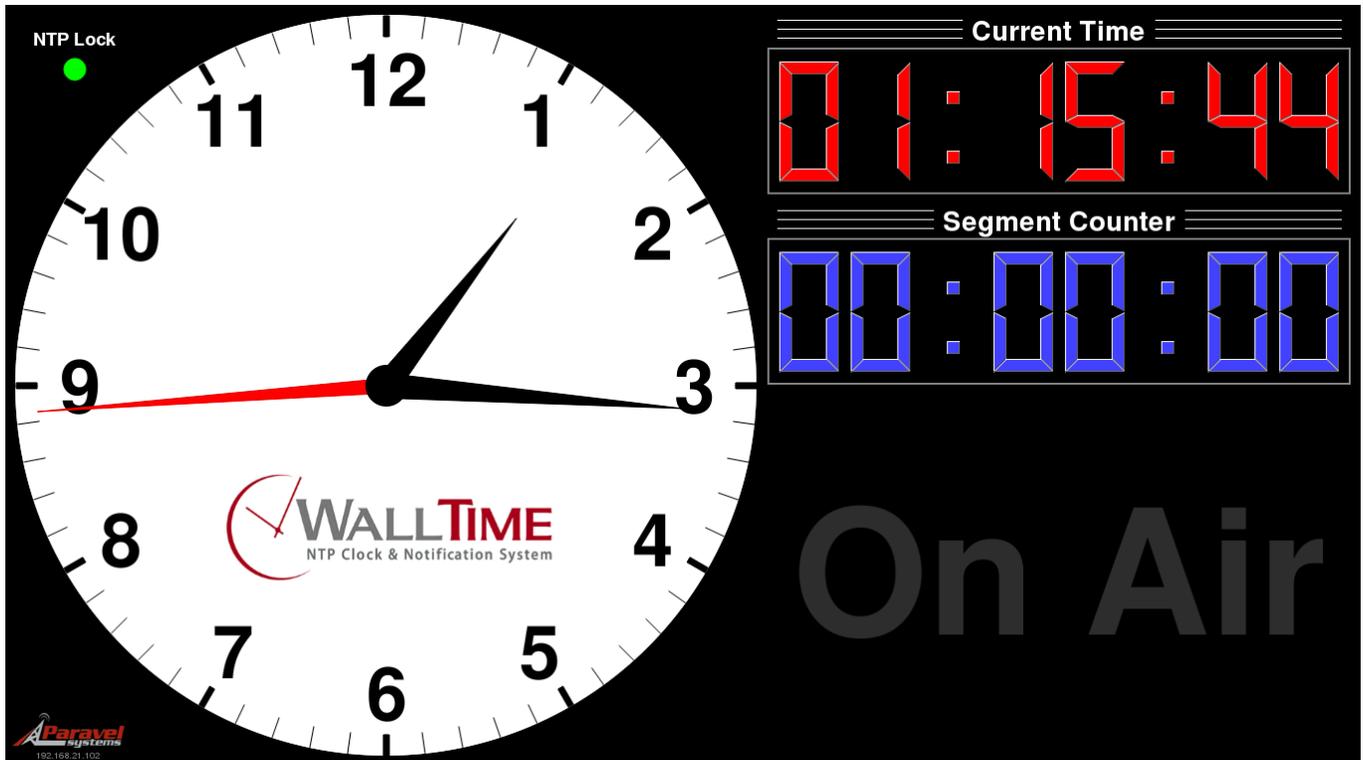# WallTime NTP Clock and Notification System

Operations Manual

Fred Gleason

4.1.7 Edition

WallTime NTP Clock and Notification System: Operations Manual

Fred Gleason

Table of Contents

List of Tables

Chapter 1. General

1.1. Getting Started
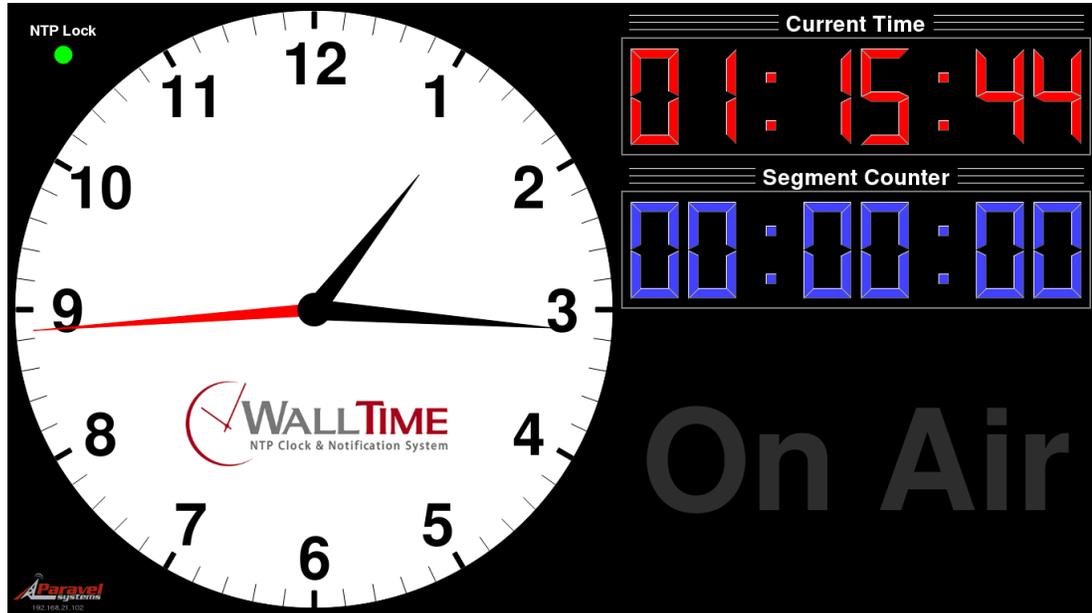
WallTime is a digital device that displays date, time and status information in one of four different display styles: a stylish realtime clock in both analog and digital formats; a full screen Notifications status display, a screenful of up to six multi-zone digital date/time displays, each configured for a different time zone or up to three multizone digital date/time displays with auxiliary widgets. Output display is by means of a connected video monitor (not included). In addition to the time and status displays, WallTime can act as a segment timer, programmable text display and more.

All time readouts in WallTime are kept accurate automatically by synchronization with one or more external time servers running the Network Time Protocol (NTP), including those freely accessible via the public Internet. All device interfacing is done by means of the unit's integrated 100BaseTX Ethernet port.

The WallTime Analog Clock with Widgets style is divided into three functional areas. In addition to the analog clock, two user-configurable "widgets", occupy the right-hand portion. As set at the factory, these two right-hand widgets are the Digital Clock and OnAir Light widgets. Other available widgets include the Text Widget (used for displaying arbitrary text content), the Notifications Widget (used for displaying the status of up to 36 Livewire™, WheatNet™ or Modbus™ TCP GPIO lines in real time) and real-time audio metering for select AoIP systems.

1.1.1. Connections

1.1.1.1. Video Output

WallTime will work with most any monitor or television with a 16:9 aspect ratio (often referred to as "HDTV" or "widescreen") and an HDMI input, with optimum results on units capable of displaying 1920x1080 resolution (also known as "1080p" mode). 16:9 displays with a DVI input can also be used though use of an inexpensive HDMI-to-DVI adapter dongle (not included). The WallTime unit can be attached to the back of the display by means of adhesive velco tape (included).

1.1.1.2. Ethernet

Connect the unit to an Ethernet switch port capable of 100BaseT or better connections. If operation with Livewire GPIO is desired, the unit must be connected directly to a Livewire switch.

1.1.1.3. Power

WallTime can be powered by means of any standard 5 vdc micro-USB power source with a capacity of 2.4 A or more. An appropriate "wall-wart" type supply is included with the unit.

1.1.2. Initial Configuration

Before being placed into service, the WalTime unit must be configured with valid IP address parameters. As shipped from the factory, the unit is set to use an IP address of **192.168.21.100**.

