchdog mode, the remote relays will function with the local relay's watchdog settings. If a **GPIO** is selected remote relays are synchronized to the triggering details for the GPIO (default is **Disabled**).

### **Communication Mode**(Either Web Socket or TCP/IP)

Shows the mode for transmitting information to remote devices. This is set from the Port & System Settings Page as either TCP/IP commands or Web Socket Commands.

### **Off State Text** (text string)

Text assigned to the Virtual relay button when de-energized.

### **On State Text** (text string)

Text assigned to the Virtual relay button when energized.

### **Custom Output String**(Check Box)

When checked, the string sent out by a Virtual Event to a specified slave is constructed by appending the current[On/Off State Text] field to the [Virtual Relay Name] field terminated by an "/r/n" (carriage return, line feed). For instance if the Name is set to "Gate=", and the off/on state text is set to "Closed"/"Open". Checking this box would result in a WebSocket command string of "Gate=Closed/r/n" or "Gate=Open/r/n" depending on the relay's state. The Custom Output string will only be enabled when using Web Sockets.

### **Off State Color** (color select box)

Background color of the relay on the Control Center when de-energized.

### **On State Color** (color select box)

Background color of the relay on the Control Center when e

### **Power Up State** (custom select box)

This dropdown configures the initial state of Virtual relays when they are in controlled modes (**On/Off, Momentary, Resettable, Clearable**). The options are **Off, On, Last**. Depending upon the operating mode this field may be disabled, limited or forced to a given state.

1. **Off** - Virtual Relay de-energized on power up.
2. **On** - Virtual Relay energized by power up.
3. **Last** - Virtual Relay is put in the state it was in before powered down.

### **Momentary Time (sec)** (integer)

This field specifies the number of seconds for the countdown timer when Operating mode is **Momentary, Resettable** or **Clearable**.

### **Total Slave Devices** (integer)

Number of Remote uSwitches (or client devices) controlled by the Virtual Relay (value 1-8, default is 1)

### **Slave IP/URL[x]** (4-digit numeric IP)

This field should have the IP address (such as 192.168.0.50) of a slave uSwitch that is addressable from the local LAN. If the network address specified is not routable from this uSwitch (because of a firewall or address limitation) the feature can not talk to the remote device and communication failures will occur. Slave IP[x] will only be displayed if the virtual relay connection (set in Port and System Settings) is set to **TCP/IP** (dictating IP Addresses), if it is in **Web Socket** mode than this field will be titled **Slave URL[x]** and a URL of the form "MyRemoteUSwitch.ddns.net" should be specified.

**Slave Link(s)** (4-digit numeric IP, read-only)

System generated, list of all slave uSwitch addresses (either IP or URL) controlled by this virtual relay. The user can click on any Slave link and the interface will go to the control page of the selected remote uSwitch if it is online.

**Slave Port** (integer-port) (only for **TCP/IP** mode, ignored in **Web Socket** mode)

TCP communication port for any TCP commands sent by this virtual device to its slaves. By default the TCP port is set to 9760. This port only needs to be changed when a set of remote devices uses a TCP port other than 9760. Since only one TCP port is available per Virtual Relay, all slave uSwitches driven by a single Virtual Relay must use the same port. A uSwitch CS can command any other uSwitchCS, uSwitch Pro, or uSwitch Std. Uswitch Pros, can also command uSwitch CS relays if they are designated as slaves.

**Slave Relay(s)** (custom select box)(only for **TCP/IP** mode, ignored in **Web Socket** mode)

This pulldown specifies which remote relay(s) on a slave are commanded by it. **1** controls relay **1**, **2** controls relay **2**..., **All** will control all relays on the specified uSwitch. Note: uSwitches specified here must have their specified relay set to slave mode. If virtual Relay is sending out Custom Output Strings this field is irrelevant.

**Add Sub Control** (checkbox)

This field enables overriding the current state of the Virtual Relay (when allowed). An override button will be displayed in the Sub-Control column on the control page..

**Notifications** (check box) Enables notifications for Virtual relay.

**Data Logging** (selection box)

If enabled relevant Virtual Relay events are written to the event log.

**Next/Prev Virtual Relay >>**

Advances to the next or previous Virtual Relay Page when not all Virtual Relays are displayed on the current page.

# Relay Watchdogs

The Auto Reboot feature allows uSwitches to automatically detect failed equipment and restart it without human intervention or generate Alarms on device communication failures. You may set one to three URLs or IP addresses to be periodically polled or you can set up a single I/O to sense as a heartbeat for each configured **Watchdog**. If the Watchdog is configured to **Reboot** mode and it determines a ping or heartbeat failure for a selected watchdog, the associated relay (specified in the Relay Settings page) will automatically cycle the device whose power source is run through the relay, resulting in a power cycle of the device(s). If the Watchdog is in ALARM Mode the relay will change states and only return to the pre-alarm state after communication is restored.

Watchdog parameters are effective only when the assigned relay is configured for **Watchdog** mode.

Control Center	uHaveControl™ Relay Watchdogs <span>Help</span>		
Relay Settings	URL(s) to Ping for Relay2-i (Enabled)		
Digital I/O Settings	<u>Watchdog Mode</u>		Reboot <input type="button" value="v"/>
Analog I/O Settings	<u>1st URL [31]</u>		google.com
Virtual Relay Settings	<u>2nd URL [31]</u>		192.168.0.197
Relay Watchdogs	<u>3rd URL [31]</u>		yahoo.com
Event Calendar	<u>Ping/HeartBeat</u>		Ping ALL URLs <input type="button" value="v"/>
Event Times	<u>Notifications</u>		Enable <input checked="" type="checkbox"/>
Network Settings	Relay2-i WatchDog Counters		
Port Forwarding	<u>Max Consecutive Failures</u>		2 <input type="button" value="v"/>
Account Settings	<u>Max Consecutive Reboots</u>		2 <input type="button" value="v"/>
Port & System Settings	Relay2-i WatchDog Timers		
Notification Settings		Hours	Minutes
Log Settings	<u>Watchdog Startup Delay</u>		Seconds
Time/Date Settings		0 <input type="button" value="v"/>	18 <input type="button" value="v"/>
User Interface Settings	<u>Time Between Pings</u>		5 <input type="button" value="v"/>
Modbus TCP Settings	<u>Reboot Hold Time</u>		6 <input type="button" value="v"/>
Backup & Restore	<u>Fault Mode Time</u>	0 <input type="button" value="v"/>	0 <input type="button" value="v"/>
Software Update	Reboots[1], Faults[0]		<input type="button" value="Reset Counters"/>
About	<u>Prev/Next Watchdog</u>		<input type="button" value="⏪"/>
Graphs	03:06:58 PM 09/27/22		
User Manual	<input type="button" value="Save Changes"/>		<input type="button" value="Reset Entries"/>
	uSwitchCS by uHaveControl™		

## Watchdog Mode (Selection Box)

If **Watchdog Mode** is set to **Reboot** the relay will cycle when it detects a ping/heartbeat failure. If the **Watchdog Mode** is set to **Alarm** when a ping/heartbeat failure is detected the relay will change states and only return to the pre-failure state when communication is restored.

### **1stURL, 2nd URL, 3rd URL** (URL string or 4-digit numeric IP)

The three URL fields are for IP addresses, or URLs of network devices or servers that uSwitch can ping to periodically ring out communication lockups or device failures. The URLs may include the static IP address or remote IP of devices that will be tested such as routers, cellular modems, computers, Kiosks, network cameras, servers, etc. This is ideal for restarting network devices such as CSU/DSUs/RTUs, security cameras, satellite modems, routers, re-closures, power meters, etc., after lock-up. When specifying URL(s) the network **Gateway** field must be correct to provide access to a DNS server for resolving URLs to network addresses.

### **Ping/Heartbeat** (Selection Box)

Sets the source of the Watchdog Heartbeat to either ping responses that must be received from all three URLs, any of the three URLs, or to periodic input pulses from a selected GPIO. Whether specifying GPIOs or URLs, all Watchdog configuration parameters that follow apply to either URL or GPIO sources.

### **Notifications** (checkbox)

Enable this field to generate notifications from Watchdog events

### **Max Consecutive Failures** (integer)

The maximum number of consecutive failures which will cause the selected relay to change its state. A ping failure occurs if any single URL fails to respond when **Ping ALL URLs** is selected, or if no URL responds and **Ping ANY URL** is specified. When the watchdog is GPIO based, it must get a regular pulse (level change) from the GPIO within the time value specified in the **Time Between Pings** field.

### **Max Consecutive Reboots** (integer)

After **Max Consecutive Reboots** without a successful pulse or ping detected, the uSwitch exits the Watchdog Mode for the period of time specified in the **Fault Mode Time** field. During the **Fault Mode Time** period the uSwitch stops the relay from power cycling devices.. This period gives a functional device a break, when a watchdog reboot doesn't appear to be curing a heartbeat failure. This field is not required in Alarm Mode.

### **Watchdog Startup Delay** (integer)

When a uSwitch is first powered on, or after a Watchdog reboot occurs the software will hold off for the **Startup Delay** period before initiating the Watchdog feature. The **Watchdog Startup Delay** gives a newly powered device or system time to initialize and establish stable operating communication before watchdog testing begins. Certain devices, such as cellular modems or servers may never get a chance to establish communication with an ISP and WAN if the **Watchdog Startup Delay** period is insufficient. This would result in endless reboots because the Watchdog would always determine failure conditions if the system never establishes stable communication (factory default, and recommended **Watchdog Startup Delay** time is 7 minutes)

### **Time Between Pings**(integer)

This is the time between consecutive device pings or GPIO input pulses. This field prevents ping flooding the network. (The default, and recommended minimum time is ninety seconds).

### **Reboot Hold Time** (integer)

This is the time period that the watchdog will keep the Watchdog Relay in Reboot state. The time specified should be enough for a clean power cycle to occur (the recommended minimum, and factory default **Reboot Hold Time** is five seconds).

### **Reboot Fault Mode Time** (integer)

This is the time a watchdog goes idle in Device Fault Mode before returning to its normal operation after **Max Consecutive Reboots** occur with no communication restorations. This feature prevents the continuous power cycling of a device that may not have a power cycle curable fault. The recommended minimum, and factory default, stand-off time is four hours.

### **Reset Counters** (button)

Watchdog reboot and fault statistics are stored for each operating watchdog. This button resets the watchdogs counters.

# Network Settings

Network adapter selection, Network Adapter Settings, Network properties, and TCP-IP settings are configured from the **Network Settings** page. The Network Settings Page below shows the factory default network settings.

Control Center	uHaveControl™ Network Settings <span>Help</span> <span>Logout</span>	
Relay Settings	Networking Mode	APStation
Digital I/O Settings	WiFi Access Point (AP) Settings	
Analog I/O Settings	SSID [31]	uStationAP_AE61
Virtual Relay Settings	Security Options	Open
Relay Watchdogs	Passphrase [31]	uSwitchCS
Event Calendar	IP-MAC [C0:49:EF:92:AE:61] [15]	192.168.4.1
Network Settings	AP Primary DNS [15]	192.168.4.1
Port Forwarding	Broadcast SSID	Enable <input checked="" type="checkbox"/>
User Account Settings	NAT/Repeater (Sets DHCP Server)	Enable <input checked="" type="checkbox"/>
Menu Access Privileges	DHCP Server	Enable <input checked="" type="checkbox"/>
Port & System Settings	WiFi Station Settings	
Notification Settings	Available SSIDs	NETGEAR60
Event Log	SSID (chan:11, Pwr -47 dB) [31]	NETGEAR60
Time/Date Settings	Passphrase [31]	mySSID
User Interface Settings	DHCP Client	Enable <input type="checkbox"/>
Modbus TCP/IP Settings	IP (Static)-MAC: [C0:49:EF:92:AE:60]	192.168.0.190
Backup & Restore	Radio Channel - Auto if Unknown (Current:11)	Auto
Software Update	Region	United States
About	Radio Tx Power	16 dBm
Graphs	Bandwidth (currently HT20)	HT20 <input checked="" type="checkbox"/>
User Manual	Network Settings (TCP/UDP)	
	Gateway [15]	192.168.0.1
	Subnet Mask [15]	255.255.255.0
	Host Name [31]	uSwitch_EF92AE61
	Primary DNS (Static) [15]	192.168.0.1
	Secondary DNS (Static) [15]	8.8.8.8
	Tertiary DNS (Static) [15]	8.8.4.4
	MTU (Max 1500 Bytes)	1500
	<div style="display: flex; justify-content: space-between;"> <span>Save Changes</span> <span>Reset Entries</span> </div>	
	uSwitch by uHaveControl™	

## Networking Mode (custom select box)

The **Networking Mode** pulldown selects a network interface. Four different network interfaces are supported. The first three: **Station**, **Access Point** and **APStation**, are for WiFi 802.11. The fourth interface is for hard wired **Ethernet** only.

When the **Networking Mode** is configured for either Access Point (AP) or Access Point Station Mode, fields under the heading **WiFi Access Point (AP) Settings** are populated. When the adapter is configured as a WiFi Station (infrastructure mode) or Access Point Station Modes, then the fields under the heading **WiFi Station Settings** are populated. When the unit is set up for Ethernet, **Ethernet Adapter** (non-wireless) fields are populated.



## WiFi Access Point (AP) Settings (AccessPoint or APStation modes)

### SSID (text string)

Sets the SSID assigned to the uSwitch AccessPoint whenever it is in an Access Point or APStation Modes. Cell phones, computers and client sensors can connect to the uSwitch AccessPoint network directly in this mode. The factory default SSID is "uStationAP\_xxxx" and WiFi Security is **Open** (xxxx are the last four HEX characters of the AP's MAC address).

### Security Options (custom select box)

Sets Security mode for the uSwitch Access Point (factory default is **Open**, no security). It is recommended that after initial connection, the user change Security Options to protect it from being **Open** to a security mode.

### Passphrase (text string)

Security Passphrase to connect to the uSwitch internal Access Point (factory default is **uSwitchCS**)

### IP-MAC[xx:xx:xx:xx:xx:xx] (4-tuple/digit numeric IP,[unique MAC address for the uSwitch AP])

This field sets the IPV4 static IP address assigned to the uSwitch Access Point. To connect to the AP from a web browser this address should be entered in the address bar (certain browsers may require the prefix (HTTP://)). When assigning a client or infrastructure device to the uSwitch AP this address should be entered as the client's AP field.

### AP Primary DNS (4-digit numeric IP)

**AccessPoint** mode: set to the IP address of the AP

**APStation** mode : for NAT, Port Forwarding or Repeater modes set to the external Access Point specified in Station Settings

### Broadcast SSID (checkbox)

Check to enable broadcasting of the uSwitch SSID. Helps if trying to connect and you forget the SSID.

### NAT/Repeater (checkbox, APStation Only)

This box should be checked in APStation Mode if the uSwitch is to be used as a Repeater to the Station's AP, or if it has locally connected clients that will be remotely accessed via Network Address Translation (NAT) or Port Forwarding.

### DHCP Server (checkbox)

This box should be checked if clients are going to connect directly to the AP and will acquire their IPV4 network addresses dynamically from the uSwitch's DHCP server.

## WiFi Station Settings (Station or APStation modes)

When the **Networking Mode** is either **Station** or **APStation**, then the fields under the heading “**Station Settings**” are populated.

