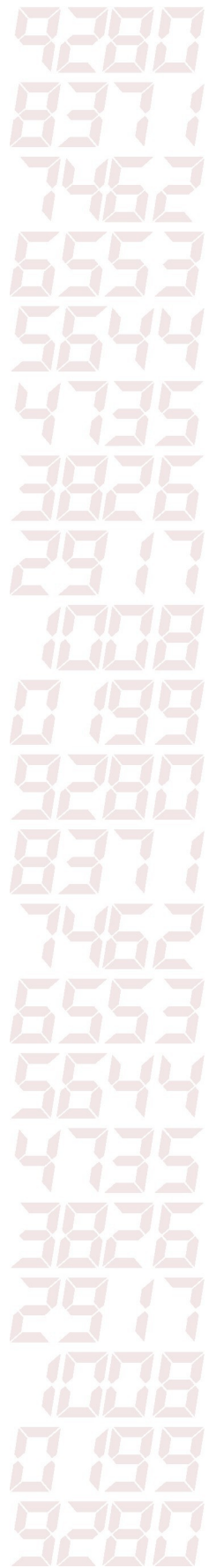




WiFi Precision Clocks

Installation and Operation Manual

* Legacy Edition *



TIME MACHINES

Table of Contents

1 Introduction.....	1
2 Initial Setup.....	2
2.1 WiFi Connection.....	2
2.2 Network.....	2
2.3 Mounting.....	2
2.3.1 Surface Mounting to Drywall.....	2
2.3.2 Rack Mounting.....	3
2.3.3 Dual Clock Mount Bracket.....	3
3 Configuration.....	5
3.1 Web Page – Default password is “tmachine”.....	5
4 Initial Setup of the WiFi Connection.....	5
4.1.1 Step 1: Connect the WiFi clocks wired Ethernet interface and apply Power.....	5
4.1.2 Step 2: Log in to the clock through the Wired connection at the DHCP assigned address....	5
4.1.3 Step 3: Setup the WiFi parameters.....	6
4.2 Web Page Parameter Reference.....	8
4.2.1 Network.....	8
4.2.1.1 DHCP Setup.....	8
4.2.1.2 Network Parameters, IP, Mask, Gateway, and DNS.....	8
4.2.1.3 MAC.....	9
4.2.1.4 SSID, Security Mode, and AP Password.....	9
4.2.1.5 Channel and RSSI.....	9
4.2.2 Time Synchronization.....	9
4.2.2.1 NTP Servers.....	9
4.2.2.2 Time Zone.....	9
4.2.2.3 Custom Time Zone.....	9
4.2.2.4 SNTP Resync Period.....	9
4.2.2.5 Twelve Hour Time.....	9
4.2.3 Daylight Savings.....	11
4.2.3.1 Daylight Savings(DST Options).....	11
4.2.3.2 Fixed Day.....	11
4.2.3.3 Start/Stop date.....	11
4.2.3.4 Hour Bias.....	11
4.2.4 Clock Type and Date Mode.....	12
4.2.4.1 Use Calendar.....	12
4.2.4.2 Date Mode.....	12
4.2.4.3 Time.....	12
4.2.4.4 Date.....	12
4.2.4.5 Date Offset.....	12
4.2.5 Other.....	12
4.2.5.1 Unit Name.....	12
4.2.5.2 Password.....	12
4.2.6 Alarms.....	13
4.2.6.1 External Connection.....	13
4.2.7 Brightness.....	14
4.3 Push Button.....	15
4.3.1 Changing the Time Zone.....	15