Using any standard we browser, navigate to that IP address. Log in with a User Name of **user** and no password.
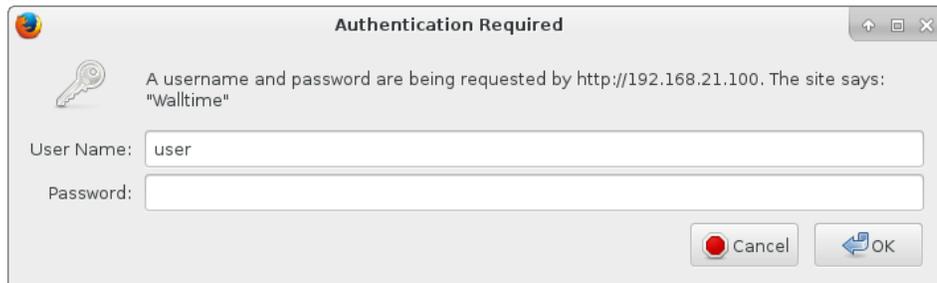
The system will then display the main menu.
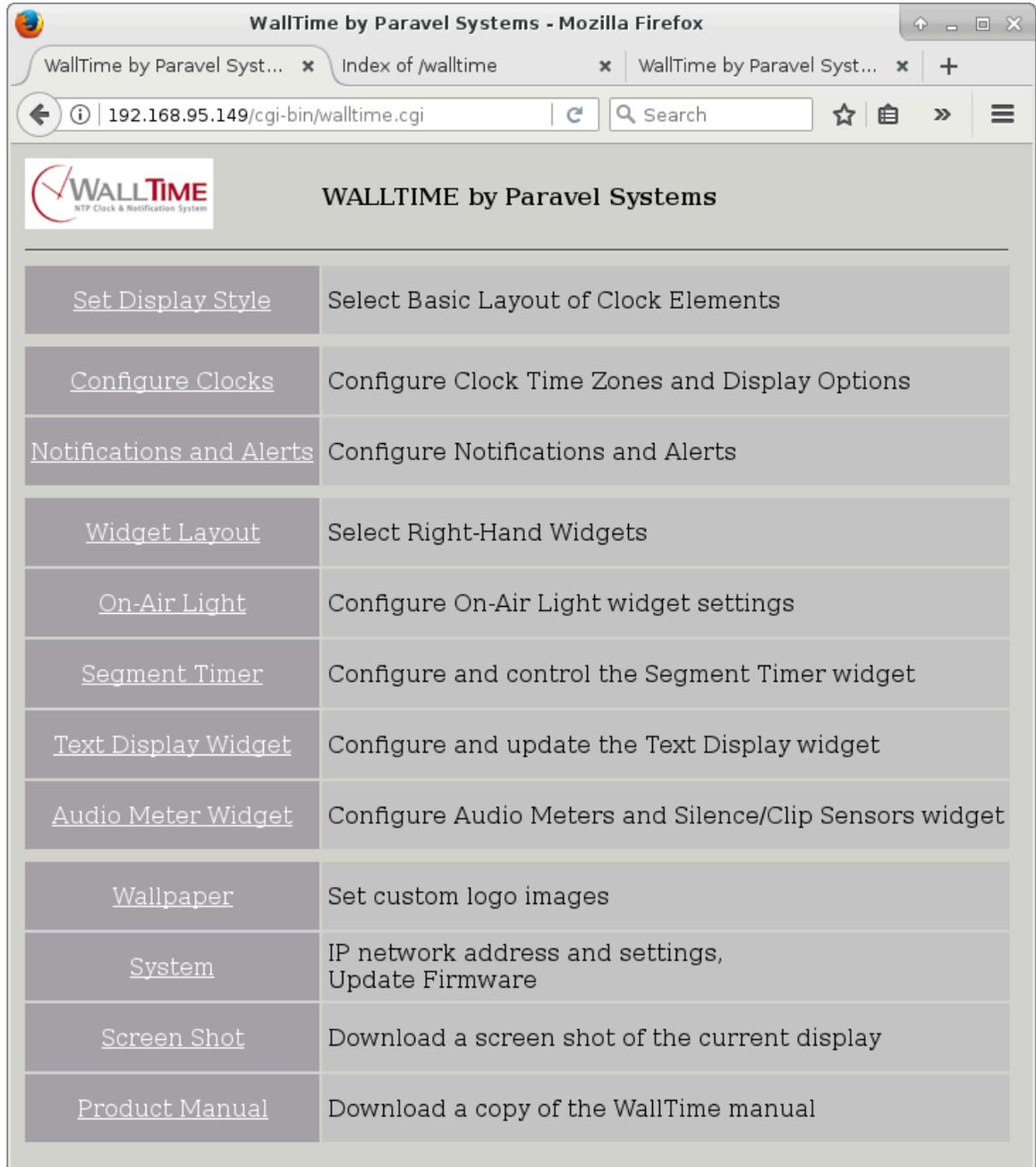
Click the System link to display the System Settings page.

WallTime - System - Mozilla Firefox

WallTime - System

172.30.4.214/cgi-bin/walltime.cgi

Search

| Home | Style | Clocks | Notifications | Widgets | OnAir Light | Timer | Text Widget | Meters | Wallpaper | System |

Wired Network Settings

Get IP settings via DHCP: No
Network address: 172.30.4.214
Netmask: 255.255.252.0
Gateway:
DNS 1: 8.8.8.8
DNS 2: 8.8.4.4

Wifi Network Settings

SSID: [none]
Password: ●●●●●●●●

NTP Settings

NTP server 1: 0.pool.ntp.org
NTP server 2: 1.pool.ntp.org

Connection Password

New password: ●●●●●●●● (5-8 characters: letters and numbers)
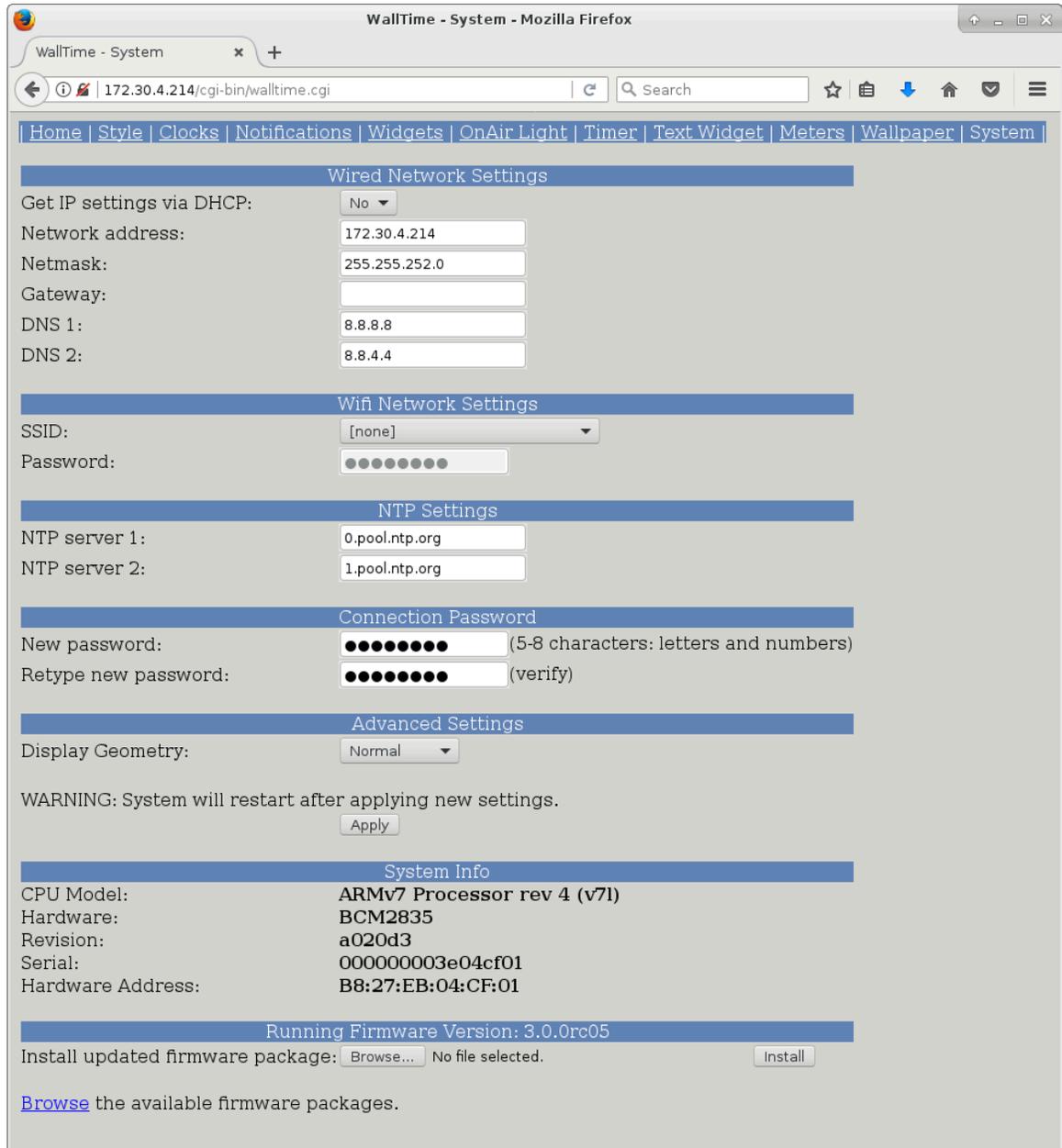Retype new password: ●●●●●●●● (verify)

Advanced Settings

Display Geometry: Normal

WARNING: System will restart after applying new settings.
Apply

System Info

CPU Model: **ARMv7 Processor rev 4 (v7l)**
Hardware: **BCM2835**
Revision: **a020d3**
Serial: **000000003e04cf01**
Hardware Address: **B8:27:EB:04:CF:01**

Running Firmware Version: 3.0.0rc05

Install updated firmware package: Browse... No file selected. Install

Browse the available firmware packages.

WallTime connects to an IPv4 network by means of its integrated Ethernet network port. Additionally, WallTime Revision 2 units have the option of utilizing wifi connectivity, either in conjunction with Ethernet or by itself. Dual use can be especially helpful in situations where the wired Ethernet network is isolated from access to the public Internet. In such cases, the wifi connection can often be used to access NTP servers on the public Internet.

Note

Wifi operation is supported for open, WEP and WPA-PSK networks using DHCP only. When wifi is active, WallTime assumes that the default route will reside on the wifi.

Enter the appropriate IP configuration information in the `Wired Network Settings` and/or `Wifi Network Settings` (if so equipped) sections. If neither network connection will have access to the

public Internet, it will also be necessary to change the default `NTP Server` values so as to specify at least one address for a reachable NTP server in the `Global Time Settings` section.

Note

WallTime requires access to one or more servers providing full NTPv3 or NTPv4 time syncronization services. Several popular "freeware" time sync utilties (such as Dimension 4) offer only so-called "simple" NTP (SNTP); these do *not* satisfy this requirement and hence cannot be used as a time source for WallTime.

Services that meet the requirments are freely available on the public Internet. See http://www.pool.ntp.org for more information.

Click the `Apply` button when finished. After restarting, WallTime will be ready for service.

1.1.3. Setting the Display Style

The style of the output display can be set by clicking on the `Style` tab on the top of the screen. Five different display styles are available:

Analog Clock with Widgets
Full Screen Notification Status
MultiZone Digital Clocks
MultiZone Clocks with Widgets
Analog Clock with MultiZone Clocks

Each of these Styles will be discussed in the following chapters.

1.2. WallTime GPIO Notifications

Caution
All notification protocols supported by WallTime rely upon IP multicasting technology for proper functioning, and as such are designed and optimized for use on wired network connections. Use of these protocols via wifi connections may result in less than fully reliable operation.

WallTime supports the use of GPIO [General Purpose Input Output] signals as a means of providing notifications and display of the state of external events. A notification can be anything that has a binary --i.e. ON or OFF -- state, such as a silence sense or transmitter alarm. WallTime supports five different types of GPIO signals for this purpose:

Livewire Node GPI   GPI node interfaces used in the Axia Livewire AoIP system.

> ### Note
> In addition to standalone hardware GPIO nodes, many Livewire hardware products (e.g. PowerStation) include bundled GPIO nodes; while many Livewire software products (e.g. audio drivers) include bundled "virtual" GPIO nodes. All of these can be accessed using this type setting.