Control Center	uHaveControl™ Network Settings <span>Help</span> <span>Logout</span>	
Relay Settings	Networking Mode	Station ▼
Digital I/O Settings	WiFi Station Settings	
Analog I/O Settings	Available SSIDs	NETGEAR60 ▼
Virtual Relay Settings	SSID (chan:11, Pwr -47 dB).[31]	NETGEAR60
Relay Watchdogs	Passphrase [31]	mySSID
Event Calendar	DHCP Client	Enable <input type="checkbox"/>
Network Settings	IP(Static)-MAC: [C0:49:EF:92:AE:60]	192.168.0.190
Port Forwarding	Radio Channel - Auto if Unknown (Current:11)	Auto ▼
User Account Settings	Region	United States ▼
Menu Access Privileges	Radio Tx Power	16 dBm ▼
Port & System Settings	Bandwidth (currently HT20)	HT20 <input checked="" type="checkbox"/>
Notification Settings	Network Settings (TCP/UDP)	
Event Log	Gateway [15]	192.168.0.1
Time/Date Settings	Subnet Mask [15]	255.255.255.0
User Interface Settings	Host Name [31]	uSwitch_EF92AE61
Modbus TCP/IP Settings	Primary DNS (Static).[15]	192.168.0.1
Backup & Restore	Secondary DNS (Static).[15]	8.8.8.8
Software Update	Tertiary DNS (Static).[15]	8.8.4.4
About	MTU (Max 1500 Bytes)	1500
Graphs		
User Manual		
	<span>Save Changes</span>	<span>Reset Entries</span>
	uSwitch by uHaveControl™	

### Available SSIDs (custom dropdown-box)

An automatically populated selection box displaying all WiFi Networks that respond to uSwitch WiFi scan. This field is used to select the SSID of a private AP/Modem for Repeating or Port Forwarding/NAT.

**SSID [31]** (text string)

The SSID for the access point that the station is currently connected to. It can be manually overwritten to a known SSID if the uSwitch fails to discover the desired SSID of an AP from the scanned list above (this can occur if the desired AP has broadcasting disabled or if the uSwitch is not in wireless range of the remote AP). Once a connection has been established to a Host AP, the (b/g/n) radio channel used by the host is displayed in parentheses along with the received signal strength from the remote AP. This channel number can be selected in the **Radio Channel** field described below.

**Passphrase** (text string)

This is the passphrase to the Host AP.

**DHCP Client** (checkbox)

If **DHCP** is checked (not recommended) then this Station gets its IPV4 address and DNS fields automatically assigned by the selected AP (best practice is to never assign a DHCP address to the uSwitch as it is a server and its IP address should be static so it can always be known by users and firewalls for NAT or Port Forwarding). This is less important in a Cloud implementation.

**IP(Static)-MAC[XX:XX:XX:XX:XX:XX]** (4-digit numeric IP)

This field represents the IPV4 address you are 'statically' assigning (or that was automatically assigned via DHCP) to the Station in either Station or Ethernet mode. It must be set to the Host's AP subnet (the adapter's unique MAC address will be displayed on the left of the identification field).

**Radio Channel** (select box)

When Networking Mode is **Station** or **APStation** mode, this channel should be set to **Auto**. It should only be changed to the channel of the Station's Host AP if it is known and not expected to change. Leaving the field in **Auto** mode should not affect device operation.

**Region** (Select Box)

In the **Region** list, select the regional area where the uSwitch will be deployed. Entering an incorrect region can result in unpredictable wireless behavior.

**Radio Tx Power** (select Box)

The Tx Power should be set to the minimum power limit that works well in your environment. The factory default value is 15dBm. Unnecessarily setting to Maximum values can result in excessive power usage, and or cause unnecessary noise and radio interference with other local wireless networks.

## Network Settings (TCP/UDP)

**Gateway** (4-digit numeric IP)

The gateway field specifies the IPV4 address to a router, cellular modem or gateway responsible for creating the LAN and connecting to outside networks/internet. If unknown, obtain the gateway address from a network administrator. In **AccessPoint** (only) mode, the gateway should be the IP address of the uSwitch AP. In **Station, APStation or Ethernet** modes the **Gateway** should be the IP address of the device that routes the network/LAN and provides access to the outside network. The Gateway must be correct if using an external mail server, NTP server, or URLs in the watchdog to ping devices outside the network.

**Subnet Mask** (4-digit numeric IP)

The subnet mask identifies a mask for a specific LAN's private addressing scheme on a TCP IPV4 network. The subnet mask can be obtained from a network administrator. The uSwitch's default subnet mask is set to 255.255.255.0. Each of these four fields represent an IPV4 byte (8bit) field from 1-255. Any bit positions in the address mask byte with a value of zero are accessible on the local subnet (0 in the last field implies that network address in the first three bytes must exactly match the first three bytes of the IP and the last byte can be any number from 1 to 255). Any bit positions with a value of 1 are fixed (unchangeable) on the local subnet. In the subnet mask, 255.255.255.0, the first three IP byte address fields are fixed and must match the gateway. The last byte field may vary from 1 to 255 (a value of 255 is equivalent to 11111111 in binary).

**Host Name** (Text String)

The network host name for the uSwitch. It is a virtual name and may be referenced in SSL Security Certificates.

**Primary DNS** (4-digit numeric IP)

This field specifies a network Name Server used by the Station to resolve URLs outside the local area network of the uSwitch. Factory Default is 192.168.0.1. For Access Point mode this field must be set to the IP address of the uSwitch AP and is set automatically in DHCP mode if the specified adapter type is **APStation**, **Station** or **Ethernet**.

**Secondary DNS** (4-digit numeric IP, station/ethernet mode only)

This field specifies a network Name Server used by the Station to resolve URLs that may be included in the automatic reboot options or device firmware whose actual IP addresses are unknown from the private network just in case the primary DNS is not available or cannot resolve a URL. Factory default is 8.8.8.8 (set automatically in DHCP mode if adapter type is station or ethernet).

**Tertiary DNS** (4-digit numeric IP, station/ethernet mode only)

This field specifies a network Name Server used by the Station to resolve outside URLs that may be included in the automatic reboot options or device firmware whose actual IP addresses are unknown from the private network just in case the secondary and primary DNS cannot resolve a URL. Factory default is 8.8.4.4. Not affected by DHCP.

**MTU (Max 1500 Bytes)** (integer)

Specifies the Maximum Transmission Unit (MTU) size for TCP network packets. It is recommended that **MTU** is only modified if you have communication issues or are operating with a VPN. A VPN can add additional information to TCP packets, therefore reducing the overall size of a standard TCP transmission packet. MTU should never be set to a value higher than 1500 or lower than 300.

# Ethernet Adapter Settings

The following network page is populated when the Networking Mode is **Ethernet**.

Control Center		uHaveControl™ Network Settings		Help	Logout
Relay Settings	Networking Mode	Ethernet			
Digital I/O Settings	Ethernet Adapter Settings				
Analog I/O Settings					
Virtual Relay Settings	DHCP (Auto Acquire IP)	Enable DHCP <input type="checkbox"/>			
Relay Watchdogs	IP (Static)-MAC: [C0:49:EF:92:AE:63]	192.168.0.191			
Event Calendar	Full/Half Duplex	Enable <input type="checkbox"/>			
Network Settings	100Base-T/10Base-T	Enable <input type="checkbox"/>			
Port Forwarding	Network Settings (TCP/UDP)				
User Account Settings					
Menu Access Privileges	Gateway [15]	192.168.0.1			
Port & System Settings	Subnet Mask [15]	255.255.255.0			
Notification Settings	Host Name [31]	uSwitch_EF92AE61			
Event Log					
Time/Date Settings	Primary DNS (Static) [15]	192.168.0.1			
User Interface Settings	Secondary DNS (Static) [15]	8.8.8.8			
Modbus TCP/IP Settings	Tertiary DNS (Static) [15]	8.8.4.4			
Backup & Restore	MTU (Max 1500 Bytes)	1500			
Software Update					
About					
Graphs	Save Changes		Reset Entries		
User Manual	uSwitch by uHaveControl™				

## DHCP (Auto Acquire IP) (checkbox)

If **DHCP** is checked (not recommended) then this network device expects to have its IP address and DNS fields automatically assigned by the specified router (best practice is never assign a DHCP address to a server whose IP address must be known in advance for access). uSwitch clients may be accessed through Port Forwarding so their addresses can be dynamic. A good site to find out how to port forward on your home router is [portforward.com](http://portforward.com).

## IP(Static)-MAC[XX:XX:XX:XX:XX:XX] (4-digit numeric IP)

This field represents the IPV4 address you are assigning (or that was automatically assigned via DHCP) to the Ethernet adapter. It must be in the address space of your router's subnet. The adapter's MAC address is displayed along with the identification field. The default Ethernet address is 192.168.0.191. (to connect to this address make sure your device has access to the 192.168.0.xxx network space)

## Full/Half Duplex (checkbox)

Put adapter in full duplex mode, unchecked mode is half duplex (set to full duplex only if your network hardware supports it)

## 100BASE-T/10Base-T (checkbox)

Set transmission rate to 100BASE-T, unchecked rate is 10BASE-T (set to 100-Base-T only if your network hardware supports it)

## Adding Multiple uSwitch Devices on the same Network

You may need to clear the Address Resolution Protocol Cache (ARP) each time you add a new uSwitch onto your local network. This is because each uSwitch starts with the same factory default IP address. If the ARP cache is not cleared an IP address conflict may occur if a network router identifies two devices with the same IP addresses and different MAC addresses (each uSwitch has a unique MAC address). To clear the ARP cache on a Windows PC enter: "arp -d [IPV4 address]", in a command prompt window. For a Mac, enter: "sudo arp -d -a [IPV4 address]", as a superuser under Apple OSX, Linux/Unix enter: "arp -d -a [IPV4 address]".

(Note: When multiple uSwitch devices are installed on the same local area network, each must have its own unique 'LAN' IP address. Every uSwitch comes with a factory default IP address of 192.168.0.190 If multiple uSwitchCS devices are used, assign a unique IP address to each, such as: 192.168.0.195, 192.168.0.196, 192.168.0.197, etc.).

You can use a proxy server to connect multiple uSwitch devices to an outside network or the internet from a single static or dynamic IP. This can be done using most conventional routers. When a proxy server environment is set up, each uSwitch will not be accessible from the internet until the proxy server (router) is configured with unique port numbers and IP address assignments to each uSwitch on your router's local area network. This is a form of Network Address Translation (NAT) also called Port Forwarding or Virtual Port Addressing. To determine how to set up the proxy server for port forwarding, review your router's manual which acts as the proxy server and gateway for the uSwitch. In APStation mode, if the uSwitch is set up as a repeater, it directly supports Port Forwarding. In repeater mode use the Port Forwarding Menu for Proxy setup.

## Port Forwarding (APStation Mode Only)

The uSwitch supports Port Forwarding (also known as NAT or Virtual Port Addressing) from a device that is connected through the uSwitch internal Access Point. For this to apply the uSwitch must be in APStation Mode (menu only displayed for APStation Mode).

Port forwarding directs the uSwitch to send any incoming data from the network on a specified port to the specified uSwitch connected to its private Access Point network. This directs all communication not on the uSwitch AP to a designated port number which selects the IPV4 address assigned to that port.

In order for Port forwarding to work **NAT/Repeater** must be enabled in the WiFi Access Point Settings from the **Network Settings** Menu. The External IP is the local IP address of the device on the WiFi spectrum of the uSwitch AP. The Internal port is the port assigned to the uSwitch of which to Port Forward.

Control Center		uHaveControl™ Port Forwarding			
Relay Settings		<a href="#">Help</a>			
	#	External IP	Service	Internal Port	External Port
Digital I/O Settings	0	0.0.0.0	TCP ▾	443	443
Analog I/O Settings	1	0.0.0.0	TCP ▾	80	80
Virtual Relay Settings	2	0.0.0.0	UDP ▾	8080	8080
Relay Watchdogs	3	0.0.0.0	TCP ▾	0	0
Event Calendar	4	0.0.0.0	TCP ▾	0	0
Network Settings	5	0.0.0.0	TCP ▾	0	0
Port Forwarding	6	0.0.0.0	TCP ▾	0	0
Security & Port Settings	7	0.0.0.0	TCP ▾	0	0
Notification Settings	8	0.0.0.0	TCP ▾	0	0
Log Settings	9	0.0.0.0	TCP ▾	0	0
Time/Date Settings	10	0.0.0.0	TCP ▾	0	0
User Interface Settings	11	0.0.0.0	TCP ▾	0	0
Backup & Restore	12	0.0.0.0	TCP ▾	0	0
Software Update	13	0.0.0.0	TCP ▾	0	0
About	14	0.0.0.0	TCP ▾	0	0
User Manual	15	0.0.0.0	TCP ▾	0	0

[Save Changes](#) [Reset Entries](#)

### External IP (4-tuple IP address)

This field represents the IPV4 address of a device on the APs network that will be connected whenever an access is made to the station with the expressed Internal Port.

### Service

Identifies the allowed Network Services on the port.

### Internal Port

The Port assigned to the device on the AP's internal Network

### External Port

The port of the external device as it comes into the uSwitch.

# Event Calendar

The uSwitch supports Scheduled events so that a specific Relay can be controlled by a Calendar, Day/Time schedule. Two types of scheduled events are available, **Calendar** events and **Weekday** Events. If an event is scheduled on a **Calendar Day** that coincides with a **Weekday**, the **Calendar Day** will be the control source for the event. For instance, if an event is established for Monday and New Year's Day falls on Monday, the New Year Day event schedule determines the state. Once a calendar or weekday event is defined and enabled its timed activation is scheduled from the **Event Times** menu. A calendar event for the Event Times Menu to appear. For a relay to be controlled by the event schedule, the relay's Operating Mode must be set to **Scheduled** on the **Relay Settings** page.

Control Center	uHaveControl™ Event Calendar <span>Help</span>				
Relay Settings	Calendar Day Events [15]	Month	Day	Events	Relay1-i
Digital I/O Settings	<input type="text" value="NewYear"/>	January ▾	1 ▾	4 ▾	<input checked="" type="checkbox"/>
Analog I/O Settings	<input type="text" value="MLK"/>	January ▾	15 ▾	4 ▾	<input type="checkbox"/>
Virtual Relay Settings	<input type="text" value="President"/>	February ▾	19 ▾	4 ▾	<input type="checkbox"/>
Relay Watchdogs	<input type="text" value="Easter"/>	April ▾	12 ▾	4 ▾	<input checked="" type="checkbox"/>
Event Calendar	<input type="text" value="Patriots"/>	April ▾	16 ▾	4 ▾	<input type="checkbox"/>
Network Settings	<input type="text" value="Memorial"/>	May ▾	28 ▾	4 ▾	<input type="checkbox"/>
Port Forwarding	<input type="text" value="July4th"/>	July ▾	4 ▾	4 ▾	<input type="checkbox"/>
User Account Settings	<input type="text" value="Labor"/>	September ▾	3 ▾	4 ▾	<input type="checkbox"/>
Menu Access Privileges	<input type="text" value="Columbus"/>	October ▾	8 ▾	4 ▾	<input type="checkbox"/>
Port & System Settings	<input type="text" value="Christmas"/>	December ▾	25 ▾	4 ▾	<input type="checkbox"/>
Notification Settings	<input type="text" value="Custom1"/>	May ▾	13 ▾	4 ▾	<input type="checkbox"/>
Event Log	<input type="text" value="Custom2"/>	June ▾	25 ▾	4 ▾	<input type="checkbox"/>
Time/Date Settings	Weekday Events [15]	Event Time Selection	Events	Relay1-i	
User Interface Settings	<input type="text" value="Sunday"/>	Custom ▾	8 ▾	<input type="checkbox"/>	
Modbus TCP/IP Settings	<input type="text" value="Monday"/>	Interval ▾	172	<input checked="" type="checkbox"/>	
Backup & Restore	<input type="text" value="Tuesday"/>	Daylight ▾	2	<input checked="" type="checkbox"/>	
Software Update	<input type="text" value="Wednesday"/>	Custom ▾	4 ▾	<input checked="" type="checkbox"/>	
About	<input type="text" value="Thursday"/>	Custom ▾	4 ▾	<input checked="" type="checkbox"/>	
Graphs	<input type="text" value="Friday"/>	Custom ▾	4 ▾	<input checked="" type="checkbox"/>	
User Manual	<input type="text" value="Saturday"/>	Custom ▾	4 ▾	<input type="checkbox"/>	
10/03/23, 04:35:20 PM					
<a href="#">Save Changes</a>			<a href="#">Reset Entries</a>		
					

## Calendar Day Events (text string)

This field is for the name assigned to a specific Calendar Day event. The name will be used in notifications or emails when the calendar



event triggers and it is used to schedule the event's activation times from the **Event Times** menu..

