![National Time & Signal]

TimeCast™ Clock System
Setup and User Manual

Revision D – March 2024

Related Literature

C-617 TimeCast Product Line
C-618 TimeCast Digital Mounting Instructions
C-619 TimeCast Digital Double Face Assembly Instructions
C-622 TimeCast Analog Mounting Instructions

Visit https://www.natsco.net/clock-systems/products

Contents

Introduction

The TimeCast™ line of clocks can create a synchronized clock system without wiring each clock together throughout a building or campus. The time base synchronization method for the clocks can be selected using the *Advanced Configuration* menu as these choices:

1. **An RF signal can be transmitted by a TimeCast™ Base Station (RF Mode)**. One or more Base Stations are connected to the LAN to acquire accurate time from a local or internet NTP or SNTP time. This time is wirelessly broadcast to the building clocks. Having received this broadcast, the individual clocks then retransmit this signal to clocks further away from the base station until all clocks have received the signal. The Base Station receives acknowledgement from the clocks and sends the status of the clocks to the *Natsco Device Cloud.*

2. **A local Wi-Fi connection (Wi-Fi Mode)**. Each clock can connect to the building's 2.4GHz Wi-Fi network. Once per day, the clocks will individually connect to an internet NTP, SNTP, or National Time Device Cloud Service to synchronize the time. The *Natsco Device Cloud* has the advantage of logging the status of the clock synchronization and battery voltages when supplying the SNTP response. No Base Station is required in this mode.

An LED screen on every clock makes setup and diagnostics fast and simple. The synchronization mode of each can be selected in the user menus.

This manual details how to install and maintain a TimeCast clock system, as well as how to use the free *Natsco Device Cloud* to supervise the functionality of your clock system.

System Components

1) **TimeCast Base Station**. (RF Mode Only) Connection to the Internet via the building LAN[1] is strongly recommended for automatic time correction but is not required for operation. At least one base station is required, but more may be added for greater system capacity and redundancy, or to provide service to more than one building.

2) **TimeCast Clocks.** Available in analog or digital varieties. You may mix and match different types of TimeCast clocks on a single system to meet the needs of your facility. See cutsheet 617 for the full list of TimeCast clocks, available accessories, and mounting options.

3) AA batteries for battery clocks, or appropriate 24V/120V power supply for hard-wired units. See cutsheet 617 for a full list of power options and model numbers.

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[1] The LAN connection uses dynamic (automatic DHCP) addressing or static addressing. It requires the SNTP (UDP port 123) port to be open outbound on the firewall to communicate with Natsco's Internet time server. This server also provides the cloud monitoring and reporting features for the TimeCast system.

The TimeCast User Interface

All TimeCast devices feature a text display to provide an easy way to get diagnostic information as well as to change settings. In most cases, settings should be changed on the Base Station, which will then send those settings to the clocks. The clock screens are mostly used for verifying the time and checking battery/signal levels.

User Interface Location

Base Station: The user interface for the Base Station is on the front of the device, with four buttons: Up, Down, Right, and Exit. The Up button doubles as the SELECT button, and the Right button doubles as the ENTER button.

Analog Clocks: The user interface is on the back of the unit. The ENTER and SELECT buttons are located on the left side of the mechanism.

Digital Clocks: Depending on the model, the user interface is on the back of the clock or on the side. The ENTER (E) and SELECT (S) buttons are located directly below the display.

```
2:29:10 PM    RF
Battery: 3.88V
Sig:80% Peers:10
 19h 29m 10s ago
```
RF Mode is indicated by "RF" in the corner of the display.

```
2:29:10 PM    ▼
Battery: 3.88V
Sig:48%
Wifi: OK
```
Wi-Fi Mode is indicated with a signal icon in the corner of the display.

Basic Menu Operation

Regardless of the exact model, the user interfaces for TimeCast devices operate in a similar fashion.

1) During normal running, the display is in power-save mode and can be woken up with a press of the ENTER button.

```
8:15:30 PM    RF
Battery: 4.50V
Sig:50% Peers: 5
 0h 15m 30s ago
```

2) The first screen provides the most important information on that device, such as the current time as tracked by the internal processor as well as network/signal and battery statuses.

```
Pick an Option:

 Set Date/Time
```

3) Pressing SELECT will navigate through settings and information menu choices.

4) Press ENTER to choose the selected menu option or setting. To return to the first screen, navigate to the EXIT menu with the SELECT button.
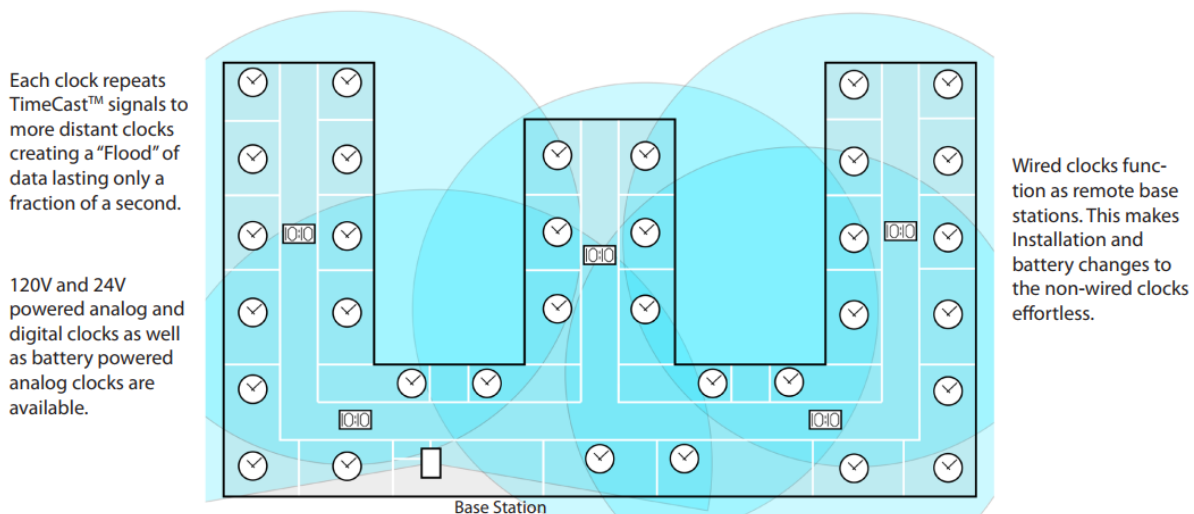
```
Pick an Option:

      EXIT
```

If no button is pressed, the screen will eventually time out and go blank. Battery units will automatically go back to sleep after one minute. For more details on exactly what options are available via the menus, see the following sections specific to either base station or clock.