Livewire Surface GPI   GPI events generated by programmable soft keys on console control surfaces in the Axia Livewire AoIP system. Certain other software products (e.g. the Rivendell Radio Automation System) also have the ability to originate such events.

Modbus   Input events generated by devices using the Modbus TCP protocol.

WheatNet LIO	WheatNet Logic I/O. Physical GPI interface found on many Wheatstone "Blade" systems.
WheatNet SLIO	WheatNet Software Logic I/O. Virtual GPI interface found on many Wheatstone "Blade" systems.

When configuring a notification in WallTime, at least three parameters will always be required:

Type The type of GPIO signal. Possible values are `Livewire Node GPI`, `Livewire Surface Button`, `Modbus`, `WheatNet LIO` or `WheatNet SLIO`.

For GPIO types of `Livewire Node GPI` or `Livewire Surface GPI`, the next two items are:

Livewire Source (1 - 32767)	The Livewire source number of the GPIO event, in the range 1 - 32767.
Livewire GPIO Bit (1 - 5)	The number of the bit (sometimes referred to as the 'pin' in the Axia documentation) within the GPIO event for the specified Source Number, in the range 1 - 5.

For the GPIO type of `Modbus`, the next two items are:

Modbus ID (1 - 254)	The Modbus ID number of the originating device, in the range 1 - 254. (See the 'Configuring Modbus Devices' section for an explanation of how to determine ID numbers).
Modbus Input Number (1 - 2000)	The input number of the source line on the Modbus device at the specified ID number, in the range 1 - 2000.

For the GPIO types of `WheatNet LIO` and `WheatNet SLIO`, the next three items are:

WheatNet Blade ID (1 - 199)	The ID number of the originating blade, in the range 1 - 199.
WheatNet Blade IP Address	The IP address of the originating blade. This field can be left blank unless the WallTime unit is communicating with the blade by means of one or more IP routers (rather than being connected directly to the WheatNet network).
WheatNet (S)LIO Line Number	The input number of the source line on the specified WheatNet blade to read.

1.2.1. "Bits" versus "Pins" in Livewire GPIO

Livewire GPIO is organized on the basis of five individual logical signals that are associated with a given source ID number. The original intent was to allow devices which require complex logical states to be interfaced merely by specifying its associated source ID number. However, when interfacing external devices for WallTime, this arrangment can often result in unused and hence "wasted" input lines on the physical DB15 GPIO connectors. Thus, WallTime notifications for Livewire take a "Bit" argument in addition to the source number, which indicates which particular signal within the group of five is being referenced. The Axia documentation sometimes refers to a "pin" in this connection, but there is a difference: "pin" refers to a particular *physical* pin on a DB15 connector, while "bit" indicates the *logical* number of a signal within the set of five specified by the source number. The distinction is important because WallTime can receive and process signals that neither originate from nor terminate to a physical DB15 port --e.g. button presses from a control surface.

The following shows how "bits" and "pins" relate when addressing notifications to/from a physical DB15 port:

Table 1.1. Bits vs. Pins in Livewire GPIO

WallTime Logical Bit Value	Livewire Physical GPI Pin Value (DB15)	Livewire Physical GPO Pin Value (DB15)
1	11	1
2	12	2
3	13	3
4	14	4
5	15	5

1.2.2. Configuring Modbus Devices

A Modbus TCP device must be registered with at least one WallTime unit on the network before its line updates can be received. To access the list of current registrations, click the 'Notifications and Alerts' link on the main menu and scroll to the bottom of the page.

To add a new device, click the `Add New Device` button.

The following parameters must be provided:

IP Address   The IPv4 address of the Modbus TCP device. This address must be unique --i.e. not shared with any other Modbus device used by WallTime.

TCP Port   The TCP port number of the Modbus TCP service on the device. This will almost always be **502**.

Modbus ID (1 - 254)   The Modbus ID of the device. This value must be unique --i.e. not shared with any other Modbus device used by WallTime.

Number of Inputs (1 - 2000)   The number of GPI inputs provided by the device.

1.2.3. Using Modbus Devices with Multiple WallTime Units

When using one or more Modbus devices with multiple WallTime units that are connected to the same subnet, it is only necessary to register the Modbus device with one WallTime, which will then act as a "repeater" for the other WallTime units.

1.3. WallTime Wallpaper

Each display style in WallTime includes a "wallpaper", a graphics area that can be used to display a logo or other artwork. In addition to the default images that are included, custom images can be uploaded into WallTime and used; either statically, or as a set of multiple images that can be configured to change on a set schedule.

To configure wallpapers, click the `Wallpaper` tab on the top of the screen.

Three different wallpaper areas are available, used as follows:

|	
Analog Clock Wallpaper	Displayed as the graphic behind the face of the large analog clock. Used in the `Analog Clock with Widgets` and `Analog Clock with Multizone Clocks` display styles. Images files should be 1060x1060 pixels in JPEG or PNG format.
Full Screen Notification Wallpaper	Displayed as a banner graphic at the bottom of the screen, this wallpaper is used in the `Full Screen Notification Status` display style. Images files should be 1210x150 pixels in JPEG or PNG format.
Full Screen Notification Wallpaper	Displayed as a banner graphic at the bottom of the screen, this wallpaper is used in the `Multizone Digital Clocks` and `Multizone Digital Clocks with Widgets` display styles. Images files should be 900x150 pixels in JPEG or PNG format.

The configuration for each wallpaper area consists of a `FILE LIBRARY` area, containing the list of available image files and a `SCHEDULE EVENTS` area, containing the list of events used to update which wallpaper image is displayed at a given time.

1.3.1. The File Library Section

Additional wallpaper images can be uploaded by touching the `Browse...` button for the desired area, which will open a file picker dialog.
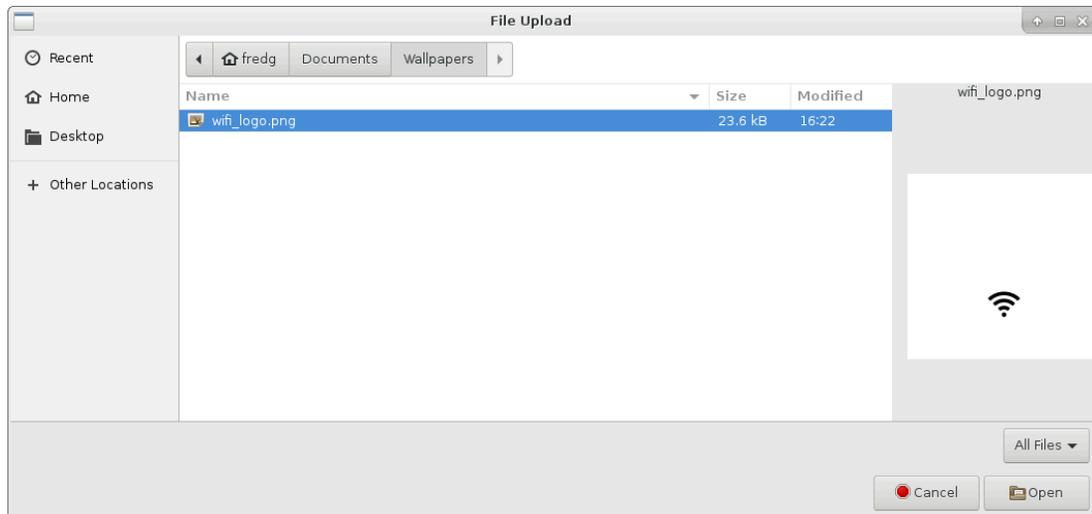
Choose the desired file to upload, then touch the `Open` button. The name of the selected file will appear next to the `Browse...` button.
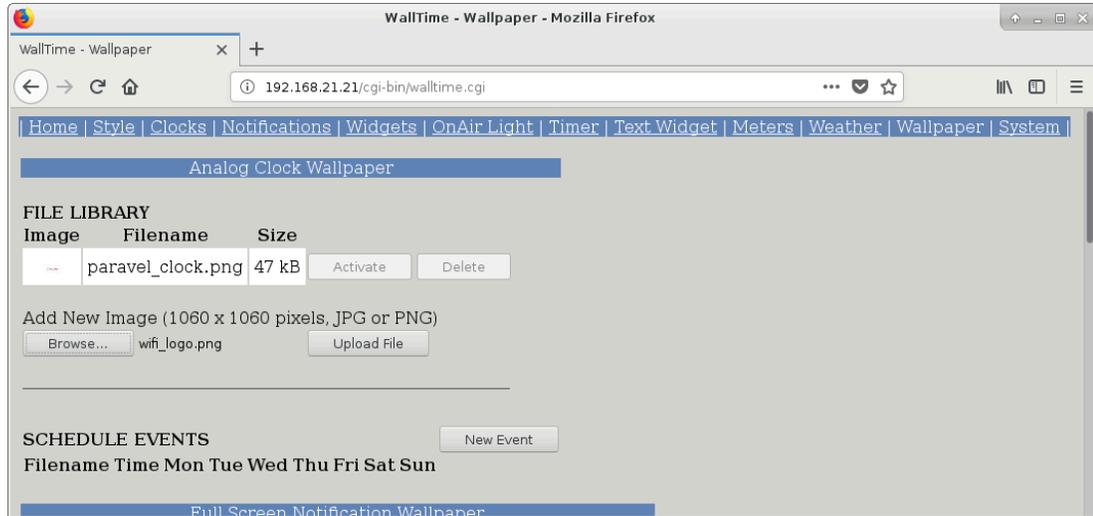
Touch the `Upload file` button to perform the upload, after which the newly uploaded file will appear in the `FILE LIBRARY` list.
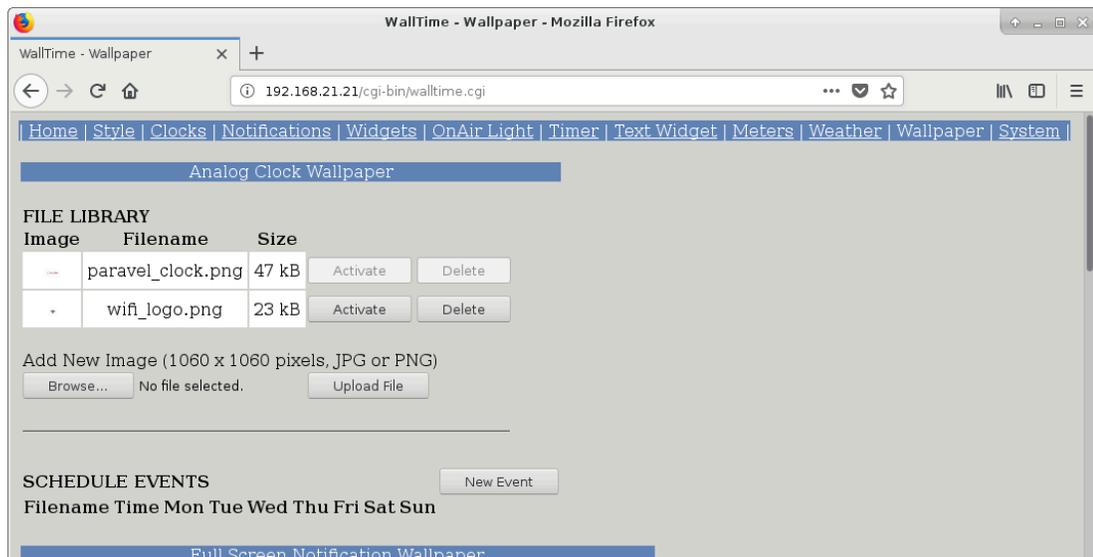