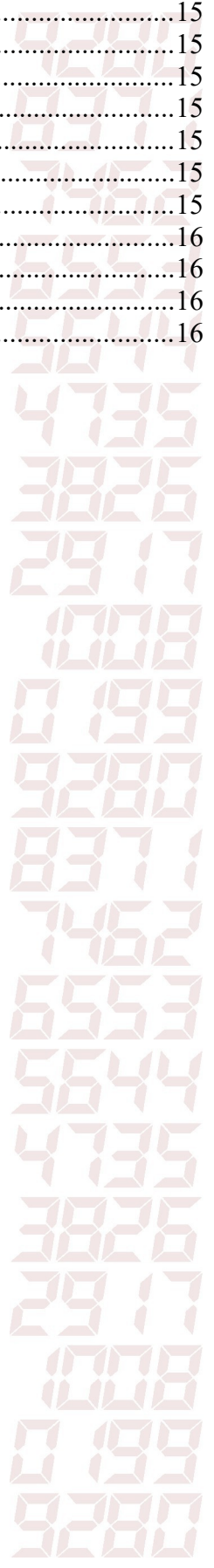
4.3.2 Scrolling the IP address.....	15
4.3.3 Set Parameters to Default.....	15
5 Troubleshooting.....	15
5.1 Flashing Seconds.....	15
5.1.1 Lost Network.....	15
5.1.2 Lost Access Point.....	15
5.2 AM/PM LED Indications.....	15
5.2.1 Both AM & PM Off.....	16
5.2.2 AM On, PM Off.....	16
5.2.3 AM Off, PM On.....	16
5.2.4 Both AM & PM On.....	16

TimeMachines, Inc.
300 South 68th Street Place, Suite 100
Lincoln, NE 68510

Engineered and Manufactured in Lincoln, Ne, USA

402-486-0511

www.timemachinescorp.com



TIME MACHINES

1 Introduction

Time Machines Precision WiFi Clocks (TMPCs) provide an accurate synchronized time source when you absolutely can't afford a time shift. TMPCs use mains power and communicate with WiFi and Simple Network Time Protocol (SNTP) to make installation and setup as clean and simple as possible. Connecting the clock to a WiFi enabled Network is all that needs to be done.

Clocks:	Part Number
• Digital PoE Clock 2.5" x 4 Red Digits, Black Case	760-240W-000
• Digital PoE Clock 2.5" x 6 Red Digits, Black Case	760-260W-000
• Digital PoE Clock 2.5" x 4 Green Digits, Black Case	760-242W-000
• Digital PoE Clock 2.5" x 6 Green Digits, Black Case	760-262W-000
• Digital PoE Clock 4" x 4 Red Digits, Black Case	760-440W-000
• Digital PoE Clock 4" x 6 Red Digits, Black Case	760-460W-000
• Digital PoE Clock 4" x 4 Green Digits, Black Case	760-442W-000
• Digital PoE Clock 4" x 6 Green Digits, Black Case	760-462W-000

Optional Products:

Description	Part Number
• 2.5" PoE Clock Rack Ear Set, Black	760-201-000
• 2.5" Dual Mount Bracket	760-265-000
• 4" 4-Digit Dual Mount Bracket	760-445-000

TIME MACHINES

2 Initial Setup

2.1 WiFi Connection

The WiFi Clocks require a Wireless Network to be in place to function, as well as 110V 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.

2.2 Network

Beyond connecting to a WiFi network, nothing else is required to get TMPCs 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 nist1-chi.ustiming.org but can be changed using the configuration web page. These processes are described with further detail in the Configuration section.

2.3 Mounting

TMPCs may be surface mounted, rack mounted, or in a dual mount bracket (using two clocks). Required tools: hammer, drill, 1/4" drill bit, screwdriver and pencil. Mounting options are optional.

2.3.1 Surface Mounting to Drywall

1. Use the provided template to mark the surface with the necessary hole positions for mounting.
(The template is located on the back side of the Quick Setup page included in the clock box.)
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.

TIME MACHINES

2.3.2 Rack Mounting

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

2.3.3 Dual Clock Mount Bracket

Materials needed;

1. Two Time Machine Clocks of the same size
2. One Dual Mounting Bracket (760-265-000, 760-445-000 or 760-465-000)
3. 3/4" pipe, elbows, flange. Depending upon how you want to mount the clock determines what pipe lengths and fittings you will need. The Dual Mounting Bracket accepts any 3/4" tubing with NPT (National Pipe Threads) threads on the ends. This product is available through local hardware stores or large national chain stores.
4. Power outlets need to be near enough to run from the Mains source to the clock through the 3/4" pipe. When threading the cables through the pipe it is recommended that you run both cables at the same time – one in front of the other.