## **Month** (selection Box)

Every Calendar day Event must have a month selected.

## **Day** (selection Box)

Every Calendar Day Event must have a day for the selected Month specified

## **Events** (selection Box)

Number of events for a given **Calendar** or **Weekday** event (max is 8 events for a given Calendar Day or Weekday)

## **Weekday Events** (selection Box)

Weekday events occur on the given weekday when the current day does not fall on a **Calendar Day Event** (calendar day events have precedence over weekday events).

## **Event Mode** (selection Box)

There are three Weekday Event Modes. Custom, Interval, Daylight mode.

**Custom** mode supports the same 8 scheduled event times as Calendar mode described above. Up to 8 scheduled times may be programmed just like a calendar day event.

**Interval** mode lets a user set up a repeatable function for a relay that can occur between 1 and 9999 times. Interval mode only requires an event start time, an event time duration, and a number of times to repeat that event. An interval event can have between 1 and 9999 events per a day. The start time, length and initial state for a weekday event is set up on the **Event Times** Page as are the times for calendar day and custom events.

**Daylight** mode sets up two events for a given day and those events will occur at sunrise and sunset times based on the geographic location of the uSwitch. The geographic location is specified on the User Interface Settings page.

## **RelayX-i** (checkbox, one for each relay that is in Scheduled Mode on its Operating Mode from the Relay Settings page)

Any relay that is in **Scheduled** Mode will have a checkbox on this page. In the page above events are enabled for New Year's, Easter and Monday-Friday for Relay1-i. Each event for a given day requires an entry in the Event Times Menu shown below. The Event Times menu gets populated based on selections from this Event Calendar Menu. If different relays require different event times for the same day, a second Calendar event for that day may be created. Additionally, a second event for the same day can be created if the 2nd event's times are chronologically later than the previous event. This would allow for one Calendar Day to have more than 8 events.

## Event Times

The **Event Times** page works in conjunction with the **Event Calendar** page. For each enabled **Calendar** or **Weekday** event an entry is created for an **Event Time** schedule. This entry defines the times on that day the associated event triggers and whether the relay is to be energized or de-energized. Up to Eight **Event Times** are available for any **Event Calendar** entry. If more than 8 event times are required on a given day, additional Event Calendar items can be assigned the same date and additional Event Time entries can be scheduled for it. The example below shows the **Event Calendar** items that were enabled on the **Event Calendar** menu.

Control Center	uHaveControl™ Event Times <span>Help</span>					
Relay Settings						
Digital I/O Settings	Calendar Events	Event_1 (state)	Event_1 Time (Hour:Min)	Event_2 Time (Hour:Min)	Event_3 Time (Hour:Min)	Event_4 Time (Hour:Min)
Analog I/O Settings						
Virtual Relay Settings						
Relay Watchdogs						
Event Calendar	NewYear (Custom)	Off ▾	12 am ▾ :00 ▾	3 am ▾ :00 ▾	6 am ▾ :00 ▾	9 am ▾ :00 ▾
Event Times						
Network Settings	Interval Events	Event_1 (state)	Event_1 Time (Hour:Min)	Event Duration (Min:Sec)	Post Event Time (Min:Sec)	Total Events
Port Forwarding						
User Account Settings						
Menu Access Privileges	Monday (Interval)	Off ▾	12 am ▾ :00 ▾	3 ▾ :00 ▾	6 ▾ :00 ▾	172
Port & System Settings						
Notification Settings						
Event Log	Tuesday (Daylight)	Off ▾	Sunrise	7:13 AM	Sunset	4:22 PM
Time/Date Settings	10/03/23, 04:55:25 PM					
User Interface Settings						
Modbus TCP/IP Settings						
Backup & Restore	<span>Save Changes</span>		<span>Reset Entries</span>			
Software Update						
About						
Graphs						
User Manual						

### Event\_1 (state) (custom select box)

State 0 represents the relay's state at **Event 0** time. At each subsequent time the relay changes state (for instance, if Event 0 is Off, Event 1 is On, Event 2 is Off, ...).

### Event 1-8 Time (custom select box)

Times for relay state changes. Event times must be in sequential time order to prevent ignored events or erratic behavior.

(Note: As set up in **Event Times** above, each day has 4 event times, MLK day has seven, Easter has one event.

In the example above, Monday is a weekday **Interval** event. At **Event1** Time(12 am), the relay is set to **State 0** (off). The relay State changes every **Event Duration** (3 minutes in this example) and resets to **State 0** after **Post Event Time** (6 minutes). This event repeats **Total Events** (172) times per day and then stops.

In the example above Tuesday is a **Daylight** event, the 2 event fields are automatically populated with local sunrise and sunset times. Twice a day **Daylight** events automatically trigger the relay beginning at state 0 at sunrise time.

## User Account Settings

The User Account Page configures user accounts, assigns passwords, levels of security and sets usage timeouts.

Control Center		uHaveControl™ User Account Settings <span>Help</span>		
Relay Settings		<span>Logout</span>		
Digital I/O Settings	User Name [15]	Access Level	PIN [15]	Timeout (Mins)
Analog I/O Settings	Supervisor	Security	Sec913B	30
Virtual Relay Settings	Manager	Admin ▼	uHaveControl	30
Relay Watchdogs	Staff	Control ▼	control	30
Event Calendar	User1	Lower ▼	guest1	20
Network Settings	User2	Disabled ▼	guest2	20
Port Forwarding	User3	Disabled ▼	guest3	20
User Account Settings	User4	Disabled ▼	guest4	20
Account Access Rights	User5	Disabled ▼	guest5	20
Port & System Settings	User6	Disabled ▼	guest6	20
Notification Settings	User7	Disabled ▼	guest7	20
Event Log	User8	Disabled ▼	guest8	20
Time/Date Settings	User9	Disabled ▼	guest9	20
User Interface Settings	User10	Disabled ▼	guest10	20
Modbus TCP/IP Settings	User11	Disabled ▼	guest11	20
Backup & Restore	User12	Disabled ▼	guest12	20
Software Update	User13	Disabled ▼	guest13	20
About	User14	Disabled ▼	guest14	20
Graphs	User15	Disabled ▼	guest15	20
User Manual	User16	Disabled ▼	guest16	20
	User17	Disabled ▼	guest17	20
	User18	Disabled ▼	guest18	20
	User19	Disabled ▼	guest19	20
	User20	Disabled ▼	guest20	20
	User21	Disabled ▼	guest21	20
	<u>Login Requires Password</u>		Required	<input checked="" type="checkbox"/>
	<u>Hide Passwords</u>		Enable	<input type="checkbox"/>
	<u>Login Notifications</u>		Enable	<input type="checkbox"/>
	<u>Security Password (Required to Save Changes)</u>		Save Password	<input type="button" value="Save Password"/>

### User Name[15] (text string)

There are 24 user accounts. The user name uniquely identifies a given user. It will be output wherever the user name is referenced via a log entry or display. The User name is used to identify a given user for the life of his connection, by setting the account to disabled or resetting a password a user will no longer be able to access a uSwitch.

### Access Level (selection box)

Specifies the privilege level for that user.

**Disabled** - Account cannot be used.

**Viewer** - A Viewer account has rights to connect and review uSwitch features, operation and statistics.

**Admin** - has Universal rights to make any changes or perform any operations on a uSwitch. The administrator also sets up user accounts, and can assign rights to all user types via the Menu Access Privileges page.

**Control** - a Control user has any rights that the Admin decides to allow the control user to have.

**Security** - The security account is a non modifiable. This prevents deletion of this account which would prevent any access to the system. The password for this account should be saved and never shared to non-privileged users. This prevents deletion of the account that could result in no access to the system.

## **Pin [15]** (text string)

There are 24 accounts. A user may be given a password and then removed from the list if they no longer are entitled to access the uSwitch. Passwords should be secure and non-obvious. This means at least 8 characters, including digits, upper/lower case letters, no spaces.

## **Timeout (mins)**(integer)

Specifies the amount of time the selected user can be logged into a uSwitch without activity before the uSwitch will automatically log the user out.

## **Login Requires Password** (checkbox)

When checked the uSwitch will not allow connections without one of the assigned Passwords/Pins. Once logged in a user is automatically logged out after **Timeout** minutes without activity.

## **Hide Passwords** (checkbox)

When this field is checked all passwords are hidden for all menus.

## **Login Notifications** (checkbox)

When checked notifications and Log entries are created every time a new user logs into or out of a uSwitch. If it is desired to have all actions taken by the user logged with their ID, check the box "Include User Names" in the Event Log Menu.

## **Security Password** (Required to Save Changes) (text field)

For extra security, no settings on this page can be saved unless the user enters the Security Password on the last entry field. This prevents any remote access from changing these settings. The default security password for each uSwitch is unique and should be changed and saved. If the security password is forgotten the only way to change security features of the device will be a full factory reset, which will reset and then enable retrieval of a default factory Security password. This feature prevents a hacker from attempting random security passwords.

# Account Access Rights

This Item assigns privileges to logged in users based on their Access rights.

uHaveControl™ Account Access Rights <span>Help</span>				
<span>Logout</span>				
	Menu Item	Account		
		Viewer	Control	Admin
Relay Settings	<a href="#">Relay Settings</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Digital I/O Settings	<a href="#">Digital I/O Settings</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Analog I/O Settings	<a href="#">Analog I/O Settings</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Virtual Relay Settings	<a href="#">Virtual Relay Settings</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Relay Watchdogs	<a href="#">Relay Watchdogs</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Event Calendar	<a href="#">Event Calendar</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Network Settings	<a href="#">Event Times</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Port Forwarding	<a href="#">Network Settings</a>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
User Account Settings	<a href="#">Port Forwarding</a>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Account Access Rights	<a href="#">User Account Settings</a>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Port & System Settings	<a href="#">Account Access Rights</a>		<input type="checkbox"/>	
Notification Settings	<a href="#">Port &amp; System Settings</a>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Event Log	<a href="#">Notification Settings</a>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Time/Date Settings	<a href="#">Event Log</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
User Interface Settings	<a href="#">Time/Date Settings</a>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Modbus TCP/IP Settings	<a href="#">Modbus TCP/IP Settings</a>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Backup & Restore	<a href="#">Backup &amp; Restore</a>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
Software Update	<a href="#">Software Update</a>		<input type="checkbox"/>	<input checked="" type="checkbox"/>
About	<a href="#">About</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Graphs	<a href="#">Graphs</a>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
User Manual				
<span>Save Changes</span>		<span>Reset Entries</span>		

## Menu Item

The leftmost field on this page specifies the menu that a user with the specified account access (view/admin/control) will be able to open and execute.

## Account

The rows to the right of Menu Item specify all account access rights. The columns below each access right specifies which menus a user who has that access right will be able to access. Note: if a menu item is not checked for a specific set of user rights, that menu will not show up when the user with those access rights is logged in.

# Port & System Settings

The Port & System Settings Page configures application Ports, Application Security Levels, Protocols, general Virtual Relay features and DDNS Settings. Additionally it supports uSwitch system Watchdogs and diagnostic settings.

Control Center	<b>uHaveControl™ Port &amp; System Settings</b> <span>Help</span>	
Relay Settings	<span>Logout</span>	
Digital I/O Settings	HTTP Protocols	
Analog I/O Settings	Browser Protocol	HTTP Only ▼
Virtual Relay Settings	HTTP/WS Port	80
Relay Watchdogs	Virtual Relay Protocols	
Event Calendar	Socket Type	TCP/IP ▼
Network Settings	Socket Port	9760
Port Forwarding	Update Interval (secs)	1 ▼
User Account Settings	Max Consecutive Errors	3 ▼
Account Access Rights	Dynamic IP Client Settings (DDNS)	
Port & System Settings	DDNS Provider	None ▼
Notification Settings	Device URL [63]	myuswitch.ddns.net
Event Log	User Name [31]	ddnsName
Time/Date Settings	Password [15]	ddnsPass
User Interface Settings	Internal Watchdogs	
Modbus TCP/IP Settings	Software Watchdog	Enable <input checked="" type="checkbox"/>
Backup & Restore	Network Watchdog (secs)	60
Software Update	System Diagnostics	Enable <input type="checkbox"/>
About	<span>Reboot</span>	<span>Factory Restore</span>
Graphs	10/04/23, 02:43:28 PM	
User Manual	<span>Save Changes</span>	<span>Reset Entries</span>
	uSwitch by uHaveControl™	

**VPN(s) and Firewall(s):** If a firewall is in place the firewall can be set up to limit access to only certain device MAC addresses. Additionally, a VPN may be used between the uSwitchCS and connected devices limiting access to only those devices or individuals who have access via the VPN.

## Connections/Ports

### Browser Protocol (Selection box)

Selects whether the web server communicates with browsers using the secure **HTTPS** protocol, or vanilla **HTTP**.. The default HTTP port for the uSwitch is 80, many browsers do not support or will print warnings if a device is accessed using non-secure HTTP.

### HTTP/WS Port (integer-port)

Specifies the port used if connecting to the browser. Typically if HTTP is used the port is 80, and if HTTPS is the chosen interface the port is 443. This port applies to HTTP and WS if using Websockets and HTTPS and WSS if using secure sockets. A unique port is required for a uSwitchCS if accessed from outside the local network. The user or system administrator must allow access to this port through the firewall.

### **Socket Type** (Selection Box)

This selection box determines whether Virtual (slave) relays are communicated to by TCP/IP sockets commands with **Local IPs** or URL addresses and **Web Sockets**. In the event **Web Sockets** is the communication mode the security will match that of the connection type above (HTTPS will use SSL and Secure Web Sockets) if HTTP is the selected web sockets will not implement SSL.

### **Socket Port** (integer-port)

The Port that will be used by other uSwitch devices or remote TCP API connections to send messages to this uSwitch and control its slaves (same for Web Sockets). The Remote Master uSwitch's Virtual Relay Settings entry for this **Slave TCP Port** must match this port to command its relays. If a communication problem exists check the firewall for access privileges on this port.

### **Update Frequency (secs)**

Sets the frequency of Virtual Relay updates.

### **Max Consecutive Errors (secs)**

Number of consecutive virtual relay failures for error reporting.

## **Dynamic IP Client Settings (DDNS)**

### **DDNS Provider** (selection box)

Selects a web based provider for DNS mapping a uSwitch's gateway IP address automatically via an internal DDNS client. If no DDNS is required or if the DDNS update client is managed by another network device or router, select **None**.

### **Device URL [64]**(text string)

When using a DDNS provider for port forwarding, the uSwitch can be accessed even if its IP changes by the ISP. In the Device URL field enter the URL that you want to assign to this uSwitch so it can be accessed from the internet. This URL must first be created at the DDNS provider site so it can be mapped to the uSwitch. Any unique name, such as "myUswitch.myHome.com" should work if it is available.

### **User Name [31]** (text string)

Name on your account on DDNS provider (as required)

### **Password [16]** (text string)

Password to DDNS provider account (as required)

## **Internal Watchdogs**

### **Software WatchDog** (checkbox)

This is a uSwitch internal Watchdog. It is used in the event that an unpredictable error occurs and will restart the uSwitch. The factory default setting is enabled (default is checked).