To make an image appear on the WallTime display, touch the `Activate` button for the appropriate file entry, or create one or more events in the `EVENTS SCHEDULE` (see below). Touching the `Delete` button will cause the file to be completely deleted from WallTime.
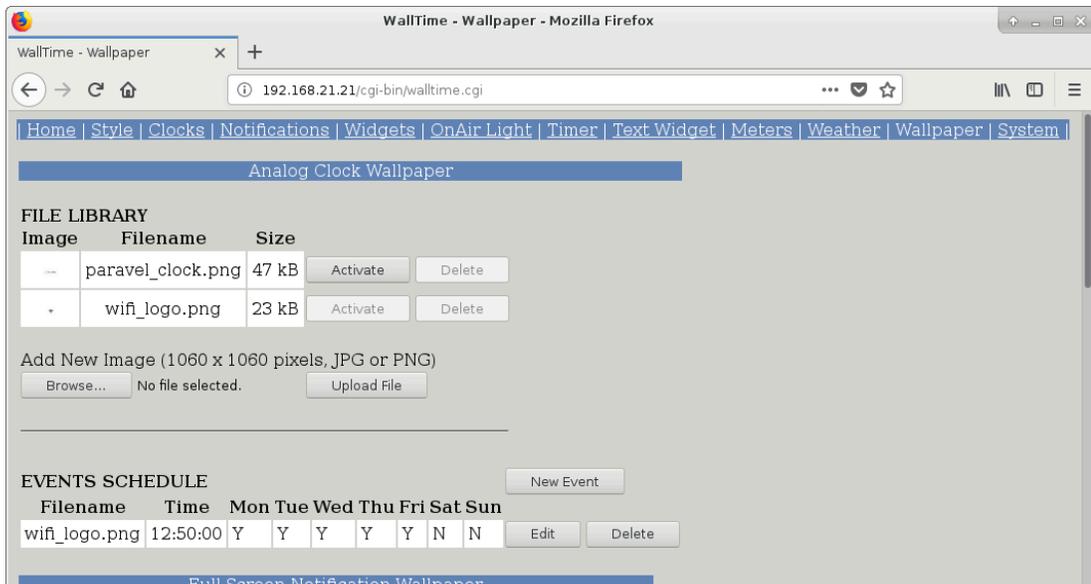
Note

The default Paravel Systems wallpapers cannot be deleted, nor can any wallpapers that are being used in one or more schedule events. To delete such images, remove them first from any active events in the `SCHEDULE EVENTS` list.

1.3.2. The Schedule Events Section

It is possible to create a schedule for changing the currently displayed wallpaper by adding one or more events to the `SCHEDULE EVENTS` list. To add a new event, touch the `New Event` button, which will open the wallpaper editor screen.
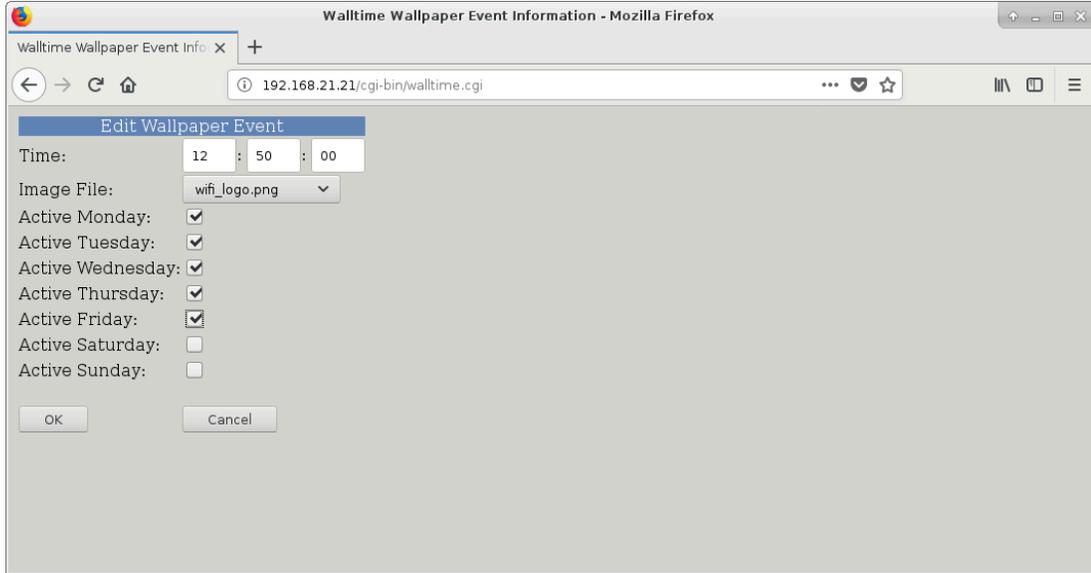
Choose the desired file from the `Image File` dropdown, then enter the desired time and days of the week at which the selected wallpaper will be made active.

Note
The time and day of the week values for events will be applied in accordance with global date/time settings (see Section 3.1, "Configuring Clocks").
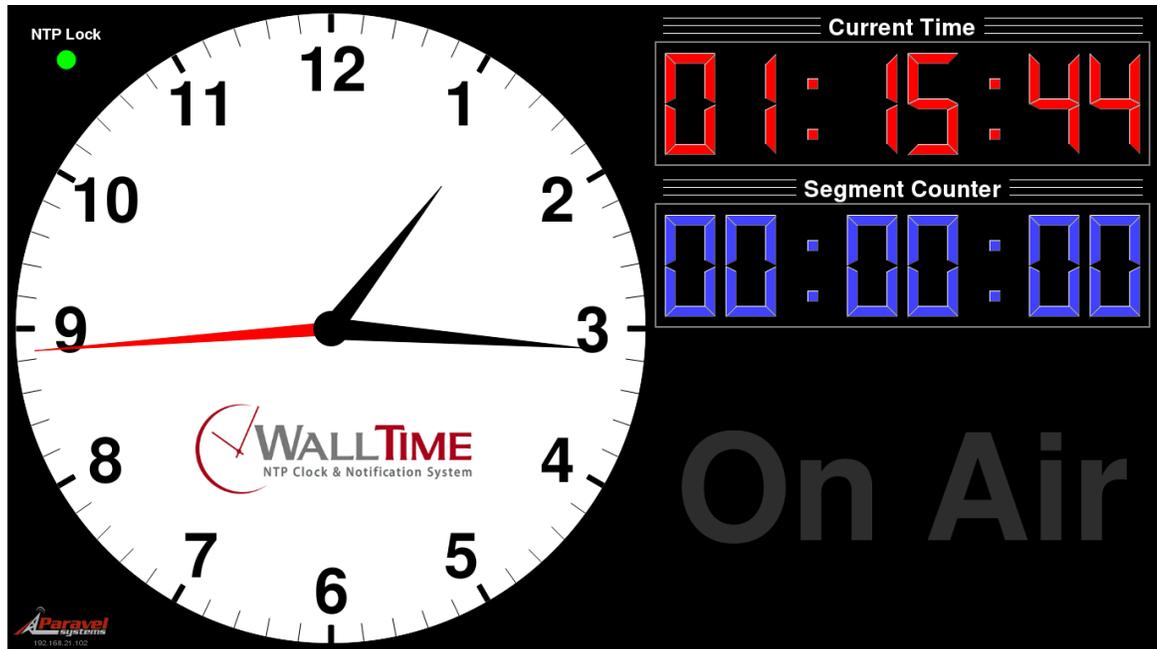
An existing event can be modified by touching its `Edit` button, or deleted entirely by touching its `Delete` button.

Note
Deleting an event does *not* remove the wallpaper file that it referenced, which will remain in the file library and be available for other events.