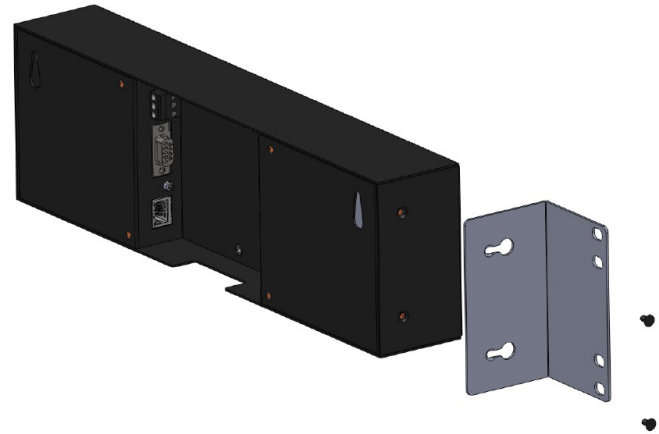


Illustration 1: Attaching Rack Mounting Ears

How to mount two clocks in the Dual Mount Bracket:

1. Take two Time Machine clocks and match where the notch is on the display cover – this is where the Power and Antenna cables will enter into the clock displays. The Dual Mount Bracket can be placed on the bottom or on the top of the clocks. If needed, the display can be inverted so that the cables can run through the bracket and down into the backside of each clock.
2. At the ends of the clocks, leave the screws out about 1/4" so that they can be inserted into the key holes on the Dual Mount Bracket.
3. BEFORE you mount the clocks into the bracket, run two power cables through all pipe and fittings that will be used to hang the clocks. Connect the cables to the clocks and then mount the clocks into the bracket.
4. Secure the bracket to the clocks by tightening the screws on the ends of the bracket into the

TIME MACHINES

clock.

5. Begin to tighten the pipe into the bracket. Work from the pipe/Dual Clock Bracket connection out to the connections for the wall or ceiling.
6. Secure the entire fixture to the wall or ceiling.
7. Power up the clocks



Illustration 2: 2.5" Dual Mount Bracket

TIME MACHINES

3 Configuration

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

All TMPC parameters are accessed on the configuration web page. The page can be accessed by pointing any web browser at the IP address of the TMPC.