Operational Overview (RF Mode)

Every day, the TimeCast Base Station transmits time to nearby clocks, and those clocks in turn broadcast time to nearby clocks. In this manner, the time "floods" to all the clocks in the building. In the case of hard-wired clocks, this flood can happen at any time and the clocks will already be awake and listening. In the case of battery clocks, those clocks will wake themselves up at a specific time each day to prepare to receive the time flood, which allows the clocks to get a precise time synchronization and send their status back to the base station.

Each clock repeats TimeCast™ signals to more distant clocks creating a "Flood" of data lasting only a fraction of a second.

120V and 24V powered analog and digital clocks as well as battery powered analog clocks are available.

Wired clocks function as remote base stations. This makes Installation and battery changes to the non-wired clocks effortless.

Base Station

Install Steps Overview

The setup process for the TimeCast system is outlined below. Further details are provided in the following sections.

1) Install and power up Base Station(s) and connect it to the LAN.
   a. Set the appropriate **Time Zone**.
   b. If time is not acquired from the network automatically, set the **time and date**.
      See *Base Station Setup* for details.
2) Install and power up any hard-wired clocks. Start with clocks that are near the base station first so they can receive and re-broadcast the time from the Base Station. The time on the display will update when a signal is received. Allow up to 10 minutes for analog clocks to move the hands on-time after receiving the signal. The hands will advance to the 12:00 position first. Then after 4 minutes, the hands will advance to the correct time.
3) Install and power up battery clocks. Again, start with the clocks that are closest to the base station. As you work your way through your facility, each clock that is installed will send out setup beacons for a fixed amount of time. These beacons will configure new clocks as you hang them nearby. As you hang each clock, verify that it is within range of some neighbors to ensure proper operation. See the section *Clock Setup* for more information.

Base Station Setup

The Base Station is the main time source for the TimeCast system. Each day, the base station broadcasts a time synchronization "flood" that reaches all nearby clocks, which then re-broadcast that time information to all their neighbors. In this way, the time information, as well as any settings updates or other information is transmitted to the entire system. In addition, the clocks send check-in information back to the Base Station during this period. Because all clocks get their time and settings from the Base Station, **Base Station setup should be completed before clocks are installed.**

Base Station Status Display

The base station's display is normally *off* to prolong the life of the screen. To wake it up, press the ENTER button. Once the screen is awake, it will show the following information:

```
 2:29:10 PM
Network: OK
10.0.0.182
Peers: 1
```

Current time in local time zone.

Network status: See table below.

IP Address. Enter http://X.X.X.X to view the base stations internal web page, where X.X.X.X is the IP address shown on the screen.

A "peer" is another base station or clock that is visible nearby. This number is reset every night during the primary flood period. There must be at least one nearby peer for the time flood to reach any clocks. Higher numbers are better.

Status Indicator	Meaning
"Initializing"	Uncommon; suggested corrective action would be to power-cycle the unit.
"Net Disconnected"	The Ethernet network cable to the building LAN is disconnected, or the cabling back to the network switches is bad.
"No IP Address"	The unit cannot acquire a network address from DHCP. Check VLAN settings on your network switches or configure the base station for static IP. Contact your network administrator.
"No Time Server"	The unit cannot reach an network time server. Ensure that SNTP (UDP port 123) outbound is enabled on your network's firewall. Contact your network administrator.
"Network OK"	The base station has successfully retrieved time from the network. The network connect is operating properly.

Setting the Time Zone (Base Station)

1) Press ENTER to wake the screen.
2) Press SELECT to navigate to *Set Time Zone*, then press ENTER
3) Press ↑ and ↓ keys to change time zone hours.
4) Press → move to next field.
5) Press ↑ and ↓ keys to change time zone minutes.
6) Press → to move to next field.
7) Press ↑ and ↓ keys to change daylight saving time rule.
8) Press ENTER to finalize changes or EXIT to cancel.

```
Pick an Option:

  Set Time Zone
```

```
Time Zone:
UTC -05:00
Daylight Saving:
  USA/Canada
```

Common Time Zones

Atlantic:	UTC -4	Note: these "base" time zones can be referenced
US Eastern:	UTC -5	regardless of whether you are currently
US Central:	UTC -6	in Daylight Saving Time.
US Mountain:	UTC -7	
US Pacific:	UTC -8	
Newfoundland:	UTC -3:30	

Setting the Current Date/Time (Base Station)

It is critical for the correct operation of the TimeCast system for the system time to be accurate. **The best way to get on-time is to plug in the Base Station to your local network**. The Base Station will then automatically connect to the Internet to get accurate time. If the system is intended to operate in a disconnected mode or the LAN is not available yet, you can follow these steps to set the date and time.

```
Pick an Option:

  Set Date/Time
```

1) Press ENTER to wake the screen.
2) Press SELECT to navigate to *Set Date/Time* and press ENTER
3) For each field, use the ↑ and ↓ keys arrows to change the value, and use the → key to move to the next field.
4) Once you are on the final AM/PM selection, press ENTER to finalize changes or EXIT to cancel.
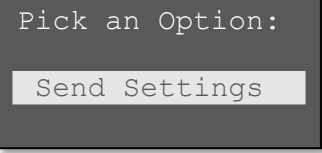   **NOTE: Pressing ENTER will set the current seconds to zero.** It is best to set the minute one ahead of the current time, and then time the final ENTER press to coincide with the "actual" minute rolling over to the value entered in step 4.

```
Set Date/Time:
06/22/23 MMDDYY
03:49 PM
```

Sending Settings to the Clocks

Once settings have been entered into the base station, you will need to push those settings to the clocks. Even if the clocks have not been powered up yet, you can select this option at the base station. During the next several daily time floods, the base station will continue to send the correct settings to the clocks, including any new ones that were just powered up.