### **Network Watchdog**

This is an optional uSwitch internal network watchdog. It can be used if the uSwitch loses connection regularly due to a faulty/noisy network or unreliable power source. By default the Watchdog checks every 90 seconds for a network connection. After (3) three consecutive failures, the uSwitch reboots. Changing this period changes the frequency of the **Network Watchdog** test. Set this value to 0 to disable network Watchdog (with 90 seconds tests, the watchdog will take roughly five minutes to detect operational failure).

### **System Diagnostics** (checkbox)

This field should only be enabled by developers to enable internal diagnostics for a serial console. When Checked the Control Screen will Indicate "Dev. Mode" in the title of the first column adjacent to the **Operation** spinner.



## Notification Settings

This page sets up the eMail client. It also sets any port/connection requirements and identifies email/SMS recipients. The user can also select a few universal events that will automatically generate emails.

Control Center	uHaveControl™ Notification Settings <span style="float: right;"><a href="#">Help</a> <a href="#">Logout</a></span>	
Relay Settings	<b>Mode</b>	Off <input type="text"/>
Digital I/O Settings	<b>Use uHaveControl™ Mail Server</b>	Enable <input checked="" type="checkbox"/>
Analog I/O Settings	<b>SMTP Server URL (ip Detected) [47]</b>	
Virtual Relay Settings	<b>SMTP Port</b>	
Relay Watchdogs	<b>Encryption</b>	
Event Calendar	<b>Server Requires Authentication</b>	
Network Settings	<b>Account Name (Authentication Only) [47]</b>	
Port Forwarding	<b>Password (Authentication Only) [31]</b>	
User Account Settings	<b>Send eMail From [47]</b>	
Account Access Rights	eMail Receivers	
Port & System Settings	<b>1) Address/📠 SMS Number [47]</b>	myName@gmail.com
Notification Settings	<b>1) eMail or 📠 Carrier for SMS</b>	eMail <input type="text"/>
Event Log	<b>2) Address/📠 SMS Number [47]</b>	4032714442
Time/Date Settings	<b>2) eMail or 📠 Carrier for SMS</b>	Verizon <input type="text"/>
User Interface Settings	<b>3) Address/📠 SMS Number [47]</b>	
Modbus TCP/IP Settings	<b>3) eMail or 📠 Carrier for SMS</b>	eMail <input type="text"/>
Backup & Restore	<b>4) Address/📠 SMS Number [47]</b>	
Software Update	<b>4) eMail or 📠 Carrier for SMS</b>	eMail <input type="text"/>
About	<b>5) Address/📠 SMS Number [47]</b>	
Graphs	<b>5) eMail or 📠 Carrier for SMS</b>	eMail <input type="text"/>
User Manual	eMail and Test Options	
	<b>uSwitch Reboot Notification</b>	Enable <input checked="" type="checkbox"/>
	<b>Settings Update Notification</b>	Enable <input type="checkbox"/>
	<b>Test eMail/SMS on Save Changes</b>	None <input type="text"/>
	10/04/23, 03:40:04 PM	
	<a href="#">Save Changes</a>	<a href="#">Reset Entries</a>
	<a href="#">uSwitch by uHaveControl™</a>	

**Mode** (select box)

Off-disable all eMail. **Standard**-minimal eMail messages or **Detailed** for enhanced messaging.

**Use uHaveControl Mail Server™** (checkbox)

When checked the eMail server and settings are assigned by uHaveControl's test site. This should be used only during

initial mail setup and testing. It should be changed to a private mail server to ensure privacy and desired performance.

## SMTP Server URL

The URL or IP address for the SMTP mail server. (When URLs are used the gateway and the DNS fields on the **Network Settings** must be valid).

## SMTP Port (integer-port)

The uSwitchCS securely transmits emails using TLS/SSL. The standard port for TLS/SSL is 465. If the mail server user chooses requires a different port this value should be changed to the user's port.

## Encryption (selection box)

Use this selection box to determine whether to connect to an encrypted mail server or not, and to set the method of encryption. The three options are None, Auto or StartTLS. Typically non-secure email servers use an SMTP port of 25..

## Server Requires Authentication (checkbox)

Check this box if the specified Mail Server requires authentication (username and password)

## Account Name [47](text string)

Account name on the mail server (if required)

## Password [31](text string)

Account Password for mail server (if required)

## Send eMail From [31] (full email address)

This is the email address that will be identified as the sender's email to any mail recipients. It should reflect a legitimate account on your mail server. You can set it to a help desk or technical support address if you have one.

## 1..5) Address/SMS Number [41](full email address(s))

The Notification service allows up to five (5) notification recipients per uSwitch. When **eMail** is preferred this field should contain a legitimate eMail address. If SMS is preferred, this field should contain the phone number for the recipient's SMS.

## 1..5) eMail or Carrier for SMS ( Carrierselection box)

Select **eMail** to send notifications to an eMail account. Select a phone carrier to send notifications to an SMS recipient.

## uSwitch Reboot Notification (checkbox)

send notification whenever the uSwitch Reboots

## Settings Update Notification (checkbox)

Send notification whenever settings are modified

## Test eMail/SMS on Save Changes (selection box)

Selecting any eMail/SMS from this drop-down box, other than **None**, sends a test message to that recipient on **Save Changes**.

The Following table is a comprehensive list of all alarm/event messages, their configuration page, message text. Bracketed items are variable and based on the specific event, or user specified configuration value. If Enhanced email is checked on the Notification page, then all messages below will be preceded with the uSwitch's Name and Location as specified by the user in the Device Name, and Device Location fields on the User Interface Settings Page.

Event Type	Enabling Source	Event Message	Comment
Device Restart	Notification Settings	"uSwitch Started"	To enable check Notification box
Device Configuration Update	Notification Settings	"{Page Name} Settings Modified"	To enable check Notification box
CPU OverTemp	User Interface Settings	"Warning CPU Temp {Current Temp} exceeds Max Internal Temp {Max Temp}"	To enable set "Over Temp Notification" to a non-zero value
User Logout	Account Settings	"User Logged Out"	To enable check Notification box
User Login Timeout	Account Settings	"Browser Timed Out"	To enable set "Account Timeout" to a non-zero value.
Relay	Relay Settings	"{relay} Set to {state} by {event type}"	event type is the user configured event that generated the state change of the relay.
GPIO state Change	Digital I/O Settings	{gpio} changed to {state}	[state] and [gpio] are user defined strings. Enabled by notification checkbox on Digital I/O page.
GPIO Timed Change	Digital I/O Settings	{gpio} {state} alert!!!, for a time exceeding {x} seconds.	gpio and state are user defined text strings. [x] is the amount of elapsed time generating the event. Enabled by checkbox on Digital I/O page.
GPIO trigger Event	Digital I/O Settings	{gpio} Triggered on {trigger} value of {y}	gpio is user defined name string, trigger is range, y is numeric value. Enabled by checkbox on Digital I/O page.
GPIO cutoff Event	Digital I/O Settings	{gpio} Exceeds cutoff (cutoff{y} {units})	gpio is in counter mode, cutoff is the numeric value specified by the user as cutoff, units are as defined by user. Enabled by checkbox on Digital I/O page.
GPIO Rate (frequency) transition Event	Digital I/O Settings	{gpio} Crossed into {state} Range, Currently {y} {units}	gpio is user defined name, state is state based on the frequency, y is numeric frequency, units is user defined text string. Enabled by checkbox on Digital I/O page.
ADC Event	Analog I/O Settings	{adc} moved [above/below] Limit {x} {units}, currently {y} {units}	adc is user defined name, x is value of numeric limit, y is the current value, units is user defined. Enabled by checkbox on ADC page.
Watchdog Event	Relay Watchdogs	{relay} Watchdog entered fault mode	relay is the user defined watchdog name. Enabled by notification checkbox.
Watchdog Event	Relay Watchdogs	{relay} Watchdog got response after {x} failures	Number of failed attempts prior to reconnection event. Enabled by Notification Checkbox

# Event Settings

uSwitchCS maintains a system event log in non-volatile memory. The information recorded in Event Log is determined from the selections on this page.

Control Center		uHaveControl™ Event Log <span>Help</span> <span>Logout</span>	
Relay Settings	Logging		Enable <input checked="" type="checkbox"/>
Digital I/O Settings	Events to Log		
Analog I/O Settings	Settings Modified		Enable <input checked="" type="checkbox"/>
Virtual Relay Settings	Relay State Changes		Enable <input type="checkbox"/>
Relay Watchdogs	System Restart		Enable <input checked="" type="checkbox"/>
Event Calendar	Watchdog Reboots		Enable <input type="checkbox"/>
Network Settings	Watchdog Reboot Faults		Enable <input checked="" type="checkbox"/>
Port Forwarding	Page Changes		Enable <input type="checkbox"/>
User Account Settings	Login Events		Enable <input checked="" type="checkbox"/>
Account Access Rights	uSwitch Uploads		Enable <input checked="" type="checkbox"/>
Port & System Settings	Include User Names		Enable <input checked="" type="checkbox"/>
Notification Settings	<div style="border: 1px solid black; padding: 5px;"> <ul style="list-style-type: none"> <li>• 10/04/23, 03:35:40 PM ▶ NTP Client Got Time, Attempt 3</li> <li>• No NTP Connection (2 secs) ▶ IP_EVENT_STA-ETH_GOT_IP: Gateway Connected</li> <li>• No NTP Connection (2 secs) ▶ SE_STA_CONNECTED to NETGEAR60, chan:11, rssi:-72, auth=WPA2-PSK</li> <li>• No NTP Connection (1 secs) ▶ Starting Server, Port:80, Control:32768, Timeout:5s, MaxSockets=4</li> <li>• ▶ -----</li> <li>• ▶ Restart (Power Cycle), Software Rev. 14.73, Temp 97°F, Heap Size: 219.32kB, Low Water Mark: 135.88Kb</li> <li>• ▶ AP Station, 2.0 dBm, United States, NAT[On], MTU(s):1500, HTTP</li> <li>• ▶ User Accounts, Software Watchdog On, Network Watchdog On</li> <li>• ▶ NTP (north-america.pool.ntp.org, time-b.nist.gov), Time Zone[-5], Daylight Savings</li> <li>• ▶ ----- Cold Reboot -----</li> <li>• ▶ -----</li> <li>• No NTP Connection (0 secs) ▶ SE_AP_START: soft-AP start, forced by wifi_start</li> <li>• No NTP Connection (0 secs) ▶ SE_STA_START forced by esp_wifi_start</li> <li>• No NTP Connection (1 secs) ▶ Starting Server, Port:80, Control:32768, Timeout:5s, MaxSockets=4</li> <li>• ▶ -----</li> </ul> </div>		
Event Log			
Time/Date Settings			
User Interface Settings			
Modbus TCP/IP Settings			
Backup & Restore			
Software Update			
About			
Graphs			
User Manual			
<span>Update Log</span>		<span>Erase Log</span>	
10/04/23, 03:43:02 PM			
<span>Save Changes</span>		<span>Reset Entries</span>	
<small>uSwitch by uHaveControl™</small>			

## Logging (checkbox)

When checked the system creates entries that are put into the System Log. To download the log, select the Text within the Log's text window and copy it (click copy). The log can then be pasted into a text file or email message.

## Settings Modified (checkbox)

Creates a log entry whenever a configuration change is made.

## **Relay State Changes** (checkbox)

Creates a Log entry whenever a relay changes state.

## **System Restart** (checkbox)

Creates a log entry each time the system is rebooted, power cycled or reset.

## **Watchdog Reboots** (checkbox)

Creates a Log entry when a watchdog enters a reboot cycle.

## **Watchdog Reboot Faults** (checkbox)

Creates a log entry when a watchdog reboot fault is detected.

## **Page Changes** (checkbox)

Creates a log entry whenever a user navigates to a new page.

## **Login Events** (checkbox)

Creates a log entry on all user login events.

## **uSwitch Uploads** (checkbox)

Creates a log entry when a file is updated. Including firmware updates, SSL Keys or Certificates, etc.

## **Include User Names** (checkbox)

Whenever a log entry is made if it is the result of user activity, the current user is placed in the notification.

## **Update Log** (button)

Clears and re-writes the event log to include most recent events

## **Erase Log** (button)

Clear all entries in the log.

## Time/Date Settings (if NTP enabled)

The uSwitchCS supports scheduled events and an event log. Events occur according to an entered schedule. Accurate time is required to turn a relay on or off on a schedule and when logging events with accurate time stamps. To support accurate event logging, scheduling and messaging a real-time clock is employed. This page is used to configure clock settings.

Control Center		uHaveControl™ Time/Date Settings		Help	Logout
Relay Settings	NTP			Enable	<input checked="" type="checkbox"/>
Digital I/O Settings	Primary NTP Server [47]			north-america.pool.ntp.org	
Analog I/O Settings	Secondary NTP Server [47]			time-b.nist.gov	
Virtual Relay Settings	NTP Reset Period (Days)			3	▼
Relay Watchdogs	Custom Time Settings				
Event Calendar	Time Format (12/24 Hour)			12	▼
Network Settings	Time Zone (UTC Offset)			-5	▼
Port Forwarding	Daylight Savings			<input checked="" type="checkbox"/>	
User Account Settings	Daylight Savings Settings	Start Date	End Date		
Account Access Rights	Month	March	▼	November	▼
Port & System Settings	Week of Month (1-5)	2	▼	1	▼
Notification Settings	Weekday	Sunday	▼	Sunday	▼
Event Log	Hour (0-23)	2	▼	2	▼
Time/Date Settings	Enter Time/Date Manually				
User Interface Settings	Current Month				
Modbus TCP/IP Settings	Current Day				
Backup & Restore	Current Year				
Software Update	Current Hour (00-23)				
About	Current Minute (00-59)				
Graphs	Current Second (00-59)				
User Manual	Waiting For NTP (26 secs)				
		Save Changes		Reset Entries	
uSwitch by uHaveControl™					

### NTP (checkbox)

When checked an NTP server will be used to get and maintain time (preferred method). If an NTP server is used, gateway and DNS entries must be correctly set up in the **Network Settings** page. When unchecked time will be less reliable (electronic devices inherently lose time and an automated time update application, such as provided by NTP, minimizes time inaccuracies).

### Primary NTP Server [47](URL text string)

This is the IP address or URL of an NTP server (a list of public NTP Servers can be obtained by googling 'public NTP'). The default primary NTP Server is time-a.nist.gov.

### Secondary NTP Server [47](URL text string)

In the event the Primary NTP Server is not available, the secondary NTP server provides back-up. Default secondary server is time-b.nist.gov.

### NTP Reset Period (Days) (selection box)

In order to maintain accurate time, a periodic time update request is sent to an NTP Server. The value in this field will be the number of days between time update requests. There is a minimum of 24 hours between updates (preventing a device from flooding a time server) and a maximum value of 30 days (factory default: 3 days).

### Time Format (12/24 Hour) (custom select box)

Select whether time is displayed and recorded in a 12 or 24 hour format (12 hour formats include an AM/PM designation).

### Time Zone (UTC offset) (custom select box, NTP mode only)

NTP servers provide time in Universal Greenwich Mean Time (GMT) format. This time can be adjusted to a local time using the local UTC Offset. The Time Zone selected should be based on the time zone for the location of the uSwitchCS or the time zone where its readings are to be processed (default Time Zone is US-Eastern Standard Time).

### Daylight Savings (checkbox, NTP mode only)

When checked, time is adjusted to account for daylight savings in the specified time zone. If daylight savings is enabled the user will need to enter the **Start Month** for daylight savings, the **Start Week** in the Start month, and the **Start Hour** on the Month/Week combination. Similarly the **End Month**, **End Week** and **End Hour** should be programmed.