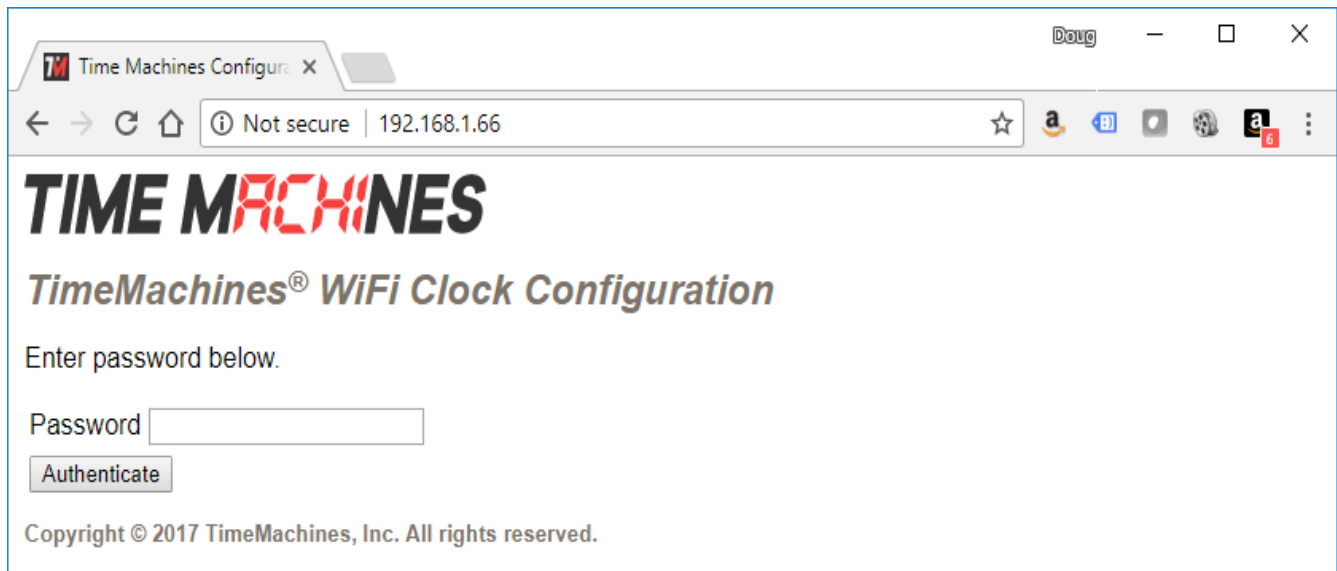
4 Initial Setup of the WiFi Connection

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

It is important that the network that the clock is connected to have 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 TMPC.

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 (Internet Explorer, Chrome, Safari, Firefox) 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”.



TIME MACHINES

4.1.3 Step 3: Setup the WiFi parameters

Once the password is entered, the parameters for the clock will be displayed. It will be important to know the WiFi SSID to connect to, along with the password and type of security in use. If these parameters are not set correctly, then the clock will not be able to access the network via WiFi.

TIME MACHINES

The screenshot shows a web browser window with two tabs: "NIST Internet Time Service" and "Time Machines Configur...". The address bar shows the URL "[2600:1014:b129:4041::10]". The page title is "TIME MACHINES by CSS" and the main heading is "Time Machines® Network Clock Configuration". Below the heading, there is a brief instruction: "View and modify the clock settings using the following form." The form is divided into three sections: "Network", "Time Synchronization", and "DST Options".

Network

Use DHCP	<input checked="" type="checkbox"/>
IPv4	172.20.10.2
IPv6	2600:1014:b129:4041::10
IPv6 link local	fe80::250:c2ff:fed3:ff17
IPv6 temporary	2600:1014:b129:4041:250:c2ff:fed3:ff17
Netmask	255.255.255.240
Gateway	172.20.10.1
Primary DNS Server	8.8.8.8
Secondary DNS Server	8.8.4.4
MAC	00:50:C2:D3:FF:17
SSID	iPhone
Security Mode	WPA2
AP Password	dumbphone
Channel	6
RSSI	-32 dBm
Mask HTTP access on Subnet	<input type="checkbox"/>
Mask NTP access on Subnet	<input type="checkbox"/>

Time Synchronization

Primary NTP Server	utcnist.colorado.edu
Primary IPv6 NTP Server	2610:20:6f15:15::27
Secondary NTP Server	time-a.timefreq.bldrdoc.gov
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)	0:01
Use 12-hour Format	<input checked="" type="checkbox"/>

DST Options

- 1) Enter the SSID for the access point the clock will use to get the time. This is case sensitive.

TIME MACHINES

- 2) Enter the Security mode, typically WPA1 or WPA2.
- 3) Enter the password associated with the access point.

After making changes to the configuration page the “Save Settings” button must be pushed to submit form data.

To test whether the WiFi parameters take effect, disconnect the Ethernet cable from the clock and make sure the WiFi Antenna is connected. Power up the clock and see if time is displayed or if at a minimum double-clicking the button displays an IP address that can be reached on the network. This would mean that the WiFi system got a connection and an IP address, but that the clock was unable to get the time.

*See section 5.2 for troubleshooting.

If the letters “no AP” are seen to scroll across the display, then connection to the AP (Access Point) was not achieved.