1) Press ENTER to awaken the screen if necessary.
2) Press SELECT to navigate to *Send Settings* and press ENTER.
3) The settings will be sent during the next daily flood. This happens in the early evening by default: 8PM EDT/7PM EST, or 5PM PDT/4PM PST.

```
Pick an Option:

  Send Settings
```
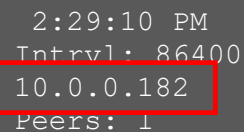
If there are multiple base stations, saving settings on one base station will propagate those settings to other base stations that are reachable through the daily flood. With that said, we recommend setting time zones on each base station and getting them synced on Internet/network time prior to setting up your clocks.

Accessing the Base Station Web Pages

The TimeCast base station has an internal web page that can be used to enter a larger number of settings than is available through the device screen. In general, this does not need to be used, but it can be useful if off-site facilities or IT managers wish to access the settings on the base station. In addition, it is also the only way to enter the following setting types:

- Wi-Fi SSID and passwords for clocks to get over-the-air software updates using Wi-Fi.
- Custom daylight saving time rules.
- Time server address
- Advanced TimeCast flood parameters

To access the internal web page, navigate to the IP address indicated on the unit's front display. If it reads "0.0.0.0", first ensure that the unit is plugged in to the LAN. In the example to the right, you would enter *http://10.0.0.182* in your web browser address bar. Note that this must be done from a PC on the same network as the base station.

```
 2:29:10 PM
Intrvl: 86400
10.0.0.182
Peers: 1
```

If the unit is plugged in but still reads 0.0.0.0, see the section *Assigning Base Station IP Address* for more information on how to give the base station an IP address.

Assigning Base Station IP Address

By default, the base station will automatically acquire a dynamic (DHCP) address when it is plugged into the network. However, some networks do not support automatic addressing. In that case, the address may remain *0.0.0.0* even when the network cord is plugged in.

To change the IP addressing mode:

```
Pick an IP
addressing mode:

 Default Static
```

1) Press ENTER to turn on the display if necessary.
2) Press SELECT to scroll through choices.
3) Select one of the following:
   a. *Dynamic IP* – uses DHCP to find an IP address
   b. *Static IP* – use whatever static IP is currently saved in the settings
   c. *Default Static* – assigns the IP 192.168.5.2 to the base station. This option should only be used if you are connected directly from a laptop to the base station with a single Ethernet cord.
4) Press ENTER to confirm the choice. The new IP will appear on the top menu display.
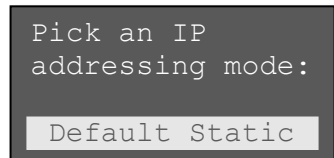
Note that *Default Static* is a one-time-use setting and it should not be left in that configuration. It is intended for use when a regular network is unavailable, or if a specific static address needs to be assigned via the base station's internal web interface.

Once a dynamic or static IP has been assigned, you can use the web-based configuration at http://X.X.X.X to program specific IP, gateway, netmask, and DNS into the unit. For more information, see the section *Base Station Internal Web Pages* later in this manual. In most cases you do not need to do this, since the default DHCP setting works on most networks.

Base Station Menus

Basic Menus:

Menu	Function
Set Date/Time	Sets the Base Station to a specific date/time. This is not necessary or recommended if a LAN network is available.
Set Time Zone	Sets the Base Station's time zone.
Send Settings	Schedules the base station to send any new settings to the clocks during the next time flood period.
Network Config	Enters the network configuration menu.
Get Net Time	Immediately request a time update from the network.
Advanced Config	Go to the *Advanced* menus.
Restart	Reboot the Base Station. Time and settings will be preserved.
Back to Top	Go back to the top status menu.

Advanced Menus

Menu	Function
Factory Default	Return the Base Station to factory defaults. You will need to re-do the initial setup process.
Firmware Update	Use the Ethernet connection to connect to Natsco's Internet server and download the latest firmware. This update only takes place on the base station.
Check-In Clocks	Requests that the clocks check-in via Wi-Fi after the next time flood. Wi-Fi settings must be set via the base station's web page and sent via the "send settings" option first. This can be used to check clock status if the mesh network signal strength is in doubt.
Update Clock FW	Tells the clocks to perform an over-the-air firmware update via the Wi-Fi after the next time flood. Wi-Fi settings must be set via the base station's web page and sent via the "send settings" option first.
Sleep Clocks	This option is only used in special circumstances as directed by technical support. It forces battery clocks to go back to sleep.
EXIT	Go back to the main screen.

Base Station Internal Web Pages

In most cases, the default DHCP IP address and other network settings of the base station are enough to get it online and talking to the Natsco Device Cloud. However, there are some situations where you need to input more information. These include:

- Custom Daylight Saving Time Rules
- Custom Time Server
- Static IP Address
- Wi-Fi SSID/Password for Over-the-Air Software Updates on the clocks

To begin, enter http://X.X.X.X, where X.X.X.X is the IP address displayed on the Top menu screen on the front of the unit, then press the *Enter Setup* button. **The username is *admin* and the default password is *natsco***

Main Web Menu

The top of the main menu includes some diagnostic information, including the serial number, software version, and the Ethernet MAC address.

The main menu also provides links to the following sections.