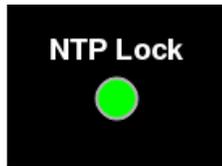# Chapter 2. The "Analog Clock with Widgets" Display Style

2.1. The Analog Clock Widget

The analog clock widget occupies the left-hand portion of WalTime's display and consists of three elements:

2.1.1. NTP Lock Display

The 'NTP Lock' display in the upper left-hand corner of the analog clock widget indicates the status of WallTime's connection to the NTP server(s). A green light indicates that the connection is good and the clock synchronized, while red indicates that the clock is not currently synchronized and thus may not be displaying accurate time.
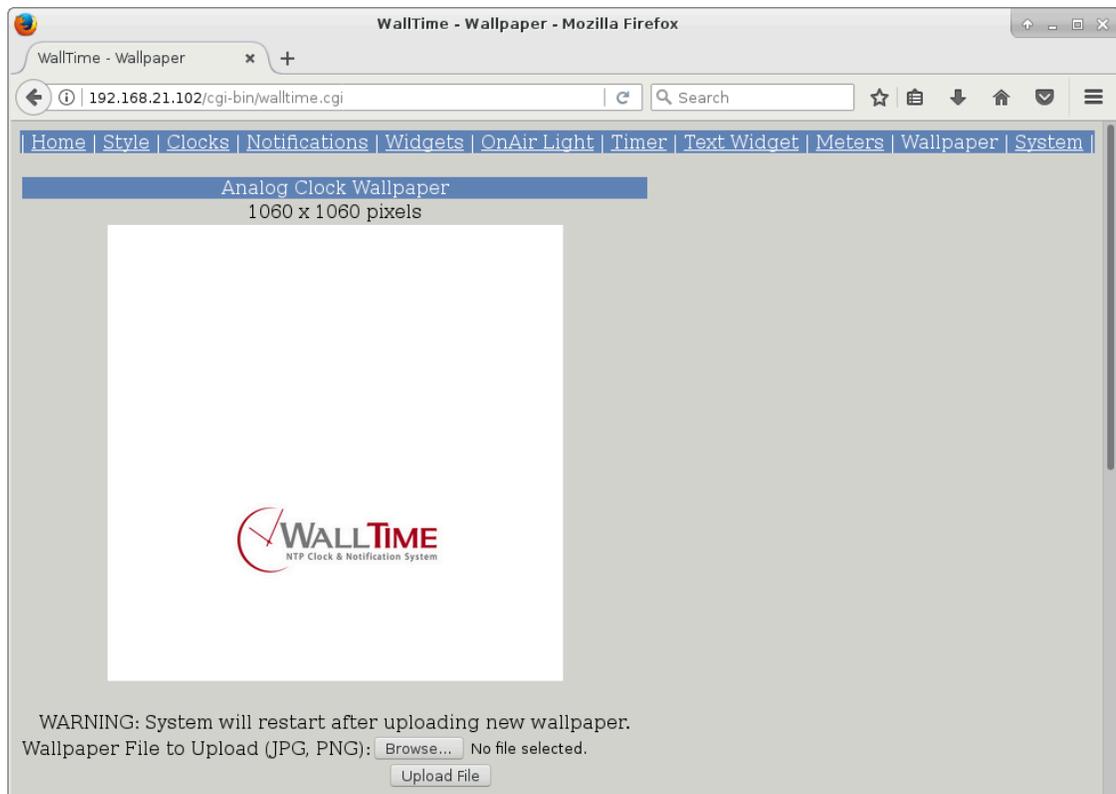
2.1.2. IP Address Display

The 'IP Address Display' in the lower left-hand corner of the analog clock widget shows the currently configured IP address of the unit.

2.1.3. Analog Clock

The logo displayed on the analog clock is user-configurable. To set it, click the `Wallpaper` link on the main menu of the WallTime web interface.

The logo consists of a 1060x1060 pixel PNG or JPG image, which becomes the background to the overall analog clock face when uploaded.

2.2. Selecting Widgets

When using the `Analog Clock with Widgets` or `MultiZone Clocks with Widgets` styles, the widgets to be displayed on the right-hand portion of the display can be set by clicking the `Widgets` tab on the top of the screen of the WallTime web interface.
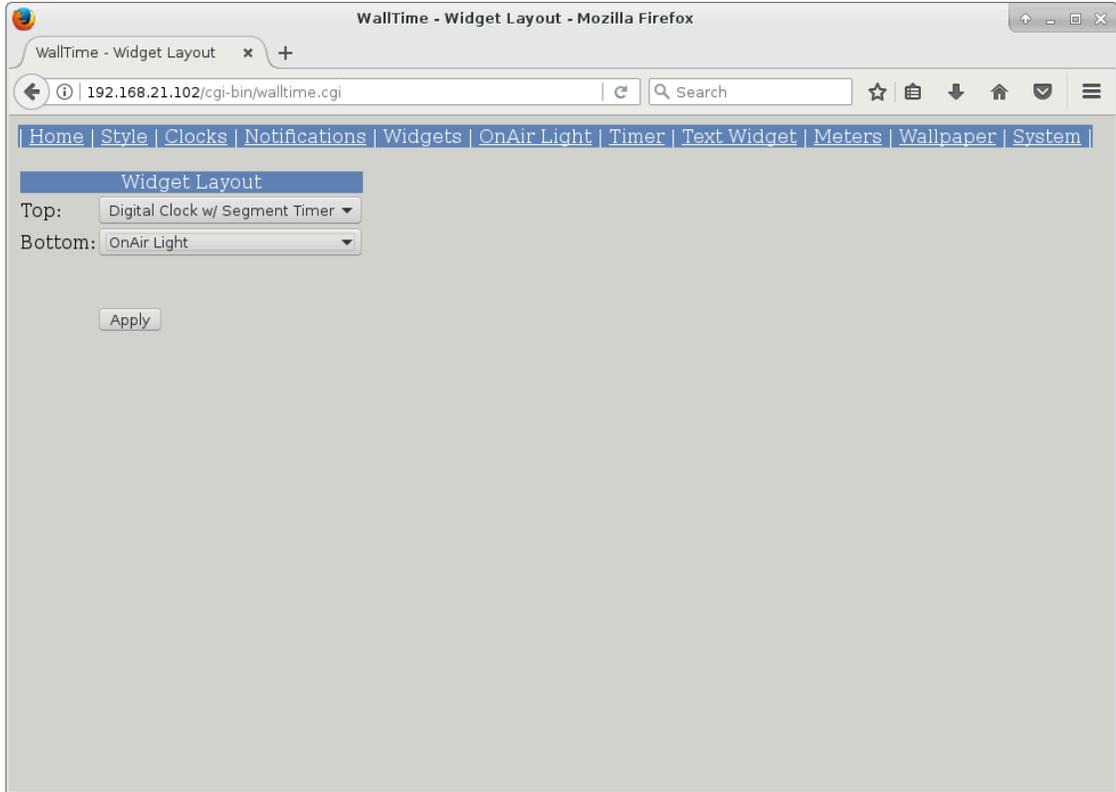
Select the desired widget for each location and then click the `Apply` button. (NOTE: it is not possible to have the same widget appear in both positions).

## 2.3. The Audio Meter Widget
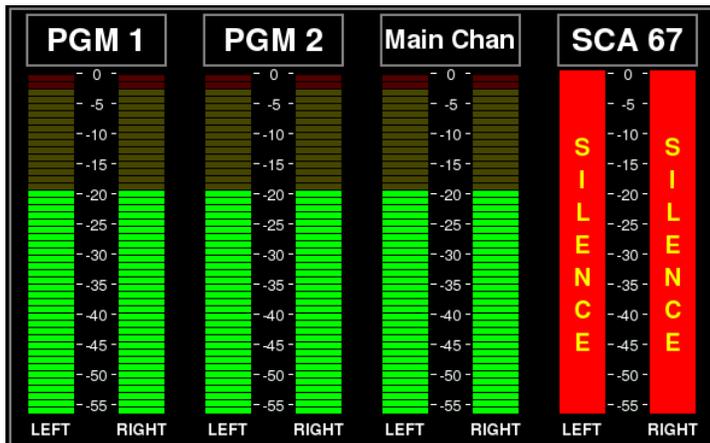
The Audio Meter Widget consists of a display of up to four audio meters that show realtime audio levels on the Source or Destination ports of one or more Livewire nodes. Each meter also includes built-in sensors

to detect a "silence" (low-level) or "clip" (over-level) condition, with the ability to generate notifications for reception by the originating and other WallTime units.

Configuration is accomplished by clicking the `Audio Meter Widget` link on the main menu of the WallTime web interface.
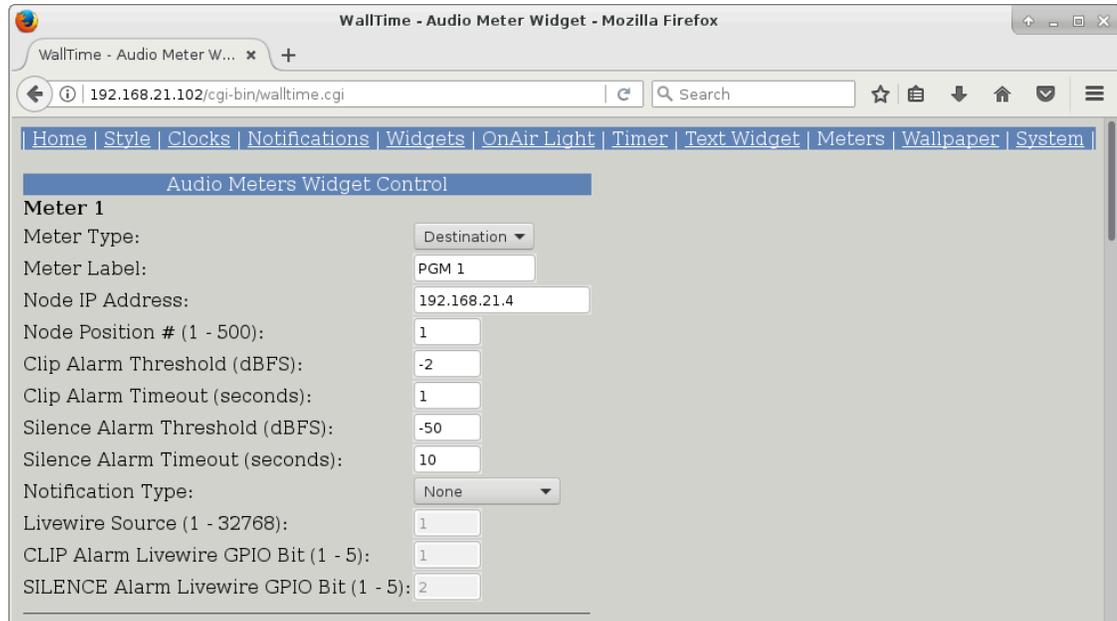
Up to four meters can be configured. Each meter takes the following parameters:

Meter Type

The type of audio port to monitor. Choices are `Source`, `Destination` or `None`

Meter Label

The text to appear in the label at the top of the meter.