If the clock is not displaying time from the WiFi network, repeat these instructions by connecting to the wired Ethernet.

4.2 Web Page Parameter Reference

4.2.1 Network

4.2.1.1 DHCP Setup

The wired network connection, if connected to an active network port, will take precedence over the wireless network connection. Generally it is best to have the WiFi operation based on DHCP and the wired can be setup as DHCP or Static by unchecking the DHCP checkbox.

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 TMPC must be restarted for these changes to take affect.** Addresses in the Network section must be entered in Ipv4, dotted quad, format.

4.2.1.2 Network Parameters, IP, Mask, Gateway, and DNS

The IP address setup is based on version 4 of the IP standards. DNS servers are required if the time source being used will be a fully qualified domain name rather than an IP address. Any invalid address entries will prevent the settings from being saved. The clocks will work best if allowed to access a time server on the local network rather than an Internet based time source. The Time Machines TM1000A is an inexpensive GPS based NTP server that works well with the clock products.

The clock generates a link local IPv6 address and will autoconfigure an IP address based on the router's subnet so no information needs to be supplied, however if the user has a specific IP address the clock

TIME MACHINES

should use, it can be entered into the IPv6 input box.

4.2.1.3 *MAC*

The MAC address field is read only and only for information. It is needed for firmware updates.

4.2.1.4 *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 WPA1 or WPA2. The “SSID” and “AP Password” fields must be filled even if operating in wired mode.

4.2.1.5 *Channel and RSSI*

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

4.2.2 Time Synchronization

4.2.2.1 *NTP Servers*

The first entry (Primary NTP Server) sets the address for the NTP server. The NTP server is where the TMPC gets its timing information. In the case where the Primary NTP Server is unreachable the TMPC will fall to the Backup NTP Server. Both DNS names (time.nist.gov) and IPv4 (192.43.244.18) formats are accepted.

4.2.2.2 *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.

4.2.2.3 *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 (+/-).

4.2.2.4 *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.

4.2.2.5 *Twelve Hour Time*

Select 12 or 24 hour time. When the box is checked the TMPC is in 12 hour mode, when the box is

TIME MACHINES

unchecked the TMPC 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)

Primary NTP Server

Primary IPv6 NTP Server

Secondary NTP Server

IPv4 Enable Flag (0 or 1 only)

Time Zone

Custom Time Zone

SNTP Resync Period (Hours:Mins)

Use 12-hour Format

DST Options

Daylight Saving Time

Fixed Day

Start Date

Start Time

Stop Date

Stop Time

Hour Bias

Clock Type and Date Mode

Use Calendar

Date Mode

Display Duration

Time Seconds

Date Seconds

Date Offset Days

Other

Unit Name

Password

Alarms(Hour:Min-Sec)

Brightness

Host FW

Radio FW

TIME MACHINES

4.2.3 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.

4.2.3.1 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.

4.2.3.2 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.

4.2.3.3 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).

4.2.3.4 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.

TIME MACHINES

4.2.4 Clock Type and Date 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.

4.2.4.1 *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.

4.2.4.2 *Date Mode*

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

4.2.4.3 *Time*

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

4.2.4.4 *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.

4.2.4.5 *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.

4.2.5 Other

4.2.5.1 *Unit Name*

This can be any alpha numeric name up to 19 characters long.

4.2.5.2 *Password*

The password field displays the current password. To change it, enter a new password, push Set and Restart Clock. TMPC passwords are limited to 11 characters. The default password is “**tmachine**”

TIME MACHINES

4.2.6 Alarms

The TMPC has the capability of signaling 24 alarms throughout the course of a single day. Alarm entries are to be separated by semicolons with no spaces. The hour, entered in 24 hour time, at which the alarm is to be set off is entered first and followed by the minute, the two are to be separated by a colon. The last entry is the duration, in seconds, that the alarm is to sound, it is limited to a maximum of 59 seconds. The minutes and seconds are to be separated by a single dash. Simply delete an alarm from the alarm field and click “Save Settings” to disable it. Any invalid values entered into the alarms field will be truncated to zero. The default setting is to have no alarms set.