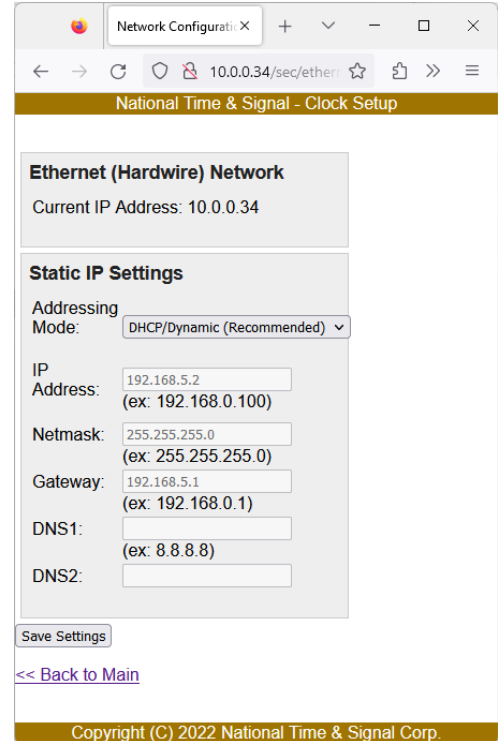| Page	Usage
Base Station Ethernet Settings	Allows setting IP addressing mode, including static IP information.
Clock Wi-Fi Settings	Allow setting Wi-Fi SSID and password. This will be sent to the clocks to allow them to update their firmware via the Wi-Fi network. It is not needed for normal operation.
Configure Time Settings	Allows configuring time zone, daylight saving time, and the time server used by the base station.
TimeCast Control	Allows requesting the clocks to do specific actions during the next daily time flood period.
TimeCast Settings	Advanced TimeCast settings. **Only change in consultation with tech support.**
Change Password	Control access to this webpage.
Update Firmware	Allows uploading a specific firmware .bin file to the base station to update it to a particular version. Contact support for further instructions and links to the proper file.
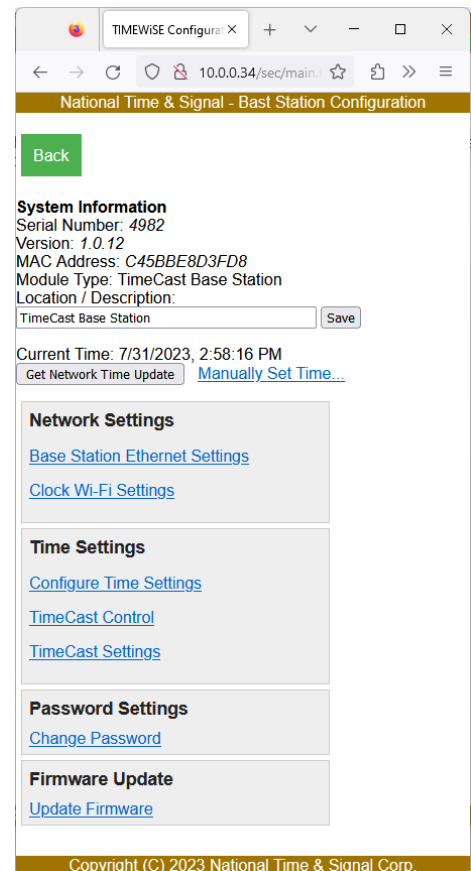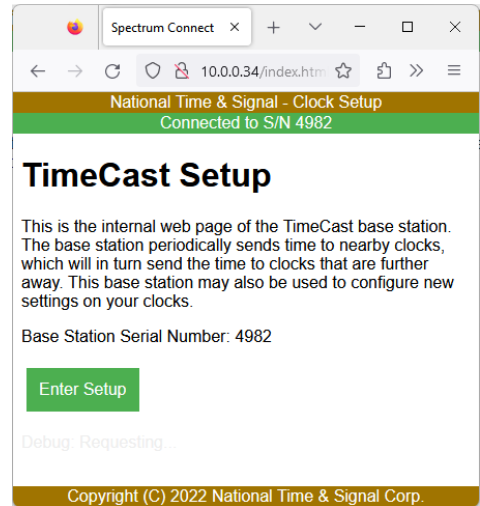
Base Station Ethernet Settings Page

This page allows for configuring DHCP or Static IP network addressing modes.

These network settings can be acquired from your IT networking administrator.

Please note that in the case where you are connected to the base station directly using a temporary "Setup IP", you should wait to change to the "real" networking settings until *after* you have finished putting in any of the other settings that you wish to configure on other pages. Once you enter the new settings on this page and click *Save Settings* at the bottom, the new settings "go live" and you will need to re-enter the web page via the new IP address that you entered.
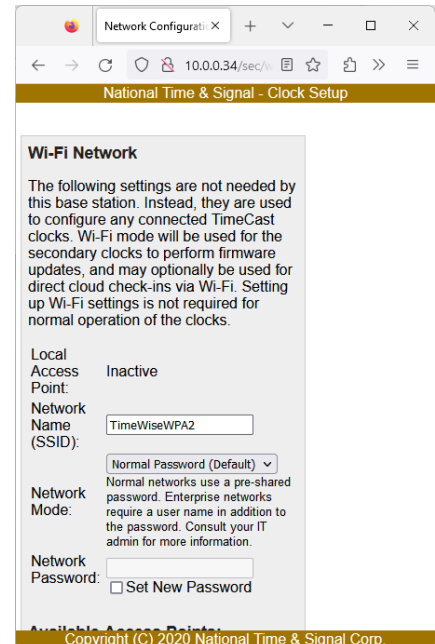
Clock Wi-Fi Network Settings

For clocks to receive over-the-air software updates, they will need your facility's Wi-Fi network settings. In general, it is not recommended to update the clock firmware unless you consult with technical support first, so you can generally leave these settings alone and unconfigured unless you have a reason to update the clocks.

This can be any of your networks, usually including a guest network.

The *SSID/Network Name* and the *Password* fields are <u>both</u> case-sensitive, so take care while entering them.

Once the new settings are entered, press the *Save* button at the bottom of the page. Finally, to push the new settings to the clocks during the next nightly flood cycle, use the *TimeCast Control* page to schedule a settings update.
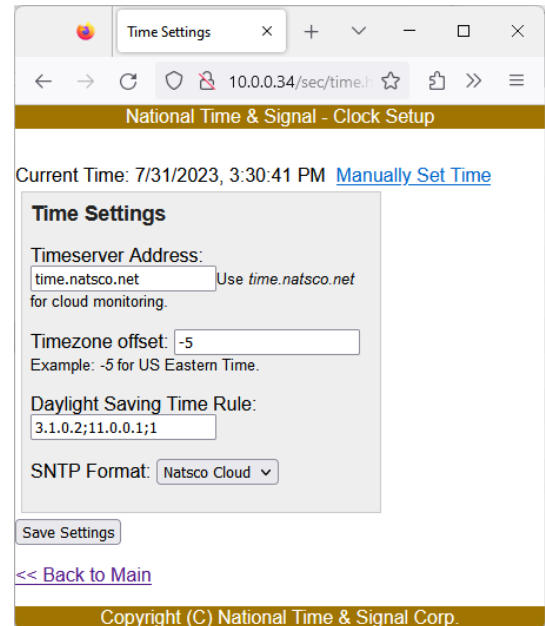
Time Settings Page

The *Time Settings* page controls time-related options on the base station.

