



POE/WiFi RGB Digital Clocks

4, 6, and 9 Digit clocks

2 Line TimeZone clocks

Installation and Operation Manual

For Clocks with Serial Numbers beginning with 'C'

POE v5.4+ firmware, WiFi v3.4+ firmware



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1 Introduction

TimeMachines clock displays provide an accurate, synchronized time source. Utilizing Power over Ethernet (POE) or WiFi for network connectivity, and Simple Network Time Protocol (S)NTP to set their time, makes installation and setup as clean and simple as possible. With full timing functions, these clock displays can provide most timing needs.

TimeMachines also makes double sided clocks that use a single Ethernet/WiFi connection for both sides. All double sided clocks include mounting options to support flush and drop ceiling mount as well as cantilever mount. These clocks have all the same features as the rest of the TimeMachines products.

Nine digit clocks are also supported that allow for additional information to be displayed. Multi-Day countdowns can be setup, as well as timer features that show hours, minutes, seconds, and fractions of a second.

TimeZone, or 2 line displays that allow showing free form text on the second line of the display, are supported in the POE clock firmware starting in version 5.4, and the WiFi firmware version 3.4. Version information for the two types of clocks will generally be referenced as POE/WiFi, such as 5.4/3.4. If the purchased clock doesn't have this second line, these features will make no apparent change to the function of the device. In a couple instances, it is possible to get "odd" behavior because a TimeZone feature has been turned on, but no display is present to make it clear what is happening. The best example of this is the multi-zone feature where the clock can switch between up to 5 different time zones on a periodic basis. Without the second line of information to explain what timezone is currently being displayed, the clock simply appears to be changing times randomly.

2 Installation

2.1 POE Connection

TimeMachines clock displays require connection to a POE enabled LAN. There are two ways of going about this, one is to have a POE switch and the other is to have a POE injector. POE injectors are offered through TimeMachines as an accessory. Any standard 802.1af compliant 15W per port Ethernet switch is all that is required, sold separately.

2.2 WiFi Connection

The WiFi Clocks require a Wireless Network to be in place to function, as well as an 80-240V 50/60Hz power source. Alternately the clock can be used on a wired network without the requirement of WiFi. Initial setup is all done with a web browser through the wired connection. 802.11 b/g/n are supported at 2.4 GHz. POE is not supported on WiFi models.

2.3 Network

Beyond connecting to a POE/WiFi enabled LAN, nothing else is required to get TimeMachines clocks up and running. IP, Netmask, Gateway, and DNS addresses are all setup using Dynamic Hosting Configuration Protocol (DHCP) by default. Static addresses may be assigned by accessing the configuration web page. The default time server is set to utcnist.colorado.edu but can be changed using the configuration web page. These processes are described with further detail in the Configuration section.

2.4 Mounting

Single sided clocks may be surface mounted or rack mounted (2.5" clocks only) with the 760-201-000 rack mount kit. Required tools: hammer, drill, 1/4" drill bit, screwdriver and pencil. Other mounting options are left to the user. Double sided clocks are also available and include mounting hardware to cover most mounting configurations. See the double-sided clock mounting guide on the website.

2.4.1 Surface Mounting to Drywall

1. Mark the holes to be drilled based on the spacing of your specific clock. 12.5 inch centers for the 2.5 inch digit clocks as well as the 4 inch by 4 clocks, and 16 inches for the 4 inch 6 digit clock.
2. With a 1/4" drill bit, drill through the two marks.
3. Insert an anchor into each of the 2 holes using a hammer.
4. Insert a screw into each anchor leaving a 1/16-1/8 inch gap between the head of the screw and the mounting surface.
5. Connect the network cable to the back of the clock.
6. Place the keyhole slots on the back of the clock over the screws and secure it into place.