## Enter Time/Date Manually (NTP not enabled)

When NTP is not enabled or an NTP server is not accessible, the user should enter the current date and time manually. The following fields are displayed when NTP is disabled (note: daylight saving and time zone fields are unnecessary in this mode).

Control Center	uHaveControl™ Time/Date Settings <span>Help</span>	
Relay Settings	Enable NTP	<input type="checkbox"/>
Digital I/O Settings	Clock (12/24) Hour	12
Analog I/O Settings	NTP Off, Manually Enter Time and Day	Date/Time
Virtual Relay Settings	Current Month	June
Relay Watchdogs	Current Day	13
Event Calendar	Current Year	2027
Event Times	Current Hour (0-23)	17
Network Settings	Current Minute (0-59)	24
Port Forwarding	Current Second (0-59)	54
Security & Port Settings	05:25:01 PM 06/13/27	
Notification Settings	<span>Save Changes</span>	<span>Reset Entries</span>
Log Settings		
Time/Date Settings		
User Interface Settings		
Backup & Restore		
Software Update		
About		
User Manual		

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Enter the current Month, Day, Year, Hour, Minute and Second in the **Enter Time/Date Manually** section of the Page. Using this mechanism, it is expected that time will become less accurate as time from the entry moves on. It is recommended to enter time daily or by automated script/API if an NTP server in situations where an NTP server is not available.

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## User Interface Settings

This page configures general system settings, such as color schemes, menu settings, Interface/OEM options.

Control Center	uHaveControl™ User Interface Settings <span>Help</span> <span>Logout</span>	
Relay Settings	System Customizations	
Digital I/O Settings	Title & Menu Color	Black ▼
Analog I/O Settings	Section Title Color	Yellow ▼
Virtual Relay Settings	Button Color	Green ▼
Relay Watchdogs	Hover Color	Magenta ▼
Event Calendar	Devices Per Settings Page	2 ▼
Network Settings	Measurement Standard	English ▼
Port Forwarding	Over Temperature Notification °F (0=None)	165
User Account Settings	Blink Triggered Relays <input checked="" type="checkbox"/>	Enable Help/Info Pages <input checked="" type="checkbox"/>
Account Access Rights	Display Icons <input type="checkbox"/>	
Port & System Settings	OEM Customizations	
Notification Settings	Device Name [15]	uSwitch
Event Log	Device Location [31]	Boston
Time/Date Settings	Latitude	42.3601
User Interface Settings	Longitude	71.0689
Modbus TCP/IP Settings	Company Name [15]	uHaveControl
Backup & Restore	Company Website [127]	www.uHaveControl.com
Software Update	Emergency Call Dispatch [13]	800-000-0000
About	Support/Manual Link [127]	https://uhavecontrol.com/pages/support
Graphs		
User Manual		
	<span>Save Changes</span>	<span>Reset Entries</span>
	uSwitch by uHaveControl™	

### Title & Menu Color (color selection checkbox)

Sets Color of Web Page Title and Menu items. In this instance the Title & Menu Color is Black.

### Section Title Color (color selection checkbox)

Sets Colors of Text Sections. In this instance the Section Color is Yellow.

### Button Color (color selection checkbox)

Button color for non-dynamic I/O buttons whose color isn't changed when the state of an Input/Output changes.

### Hover Color (color selection checkbox)

Sets Colors of Current Selected line/Item. In this instance the Hover Color is set to Magenta.

### Devices Per Settings Page (color selection checkbox)

This field sets the number of devices that can be programmed from a single configuration page where there are multiple devices, such as the Relays, Digital I/Os, Analog I/Os and Virtual Relay.



## **Measurement Standard** (select Measurement Standard)

Specifies measurement system (English/Metric) to be used for numerics, such as Celcius or Farenheit.

## **Over Temperature Notification** (temperature)

Whenever the internal temperature of the uSwitch CPU exceeds this temperature a notification will be sent. If the value is 0 nothing is done.

## **Blink Triggered Relays** (checkbox)

When relays are controlled by an event, they blink.

## **Enable Help/Info Pages** (checkbox)

Uncheck this box to remove page specific help from the interface.

## **Display Icons** (checkbox)

Check this box to display OEM Icons. OEM Icons affect page load performance. It is recommended to keep this box unchecked.

# **OEM Customizations**

## **Device Name** (text string)

Name used in reference to this Device on all Interfaces, Notifications and Log Entries.

## **Device Location** (text string)

This optional field is used for reference and will be included in logged information as to the specific site of the uSwitch deployment. The user should enter any device/site specific details here.

## **Latitude/Longitude** (float)

uSwitch's Latitude, used for sunrise/sunset scheduling in calendar events. Northern Latitudes should be positive, southern Latitudes should be negative. For Longitude entries, East of PM is positive, West of PM is negative.

## **Company Name** (text string)

This field is displayed on the heading of all web pages and should represent the name of a company or product or application. In this example the Company is uHaveControl.

## **Company WebSite** (URL text string)

This link will be on the bottom center of all pages. The link points to a web-site of the OEM's choosing (typically their own). Clicking the field on any page brings the user to that page. The page should be accessible on the uSwitch's network.

## **Emergency Call Dispatch** (checkbox)

This is an optional phone number that can be referenced in event of a system problem or emergency event.

## **Support/Manual Link** (URL text string)

This link will point to a manual for the uSwitchCS, default is the uHaveControl CS manual link. In the event an OEM chooses to develop their own manual, this link should be set to point to the OEM's manual.

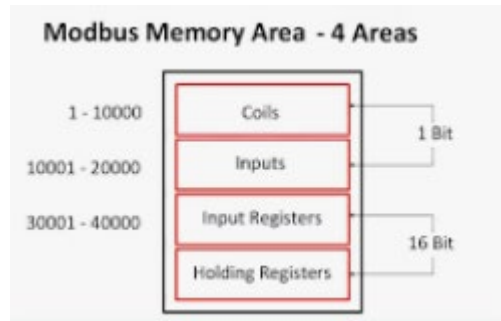
# Modbus Settings

This page configures the settings for turning on/off Modbus and its features.

When enabled the uSwitchCS supports Modbus/TCP slave operation. Via this interface other TCP devices can monitor and control operation of the uSwitchCS from pre-existing applications, such as SCADA to support or enhance or build PLC and RTU applications. By default uSwitch Modbus uses TCP Port 502, but this port can be programmed as desired. uSwitch supports the following traditional Modbus Registers and they are used as defined.

<b>Coils (r/w)</b>	Relays
<b>Discrete Inputs</b>	GPIOs, Flags
<b>Inputs (r)</b>	ADC Sensors
<b>Holding Registers (r/w)</b>	DACs, PWMs, Counts (to be implemented)

Per the Modbus specification, the uSwitch acts as a slave and never initiates communication. Comprehensive Modbus usage/programming details are available at [www.modbus.org](http://www.modbus.org).



uSwitchCS supports the following Modbus commands/addresses

Command	Function Code	Address	Length in Bits	I/O Range
Read Discrete Input (GPIO)	02	0x0000	1	10001-20000
Read Discrete Output (Coil)	01	0x0000	1	00001-10000
Write Discrete Output (Coil)	05	0x0000	1	00001-10000
Read Input Value (ADC Input)	04	0x0000	32 bits	30001-40000
Read *Holding Register	03	0x0000	32 bits	40001-50000
Write *Holding Register	06	0x0000	32 bits	40001-50000
(Holding Registers not yet defined)				
*Write Multiple Discrete Outputs (Coil)	15	0x0000	1	00001-10000
*Write Multiple Holding Registers	16	0x0000	32 bits	40001-50000

Control Center	<b>uHaveControl™ Modbus TCP Settings</b> <span style="float: right; border: 1px solid black; padding: 2px;">Help</span>	
Relay Settings		
Digital I/O Settings		
Analog I/O Settings		
Virtual Relay Settings	Enable	<input checked="" type="checkbox"/>
Relay Watchdogs		
Event Calendar		
Network Settings	Big Endian	Enable <input type="checkbox"/>
Port Forwarding		
Account Settings		
Port & System Settings	Slave Port	<input type="text" value="502"/>
Notification Settings		
Log Settings	11:17:36 AM 06/07/22	
Time/Date Settings		
User Interface Settings		
Modbus TCP Settings	<span style="border: 2px solid green; padding: 5px; color: white;">Save Changes</span>	<span style="border: 2px solid red; padding: 5px; color: white;">Reset Entries</span>
Backup & Restore		
Software Update		
About	<small>uSwitchCS by uHaveControl™</small>	
Graphs		
User Manual		

## Enable

Enables the MODBUS slave mode.

If Modbus is not required this field should not be checked. The Modbus slave uses uSwitch resources and enabling Modbus prevents other applications from using the resources it requires.

## Big Endian

Sets the endian format of the two 16 bit values returned in master float fields.

For 32 bit values two reads may be required. For instance, to read ADC0, read address 300001 followed by 300002.

CS data is stored in little-endian format. This means the most significant word (two bytes) is always at the low order address and the least significant word is stored at the high order address. In big-endian form both words are stored in the order they show up.

## Slave Port

Sets the TCP Port for Modbus TCP. (make sure port is not blocked by firewall)

# Cloud Settings

The Cloud Settings page enables and configures the MQTT protocol for Cloud based applications. A publish/subscription model is available to OEMs that want to generate their own interface and or provisioning via MQTT. Automatic provisioning is currently supported for the AWS IOT Core.

Control Center	uHaveControl™ Cloud Settings <span>Help</span>	
Relay Settings	Cloud Framework	
Digital I/O Settings	Enable MQTT Client	Enable <input type="checkbox"/>
Analog I/O Settings	Use AWS IOT Core	Enable <input checked="" type="checkbox"/>
Virtual Relay Settings	AWS Provisioning Method	Fleet <input type="text"/>
Relay Watchdogs	MQTT Broker [63]	
Event Calendar	MQTT Port	8883
Event Times	Account ID [15]	uCloud_60C13B91
Network Settings	Publish Topic [47]	policy/relays/
Port Forwarding	Subscribe Topic [47]	policy/relays/
User Account Settings	QoS Level	1 <input type="text"/>
Account Access Rights	Event Driven	Enable <input checked="" type="checkbox"/>
Port & System Settings	Loop Interval (secs)	5 <input type="text"/>
Notification Settings	Provisioned State	None
Event Log	Cloud Device [31]	uSwitch_60C13B91
Time/Date Settings	Provision by Claim	<input type="button" value="Provision"/>
User Interface Settings	Payload Telemetry	
Cloud Settings	Relays <input type="checkbox"/>	GPIOs <input type="checkbox"/>
Modbus TCP/IP Settings	ADCs <input type="checkbox"/>	Test <input type="checkbox"/>
Backup & Restore	Waiting For NTP (22 secs)	
Software Update	<input type="button" value="Save Changes"/>	<input type="button" value="Reset Entries"/>
About	uSwitch by uHaveControl™	
Graphs		
User Manual		

**Enable MQTT Client** Enables the MQTT engine.

If cloud APIs are not being used this field should not be checked. The MQTT Client uses uSwitch resources and enabling MQTT prevents other applications from using the resources it requires.

**Use AWS IOT Core**

By default the AWS IOT Core is embedded into the uSwitch Application. If your application uses IOT Core, check this box. If you are using a different MQTT/Cloud interface this box should be un-checked and the MQTT Broker field is used to enter the ARN for a custom Cloud/MQTT Interface.

**AWS Provisioning Method**

Three methods are supported for AWS IOT core device provisioning. Fleet, Pre-registered Key/Certificate, or User Name/Password. Currently only Fleet provisioning is supported.

## MQTT Broker

If **Use AWS IOT Core** is not checked, this field should contain the ARN/link of the broker that is to subscribe/publish MQTT Messages for the uSwitch.

## MQTT Port

Identifies ports being used by the MQTT Broker. Standard ports are MQTT/MQTTS(1883/8883) or WSS/WS (443/80), HTTPS/HTTP (443/80).

## Account ID

Unique Account ID for the uSwitch that is included in MQTT payload to identify device

## Publish Topic

Path used for Publishing Topics to the Broker

## Subscribe Topic

Path for incoming published topics from Broker

## QoS Level

The QoS Level for Published topics

## Loop Interval

Time between Publishing Topics. If 0, only Event driven telemetry (if enabled) is sent.

## Event Driven

If checked, telemetry is asynchronous on events. Loop telemetry may still be sent if the Loop Interval is non-zero.

## State

Indicates Provisioning state of current device

## Cloud Device

Name of Provisioned Device returned from Broker

## Provision By Claim

Button to Provision an AWS IOT Core Device

## Payload Telemetry

Payload Telemetry is the telemetry that will get Published according to the Loop Interval or on Event as programmed

## Relays

Builds payload status for all Relays

## GPIOs

Builds payload status for all GPIOs

## ADCs

Builds payload status for all ADCs

## Test

MQTT testing purposes only!

## Cloud API and uSwitch Configuration

Once provisioned the uSwitch can be fully programmed using standard JSON statements over MQTT. The following tables

show the JSON for programming all uSwitch features.

Note: Mis-configuration of network/protocol parameters may result in undefined operation. If the device becomes uncommunicative, or unreliable you may have to restore the factory default settings and start over.

# Backup & Restore

This page is used to Backup/Restore configuration settings to/from your local machine. Checkboxes under **Select Items to Backup** determine which page settings are backed up. In a multi-uSwitch deployment where many settings are the same, a user can effectively set up one uSwitch and then create a backup file or template. The template can then be used to stamp out multiple devices with similar settings. In this situation, if devices are being restored from the backup file and are on the same network, care should be taken to ensure that all devices have different and appropriate network IPV4 addresses and ports. For this reason it is recommended to manually program network entries and not restore them from common templates that could result in network conflicts. The data in the scrollable text area labeled "Backup File" shows the current uSwitch configuration settings as selected by the boxes that are checked. This data will be backed up to your template should you click on **Choose File** in **File to Backup To**.

Control Center		uHaveControl™ Backup & Restore		Help	Logout
Relay Settings	Select Items to Backup				
Digital I/O Settings	Relay Settings <input checked="" type="checkbox"/>	Digital I/O Settings <input checked="" type="checkbox"/>			
Analog I/O Settings	Analog I/O Settings <input checked="" type="checkbox"/>	Virtual Relay Settings <input checked="" type="checkbox"/>			
Virtual Relay Settings	Relay Watchdogs <input checked="" type="checkbox"/>	Account Access Rights <input type="checkbox"/>			
Relay Watchdogs	Port & System Settings <input checked="" type="checkbox"/>	Notification Settings <input checked="" type="checkbox"/>			
Event Calendar	Event Log <input checked="" type="checkbox"/>	Time/Date Settings <input checked="" type="checkbox"/>			
Network Settings	User Interface Settings <input type="checkbox"/>	Modbus TCP/IP Settings <input type="checkbox"/>			
Port Forwarding	Backup File (Based on Selected Items)				
User Account Settings	<pre>configRelays?relN0=Relay1- i&amp;relOff0=Off&amp;relOn0=On&amp;relLoClr0=Red&amp;relHiClr0=Green&amp;relMom0=30&amp;relPOS0=Off&amp;relMode0=Toggle&amp;relSync0=GPIO1- i&amp;relOp0.v=false&amp;relLat0.v=false&amp;relShow0.v=true&amp;relP0.v=false&amp;relEm0=None&amp;relLog0=None configRelays?relN1=Relay2- i&amp;relOff1=Off&amp;relOn1=On&amp;relLoClr1=Red&amp;relHiClr1=Green&amp;relMom1=30&amp;relPOS1=Off&amp;relMode1=Toggle&amp;relSync1=GPIO1- i&amp;relOp1.v=false&amp;relLat1.v=false&amp;relShow1.v=true&amp;relP1.v=false&amp;relEm1=None&amp;relLog1=None configRelays?relN2=Relay3- x&amp;relOff2=Off&amp;relOn2=On&amp;relLoClr2=Red&amp;relHiClr2=Green&amp;relMom2=30&amp;relPOS2=Off&amp;relMode2=To</pre>				
Account Access Rights	File to Backup To		Choose File No file chosen		
Port & System Settings	File to Restore From		Choose File No file chosen		
Notification Settings					
Event Log					
Time/Date Settings					
User Interface Settings					
Modbus TCP/IP Settings					
Backup & Restore	Save Changes		Reset Entries		
Software Update					
About					
Graphs					
User Manual	uSwitch by uHaveControl™				

**File to Backup To** Select a file on the connecting device to backup all selected settings.

**File to Restore From** Select a file on the connecting device to download all uSwitch Settings from.

# Software Update Page

This page is used for downloads or updates. Several types of downloads are supported: **Host Firmware, Host Certificate, Host Key, Host Logo, SMTP Certificate** and **FTP Certificate**. SSL keys/certificates must be in PEM format. SSL keys and certificates are preserved when a firmware update or factory restore is done. For details on creating Certificates and Keys, using openssl, refer to that section in the appendix.