Node IP Address

The IP address of the node hosting the port to be monitored, in dotted-quad notation.

Node Position

The position (on the list of Sources or Destinations on the specified node) of the signal to be monitored.

Clip Alarm Threshold

The audio level in dBFS above which the channel will be considered to be in a "clipping" state.

Clip Alarm Timeout

The time in seconds for which the channel must be in a "clipping" state before a `Clip Alarm` will be generated.

Silence Alarm Threshold

The audio level in dBFS below which the channel will be considered to be in a "silence" state.

Silence Alarm Timeout

The time in seconds for which the channel must be in a "silence" state before a `Silence Alarm` will be generated.

Notification Type

The type of notification to use to transmit `Clip` or `Silence` alarms.

Livewire Source

The Livewire source number to use when transmitting `Clip` or `Silence` alarms. Valid only for `Livewire Node GPI` or for `Livewire Surface GPI` notifications.

CLIP Alarm Livewire GPIO Bit	The Livewire bit number to use when transmitting `Clip` alarms. Used only for `Livewire Node GPI` or `Livewire Surface GPI` notifications.
SILENCE Alarm Livewire GPIO Bit	The Livewire bit number to use when transmitting `Silence` alarms. Used only for `Livewire Node GPI` or `Livewire Surface GPI` notifications.
Modbus ID	The Modbus ID number to use when transmitting `Clip` or `Silence` alarms. Valid only for `Modbus` notifications.
CLIP Alarm Modbus Input Number	The Modbus input number to use when transmitting `Clip` alarms. Valid only for `Modbus` notifications.
SILENCE Alarm Modbus Input Number	The Modbus input number to use when transmitting `Silence` alarms. Valid only for `Modbus` notifications.

2.4. The Digital Clock Widget

The Digital Clock Widget consists of a digital time readout (labeled `Current Time`), calculated according to the time zone set in the `Digital Clock Settings` section on the `Configure Clocks` page of the web interface. Optionally, if `Digital Clock w/ Segment Counter` was selected when configuring the widget, a a built-in timer is also displayed.

Display of the current date is also supported by setting the `Show Date` dropdown to **Yes** and selecting the desired `Date Style` on the `Digital Clock Settings` section of the `Configure Clocks` page. Display of the AM / PM and DST indicators can also be enabled on that same page.
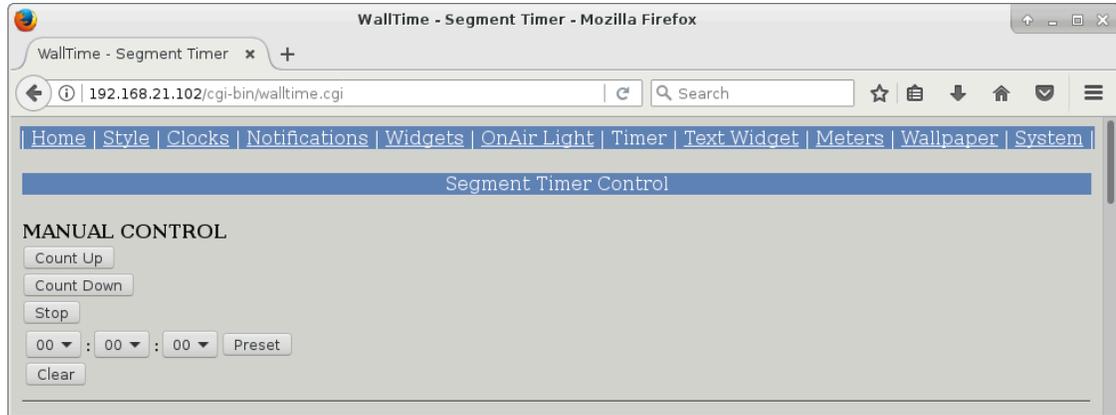
2.4.1. Controlling the Segment Counter

To control the Segment Timer, click the `Segment Timer` link on the main menu of the WallTime web interface. The Segment Timer can be controlled three different ways: manually, automatically and by means of WallTime's built-in scheduler.

2.4.1.1. Manual Control

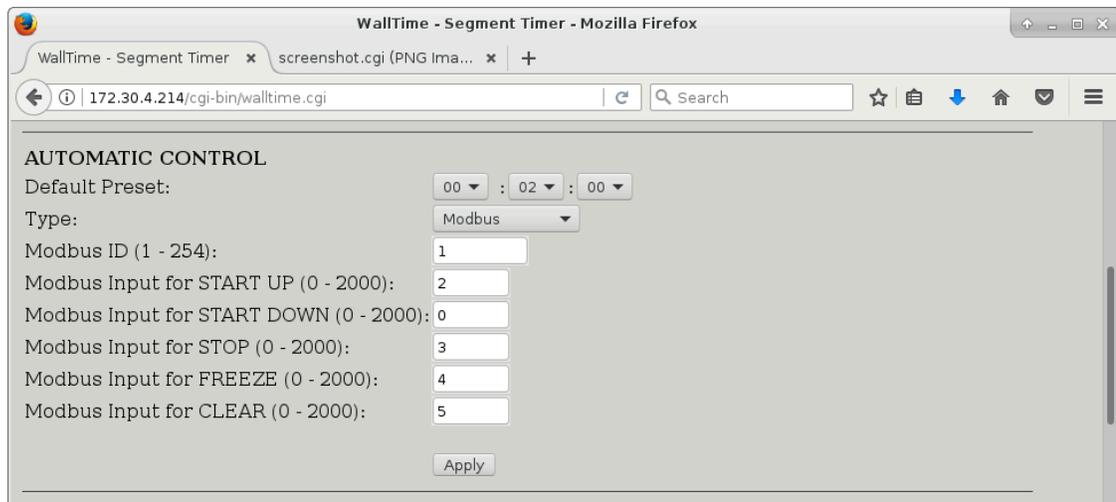Manual control is accomplished by clicking on the appropriate buttons in the `MANUAL CONTROL` section.

The value of the `Segment Counter` can be set by selecting the desired value and then clicking the `Preset` button, or set to all zeros simply by clicking the `Reset` button. The run status of the timer is controlled by clicking the appropriate `Count Up`, `Count Down` or `Stop` buttons.

In addition to WallTime's integrated web interface, the Segment Counter can be directly controlled by means of TCP/IP commands. See chapter 5 "Remote Control" for details. An applet for controlling the counter directly from a Windows desktop is also available for download at http://www.paravelsystems.com/.

2.4.1.2. Automatic Control

Automatic control allows the counter to be started, stopped or cleared by means of a status update from a Livewire, WheatNet or Modbus GPIO device.

If a particular control function is not needed --e.g. FREEZE-- enter a `0` in the corresponding `Bit` field.

2.4.1.3. Schedule Control

Scheduled operation can be accomplished by creating one or more segments by clicking the `New Segment` button in the `SCHEDULE CONTROL` section.
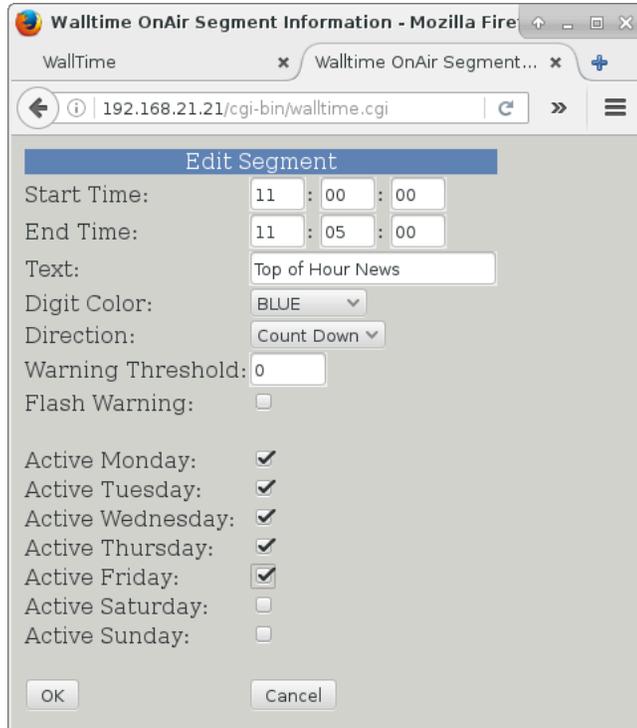
The beginning and end times of the segment are entered in the `Start Time` and `End Time` fields (values in 24 hour "military" format). The counter can be made to count either up or down by means of the `Direction` control. A `Warning Threshold` (in seconds) can set that will cause the background of the Segment Counter to flash during the final seconds of the segment.
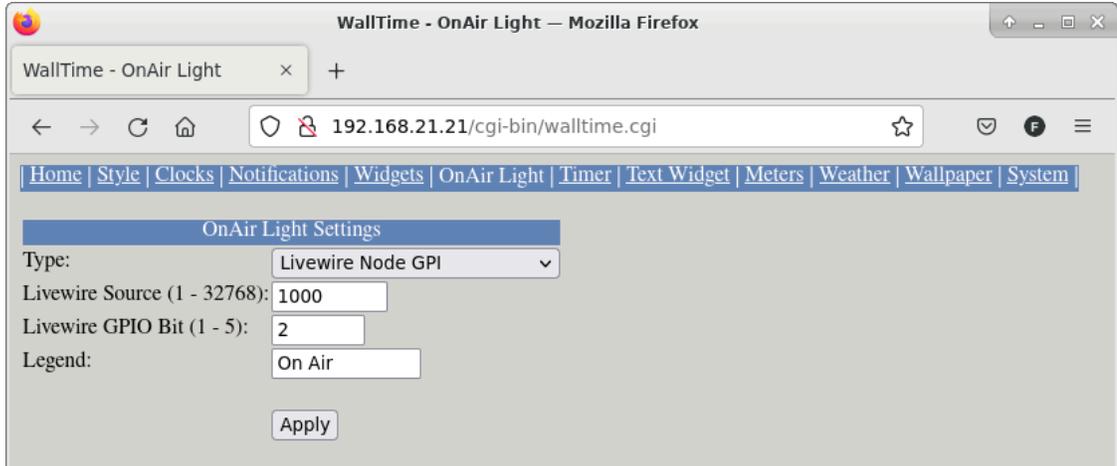
2.5. The On-Air Light Widget

The On-Air Light Widget is a digital version of the traditional warning light fixtures found in and around many studios. It can be controlled by means of a GPIO input or via WallTime's TCP/IP interface.