2.4.2 Rack Mounting

1. Attach an ear to each side of the clock.
2. Attach clock to rack.

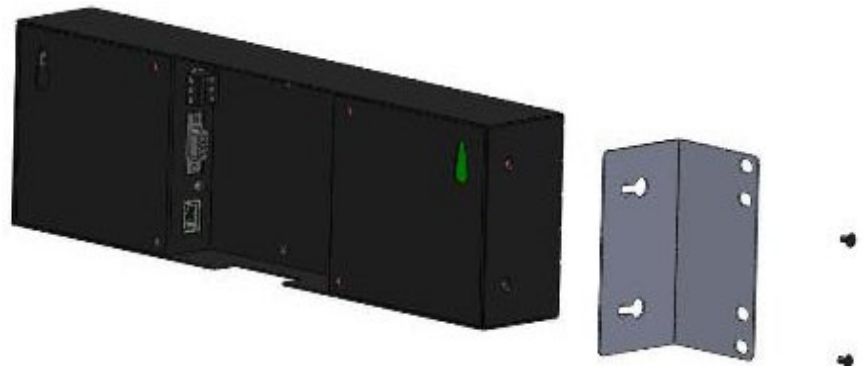
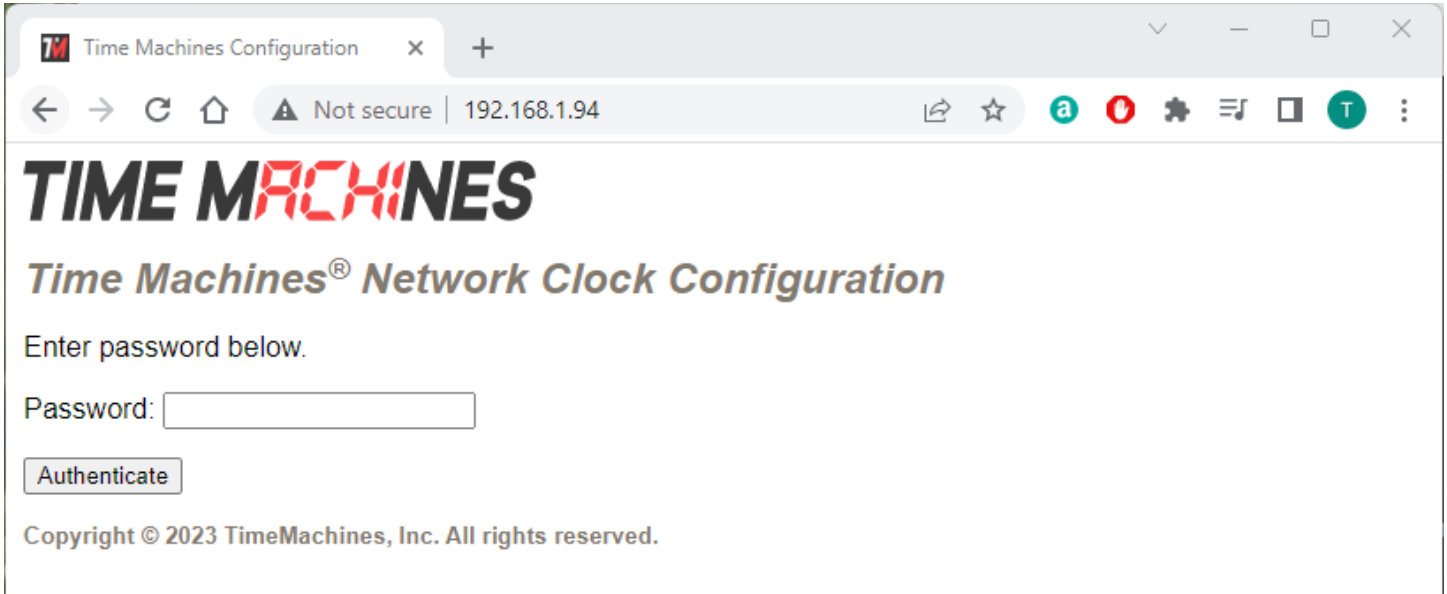


Illustration 1: Rack mount ear installation

3 Configuration

All TimeMachines products support the bulk of their configuration through a built in web server in each device. Using a standard web browser, the configuration information can be set. **The IP address of any clock/display can be found by double-clicking the button located next to the Ethernet connector.**

In addition, there is a free application that can be helpful in maintaining clock configurations. TM-Manager is a free download from the website and can be found under the Product menu. Windows and MAC configurations are available for download. Advanced configuration and bulk updates are possible using TM-Manager, as well as advanced timer functions.



3.1 Web Page – Default password is “**tmachine**”

After making changes to the configuration page the “Save Settings” button must be pushed to submit form data. If the changes made do not take effect, the “Restart” button must be pushed to restart the clock allowing changes to be applied.

4 WiFi Clocks Only: Initial Setup of the WiFi Connection

4.1.1 Step 1: Connect the WiFi clocks wired Ethernet interface and apply Power.

It is easiest if the network that the clock is connected to has a DHCP server so that the clock can receive an initial IP address for setup purposes. The initial IP address can be found by using the push button (double-click) located on the back of the clock. If no DHCP server is present on the network, after about 90 seconds the DHCP default address will be assigned statically to the clock. It will be in the 169.254.X.X range and can be used for setup of the WiFi credentials.

4.1.2 Step 2: Log in to the clock through the Wired connection at the DHCP assigned address

From a computer on the same network as the clock, open a browser (Edge, Chrome) and type in the IP address displayed on the clock when the button is double-clicked for the URL. This should bring up the login screen of the clock. The default password is *tmachine*.

4.1.3 Step 3: Enter the Wifi credentials and save them

After entering the WiFi credentials, power off the clock, remove the Ethernet cable, and power up the clock. It should now connect to the WiFi AP. If there are issues, the clock may scroll messages like “bad AP” if it can't find the assigned AP, or “bad Pass” if the password is failing. If there are issues with the setup, return to the wired connection and restart the setup until WiFi access is completed.

Note: The WiFi clock detects its connected network at power up. If a wired Ethernet connection is detected at power-up, then the clock will function as a wired clock. It cannot switch to WiFi. If no Ethernet connection is detected at power-up, then the clock will attempt to communicate over WiFi. It will not revert to wired if subsequently connected to a wired connection.

The screenshot shows a web browser window titled "Time Machines Configuration" with the URL "192.168.1.55". The page header features the "TIME MACHINES" logo and the title "Time Machines® Network Clock Configuration". Below the header is a tab labeled "Alarm Settings". The main section is titled "Network" and contains a list of configuration fields:

- Use DHCP:
- IPv4: 192.168.1.55
- IPv6: ::
- IPv6 link local: fe80::8e1f:64ff:fe7b:88b9
- IPv6 temporary: fec0:1::8e1f:64ff:fe7b:88b9
- Netmask: 255.255.255.0
- Gateway: 192.168.1.1
- Primary DNS Server: 192.168.1.3
- Secondary DNS Server: 8.8.8.8
- MAC: 8c:1f:64:7b:88:b9
- SSID: TMIncNet
- Security Mode: WPA2
- AP Password: ****
- Channel: 0
- RSSI: -49 dBm
- Mask HTTP access on Subnet:

4.2 Network

By default the network parameters are setup up using DHCP. In order to set static values, uncheck the DHCP check box and enter new values in the address fields. If the values aren't changed the current addresses will be kept. **The clock must be restarted for these changes to take affect.** Addresses in the Network section must be entered in IPv4, dotted quad, format.

4.2.1 IPv4 and IPv6

Both IPv4 and IPv6 are supported for static and DHCP setup. Set the parameters to match your network setup.

4.2.2 DNS

If using fully qualified domain names for the time servers, then DNS entries must be included.