Control Center		uHaveControl™ Software Update		Help	Logout
Relay Settings	File Selection Parameters				
Digital I/O Settings	Firmware Rev.			14.73	
Analog I/O Settings	Boot Address			0x00080000	
Virtual Relay Settings	File To Update		None	▼	
Relay Watchdogs	File On Server [63]			openssl14.60.bin	
Event Calendar	File Server Parameters				
Network Settings	File Server URL [47]			uhc-aws.s3.amazonaws.com	
Port Forwarding	File Server Port (Must be Secure)			443	
User Account Settings	User Name [31]				
Account Access Rights	Password [31]			*****	
Port & System Settings	Unique Host Name			uSwitch_60C13B91	
Notification Settings	Require Update Confirmations			Enable	<input checked="" type="checkbox"/>
Event Log	Certificate Information				
Time/Date Settings	No Data				
User Interface Settings					
Modbus TCP/IP Settings					
Backup & Restore					
Software Update	Upload Directions				
About	Previous Firmware				
Graphs	10/04/23, 04:39:44 PM				
User Manual	Upload File				
	Unload All				
uSwitch by uHaveControl™					

## File Selection Parameters

**Firmware Rev.** (text Read Only)

Displays the installed firmware version.

**Boot Address.** (text Read Only) Shows the internal address for the next firmware download.

**File to Update** (custom select box)

This selection box provides the user with all uSwitch possible updates. After an upload completes, the **File to Update** field is reset back to **None**. Resetting back to **None** forces a user to specify an upload file prior to every upload, preventing unintentional uploads into the wrong file which could lock up the system.



1. **None** – Clicking upload will have no effect (no image selected)
2. **Host Logo** – Upload a small jpg or image file
3. **Host Firmware** – Upload new firmware to the uSwitch
4. **Host Key** – Upload a custom Server key file.
5. **Host Certificate** – Upload a custom Server Certificate
6. **SMTP Certificate** – Client Certificate for the SMTP Mail Server
7. **FTP Certificate** – Client Certificate for the FTP Site

### **File on Server** (path/filename)

File path and name as required to point to the file on the remote server. To reach a remote server, gateway and DNS pointers in the Network Settings must be set up correctly.

## **File Server Parameters**

### **File Server URL [47]** (URL text string)

The network Address (URL) for the file server

### **File Server Port** (integer-port)

Remote file Server's port number

### **User Name [31]** (text string)

If required, userName for access to file server

### **Password [31]** (text string)

If required, password to access the file server

### **Unique Host Name** (Read-Only text string)

The Host name

### **Require update Confirmations** (checkbox)

When checked all firmware upgrades require a final confirmation from the user. If confirmation is not received within ten minutes after an upload, the previous version of firmware will be automatically restored (this prevents a corrupt upload from bricking the system). To confirm an upload the user must remain or return to this page, on upload completion, and click on the, "**Confirm Upload**" button, which will only be visible if an upload succeeds. If no confirmation is made within ten minutes of a firmware upgrade, the uSwitch restores the previous firmware and issues a system reset (restoring the system to its state prior software). It is recommended that this checkbox remain selected as a guaranteed system recovery mechanism.

### **Upload Directions** (button)

This button displays a step-wise set of instructions fully describing the upload procedures.

### **[Confirm Upgrade]** (button)


This button is only visible after a successful firmware upgrade has occurred. The user must click Confirm Upgrade within 10 minutes of completion otherwise the new update will be removed and the previous version of running firmware shall be restored.

### **Upload File** (text string)

This button is used to start the selected file upload to the uSwitch. **Note: after any upload or on initial connection, the File to Update selection box is always reset to None. This is because an unintentional upload to any file could lock up the system if the wrong file were to be uploaded to firmware or into a certificate. To reduce the possibility of this occurrence the user is forced to intentionally select the upload type on or before every upload.**

## **About Page**

General Information page (all fields read-only).

Control Center		uHaveControl™ About uSwitch <span>Help</span> <span>Logout</span>	
Relay Settings	<a href="#">Hardware Version</a>		V3.01
Digital I/O Settings	<a href="#">Firmware Version</a>		14.73
Analog I/O Settings	<a href="#">Firmware Date</a>		Sep 30 2023
Virtual Relay Settings	<a href="#">Firmware Time</a>		16:11:37
Relay Watchdogs	<a href="#">Tool Kit</a>		v4.4.3-dirty
Event Calendar	<a href="#">OS Version</a>		V10.4.3
Network Settings	<a href="#">TLS Rev.</a>		V2.28.1
Port Forwarding	<a href="#">Model</a>		uStation WxT 1.0
User Account Settings	<a href="#">Hardware</a>		32-R1 (3), 2 Processors
Account Access Rights	<a href="#">Heap RAM (total---free---low water)</a>		219.32kB---89.90kB---79.82kB
Port & System Settings	<a href="#">Station MAC</a>		EC:62:60:C1:3B:90
Notification Settings	<a href="#">Access Point MAC *</a>		EC:62:60:C1:3B:91
Event Log	<a href="#">Ethernet MAC</a>		EC:62:60:C1:3B:93
Time/Date Settings	<a href="#">Dynamic WAN IP</a>		Requires HTTPS mode
User Interface Settings	<a href="#">Allowed Input Voltage (Vdc)</a>		9-30 Vdc
Modbus TCP/IP Settings	<a href="#">ADC Voltage Reference</a>		0.000 mV
Backup & Restore	<a href="#">Core Temp. (165°F-Max)</a>		100°F
Software Update	<a href="#">Local Sunrise Time</a>		07:00:00 PM
About	<a href="#">Local Sunset Time</a>		07:00:00 PM
Graphs	<a href="#">Partitions</a>		2
User Manual	<a href="#">Software Watchdog</a>		On
	<a href="#">System Diagnostics</a>		Off
	<a href="#">Devices Discovered (MDNS)</a>		uSwitch_EBB79E99:192.168.0.44 09780-IPV4
	<a href="#">Website Logo</a>		
	<a href="#">Emergency Call Dispatch [13]</a>		<span style="background-color: red; color: white; padding: 2px;">800-000-0000</span>

**Hardware Version** - Hardware revision number.

**Firmware Version** - Firmware revision number.

**Firmware Date** - Firmware creation date.

**Firmware Time** - Firmware creation time.

**Tool Kit** - Libraries used in the firmware build.

**OS Version** - Revision of the Operating System.

**TLS Rev.** - Revision of TLS security in build.

**Model** - OEM product model

**Hardware** - Device Hardware Details

**Heap Ram** - Memory usage Info.

**Station MAC** - MAC address of Station Adapter.

**Access Point MAC** - Mac address of Access Point.

**Ethernet MAC** - Mac address of Ethernet Adapter

**Dynamic WAN IP** - Provides address of Dynamic IP (HTTPS mode only)

**Allowed Input Voltage (VDC)** - Input voltage range for the uSwitch.

**ADC Voltage Reference** - Voltage reference, used to calibrate the A/D.

**Core Temperature** - Internal Temperature of the CPU

**Local Sunrise Time** - Sunrise time based on Latitude and Longitude settings

**Local Sunset Time** - Sunset time based on Latitude and Longitude settings

**Partitions** - Number of Device Partitions

**Software Watchdog** - Status of Software Watchdog

**System Diagnostics** - State of system Diagnostics

**Devices Discovered (MDNS)** - Links to all uSwitch Devices discovered via Multicast DNS on the local subnet

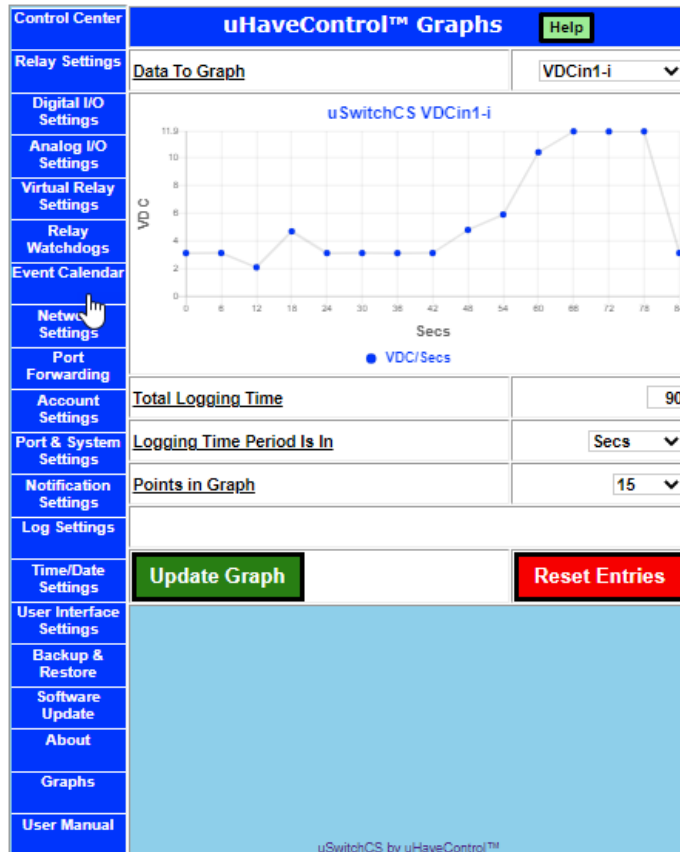
**Website Logo** (icon)

Current downloaded OEM Logo. Logo can be updated by downloading one from a server via the **Software Update** menu.

**Emergency Call Dispatch**

Call number for emergencies (as set by User).

**Graphs**



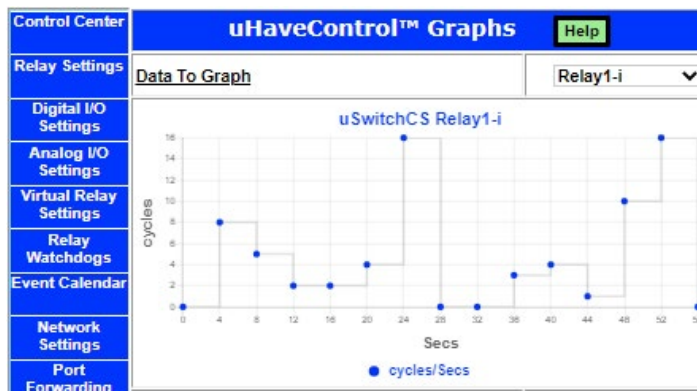
**Data To Graph**- Pull down selection box for all items that can be graphed(ADC/Relay/GPIO)

**Total Logging Time** - Total amount of time (x-axis) for the entire graph per field below

**Logging Time Period is In** - Time period for **Total Logging Time** (Secs/Mins/Hrs)

**Points in Graph** - Number of data points to draw

Note: If data is digital, non-sensor data (GPIO or Relay), each point represents the total number of changes to that value for any in the represented time period. Digital data graphs are stepped as below



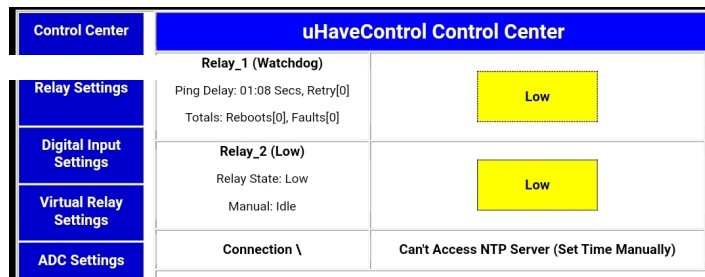
# uSwitchCS Control Center Operating Modes

## Control Center (Relay 1- Momentary Mode)

The image below shows the Control Center with relay one configured as a twenty (30) second momentary (or pulsed) relay (a relay is configured into momentary mode from the Relay Configuration page). In this case clicking the relay 1 button will force it to change state, countdown to zero (currently 5) and then changes back to its initial state. To change the relays starting state, temporarily disable momentary mode by setting the momentary time to zero (0) (from Relay Configuration page). This puts the relay into latching mode. Then manually change the state of the relay (on the Control Center page) to the desired initial state. Finally put the relay back into momentary mode by putting in a non-zero momentary time (from the Relay Configuration page). Note: Once a momentary countdown has started the push button relay controls are disabled until countdown completes (during countdown mode the colors of the relay flash between its current state and yellow).

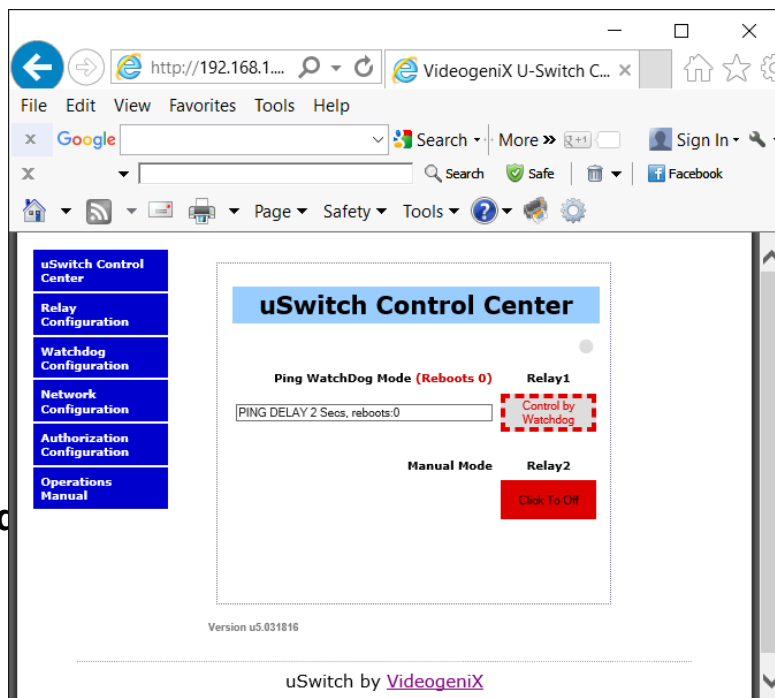
## Control Center (Relay1 Watchdog Mode, Startup Delay phase)

The image below shows the Control Center with relay1 configured in Watchdog/"Ping Auto Reboot" mode (a relay is placed in watchdog mode from the Relay Configuration page)..A grayed out relay button indicates manual control is disabled when watchdog mode has been turned on. Whenever a relay is in watchdog mode it cannot be manually controlled by a push button (however there is a watchdog over-ride from the relay configuration screen). The image below shows Relay1 in Watchdog mode. On the screen below the watchdog feature has started the initial startup countdown specified by the startup delay entry before testing for connectivity, currently 1 min, 33 seconds remain before Watchdog mode becomes fully active. A minimum recommended startup countdown time of five minutes (300 seconds) is recommended which would allow slow connecting devices time to reconnect to the network before the uSwitchCS begins testing for connection



## Control Center (Relay1 Watchdog Mode, Ping Delay phase)

The image below shows the Control Center with Relay 1 configured in Watchdog Mode, during the, "Ping Delay" phase. The Ping Delay Phase is the time between successive pings to the same URL. A recommended time of 90 seconds for the "ping delay" setting is suggested. Note: During Watchdog mode manual push-button relay control is disabled so the relay control button is grayed out.