Timeserver Address: this can be any SNTP server IP or DNS hostname, *however*, to get the free Natsco Device Cloud supervision and reporting features, this should be left as *time.natsco.net*

Time Zone Offset: this is the offset, in hours, of your local time zone. This does *not* include daylight saving time. Common time zones in North America can be found earlier in this manual in the section *Common Time Zones*.

Clock Setup (RF Mode)

TimeCast clock installation should be done after the base station(s) are powered and on-time. Because the system communication depends on all components being synchronized, it is important to ensure that the base stations are operating prior to powering up the clocks. Once a clock has received the time from the base station, it will retransmit that time to nearby clocks to allow for setting up additional clocks. In turn, those other clocks will retransmit these "setup beacons" to other new clocks, allowing for rapid installation of an entire system.

ⓘ **During installation, make a list of clock serial numbers with room number or location.** This will allow you to construct a list of clocks for monitoring purposes using the free Natsco Device Cloud service at https://cloud.natsco.net. See the section *NATSCO Device Cloud* for more information.

1) Clocks should not be powered up until they are in the room where they will be installed. This will allow you to verify that they can receive a time signal in that location. If this is a new installation of a full system, install the base station first and work your way "outward" from there to ensure a contiguous path back to the base station.

2) **Battery Powered Clock:** Install batteries for new clock. The display will show "searching" and "Awaiting Signal" to indicate that it does not know what time it is. Battery clocks should not be left in this state, because they must have at least some time sync in order to wake up each night to be re-synchronized.

```
Searching...
Battery: 4.60V
Sig: 0% Peers: 0
Awaiting Signal
```

Wired Clock: Install hardwired transformer power supplies first. If wall transformers are used, plug transformers into wall outlets and route wire to clock location as required. Turn on circuit breakers to power clock locations if necessary. Begin clock installation closest to the base station and work your way outward to more distant clock locations. If the jobsite is a hybrid mixture of battery and wired clock locations, install the battery clocks in distance order along the way to complete the mesh of clocks as necessary.

3) When powered up, a clock will receive time and setting information from any of these sources:
   a. Any nearby on-time Base Station
   b. Any nearby on-time hard-wired TimeCast clock.
   c. Any nearby on-time battery clock that has had batteries installed within the last four hours.
   d. Any nearby on-time battery clock that has been woken up with a button press within the last 20 minutes.

e. Any nearby on-time battery clock that is sending setup beacons via the *Activate Beacons* menu. See the *Setup Beacons* section.

4) Wait 30-60 seconds for the clock to receive a setup beacon from a nearby clock or base station. Once it gets a beacon, the time and time zone information will be set, and you will see the signal status on the clock's screen. The "Sig" level is a signal quality indicator, and the "Peers" number indicates how many nearby

```
11:38:22 AM    RF
Battery: 4.50V
Sig:78% Peers:10
0h 0m 2s ago
```

clocks can currently be seen. If nearby clocks are not currently awake, you will not see them in the peer count. To check the status of the clocks after initial setup, it's best to use the *Natsco Device Cloud* website to view the clock's status during the last nightly time sync.
If the clock does not receive a signal, make sure one of the nearby clocks is still transmitting the setup beacon. See *Sync Beacons* below.

5) **Hardwired clocks** will power off their displays after a minute of inactivity but will always remain listening and ready to send time to other clocks or receive a new time sync.
Battery clocks, on the other hand, go to sleep after one minute. If you haven't seen them acquire a time sync yet, you will need to provide one of the time sources in step (3) and then wake up the clock using the ENT button. This will keep it awake for another minute to get the initial time sync and settings.
Do not leave a battery clock that has not received a sync signal. The mesh is not complete and the clock will unlikely ever synchronize since it will not have a flood time to wake up. If it is not in range of another clock, the clocks may need to be relocated or additional clock(s) added. Keep in mind the nearest clock could be the floor above or below, or even through windows across a courtyard.

Battery Changes

When changing batteries in clocks, please follow the same steps as you would during initial setup. Settings that the clock needs to operate are saved even when the battery is removed, *however*, to get back on time and to stay in sync with the daily time updates, the clock must get a new valid time sync after replacing the batteries. Here are the ways the clock can acquire the valid time:

- If there is a Base Station or hard-wired clock nearby, your clock with new batteries will pick up the current time within one minute.
- If there is an on-time battery clock nearby, wake it up by pressing the ENT button on that other clock. The clock will send setup/sync beacons for the next 20 minutes. Now you can replace the batteries in any nearby clock as needed.
- If many or all the clocks on a battery-clock system need replaced, start replacing batteries at clocks near the base station and work your way outward from there. You can go down each corridor of your facility in turn. Each time you replace batteries in a clock, that clock will send out setup/sync beacons for four hours, which makes getting nearby clocks on-time easy. If the four hour timer runs out, you can always add more time by using the *Activate Beacon* menu.

Setup/Sync Beacons

Hardwired clocks and base stations are always awake and listening for nearby clocks that need a time sync or settings. The radios on battery clocks, on the other hand, mostly stay "asleep" to conserve power. However, during initial setup or during battery replacements, battery clocks send out *Setup Beacons* for a set amount of time to share their time sync and setup information with other new clocks nearby.

There are several triggers to start the setup beacons, with different durations:

Beacon Trigger	Duration
New Batteries Installed	4 Hours
Wake-up with Button	20 Minutes
Activate Beacons Menu	Selectable

Note: Setup/Sync Beacons are only sent from clocks that have previously received a synchronized time from another clock or base station

To manually activate the beacons for a selectable amount of time, you can use the *Activate Beacons* menu (battery clocks only). This will make the clock broadcast setup beacons for the selected time. This uses a bit of battery, so it should only be done when setting up a new system or doing many battery replacements nearby.

The *Activate Beacons* menu is accessible from the main menu.

1) Press ENT to show the main menu, then SEL to scroll to *Activate Beacons,* then ENT to enter the beacons menu.

```
Pick an Option:

Activate Beacon
```

2) The menu will display the current active beacon time in hours and minutes. Use SEL to choose a new duration for the beacons and then press ENT to confirm the choice.

```
Sending setup
beacons to other
clocks for 0h32m
 Send for 4 hrs
```

Clock Menus

In general, clock menus do not need to be accessed if the normal setup procedure has been followed.