4.2.3 Mask HTTP Access on Subnet

Check this box to only allow setup of the TM1000A, through the web interface, from the local sunnet. This provides a measure of security for the device from outside the subnet attack.

4.2.4 MAC

The MAC address field is read only and only for information.

4.2.5 WiFi Only: SSID, Security Mode, and AP Password

These parameters are used exclusively by the WiFi network interface and must be set to match the Access Point (AP) that the clock will use to synchronize its time. SSID is the name that the AP is referenced as and the AP Password is the password associated with it. The Security Mode must also match the setup of the AP and is typically Open, WPA1 or

WPA2.

The “SSID” and “AP Password” fields must be filled even if operating in wired mode.

Frequency: 2.4G Band

Security Support: Open, WPA1 and WPA2 with pre-shared keys. WPA2 Enterprise is NOT supported.

Due to the variation in WiFi systems, TimeMachines recommends compatibility testing before bulk purchase.

4.2.6 WiFi Only: Channel and RSSI

Channel and RSSI are read only parameters for information about WiFi performance.

4.3 Time Synchronization

NOTE* If any timezone settings are changed, the changes will not take effect until the next SNTP Resync Period.

The screenshot shows a web browser window titled "Time Machines Configuration" with the address bar displaying "192.168.1.56". The page content is divided into two main sections: "Time Synchronization" and "DST Options".

Time Synchronization

- Primary NTP Server: 72.46.55.88
- Primary IPv6 NTP Server: 2610:20:6f15:15::27
- Secondary NTP Server: pool.ntp.org
- IPv4 Enable Flag (0 or 1 only): 1
- Time Zone: USCT - USA Central
- Custom Time Zone: - 6 Hours 00 Minutes
- SNTP Resync Period (Hours:Mins): 0:10
- Time Offset: + Secs: 0 mSecs: 0
- Use 12-hour Format 24-hour Mode Leading Zero

DST Options

- Daylight Saving Time: AUTO
- Fixed Day:
- Start Date: 2nd Sun Mar 13th
- Start Time: 02:00
- Stop Date: 1st Sun Nov 6th
- Stop Time: 02:00
- Hour Bias: + 1 Hours 00 Minutes

4.3.1 Primary and Secondary NTP Servers

Primary NTP Server, sets the address of the NTP time source, which is the address where the display gets its timing information. In case the Primary NTP Server is unreachable the clock will fall to the Backup NTP Server. Both DNS names (time.nist.gov) and IPv4 (72.46.55.88) formats are accepted. These are used if the IPv4 Enable flag is set to 1.

4.3.2 Primary IPv6 NTP Server

The Primary IPv6 server can be used as a time source if the IPv4 Enable flag is set to 0 and if IPv6 is available on the network for the clock to utilize.

4.3.3 IPv4 Enable

This controls whether IPv4 or IPv6 NTP server addresses are used for time keeping. Use a 0 to disable, 1 to enable.

4.3.4 DHCP Option 42 – NTP Server Setting

The TimeMachines display products support DHCP option 42 which allows the DHCP server to serve the IP address for the device, as well as the IP address of time sources to be used by devices on the network. Up to two can be specified for use by the TimeMachines displays. When a DHCP set NTP source is used, the web page will display the DHCP sourced IP in place of the stored configuration. It is possible to save these if the web page is updated which then in the absence of a DHCP provided time server, would then attempt to be used as written and possibly fail. Consult your DHCP server documentation on how to add these settings. See the section on DHCP setup string for additional options for setting up the clock from a DHCP server.

4.3.5 Time Zone

Selecting the Time Zone sets the offset the clock will display from Greenwich Mean Time. All fields have a predetermined offset except for CUSTOM. Note, in the USA, this should typically be one of the named zones, Central or Eastern for example, to have daylight savings time “AUTO” mode function correctly. These are at the top of the pulldown list and may not be visible without scrolling.

4.3.6 Custom Time Zone

If CUSTOM is selected for the Time Zone then this field is editable. Set the desired custom offset by using the drop down menus to select hours, minutes and (+/-).

4.3.7 SNTP Resync Period

The SNTP Resync Period entry sets the period between SNTP requests. Enter the number of hours and minutes separated by a colon (Hours:Min). The default setting is 0 hours and 10 minutes and is the recommended update interval.

4.3.8 Time Offset

This setting allows the user to advance or delay the time displayed by seconds and fractions of a second. A positive offset moves the clock ahead of the NTP synchronization time, and a negative setting moves it behind the NTP synchronization time. The fractional portion of the offset is in milliseconds, so for example a half second would require an entry of 500. The accuracy of this is only to the hundredths.

4.3.9 Twelve Hour Time

Select 12 or 24 hour time. When the box is checked the clock is in 12 hour mode, when the box is unchecked the clock is in 24 hour mode. The default setting is 12 hour mode. In the 12 hour mode of operation AM hours will display a dot in the upper left corner of the display. PM hours will display a dot in the lower left corner of the display. (In 24 hour mode there will be no indication of AM or PM)

4.3.10 24-Hour Mode Leading Zero

When checked, and the clock is displaying 24 hour time, a leading zero will be added to times with single digit hours, such as 00-09 hundred hours.

4.4 Daylight Savings

Daylight Savings Time (DST) varies greatly from one country to another and sometimes even within countries themselves. As a result there are many parameters used to handle all of the various rules that are in use throughout the world. The default setting uses the rule that is observed by the majority of the United States.

NOTE* If any DST settings are changed, the changes will not take effect until the next SNTP Resync Period.

4.4.1 Daylight Savings (DST Options)

The Daylight Saving Time Drop down, allows you to select AUTO, OFF, or CUSTOM. When AUTO is selected the clocks use the default US Daylight Savings start and stop dates. If OFF is selected the clock does not adjust for Daylight Savings Time. If CUSTOM is selected the user can specify a custom start date with a start time and stop date with a stop time. The user can also adjust the bias of the offset.