Example alarm string: 8:0-3;12:0-3;13:0-3;17:0-3

This example string sets 4 alarms all on the hour and for a duration of 3 seconds.

4.2.6.1 External Connection

External connection will require the user to make a connection from the clock's internal relay to an external system. The Time Machine Clock alarm closes an internal relay. Relay closure presents 12Vdc (500mA max) on the Normally Open (NO) output. Position 1, of the relay connector.

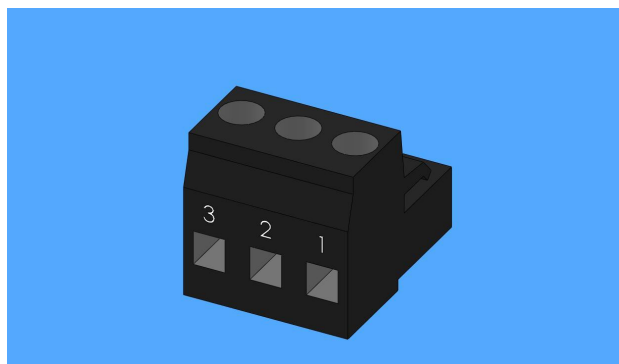


Illustration 3: Connector for Relay

The Common and Normally Closed (NC) carry 12Vdc during normal operation. When the alarm fires, the NC will float, while the NO will follow the Common to 12 Vdc.

This output can be used to drive a small sonda-alarm, or a 12Vdc relay module.

TIME MACHINES

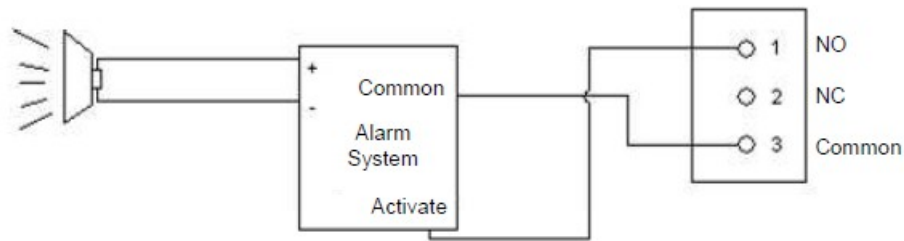


Illustration 4: Relay Connection Diagram

4.2.7 Brightness

This parameter allow the user to control the brightness of the display. There are three settings that are selectable.

- DEFAULT, the brightest setting
- MEDIUM
- LOW, the lowest setting.

TIME MACHINES

4.3 Push Button

4.3.1 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 decreases by 1 and cycles through each hour of the day.

4.3.2 Scrolling the IP address

The push button also provides a quick way to determine the IP address of the TMPC. **A rapid double push of the button will cause the IP address to scroll across the display.**

4.3.3 Set Parameters to Default

One way to set all parameters to their factory default values is to 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.

5 Troubleshooting

5.1 Flashing Seconds

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

5.1.1 Lost Network

If the seconds and the AM/PM dots are flashing with a 50% duty cycle (0.5 seconds ON, 0.5 seconds OFF) the network was lost, check to make sure everything is connected properly on the network and verify NTP server activity by connecting the clock via ethernet, rebooting, and getting a time displayed.

5.1.2 Lost Access Point

If the access point or router was lost the seconds will flash with a 25% duty cycle (0.25 seconds ON, 0.75 seconds OFF). This also scrolls "AP lost" when the access point is lost and "no AP" every 10 seconds while it is attempting to restore connection. Try rebooting the access point.

5.2 AM/PM LED Indications

During initial boot up when in WiFi mode (no ethernet connection), the AM/PM LED's will indicate

TIME MACHINES

the state that the clock is in throughout the initialization process.

5.2.1 Both AM & PM Off

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

5.2.2 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.

5.2.3 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.

5.2.4 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.