Basic Menus:

Menu	Function
Go to Sleep	Sets a battery clock to sleep, conserving battery. Turns off the display of wired clocks.
Activate Beacon	Sends setup beacons for a set duration. (Battery clocks only)
Set Date/Time	Sets the clock to a specific date/time. **Do not** use this unless you have a stand-alone clock that doesn't need to be synced to a full clock system.

	Instead, allow the clock to get its time sync from nearby clocks or the base station.
Set Time Zone	Sets the clock's time zone. Uncommon. This will be overwritten with the time zone from the base station or nearby clocks if part of a clock system.
Advanced Config	Go to the *Advanced* menus.
Restart	Reboot the clock. Time and settings will be preserved.
Back to Top	Go back to the top status menu.

Advanced Menus

Menu	Function
Calibrate Hands	Runs the clock hands through a 10-15 minute calibration routine.
Firmware Update	Use Wi-Fi connection to connect to Natsco's Internet server and download the latest firmware. Wi-Fi settings must be set using the base station prior to requesting an update.
Factory Default	Return the clock to factory defaults. You will need to re-do the initial setup process.
Get Wi-Fi Time	Gets time from Natsco's Internet time server using Wi-Fi. Wi-Fi settings must be set using the base station prior to requesting an update.
Back to Main	Go back to the main menu.

Wi-Fi Time Base Operation

The TimeCast analog and digital clocks can be synchronized with RF broadcast, as described previously, or use a building's Wi-Fi infrastructure. This section describes the Wi-Fi time base operation.

The TimeCast clock line features easy-to-follow setup instructions built into the clock. This guide provides more detailed setup instructions and descriptions of the clocks' advanced features. Most users can safely skip over much of the advanced IT-level information presented here. However, you'll want to run the following by your IT team so that they can make the best decisions on how to add the clocks to your building network.

IT Requirements

Please check these requirements with your IT department. Virtually any Wi-Fi access point can be configured to work with the following settings.

1) The clock setup can be performed with any laptop, tablet, or phone with built-in Wi-Fi.
2) The network must also be on the 2.4GHz band.
3) The building's Wi-Fi network must support open, WEP, WPA, or WPA2 security with shared passwords.

   The clocks also support EAP authentication with 802.1x MSCHAPv2. For 802.1x, please be aware that NATSCO cannot provide network troubleshooting support due to their complexity and site-specific nature. We recommend enlisting the support of your organization's network engineers to test these configurations prior to a large deployment.

4) "Captive portal" guest networks that require a password may block the clock's access to our Internet time servers[2].
5) The network firewall must allow outbound NTP/SNTP traffic (UDP port 123)

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[2] If a captive portal is installed, we recommend using an alternate non-guest network, or making a firewall exception for SNTP network traffic pass through the captive portal.

Default Settings – The Quickest Setup

The fastest and easiest way to set up the clocks is to use the default clock settings. To do this, your IT administrators will configure a hidden Wi-Fi network that matches the default settings of the clocks. If you are in the US Eastern Daylight time zone, you shouldn't need to change any settings, which means you can simply power up the clocks and put them on the wall.

This special clock network has the following advantages:

- Much faster setup.
- The clock network can be completely locked down, hidden, and isolated on a VLAN for high security.
- The clock network can be independent and isolated from any future IT initiatives or concerns.
- MAC address-based authentication can be used for added restrictiveness.

In this scenario, the following settings can be used to configure the Wi-Fi access points. You will need to show this section to your IT admin and have them set up the network on their end first.

SSID:	TimeWiseWPA2
Password:	NatscoClocks
Security:	WPA2-AES (pre-shared key)
Firewall:	Outbound UDP port 123 (SNTP). HTTP for configuring digital clocks is optional.

IT Information (Wi-Fi Mode)

The following settings should be obtained before installing the clock. Please consult with your IT department to ensure you have the correct settings. Note that if the network is not yet installed in your building, you can still install the clock and set it to the correct time. Once the network comes online, the clock will automatically sync up with the precise network time.

Setting Name	Setting Value	Notes
Wi-Fi Network Name (Also known as SSID)		Wi-Fi network can be WEP, WPA, WPA2 or open.
Wi-Fi Network Password		Network password is optional on open networks.
Clock Password		Optional password for clock's internal webpage. Default is blank, and it can be left blank if desired.
Time Server		Recommended value[3] for clock status reporting is *time.natsco.net*

Advanced Authentication

Some higher-security networks may present some challenges to setting up the clocks, but there several options available that should allow the clocks to work in any environment.

TimeCast series clocks have support for Enterprise (EAP) authentication using MSChapV2 configurations, but your environment may not be completely supported at this time. We recommend a trial clock to determine if this is a good solution for you. Due to the complexity and site-specific nature of EAP/802.1x implementations, your network administrators will need to take the lead in compatibility testing and troubleshooting for your environment.

A good alternative to EAP is to use MAC-based authentication. In this case, National Time can provide you with the MAC addresses of each clock serial number. These hardware-specific addresses can be used to provide reliable and simple authentication without compatibility concerns.

How a Wi-Fi Clock Works

National Time's Wi-Fi clocks connect to your building's existing Wi-Fi network. Using that network, it connects to a time server to get a time sync. By default, it will use National Time's cloud time server via your Wi-Fi network's Internet connection. However, you can also configure the clock to use your existing local time server or a National Time web-enabled master clock. If you use the cloud service or National Time web-enabled device, you can monitor the battery levels, signal strength, and connection status of your clocks.

---

[3] A different server can be used if syncing to internal time servers is required. In this case, contact National Time support for instructions on enabling cloud supervision using a local check-in server.

How Wi-Fi Clock Setup Works

For a clock to connect to your building's network, you will need to enter your building's Wi-Fi network name and password. You will also have a chance to set options like daylight saving time and a server from which the clock will fetch the current time.
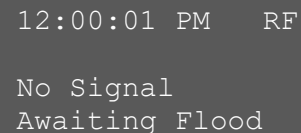
Each clock has its own internal Wi-Fi network to allow your device (phone, tablet, laptop, etc.) that they broadcast during setup. This network is labelled *TimewiseSN*, where *SN* is the serial number of the clock (for example Timewise5108). Using a smartphone or other device, you will connect to each clock in turn to push the settings to the clock. Our RappID Setup feature allows for fast configuration of each clock without needing to re-type the settings for each one.