NOTE* If a US Time Zone is selected then and DST setting of OFF is not allowed. If a DST setting of OFF is needed the Time Zone should.

4.4.2 Fixed Day

The Fixed Day check box indicates whether or not DST occurs on a specific date. For example, if DST started on March 1st of every year, the Fixed Day box would need to be checked. The Fixed Day box is important in that it changes how the Start and Stop parameters function. Based on the Fixed Day Check box certain drop down menus will be available for editing.

4.4.3 Start/Stop Date

The Start and Stop Date parameters indicate when DST changes occur.

- The first drop down is only used on floating day start time (i.e. 2nd Sunday of the month). If fixed day is selected this option is greyed out.
- The second drop down allows the user to select the day of the week you want DST to start or stop. This parameter is also only available in a floating day scenario.
- The third drop down allows the user specify the month of the start or stop date. This field is always used.
- The last field is the date, this is only used when a fixed is used (i.e. June 4th).

4.4.4 Hour Bias

The Hour Bias parameter allows the user to input a custom hour and/or minute offset if a CUSTOM Daylight Saving Time is chosen.

4.5 Calendar Mode

This section is for utilizing the Calendar feature of the clock. When in Calendar mode the clock will alternate between displaying the current time for a selected duration, and the current (or offset) date for a selected duration.

The screenshot shows a web browser window titled "Time Machines Configuration" with the address bar showing "Not secure | 192.168.1.94". The page content is organized into three sections:

- Calendar Mode:** Includes a checkbox for "Use Calendar", a "Date Mode" dropdown menu set to "MM:DD:YY", and "Display Durations" for "Time on period", "Date on period", and "Date offset" (all set to 3, 3, and 0 respectively). A "Color" dropdown is set to "Red".
- Count Up Timer:** Includes a checkbox for "Use Count Up Timer", a "Display Mode" dropdown set to "(DAY):HR:MIN:SEC", and "Start" and "Reset" buttons.
- Count Down Timer:** Includes a checkbox for "Use Count Down Timer", a "Display Mode" dropdown set to "(DAY):HR:MIN:SEC", and a "Countdown Start Time" field with sub-fields for Days (0), Hours (0), Mins (0), Secs (5), and Tenths (0). It also has checkboxes for "Activate Alarm Relay" and "Display Bargraph During Countdown", and an "Alarm Relay Duration" field set to 0. "Start" and "Reset" buttons are present.

4.5.1 Use Calendar

Check this box if the Calendar mode of the clock is desired. If unchecked, the following fields will be greyed out and the clock will operate as a precision digital clock only.

4.5.2 Date Mode

This field is used to select the format in which the date is to be displayed.

4.5.3 Time

This field is used to select the amount of time, in seconds, that the current time is to be displayed on the clock.

4.5.4 Date

This field is used to select the amount of time, in seconds, that the date is to be displayed on the clock.

NOTE* If a constant display of the date is desired, the "Time" field can be set to 0 seconds, and the "Date" field can be set to any value greater than 0.

4.5.5 Date Offset

This field is used to select a forward offset, in days, to the current date. If the "Date Offset" value is selected as 0, the

current date will be displayed.

4.5.6 Color

Starting in POE firmware 5.2/3.2, when using an RGB clock, the date can be displayed in a different color from the time. This can make it easier to determine whether the time or date is currently being displayed.

4.6 Count Up Timer

This section describes utilizing the up counting timer feature of the clock from the web page, other timer features can be accessed from TM-Timer or TM-Manager, see their associated documentation.

4.6.1 Use Count Up Timer

Check this box to use the count up timer. If unchecked, the fields in this section will be grayed out and inaccessible. As soon as this box is checked, the clock will switch to the up-counter mode showing the reset value of "00:00:00".

4.6.2 Display Mode

This field is used to select the format in which the up counter is to be displayed. Starting in version 5.2/3.2, there are now three options for display format to support 9 digit clocks. The values that are shown in parenthesis will only be shown if a 9 digit clock is in use. 4/6 digit clocks will simply not display the extra digits. The options are "(HR):MIN:SEC:tSEC", (DAY):HR:MIN:SEC and "DAY:HR:MIN". A 4 digit clock is simply a 6 digit clock without the seconds, so a 4 digit clock will not show the final value listed.

4.6.3 Start/Pause/Reset Buttons

The Start button for this section will begin an up counting timer. As soon as it's clicked, the button will dynamically switch to read "Pause" so that it now acts as a pause button for the running timer. Clicking this Pause button will switch it back to read "Start", and it will immediately stop the timer to display its current values. Selecting this button again will continue the up counting timer from this paused state.

The Reset button is only active when the timer is paused. It will clear the current timer values back to "00:00:00" so that it can be restarted from this point. The up counting timer is also automatically reset whenever it leaves timer mode and goes back to a normal clock display.

4.7 Count Down Timer

This section describes utilizing the down counting timer feature of the clock from the web page, other timer features can be accessed from TM-Timer or TM-Manager, see their associated documentation.

4.7.1 Use Count Down Timer

Check this box to use the count down timer. If unchecked, the fields in this section will be grayed out and inaccessible. As soon as this box is checked, the clock will switch to the down-counter mode showing the reset value of the current "Countdown Start Time" parameters.

4.7.2 Display Mode

This field is used to select the format in which the down counter is to be displayed. Starting in version 5.2/3.2, there are now three options for display format to support 9 digit clocks. The values that are shown in parenthesis will only be shown if a 9 digit clock is in use. 4/6 digit clocks will simply not display the extra digits. The options are "(HR):MIN:SEC:tSEC", (DAY):HR:MIN:SEC and "DAY:HR:MIN". A 4 digit clock is simply a 6 digit clock without the seconds, so a 4 digit clock will not show the final value listed.