2.5.1. Configuring the OnAir Light

The OnAir Light can be configured by clicking on the `OnAir Light` link on the main menu of the WallTime web interface.
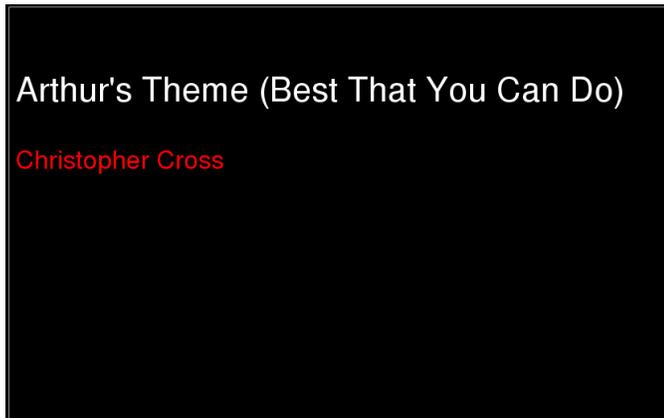
The first three fields are for configuring the GPIO notification.

The Legend field is for the text to appear on the widget.

In addition to GPIO notifications, the OnAir Light can be directly controlled by means of TCP/IP commands. See chapter 5 "Remote Control" for details.
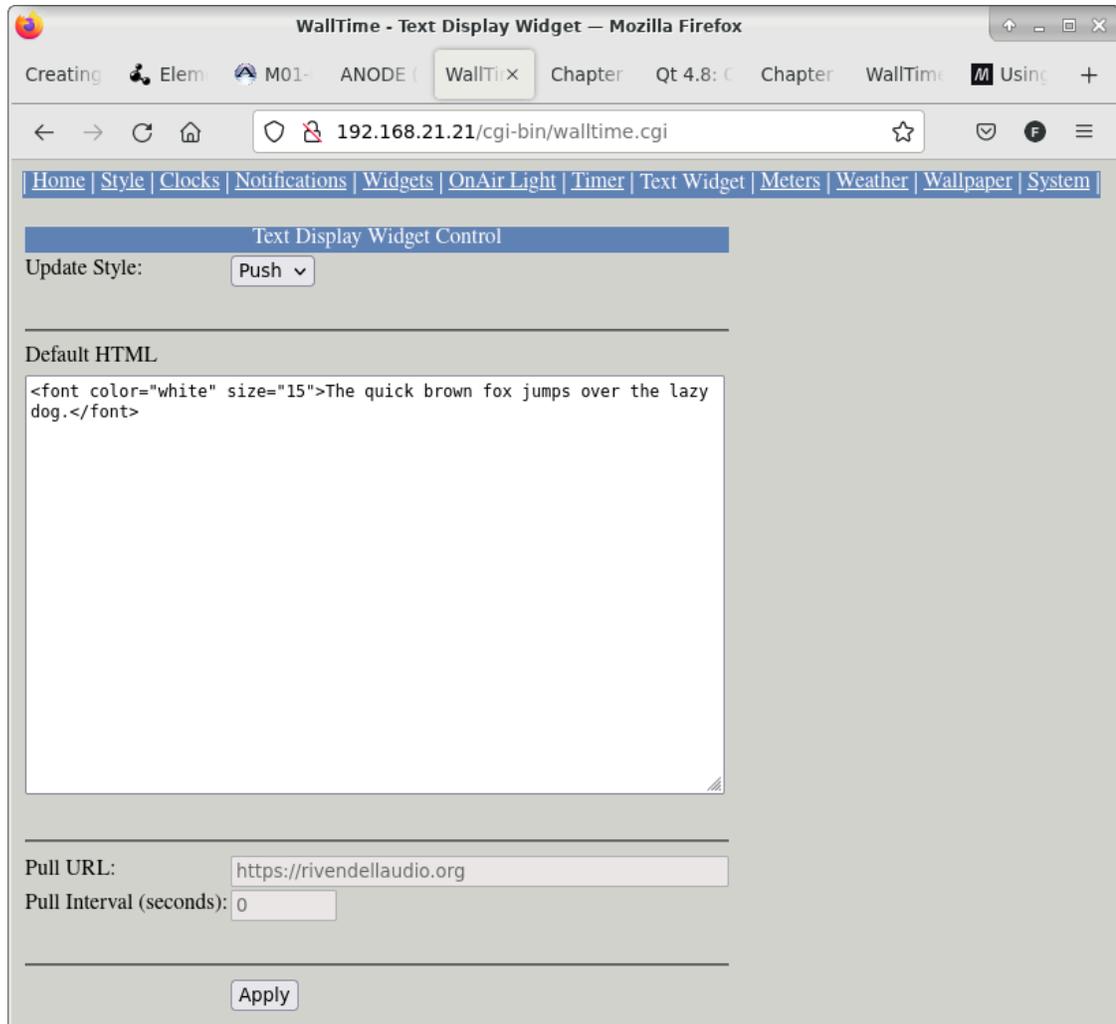
2.6. The Text Widget

The Text Widget can display simple HTML documents, set in WallTime's integrated web interface or pushed to it by means of standard http PUSH calls.

2.6.1. Updating the Text Widget

The content of the Text Widget can be set by clicking on the Text Widget link on the main menu of the WallTime web interface.

To change the HTML being displayed, edit it in the `Widget HTML` window and then click the `Update` button.

The Text Widget can also be set to update itself from a static URL at a set interval. The configure this, enter the URL from which to pull updates in the `Update URL` field and the interval between updates (in seconds) in the `Update Interval` field.

In addition to WallTime's integrated web interface, the Text Widget can be directly updated by means of standard http PUT commands. See chapter 5 "Remote Control" for details.

2.7. Configuring the Notifications Display Widget

The Notifications Widget is essentially a 'miniature' version of the full-screen display provided by the "Notification Status with Digital Clock" display style, shrunk down to fit within the space provided for a widget. Please see the "Notification Status with Digital Clock" Display Style chapter (below) for information on configuration.
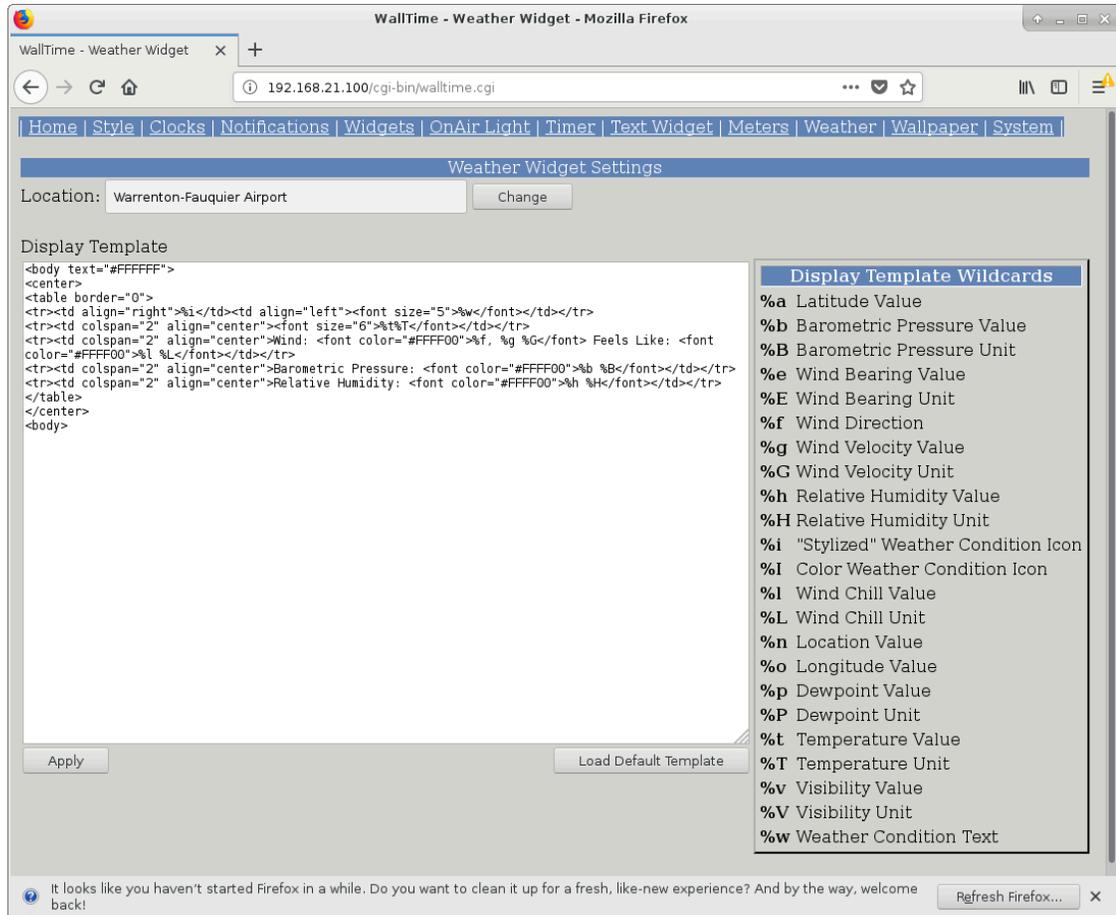
2.8. The Weather Widget

The Weather Widget allow the ability for current weather conditions --i.e. temperature, relative humidity, wind speed/direction etc.-- at selected locations in Canada and the United States.

2.8.1. Configuring the Weather Widget

To configure the Weather Widget, click on the `Weather Widget` link on the main menu of the WallTime web interface.

The contents of the Weather Widget (layout and data displayed) can be customized by means of the `Display Template`, consisting of HTML with the appropriate "wildcards" which will be replaced by the appropriate data values in the widget.

Note

To set the units used in the Weather Widget (MKS or USA), see the `Units` dropdown on the `System` page.