For most installations, the **Quick Start** mode should be used to configure the clocks. For special circumstances, such as reserved (static) IP addressing, the **Advanced Mode** should be used instead.

Enable Wi-Fi Time Base
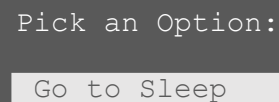
To connect to the clock's Wi-Fi, you must first select Wi-Fi as the time base using the OLED screen on the clock.

1) Press **ENTER** to wake up the clock and enable the display. If the clock was previously setup for RF time base, the display would look something like this…
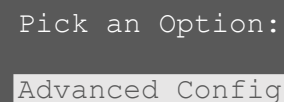
```
12:00:01 PM   RF

No Signal
Awaiting Flood
```

2) Press **SELECT** to scroll through screens and options.

```
Pick an Option:

 Go to Sleep
```
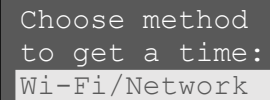
3) Press **ENTER** to choose "Advance Config"

```
Pick an Option:

Advanced Config
```

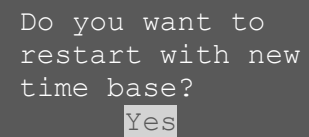4) Press **SELECT** to scroll to Time base Option.
Then press **ENTER.**

```
Adv Options:

Time base Option
```

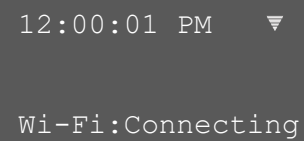5) Press **SELECT** to scroll to *Wi-Fi/Network.*
   Then press **ENTER**.

```
Choose method
to get a time:
Wi-Fi/Network
```

6) Press **ENTER** again to confirm your choice
   or press **SELECT** to scroll to "No" and **ENTER**

```
Do you want to
restart with new
time base?
     Yes
```

7) Clock will restart with Wi-Fi Time base.

```
12:00:01 PM    ▼



Wi-Fi:Connecting
```

The factory default Wi-Fi settings are now enabled:

   SSID: TimeWiseWPA2
   Password: NatscoClocks

You now have the option of creating a Wi-Fi network in your building to match or change the clock Wi-Fi settings as described next.

Wi-Fi Status Mode Status Display

When in Wi-Fi mode, the OLED display on the back or side of the clock can be woken using the ENT button.

```
12:00:01 PM    ≡
Battery: 4.59V
Signal: 39%
Wifi: OK
```
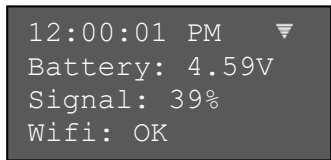
← Current local time.

← Interval between time sync transmits to clocks, in seconds.

← Signal level.

← Status indicator. See table below.

Status Indicator	Meaning
"WiFi: Inactive"	Uncommon; suggested corrective action would be to power-cycle the unit.
"WiFi: Connecting"	You'll see this when the unit is trying to reconnect but before it succeeds or fails. After a failure, the clock will periodically retry the join, displaying this state while doing so.
"WiFi: Bad Passwd"	Wi-Fi password is incorrect.
"WiFi: No Network"	Cannot find specified Wi-Fi network.
"WiFi: Conn. Fail"	Could be bad network name, bad password, or some other connection problem. Check the SSID and password, and if the issue persists consult with IT.
"WiFi: No IP Addr"	Clock connected to an AP but could not retrieve an IP address. Consult with IT.
"WiFi: SNTP Fail"	Clock connected to the Wi-Fi but was not able to get time from the configured time server. Check the configured time server address as well as the firewall configuration. Verify that DNS is available on the specified Wi-Fi network as well. SNTP (UDP port 123) outbound must be available.
"Wifi: OK"	The clock received time from the timeserver successfully.

Wi-Fi Mode IP and MAC Address

The clock's current IP address and MAC address can be retrieved through the *Device Info* menu:

1) Press ENTER to wake the screen.
2) Press SELECT to navigate to *Device Info* and press ENTER
3) Press SELECT to iterate through the various information fields.

```
IP Address:
10.100.2.53
MAC Address:
6055F97F7000
```

Wi-Fi Time Base Quick Start Setup

It is best to perform the clock setup on-site with the actual network to which the clocks will be connecting. This will ensure correct operation. However, you can configure the clocks without a network if you are sure of the correct settings.

Note: The quick-setup procedure detailed below will not save the settings to the clock until the *Save Settings* step. Settings shown prior to saving are defaults or are the settings from the last time the web page was used.

Get a Configuration Device

You can configure your clock with any smartphone, tablet, or laptop. Your device must have its Wi-Fi turned on and it must have permission to join Wi-Fi networks. For the sake of these instructions, we'll assume you're using a phone, but tablets or laptops may be used interchangeably.

Connect to Web Configuration

We'll start off with your phone on your building Wi-Fi or cellular service. Open a web browser and go to **http://natsco.link** to begin. When the page loads, press the *Let's Go* button.

Power Up: Analog	**Power Up: Digital**
1) Remove the metal shipping pin from the back if required. 2) Insert batteries or power plug 3) OLED screen will show Wi-Fi status	1) Insert power plug 2) OLED screen will show Wi-Fi Status

---

Once you've verified the clock is powered up, press the *Next* button on your phone to go to the next phase of setup.

Connect to Clock

Your phone should now be on the *Connect to Clock* screen. Initially, it will say "Connected: *No*" at the bottom. To connect to the clock, we must join your phone to the clock's internal setup Wi-Fi network.

The setup network is broadcast for 1 minute after the clock is powered on or the ENTER button on the clock is pressed. If the clock has gone back to sleep, the OLED screen will turn off and you must press ENTER again to continue.

Connect to the *TimewiseNNNN* network, where NNNN is the serial number of your clock. The serial number can be found on the clock label. Alternately, you can view the clock's serial number via the on-screen *Device Info* menu.

You connect to the Timewise network just as you would any other Wi-Fi network. See below for instructions with Android and iPhone devices.

National Time & Signal - Clock Setup

Connect to Clock

1. Open up your device's Wi-Fi settings and join the network named "TimewiseNNNN", where NNNN is the serial number of your clock.

2. Your phone may warn you that the selected network has no Internet. That condition is fine, since you are connecting directly to the clock. If prompted, select "remain connected".