4.7.3 Days

This field will set the starting number of hours. Note that the setting in the "Other" section will govern how days are displayed. On a 9 digit clock, assuming a display format showing days, the first three digits will be days. This will happen

if the “Display Format” in the “Other” section is set to one of two 9 digit formats. If the clock however is set to 4/6 digits, then the days will be calculated to display in the hours section. If the countdown is less than 99 hours, then the days will be translated to show in the hours. If the limits of the display are exceeded, then “EE” will be displayed in the field. A 100+ hour countdown that initially results in “EE” being displayed, will switch to 99 when the hours drops below 100.

4.7.4 Hours

This field is used to select an hours start time for the count down timer. Values are 0-99.

4.7.5 Minutes

This field is used to select a minutes start time for the count down timer. Values are 0 – 59.

4.7.6 Seconds

This field is used to select a seconds start time for the count down timer. Values are 0 – 59.

4.7.7 Tenths of Seconds

This field is used to select a tenths of seconds start time for the count down timer. Values from 0 – 9.

4.7.8 Activate Alarm Relay

Select this box to allow the countdown timer to trigger an “alarm” when it reaches 00:00:00. This will flip the relay, which feeds to the connector on the back (referencing section 4.1).

4.7.9 Alarm Relay Duration

This field is used to select the number of seconds a countdown “alarm” will last. This can only be changed when the Activate Alarm Relay box is checked. Values from 1 – 59.

4.7.10 Display Bargraph During Countdown

When checked, and using a two line TimeZone clock, a bargraph will be displayed on the second line of the display with a bargraph that gets smaller as the countdown progresses. The color of the bargraph will be the current color set of the bargraph. This could be something that is changing if multiple zones are active.

4.7.11 Start/Pause/Reset Buttons

The Start button for this section will begin a down counting timer. As soon as it's clicked, the button will dynamically switch to read “Pause” so that it now acts as a pause button for the running timer. Clicking this Pause button will switch it back to read “Start”, and it will immediately stop the timer to display its current values. Selecting this button again will continue the down counting timer from this paused state.

The Reset button is only selectable when the timer is paused. It will clear the current timer values back to the displayed Start Time parameters, so that it can be restarted from this point. The down counting timer is also automatically reset whenever it leaves timer mode and goes back to a normal clock display.

4.8 Count Down to Date

The screenshot shows a web browser window titled "Time Machines Configuration" with the address bar displaying "Not secure | 192.168.1.94". The main content area is divided into two sections:

- Count Down To Date:** This section includes a checkbox for "Use Count Down To Date Timer" (unchecked). Below it is a "Display Mode" dropdown menu set to "(HR):MIN:SEC:tSEC". A "Countdown to Date End Time" is configured with fields for Month (3), Day (31), Year (2023), Hours (1), Minutes (0), and Seconds (0). There is also an "Activate Alarm Relay" checkbox (unchecked) and an "Alarm Relay Duration" field set to 0. "Start" and "Reset" buttons are located below these fields.
- Line 2 Matrix Configuration:** This section features a "Display Text" field containing the code "^DA^ ^Mon^ ^DD^, ^YYYY^". The "Scroll" direction is set to "Right to Left", "Scroll Speed" is 40, "Text" is "Bold" (checked), and "Color" is "Yellow". A "Blink" checkbox is present but unchecked.
- Other:** This section contains various configuration fields: "Unit Name" (POE_Clock), "Password" (masked with asterisks), "Display Format" (4/6 Digits), "Digit Color" (HR Blue), "MM:SS" (Yellow), "Digit Brightness (0-100)" (100), "Dot/Colon Brightness (0-100)" (40), "Matrix Brightness (0-100)" (100), "Timer Revert to Time (min)" (14, with "(0=Disabled)" next to it), and "Host FW" (5.4). "Save Settings" and "Restart" buttons are at the bottom of this section.

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The Count Down to Date feature is new in POE firmware version 5.2/3.2. It supports a countdown that is not started and stopped arbitrarily like the standard Count Down Timer mode, but one that calculates and displays a continuously updating countdown to a future date and time. A countdown to Friday closing time for example. The clock will be

synchronized to the second boundary of any other network clock and is corrected for time offsets by the periodic NTP lookup.

4.8.1 Use Count Down to Date Timer Checkbox

Check this box to use the count down to date timer. If unchecked, the fields in this section will be grayed out and inaccessible. As soon as this box is checked, the clock will switch to the count down to date mode showing a default value.

4.8.2 Display Mode

This field is used to select the format in which the count down is to be displayed. Starting in version 5.2, there are now three options for display format to support 9 digit clocks. The values that are shown in parenthesis will only be shown if a 9 digit clock is in use. 4/6 digit clocks will simply not display the extra digits. The options are "(HR):MIN:SEC:tSEC", (DAY):HR:MIN:SEC and "DAY:HR:MIN". A 4 digit clock is simply a 6 digit clock without the seconds, so a 4 digit clock will not show the final value listed.

4.8.3 Countdown to Date End Time

These settings are the future time the clock should count down to. The clock cannot count down to a date in the past. Enter the future date to count down to.

4.8.4 Activate Alarm Relay

Select this box to allow the count down to date to trigger an "alarm" when it reaches 00:00:00. This will flip the relay, which feeds to the connector on the back (referencing section 4 on external connections).

4.8.5 Alarm Relay Duration

This field is used to select the number of seconds a countdown "alarm" will last. This can only be changed when the Activate Alarm Relay box is checked. Values from 1 – 59.

4.8.6 Start/Pause/Reset Buttons

The Reset button must be clicked first to set the initial values of the count down. It can be clicked multiple times and the clock will show the time to the end of the count down. Clicking the Start button is required to have continuous updates.