## Control Center (Relay1 Watchdog Mode, Ping Delay phase)

The image below shows the Control Center with Relay1 configured in Watchdog Mode. In this instance the uSwitch is attempting to ping the URL “yahoo.com” assigned for Relay 1 to determine if Relay 1 needs to be cycled. Also, note this is the 1st attempt to communicate with the URL.

Control Center	uHaveControl Control Center	
Relay Settings	<b>Relay_1 (Watchdog)</b> Ping Delay: 01:08 Secs, Retry[0] Totals: Reboots[0], Faults[0]	Low
Digital Input Settings	<b>Relay_2 (Low)</b> Relay State: Low Manual: Idle	Low
Virtual Relay Settings		
ADC Settings	Connection \	Can't Access NTP Server (Set Time Manually)

### Control Center (Relay1 Watchdog Mode, auto reboot countdown phase)

The image below shows the Control Center with Relay1 configured in Watchdog Mode. The uSwitchCS automatically is cycling the relay after failing to get responses from the URLs specified by the user on the Watchdog Configuration page for Relay1. The screenshot below shows the reboot countdown time remaining and will turn power back on to the device when the countdown reaches 0. The amount of time for the relay to be cycled is as specified in the “Relay Cycle Time” field on the Watchdog Configuration page. After a reboot of the device the Watchdog will again initiate a startup delay countdown and hold off communication tests until the device Startup period completes.

Control Center	uHaveControl Control Center	
Relay Settings	<b>Relay_1 (Watchdog)</b> Ping Delay: 01:08 Secs, Retry[0] Totals: Reboots[0], Faults[0]	Low
Digital Input Settings	<b>Relay_2 (Low)</b> Relay State: Low Manual: Idle	Low
Virtual Relay Settings		
ADC Settings	Connection \	Can't Access NTP Server (Set Time Manually)

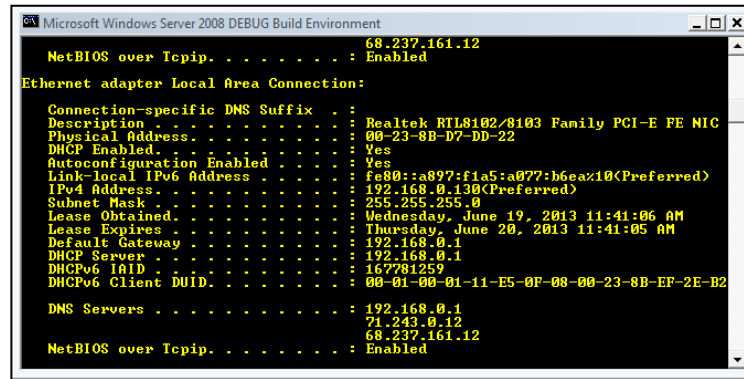
## Control Center (Relay1 Watchdog Mode, Fault Mode)

The image below shows the Control Center with Relay1 configured in Watchdog Mode. The uSwitchCS goes into Watchdog "Fault Mode" after the number of consecutive reboot attempts exceeds the user specified "Max Reboot Attempts". The screenshot below shows the uSwitchCS has attempted three consecutive reboots without success. The amount of time left in Fault Mode is 1 hour 46 Mins, 11 Secs. After the Fault Mode counts down to 0, the Watchdog will again initiate normal operation. The purpose of fault mode is after so many consecutive failures the uSwitchCS discontinues rebooting the device for a specified amount of time before restarting reboot attempts. This prevents continuously rebooting a device that may be working fine and the failure is elsewhere on the network. If at any time during "Fault Mode" the uSwitchCS determines the device is again operating normally the uSwitchCS will exit "Fault Mode" and transition back into normal Watchdog mode.

Control Center	uHaveControl Control Center	
Relay Settings	<b>Relay_1 (Watchdog)</b> Ping Delay: 01:08 Secs, Retry[0] Totals: Reboots[0], Faults[0]	Low
Digital Input Settings	<b>Relay_2 (Low)</b> Relay State: Low Manual: Idle	Low
Virtual Relay Settings		
ADC Settings	Connection \	Can't Access NTP Server (Set Time Manually)

## MAC Address

This is the physical address permanently assigned to a given uSwitchCS. It cannot be modified however it can be used to verify which LAN IP address is connected to which uSwitchCS by executing either an arp -a command (from a windows computer in a DOS or command window), or when running the uSwitchCS discovery utility.



To access a uSwitchCS remotely from an outside network, WAN or the internet you will need to set up port forwarding (also called NAT, Port Forwarding or Virtual Port addressing) on your router or gateway. You can set this up from your router's configuration page as follows:

1. Assign a specific and unique port to each uSwitchCS from the Network Configuration page of the uSwitchCS
2. Find the Port Forwarding/Virtual Server/NAT configuration in your router and specify the unique port number assigned to each uSwitchCS (from the network configuration page) along with each uSwitchCS's private IP address assigned in the step above.
3. If you are on a static IP line you may use a 3rd Party free DDNS provider to register a Domain Name for your Router (URL). Map your router to the free DDNS provider selected.
4. If the address assigned to your router by your ISP is dynamic (changes regularly) then you will need to set up the dynamic DNS page of your router to map the URL to a Dynamic IP Name Server (consult your router's user configuration manual).
5. Browse to your uSwitchCS using the following protocol from a browser; <http://myNetworksURL:myuSwitchPortNumber> (i.e. <http://myHomeRouter:8000>)

## Generating PEM files and running OpenSSL to serve files to Firmware/File/Icon upload Page

```
/* Root cert for howsmysl.com, taken from server_root_cert.pem
The PEM file was extracted from the output of this command:
openssl s_client -showcerts -connect www.howsmysl.com:443 </dev/null
```

The CA root cert is the last cert given in the chain of certs.

To embed it in the app binary, the PEM file is named in the component.mk COMPONENT\_EMBED\_TXTFILES variable.

```
*/
```

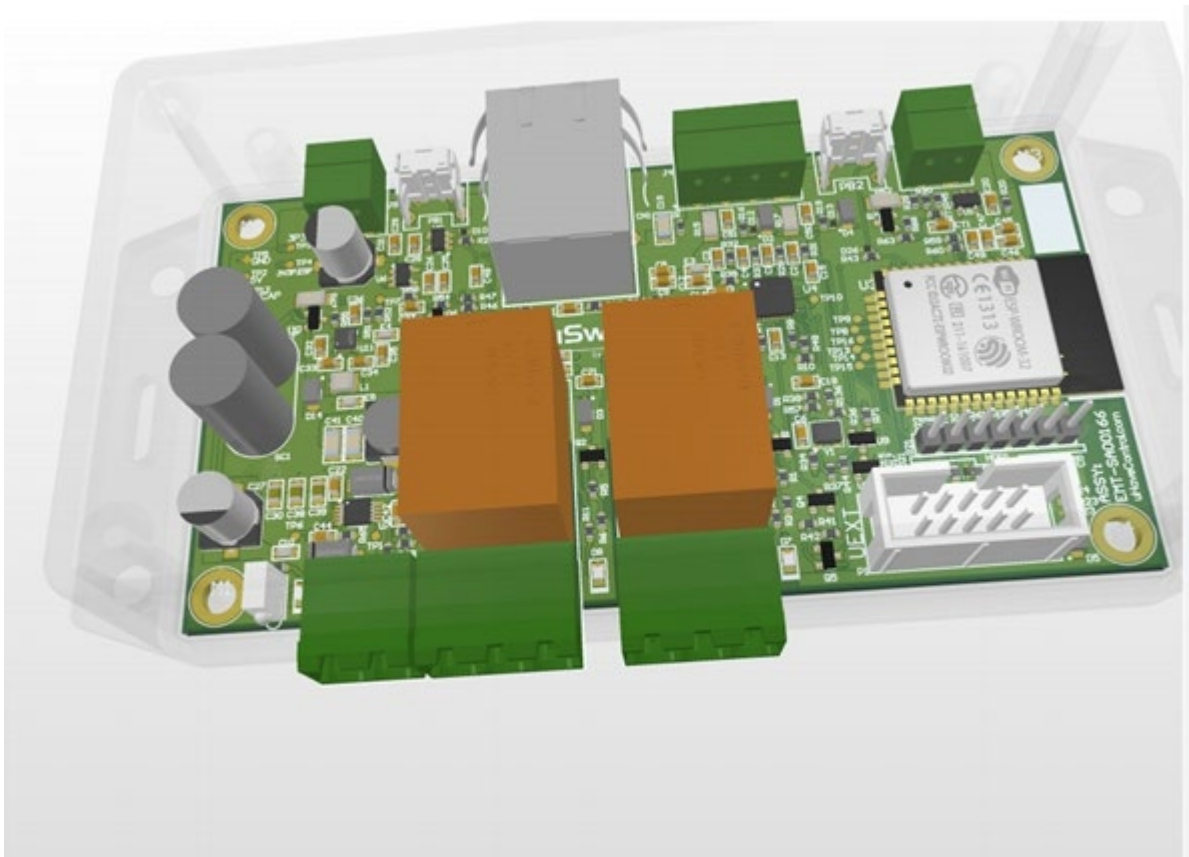
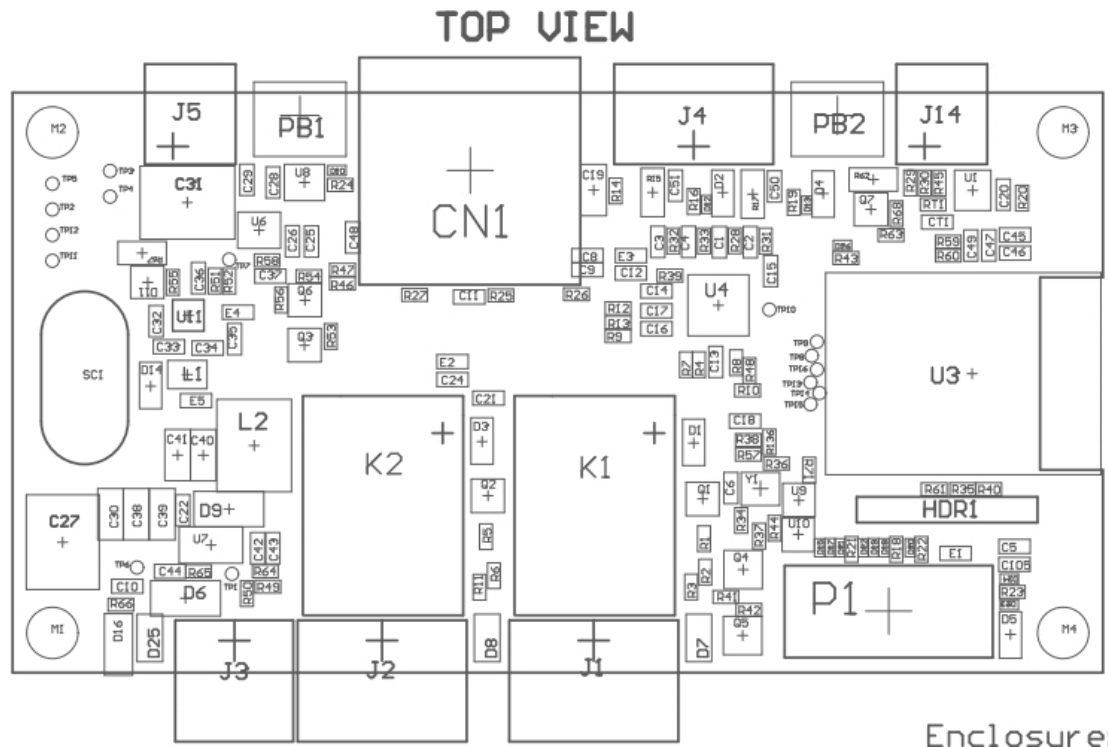
```
buildWebServerForm(SSL *ssl,int iCode)
```

```
start a web server. put files into the directory.
// You must have files on a remote web server...
// openssl s_server -WWW -key prvkey.pem -cert cacert.pem -port 443 -status_verbose -debug
```

```
"openssl req -x509 -newkey rsa:2048 -keyout ca_key.pem -out ca_cert.pem -days 365 -nodes"
```

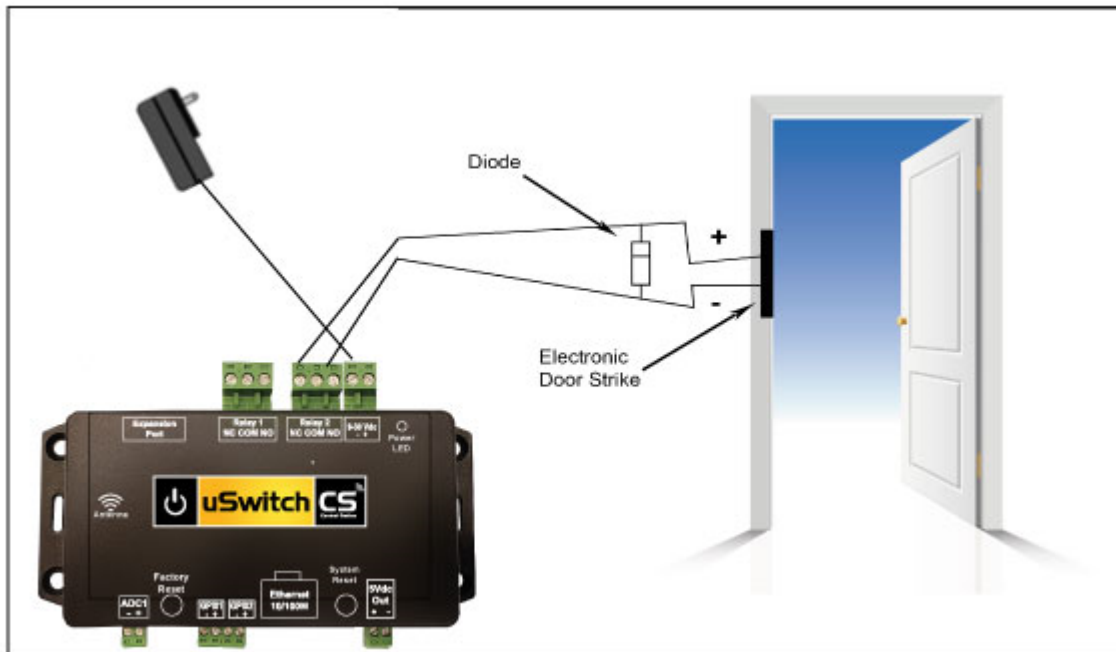
## uSwitchCS Board Schematic





## Configurations

Access Control to Electronic Door Strike



The following is a configuration where uSwitch is used to provide access control. When connecting to door strikes a reverse-bias diode is recommended. In this example, a reverse-bias diode is connected in parallel with the lock to protect the relay contacts from the inductive kickback that can occur when the lock is switched. A variety of diodes is available and can be ordered either online or directly from us. (For AC door access control no diode is necessary, for DC powered devices a 60V p/p diode is recommended).