To choose the location to use for weather conditions, click the `Change` button to bring up the `Weather Station Location` screen.
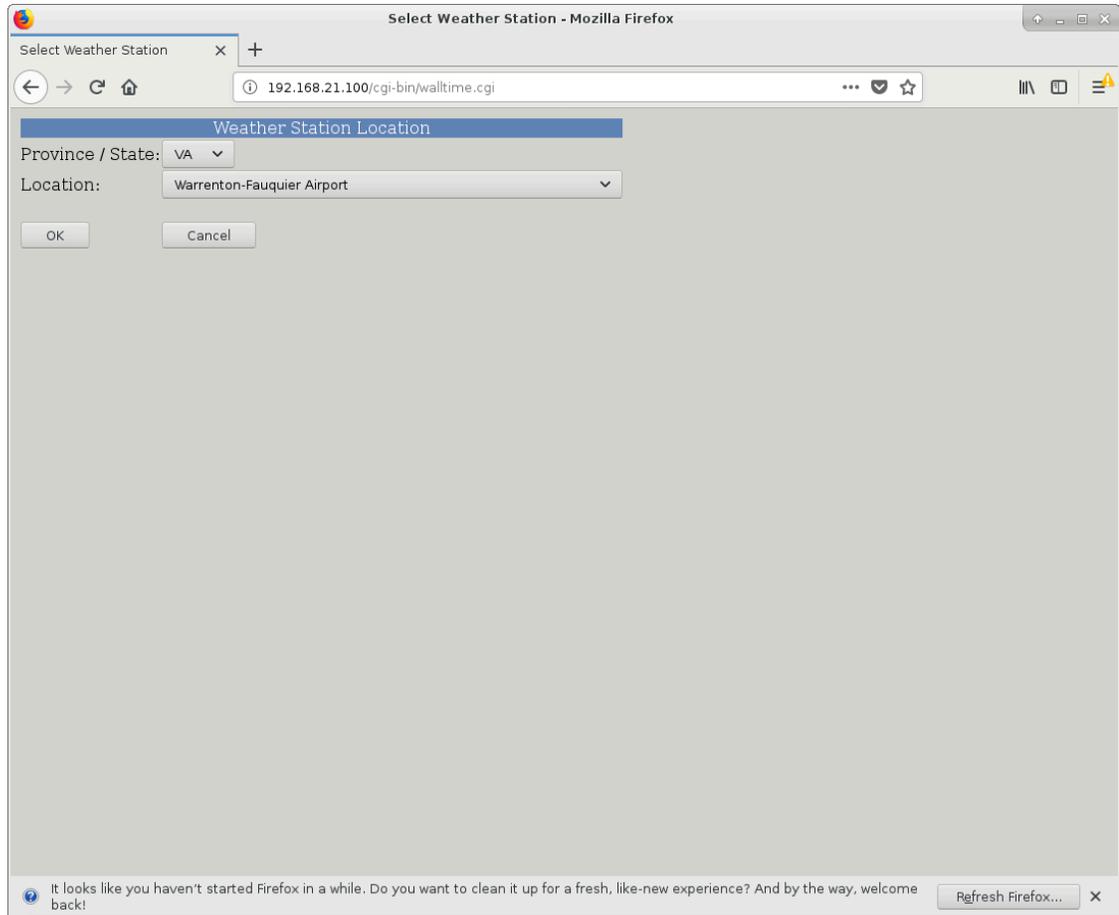
Choose the desired `Province/State` and `Location` from the dropdown lists and then click the `OK` button.

Chapter 3. The "MultiZone Digital Clocks" Display Style

3.1. Configuring Clocks

Configuration is done by clicking on the `MultiZone Clocks` link on the main menu of the WallTime web interface.

Each clock can be configured with the following parameters:

Show Clock   When set to **Yes**, display the respective clock.

Label   Sets the text display at the top of each clock.

Time Zone   Set the timezone to be used by the indicated clock. Daylight Savings Time for the selected
                 time zone (if any) will be enabled automatically as appropriate.

When finished adjusting parameters, click the Apply button to make the settings operative.

Chapter 4. The "Analog Clock with MultiZone Clocks" Display Style

4.1. Configuring MultiZone Clocks

See Section 3.1, "Configuring Clocks" for information on configuring the MultiZone clocks.

Chapter 5. Remote Control

In addition to its built-in web control interface, many aspects of WallTime's operation can be controlled remotely by means of commands sent via TCP/IP. This opens many possibilities for integration with various other systems. This section examines the methods available and provides some simple "cookbook" recipes to demonstrate how these remote capabilites can be exercised. These recipes assume a basic familiarity with using the command-line interface on a computer.

5.1. Running the Recipes

Many of the examples given in this section use one of the following tools to exercise the specific function under disucssion. All are included in most default Linux / OS X / Windows setups or freely available for download via the Internet:

Curl   Open source command line tool and library for transferring data with URL syntax. Available at https://curl.haxx.se/.

Netcat   The classic "Swiss Army Knife" for TCP/IP networks. Included with most Linux and OS X setups. A version for Microsoft Windows™ is available at http://www.securityfocus.com/tools/139.

5.2. Time Offset

The time offset of both the analog and digital clock displays can be altered dynamically by means of the following command, sent to UDP port 6060:

```
TO offset!
```

Where **offset** is the offset to apply (in milliseconds).

5.2.1. Example

Use a series of netcat (nc) commands to change the time offset so that the displayed time is one hour behind normal (-3600000 milliseconds), then set it back to normal (0 milliseconds).

```
echo TO\ -3600000\! | nc -u ip-addr 6060
```

```
echo TO\ 0\! | nc -u ip-addr 6060
```

5.3. Segment Counter

In addition to the built-in web methods, WallTime's Segment Counter can be controled by means of text commands sent to UDP port 6060. The following commands are available:

Set Count Mode   `SM mode!`

Where **mode** is one of the following:

`U`   Count Up

`D`   Count Down

Preset Counter   **PS *secs*!**

Where ***secs*** is the values to which to preset the counter, in seconds.

Reset Counter   **RS!**

Set the counter to the Preset Value (default **00:00:00**).

Start Counter   **ST!**

Start the counter.

Stop Counter   **SP!**

Stop the counter.

5.3.1. Example

Use a series of netcat (nc) commands to put the Segment Counter into 'countdown' mode, preset it to 01:00:00 and then count down to 00:00:00:

```
echo SM\ D\! | nc -u ip-addr 6060
```

```
echo PS\ 60\! | nc -u ip-addr 6060
```

```
echo ST\! | nc -u ip-addr 6060
```

5.4. On-Air Light

In addition to Livewire and Modbus GPIO, WallTime's On-Air Light can be controlled by means of text commands sent to UDP port 6060. The following commands are available:

Turn On   **LP 1!**

Turn Off   **LP 0!**

5.4.1. Example

Use a netcat (nc) command to turn ON the On-Air Light:

```
echo LP\ 1\! | nc -u ip-addr 6060
```

5.5. Text Widget

The content of WallTime's Text Widget can be updated dynamically by means of standard http PUT commands, sent to the URL:

```
http://ip-addr/webwidget
```

5.5.1. Example

Use a curl command to display the phrase "Hello World!" in the Text Widget:

```
echo Hello\ World\! | curl -u user:password -T - http://ip-addr/webwidget
```

Chapter 6. Restoring Factory Defaults

If necesary (due to a lost password or other reason), the WallTime unit can be restored to "factory default" settings by means of the following procedure:

1. Obtain a USB thumb drive. Download the file at http://static.paravelsystems.com/walltime/firmware/ factory_defaults.dat to the root folder of the drive.

2. Remove power from the WallTime unit, then insert the thumb drive into one of the USB sockets located on the end of the unit.

3. Reapply power to the unit and let the unit boot up until the Factory Reset message appears.
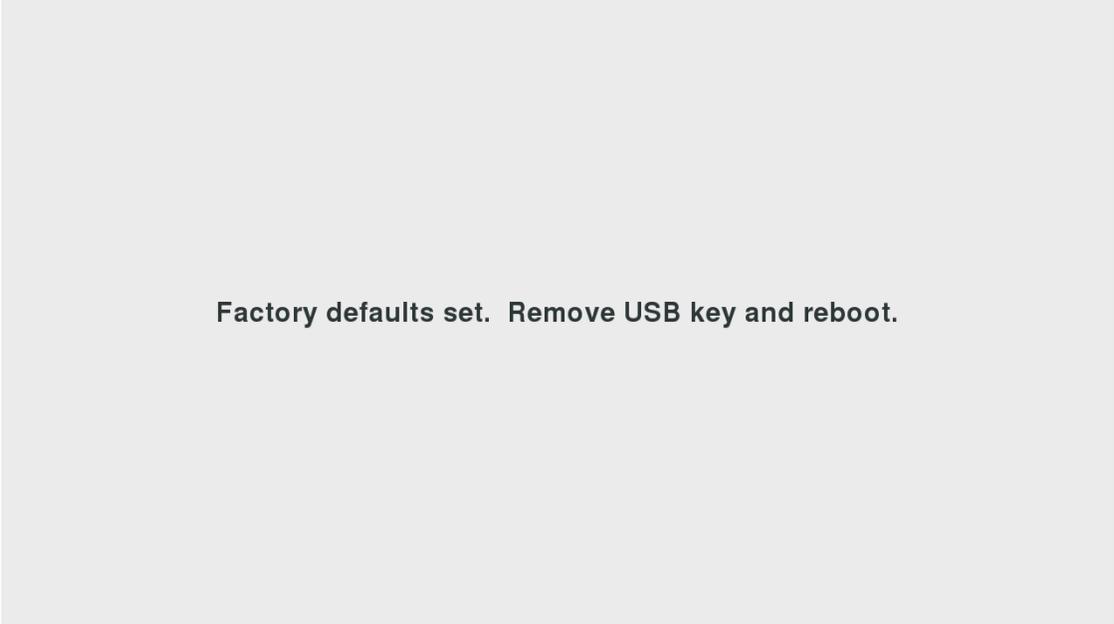
Factory defaults set. Remove USB key and reboot.

4. Remove power from the WallTime unit, then remove the USB drive.

5. Reapply power to the unit and let it boot up normally. The unit will now be set back to factory defaults.