The Start button for this section will begin allow the clock to update its display each second. As soon as it's clicked, the button will dynamically switch to read "Pause" so that it now acts as a pause button for the running timer. Clicking this Pause button will switch it back to read "Start", and it will immediately stop the timer to display its current values. Selecting this button again will continue the down counting timer from this paused state. The count down must be stopped to allow the value to be edited.

4.9 Line 2 Matrix Configuration

Starting in version 5.4/3.4 of the POE clocks, the firmware supports a second line dot-matrix display. Clocks without this display will see no change in function when these features are used.

4.9.1 Display Text

This is the text that will be displayed. The entry field supports single line text for Right to Left scrolling, as well as Multi-Line entries (carriage-return between lines) for Top to Bottom scrolling. The text is not reformatted for best display, it is up to the user to format it within this entry field.

4.9.2 Scroll Direction

Using scrolling, longer messages can be displayed. When scrolling, use this setting to control the direction of the scroll.

4.9.3 Scroll Speed

This is a number between 10 and 500 that controls the speed of horizontal and vertical scrolling. A lower number is faster and a higher number is slower. 60 is a good default to start with.

4.9.4 Text Options Bold and Blink

The Bold checkbox changes the text font into a bold format. Selecting the Blink option, will cause the displayed text to blink.

4.9.5 Text Color

This option sets the color of the text displayed on the matrix.

4.10 Date Display Format Options

One of the most common uses for the second line of the display, is to display the current date. There are essentially an infinite number of options for this on the TimeZone clocks. The text box, previously discussed, allows the date to be displayed using variables for the different date elements. A list of those variables follows:

Variable	Display Function
^D^	Day as 1 or 2 digits, no leading zero
^DD^	Day as two digit string, leading zero
^M^	Month as 1 or 2 digits, no leading zero
^MM^	Month as two digit string, leading zero
^YY^	Year as two digits
^YYYY^	Year as 4 digits (+2000)
^MON^	Month a three digit string, i.e. JAN
^Mon^	Month a three digit string, i.e. Jan, Lowercase
^MONTH^	Month as full named month, i.e. January
^DA^	Day of week, three chars, i.e. MON
^Da^	Day of week, three chars, i.e. MON, Lowercase
^DAY^	Day or week, full length string, i.e. Monday
^DOY^	Day of Year as a number 1-365
^VAR1^ - ^VAR5^	Variable string, value set from API

The default display string is: “^Da^~^Mon^ ^D^” This string will display a date in the form of “Mon-Oct 25” The variables, which appear between the '^' symbols, specify what should be displayed. It is completely acceptable to put other static text mixed into the display string. For example a valid setup might be “Day=^DOY^”. This would display the text “Day=100” which in a non-leap year is April 10th. The “Day=” portion never changes, where the variable is updated for display. Messages that are longer than can be fully on the display at one time, can always be scrolled.

4.11 Rotating TimeZone Display

Starting in version 5.4/3.4 of the POE firmware, multiple timezones can be displayed. The webpage of the clock can only be used to setup the first timezone and its associated text. To display multiple timezones, TM-Manager must be used. It is also possible to display a single time, but have the second line of text change periodically on the TimeZone clock. For example, the name of the time zone could be displayed, followed by the date, followed by a variable populated by an external system to display the temperature or stock ticker price. TM-Manager is a Windows/MAC application that can be downloaded for free from our website. TM-Manager appears under the Products menu of the website. See the TM-Manager documentation on how to setup this feature.

4.12 Other Settings

4.12.1 Unit Name

This can be any alpha numeric name up to 20 characters long. This name will be passed to the DHCP server as well.

4.12.2 Password

The password field allows changing the login password. To change it, enter a new password. Clock passwords are limited to 12 characters. The default password is "tmachine".

4.12.3 Display Format

Starting in POE version 5.2/3.2, 9 digit formats are supported. On hardware that has the extra 3 digits, this allows for multiple other timing displays, as well as a couple of new clock displays. The default option is 4/6 Digits and is where a 4 or 6 digit clock should be set and left. The next two options are DDD:HH:MM:SS which shows a Julian date (day of the year) along with the current time. The third option is HH:MM:SS:TS which shows the current time, but includes tenths and hundreds of a second. The hundredths value is +/- 1 and is not perfectly synchronized to the time second boundary by NTP.

4.12.4 Digit Color

Digit color for the clocks now allows normal operation with different settings for the HR color and the MM:SS digits. On a 9 digit clock, the HR setting will be the first 3 digits and the MM:SS setting will be the last 6 digits.

4.12.5 Digit Brightness, (0-100)

This parameter allow the user to control the brightness of the display DIGITS. 0 being off, 100 being full brightness. This affects all colors equally. This does not affect the AM/PM/Colon dot brightness.

4.12.6 Dot/Colon Brightness, (0-100)

'C' series hardware now supports separate control of the brightness of the AM/PM/Colons. This setting from 0 (off) to 100 (full on) gives significant control of this brightness to allow the customer to tailor the display to their personal preferences. On RGB clocks, this affects all colors. On single color face clocks with 'C' hardware, this will adjust the brightness as well. Note that on RGB faces, the individual dots will not perfectly match the color of the digit segments. The physics of the color blending make this very difficult, but they will be very close.

4.12.7 Timer Revert to Time (min)

Prior to version 5.2/3.2, the clocks would would revert to time display if no timer was running or changed within a hardcoded 30 minute interval. That value can now be set here or set to 0 to disable the feature and leave the clock in a timer mode indefinitely.

4.12.8 Host FW

This is the version of the clock code installed in the clock.

4.12.9 WiFi Only: Radio FW

This is the version of the code in the WiFi module of the clock. This is not updatable by the user. Updates to this code version are not anticipated and are controlled by the manufacturer of the WiFi module.