## Driving multiple uSwitch Relays from a single uSwitch GPIO or Virtual Button

In addition to a physical push button driving the local relay on the same uSwitch either that push button or the button generated on the Control Center page, or a virtual button can be created to command a relay on a remote uSwitch. Once set up, pushing that button will drive all relays in its configuration as specified by the virtual or physical button. Each uSwitch can be programmed to drive up to eight separate relays on the network. Additionally, if a relay output is hardwired into its own, or another uSwitch's GPIO it can in turn be used to drive an additional 8 relays. By daisy chaining uSwitches in this manner a single GPIO can drive an unlimited number of relays on other uSwitches.

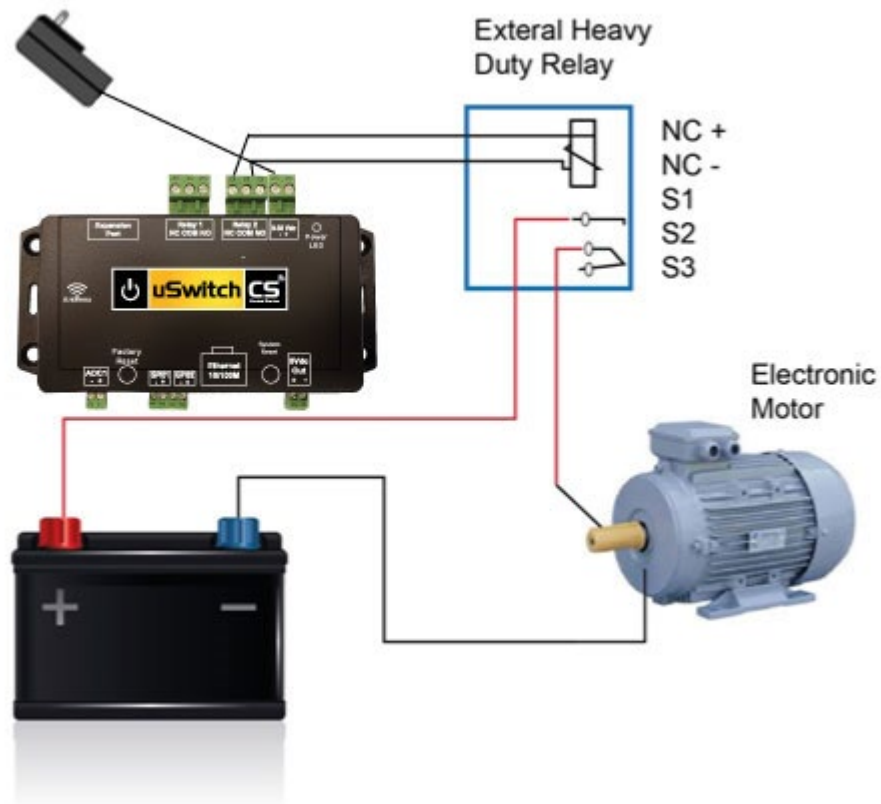
# Auto Reboot Configuration

## Connecting to High Power devices (such as Motors, etc.)

For loads greater than those rated for the uSwitchCS's internal relays, or when connected to devices with high inrush or peak current surge an external relay should be used with the uSwitchCS triggering the relay. The illustration below shows how a high current motor or other high load device can be controlled using wiring to an external relay. A variety of external relays is available and can be ordered either online or directly from uHave Control.

When relays switch inductive loads such as motors, transformers, relays, etc., electricity will arc across the internal relay contacts each time the contacts open. Over time this causes wear on the relay contacts which can shorten their lifespan. When switching a high inductive load, it is recommended that simple relay contact protection devices be used. To be economically feasible uSwitchCS cannot provide relay protection for all possible loads.

For applications with excessive loads, the following diagram shows a relay contact protection circuit for DC and for AC applications. For component values required to provide sufficient contact protection for a specific application, consult the application reference. Note: for DC circuits a diode is used and for AC circuits an RC circuit across the load can be used.





## The A-Plug Universal 110VAC uSwitchCS Adapter

The A-Plug is designed to easily snap into uSwitchCS converting its two relay outputs into two 110VAC outlets. There is no need for wiring or splicing with A-Plug. The A-Plug powers the uSwitchCS and receives its power directly from any wall outlet to which it is plugged in.

### Troubleshooting:

Before returning a device, test the power input transformer to uSwitchCS. This can easily be done by swapping out with a known working power transformer.

## Appendix A: Factory Default Settings

In the event that the IP address or passwords are forgotten, and you cannot log in to uSwitchCS, you can reset uSwitchCS to its factory default settings. With power on press the reset button for a minimum of ten (10) seconds. After ten (10) seconds, release the reset button. Wait fifteen (15) seconds then fully cycle power on uSwitchCS. At this point all settings should be restored to factory default settings (shown below). Holding the Reset Button down for <6 Seconds and more than 2 Seconds will cause the Network Settings to go back to factory but leave all other Settings as configured, this mechanism preserves a fully configured device if only the network settings have been corrupted or the network has been changed and becomes unoperational.

The following list shows the network and device hardware default settings.

### Network Settings

Networking Mode: APStation

### WiFi Access Point Settings

SSID: uStationAP\_XXXX  
WiFi Security: Open  
PassPhrase: not required  
IP: 92.168.4.1  
Primary DNS: 92.168.4.1  
Enable SSID Broadcast: Checked  
Enable DHCP Server: Checked  
Enable Repeater (NAT): Checked

### WiFi Station Adapter Settings

SSID: mySSID  
Security: WPA2-PSK  
PassPhrase: password  
DHCP (auto acquire ip): UnChecked  
IP: 192.168.0.190  
Radio Channel: Auto  
Region: United States  
WiFi Tx Power: 14.5 dBm

### Network Settings (TCP/UDP)

Gateway: 192.168.0.190  
SubNet Mask: 255.255.255.0  
Host Name: uSwitchCS-XXXXXX (where XXXXX is 3 Hex bytes of APs MAC)  
Primary DNS: 192.168.4.1  
Secondary DNS: 8.8.8.8  
FallBack DNS: 8.8.4.4  
MTU (Max 1500 Bytes): 1500  
mDNS: uSwitchCS

### Ethernet Settings (TCP/UDP)

Gateway: 192.168.0.191  
SubNet Mask: 255.255.255.0  
Host Name: uSwitchCS-XXXXXX (where XXXXX is 3 Hex bytes of APs MAC)  
Secondary DNS: 8.8.8.8  
FallBack DNS: 8.8.4.4  
Primary DNS: 192.168.0.1

### Port & Security Settings

Hide Passwords: unchecked  
Login requires Password: unchecked  
Session Timeout: 30 Minutes  
Connection Type: HTTP only  
Login Notifications: unchecked  
HTTPS Port: 443  
HTTP Port: 80

TCP Port:	9673	
Software Watchdog		Checked
Network Watchdog		Checked

## Relay Settings

Relay Name: RelayX - X is index 1..n  
Relay Address: 0  
Operating Mode: On/Off  
Event: N/A  
Latching: Unchecked  
Off State Text: Off  
On State Text: On  
Off State Color: Red  
On State Color: Green  
Power Up State: Off  
Momentary Time: 0  
Invert Output: Unchecked  
Enable Sub Control: Unchecked  
Add to Control Center: checked  
Notification Event: None

## Digital I/O Settings

Input Name: GPIOx, x is index from 1..n  
Operating Mode: On/Off  
Input Low Text: Off  
Input High Text: On  
Input Low Color: Green  
Input High Color: Red  
Internal Resistor: Pull-Up  
Debounce Time (ms): 250  
Event Time (sec): 0  
Measurement Units: Count  
Target: 300.00  
Tolerance: 12.00  
Triggering Event: Any  
Target Zone Color: Green  
Scale: 1.000  
Offset: 0.000  
Decimal Places: 2  
Rollover/Cutoff: 40.00  
Add to Control Center: Unchecked  
Notification Event: Unchecked

## Analog I/O Settings

Input Name: ADC(x)  
ADC Address: 0x0-n  
Power On A/D: Unchecked  
Measurement Units: Vdc  
Below Range Color: Yellow  
Target Range Color: Green  
Above Range Color: Red  
Sample Count: 32  
Voltage Range: 0-30.0 Vdc  
Target: 5.00  
Tolerance: 1.25  
Triggering Event: Any  
Scale: 0.010  
Offset: 0.000  
Decimal Places: 2  
Settling Time (secs): 0  
Add to Control Center: Unchecked  
Notifications: Unchecked

## Relay Watchdogs

### URLs to Ping

First: [www.google.com](http://www.google.com)  
Second: 8.8.8.8  
Third: [www.yahoo.com](http://www.yahoo.com)  
Input Heartbeat: None  
Notifications: Unchecked  
All URLs Must Respond: Checked

## Watchdog Counters

Max Ping Failures: 3  
Max Reboots: 3

## Watchdog Timers

Startup Delay (minutes): 7 Minutes, 0 Seconds  
Time Between Pings: 1 Minute, 30 Seconds  
Reboot Hold Time: 10 Seconds  
Fault Mode Time: 4 Hours

## Security Settings

User Password: admin  
Admin Password: admin

## Login Options

Require Login Passwords: UnChecked  
Hide Passwords: UnChecked  
Login Notifications: UnChecked

## Web Server/Control Security

Allow HTTP Connections: Checked  
Auto Logout Time: 30 Minutes

## Device Protection

Software WatchDog: Checked  
Network WatchDog: Unchecked



## Appendix B: Specifications

### AC

Relay Capacity: 7.5 A Max at 105-125 VAC, 5 A Max at 210-240 VAC

### Power Requirements:

Model: uSwitchCS  
Voltage: 9Vdc -30 Vdc Model uSwitchCS

### Standby Current :

Relays Off: 58mA  
One Relay Energized: 92mA  
Both Relays Energized 126mA

### Relay Ratings:

Rated Carrying Current: 5A @ 125VAC, 5A @ 250VAC, 10A @ 24VDC  
Max Current: 10A  
Max Voltage: 240VAC, 110 VDC

### Relay Performance:

Relay Control Options: on/off, Pulsed, Latched, Momentary Contact Resistance <50m ohms (initial value)  
Contact Material: Ag alloy  
Max Switching Voltage: 240VAC, 110VDC Max Switching Current 20A  
Life (rated-load)  
Mechanical: 10,000,000 ops  
Electrical: 100,000 ops.

### WiFi:

Adapter: Station(Infrastructure), Access Point, Station-AccessPoint, Repeater, NAT  
Security: Open, WPA-PSK, WPA2-PSK, WPA-WPA2-PSK, WPA2-Enterprise  
Range: 250 Feet Line of Sight  
WiFi Tx Power: User Selectable  
Region: User Selectable (supports all standard regions)

### Networking:

Network: 10/100 Base-T, IPv4  
Network Setup: static IP address assignment, DHCP, HTTP, HTTPS port selectable  
Network Connector: 8-pin RJ-45 socket

### Connectors:

Power/Input: 2-position, removable terminal strip, 3.81mm terminal spacing  
Relays: 3-position (Normally Closed, Normally Open, Common) removable terminal, 3.81mm terminal  
Ethernet: 8-pin RJ-45 socket  
GPIOs: 4-position, removable terminal strip, 3.0mm terminal spacing  
ADC: 2-position, removable terminal strip, 3.0mm terminal spacing  
5Vdc Output: 2-position, removable terminal strip, 3.0 mm terminal spacing  
Expansion Port: 10-pin Connector

### LED Indicators: (on Ethernet jack)

-Network linked  
-Network activity

### Physical:

Temperature 0-50 degrees C (-30C, +80C)  
Size: .42 in (106 mm) long, 2.15 in (55mm) wide, 1.0 in (25 mm) deep  
Weight: 4.3 oz. (122 grams)

### Password Settings:

Password protection on setup page: Yes Password protection on configuration pages: Yes

## Appendix C: Updating Firmware

### Appendix D: Definitions

NAT: Network Address Translation

DHCP: Dynamic Host Control Protocol

Port Forwarding:

Repeater:

AP

Station

Infrastructure

NTP Server: Network Time Protocol

Client/Infrastructure

URL

DNS

ARP- Address Resolution Protocol

VPN- Virtual Private Network

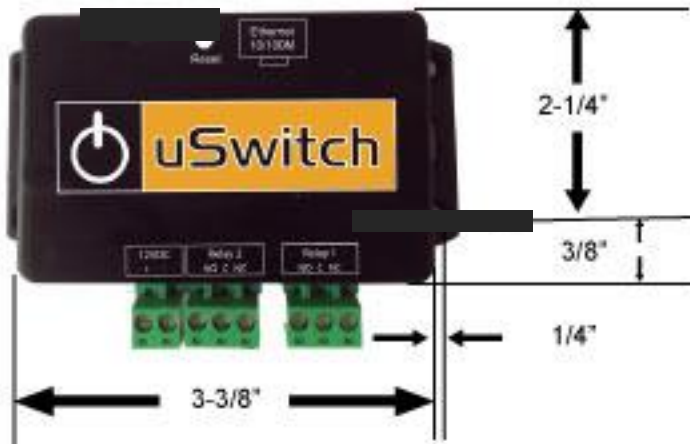
OTA - Over the Air

AWS - Amazon Web Services

## Device Dimensions:

uSwitchCS and aPlug Dimensions

Note: All dimensions are in inches  
Height is 1-1/8"



## Product Safety: FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two Conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

### Warning

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## Warranty

uHave Control warrants this product, if used in accordance with all manufacturers' specification, to be free from original defects in material and workmanship for a period of One Year from the date of initial purchase. If the product should prove defective within that period, Seller will repair or replace the product at its sole discretion.

This warranty is extended to the original purchaser of the equipment only. Call uHave Control Technical service to receive a Return Materials Authorization (RMA) Number prior to sending any equipment back for repair. Include all cables, power supplies and proof of purchase with shipment. For warranty service or repair, return to uHave Control at 1425 Beacon St, Brookline, MA. Purchaser shall prepay all charges for shipping to uHave Control. uHave Control. will pay the shipping charges to return the product to the purchaser as long as the product is shipped within the United States. If the product is shipped outside of the United States, the purchaser shall pay all shipping charges, duties, and taxes.

THIS WARRANTY DOES NOT APPLY TO NORMAL WEAR OR TO DAMAGE RESULTING FROM ACCIDENT, IMPROPER USE, MISUSE, UNAUTHORIZED REPAIR, TAMPERING, MODIFICATION, IMPROPER CONNECTION, OPERATION OUTSIDE THE ENVIRONMENTAL OR ELECTRICAL SPECIFICATIONS, ABUSE OR NEGLIGENCE. SELLER MAKES NO EXPRESS WARRANTIES OTHER THAN THE WARRANTY EXPRESSLY SET FORTH HEREIN. EXCEPT TO THE EXTENT PROHIBITED BY LAW, ALL IMPLIED WARRANTIES, INCLUDING ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE ARE LIMITED TO THE WARRANTY PERIOD SET FORTH ABOVE; AND THIS WARRANTY EXPRESSLY EXCLUDES ALL INCIDENTAL AND CONSEQUENTIAL DAMAGES.

### **Limitation**

Further, the warranty does not cover Acts of God, such as fire, flood, hurricanes, and tornadoes. This warranty does not cover damage to property, equipment, direct, indirect, consequential, or incidental damage (including damage for loss of business profit, business interruption, loss of data, and the like) arising out of the use or misuse of this product. UNDER NO CIRCUMSTANCES WILL THE LIABILITY OF UHAVE CONTROL TO THE PURCHASER OR ANY OTHER PARTY EXCEED THE ORIGINAL PURCHASE PRICE OF THE PRODUCT, REGARDLESS OF THE FORM OF THE CLAIM. No other warranty is expressed or implied. uHave Control specifically disclaims the implied warranties or merchantability and fitness for particular purpose. Some jurisdictions may not allow the exclusion of limitation of liability for consequential or incidental damage.

### **Notice:**

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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