4.13 Alarms

The Alarm Configuration Page is accessed at the top of the web page by clicking the Alarm Settings button. The Alarm Settings allow for setting of up to 40 alarms with each alarm being configurable for time of day, using 24 hour time entry.

TIME MACHINES
Time Machines® Alarm Configuration

Main Settings

Show Events 21-40

Event	Enable	Start Time (HH:MIN:SEC)	SUN	MON	TUE	WED	THR	FRI	SAT	Duration (sec)
21	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
22	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
23	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
24	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
25	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
26	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
27	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
28	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
29	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
30	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
31	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
32	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
33	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
34	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
35	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
36	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
37	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
38	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
39	<input type="checkbox"/>	0:0:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0
40	<input checked="" type="checkbox"/>	16:45:30	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	P

Save Settings Restart

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mode, days of week to occur, and duration of the alarm.

4.13.1 On/Off Alarm Events

There is a special setting that allows one event to turn on the alarm relay, and a second event to turn it off. This is setup by putting in the duration of 60 seconds. When an alarm is triggered for 60 seconds, it will not actually turn itself off after 60 seconds. A second alarm event is required to turn off the alarm. This is done by putting in a second alarm entry with a duration of zero at the time the event should turn off. A simple 1 minute configuration would look like:

Event	Enable	Start Time (HH:MIN:SEC)	SUN	MON	TUE	WED	THR	FRI	SAT	Duration (sec)
1	<input checked="" type="checkbox"/>	7:32:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	60
2	<input checked="" type="checkbox"/>	7:33:0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0

Which would have the effect of turning on the relay at 7:32:00 and turning it back off at 7:33:00.

4.13.2 Checkbox 21-40

When the checkbox is unchecked, Alarms 1-20 are displayed. When checked, alarms 21-40 are displayed.

4.13.3 Advanced Timer Execution, Alarm Time="PX"

TimeMachines displays are able to execute sequences of timer events, such as a 40 minute countdown, followed by a 20 minute countdown, followed by a count-up timer. The display can store up to 10 different sequences of timer events and using the Alarm page, the timer sequence can be executed at a certain time of day. To make an Alarm event trigger the stored timer program, simply put a "PX" in the Duration field of the timer event, where X is the timer program number between 1 and 10. When the alarm is executed, the timer program will begin to display. At the end of the timer program, the display will return to normal time display.

The timer program must be saved to the clock from an external application such as the Smartphone TM-Timer app, or the TM-Manager application. See the documentation of these programs for more information on the timer programming features of the products and how to save them to the displays.

4.13.4 Change Colors = "CX"

RGB face equipped clocks also support the ability to change time display color based on the time of day. To make the clock change color at a specific time, set up the alarm event time as normal, but for the relay duration, put in "CX", where X is the color number from 1 to 10. The colors are in the same sequence as the color setup in the main web page. 1=Red, 2=Green, 3=Blue, 4=Cyan, 5=Magenta, 6=Yellow, 7=White, 8=User1, 9=User2, 10=User3. See TM-Manager documentation for information on custom adjustments to the color pallet. Note that this color change does not save to flash memory, so if power is lost by the clock, it will revert to the color set in the main web page.

4.13.5 Change Brightness = "BX"

Starting in version 5.3/3.3, a valid duration for the alarms is BXXX. XXX is in the range of 0 to 100, and should be thought of as a percentage of the currently set brightness. As an example, at 9:00pm, an alarm duration value of B25 could be set and the brightness of the clock would be set to 25% of the currently set brightness values. At 7:00AM, a second alarm could be set with a duration of B100 which would set the clock back to full brightness. This percentage is applied to both the digit and dot brightness settings.

5 External Connections and Interfaces

5.1 External Connection

External connection will require the user to make a connection from the clock's internal relay to an external system. The TimeMachines Clock alarm closes an internal relay. The pinout of the connector is as follows:

- Pin 1: Approximately +12V maximum current of 50mA
- Pin 2: Relay Normally Open
- Pin 3: Relay Common
- Pin 4: Relay Normally Closed
- Pin 5: Ground

Small, low power piezo buzzers or lights can be driven directly from the clocks power supply. For larger loads, an intermediate relay is recommended. The relay in the clock is rated at 125VAC/60VDC MAX, at 1Amp.

*NOTE: This connector is not provided with purchase. If you are interested in information on obtaining this part contact TimeMachines Sales. (tmsales@timemachinescorp.com), or search for 660-133-005 on the website.



Illustration 2: Clock Relay Connector

5.2 Push Button

5.2.1 Changing the Time Zone

Using the push button provides a quick way to set the time zone without having to access the configuration web page. With every push of the button the GMT offset decreases by 1. Since the default offset is -6, pushing the button once would set the offset to -7. Once the negative offset reaches its limit (-11) the next offset is the maximum positive offset (14). Please note, that this will put the clock into a custom time zone setting and the Auto DST function will no longer function. If the clock is located in USA, the named time zone (Eastern, Central, Mountain, etc) needs to be set for DST to update automatically.

5.2.2 Scrolling the IP address

The push button also provides a quick way to determine the IP address of the clock. A double-click of the button will cause the IP address to scroll across the display.

5.2.3 Set Parameters to Default

To set all parameters to their factory default values, hold the button on the back of the clock down when the clock is powered up. If done successfully, three "8's" will scroll across the display before entering the usual start up routine. Once the '888' sequence is seen, release the button.

6 DHCP Option Setup String

All TimeMachines digital clocks, since version 5.2/3.2, are setup to request DHCP info to automatically set itself up. In addition to the normal IP Address information, the clocks are also able to request setup information like time server address, DST setup, and GMT offset. It requests this information at the same time it requests an IP address from the DHCP server. If no valid response is given then the clocks use the defaults saved in memory. These options, along with others can be changed on the individual web pages. The values received during a DHCP lookup will override the settings from the web page and the web page will not completely reflect the settings derived from the DHCP server.

The most common DHCP settings are the IP address, subnet mask, gateway, and DNS server. Optionally, using private option 231, the clock can read in a string response from the server. The server needs to be set up to respond to an option 231 request with a string containing the options below. After each key word used there must be a semi-colon “;” after it, including the last one. The options that can be set up via your DHCP server are as follows:

Command	Description
server=	Sets primary NTP server, Any Valid URL (FQDN) or IP Address is accepted
offset=	Sets offset hour from GMT (i.e.US Central Time is -6)
dst=	Sets DST options, 0=Auto, 1=Off, 2=Custom

If Custom is selected:

dstfixed=	Sets fixed or floating DST, 0=Floating, 1=Fixed
dststart=month:date:time:DOW:WOM	Sets start date for DST, Colon separated values, must have all 5 parameters set in the string. See web page documentation for more specific information on this setup string.
dststop=month:date:time:DOW:WOM	Sets stop date for DST, Colon separated values, must have all 5 parameters set in the string. See web page documentation for more specific information on this setup string.
dstbias=hour:min	Sets Desired custom time offset for DST

*DOW=Day Of Week, WOM=Week Of Month, DST=daylight saving time

For use with start and end date of DST:

month	1=Jan, 2=Feb, 3=Mar, 4=April, 5=May, 6=June, 7=July, 8=Aug, 9=Sept, 10=Oct, 11=Nov, 12=Dec
date	1-31 (according to the month you are in)
time	24 hour format can range 0 to 23.
DOW	0=Sun, 1=Mon, 2=Tue, 3=Wed, 4=Thur, 5=Fri, 6=Sat
WOM	Occurrence of DOW. 1=first, 2=second, 3=third, 4=fourth, 5=fifth

If fixed day is selected then, DOW and WOM are ignored, however they still must have a value. If floating is selected then date is ignored but still must also have a value.

For example:

server=www.nist.gov;offset=-6;dst=0;

The above string would set the primary server to www.nist.gov, set the gmt offset to -6(US central time) and set DST to auto. DST set to auto is the most common and the default if not defined.

Example with custom DST:

```
server=129.6.13.45;offset=-5;dst=2;dstfixed=1;dststart=4:5:2:0:3;dststop=11:2:2:0:3;dstbias=1;
```

This string would set the primary NTP server to 129.6.13.45 (www.nist.gov), set the GMT offset to -5 (US eastern time), selects a custom DST with fixed dates, that start 4th month (April), 5th day, at 2am. The DST would stop on the 11th month (Nov.), 2nd day, at 2am. and have a hour bias of +1 between those dates.

```
server=129.6.13.45;offset=-5;dst=2;dstfixed=0;dststart=4:5:2:0:3;dststop=11:2:2:0:3;dstbias=1;
```

With floating dates selected however, then DST would start on the 3rd Sun. of April at 2 am, and stop on the 3rd Sun. of Nov. at 2 am.

6.1 DHCP Server Setup for Configuration

Example of Linux DHCP minimum setup to delivery a configuration string using isc-dhcp-server:

```
option clockset code 231 = text;  
option clockset "server=time.timemachinescorp.com;offset=-6;dst=0;"
```

```
subnet 192.168.1.0 netmask 255.255.255.0{  
option routers 192.168.1.1;  
option domain-name-servers 192.168.1.3, 8.8.8.8;  
range 192.168.1.50 192.168.1.254;  
}
```

7 Troubleshooting

7.1 Flashing Seconds

There are two instances when the seconds (6 digit clock) and the AM/PM dots will flash to indicate a problem.

7.1.1 Lost Link

If the seconds and the AM/PM dots are flashing it is possible that the link was lost, check to make sure everything is connected properly at both ends of the cable.

7.1.2 Missed NTP Update

If an NTP packet was sent but a reply wasn't received, and approximately two time update periods of passed, the seconds and AM/PM dots will flash. The flashing will stop as soon as the clock completes a successful NTP request. If the primary server can no longer be reached the backup server will become the primary server. If both servers fail the seconds and AM/PM dots will continue to flash until the issue is resolved. Log into the configuration web page and set new NTP servers. Frequently, if using Internet based servers, the firewall is the culprit of this occurring. Making sure that NTP traffic is always allowed (UDP Port 123) is a good step toward improved reliability. An internal LAN time source is the best option.

7.2 AM/PM LED Indicators

During initial boot up when in WiFi mode (no ethernet connection), the AM/PM LED's will indicate the state that the clock is in throughout the initialization process.

7.2.1 Both AM & PM Off

When both the AM and PM LED's are off, the WiFi module is in the initialization state.

7.2.2 AM On, PM Off

This sequence indicates that the WiFi module is initialized and the clock is attempting to scan and join a wireless network.

7.2.3 AM Off, PM On

This sequence indicates that the clock has successfully joined a wireless access point and, if in DHCP mode, is attempting to acquire an IP address.

7.2.4 Both AM & PM On

This sequence will only be present if the clock is operating in DHCP mode. If in DHCP mode, this combination means that the clock has received an IP address from the DHCP server. If the clock is using a static IP address, this pattern will not be displayed and the "AM Off, PM On" pattern will remain shown until the clock receives a time update from the NTP server. At which point the AM/PM LED's will display the correct pattern corresponding to the current time.

7.3 Unable To Access Web Page/Fields Blank

This can occur for many different reasons. Below are a few examples with ways to potentially fix.

- Make sure the PC being used is on the same subnet as the clock.
- There are a few antivirus/firewall programs that may prevent accessing or viewing information on the web page. To avoid this try temporarily disabling before attempting to access the web page. Once you have made your changes re-enable security. This will not affect the function of the clock only the web page access.
- Some of the lesser known web browsers may not be compatible with the TimeMachines web interface. Try using a different browser such as Chrome or Edge.