3. Return to this page in your web browser.

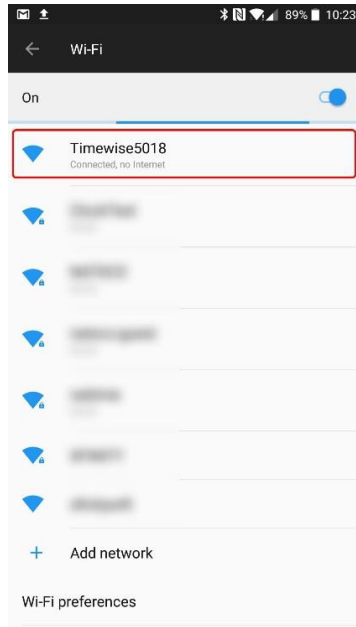*4.* Press the "Next" link below.

Connect to Clock:

Follow this link in your device's web browser to access the clock: http://192.168.4.1

[Previous] [Next]

Android

Swipe down from the top and long-press on the Wi-Fi networks button. Then select the *TimewiseNNNN* network to connect to the clock.
The phone may warn that the network has no Internet. In this case, choose "connect anyway."

iPhone

Go to the *Settings* menu from your home screen and choose *Wi-Fi.*
Then select the *TimewiseNNNN* network to connect to the clock.
The phone may warn that the network has no Internet. In this case, choose "connect anyway."
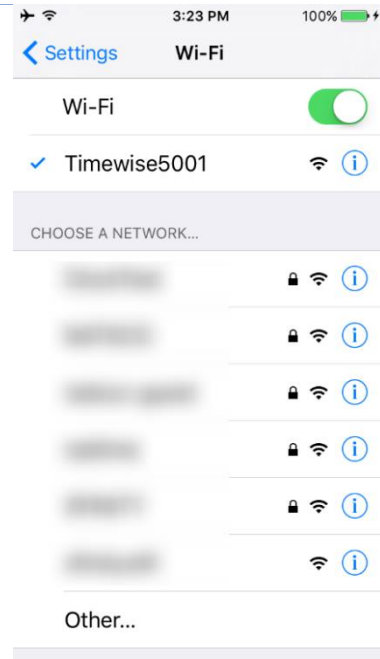
Return to Browser

Once you've joined the Wi-Fi network, return to your phone's web browser. Press the *Next* button at the bottom of the page. From this stage, you will be viewing pages directly on the clock. You may continue using the Wizard interface to finish the setup or continue with the detailed instructions below.

RappID Setup

The first page of the clock setup shows the clock's serial number as well as an interval voltage number.

The voltage should be greater than 3.2V for reliable operation. If you see a lower number, please change the batteries. Hard-wired clocks do not have a voltage indicator.

When entering the web configuration for your clock, you may be prompted for a username and password. The default settings are as follows.

Username: *admin*
Password: *natsco*

National Time & Signal - Clock Setup
Connected to S/N 5001
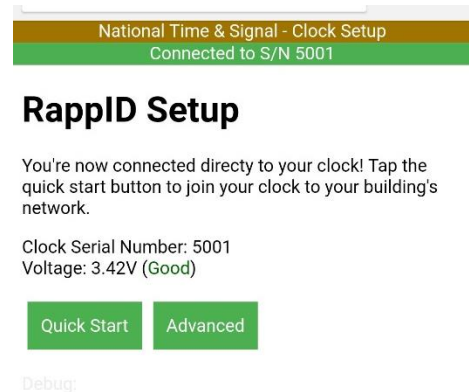
Wi-Fi Setup

Wi-Fi Setup

Enter your building's Wi-Fi network settings here. Be sure that you use the correct capitalization and spacing for these settings.

Enter the name and password of the network to connect this clock. Press *choose* to find a local network. These settings are *case-sensitive*, so be sure you have the right capitalization!

Wi-Fi Network Name: The name of your building's Wi-Fi network. Also called the *SSID*.

Wi-Fi Network Name:

natsco-guest   Choose...

Wi-Fi Network Password: The password for your building's Wi-Fi network. Also called the *Key* or *Pre-Shared Key*. If using EAP/Enterprise authentication, this will be the user password.

Wi-Fi Network Password:

☐ Show Password

Next (Basic): Press this to continue with normal setup (most users).

Previous   Help   Next (Basic)

Next (Enterprise): Press this to enter username and domain information. This is for EAP/Enterprise/802.1x networks that require a username to join the Wi-Fi.

Next (Enterprise)

Time Zone Settings

Enter your local time zone and daylight-saving time rules here. If the built-in quick-start settings don't cover your local time zone or DST, you may use the advanced time settings page to enter a custom time zone.

You can use this page to set up "world clocks" for multiple cities around the world. Simply select the appropriate time zone for the desired city.

National Time & Signal - Clock Setup
Connected to S/N 5001

Timezone Settings

Select your local time zone settings below.

Time Zone:
US Eastern Time (UTC-05:00) ▼

Daylight Saving Time:
United States ▼

Previous   Help   Next

Time Server Settings

The clock gets its time from the selected time server. Battery clocks get their time at 5:30a each morning, while hardwired clocks connect every 24 hours after power-up. If the default server *time.natsco.net* or a *TIMEWiSE* supervision server is used, you will be able to monitor your clocks via http://cloud.natsco.net

If **Set time with phone/laptop** is selected, the clock's initial time will be set from your phone. Setting this to **on** is useful if the Wi-Fi network isn't operational yet. The clock will keep time internally until the network comes online. If the network is already online, leaving this setting **off** can help confirm that the clock is getting the correct time.

National Time & Signal - Clock Setup
Connected to S/N 5001

Time Server

Enter the time server address that the clock will synchronize its time with.

For National Time cloud supervision, use the default of *time.natsco.net* (recommended).

Time Server Address:
time.natsco.net

☑ Set time with phone/laptop if network is unavailable.

[Previous] [Help] [Next]

Save Settings

Once on this page, all the basic settings have been configured. Until this point, the settings are only stored in the phone. On the *Save Settings* page, those settings are pushed to the clock.

Press the *Save* button to push the settings to the clock.

National Time & Signal - Clock Setup
Connected to S/N 5001

Save Settings

Press *Save* below to save the new settings to the clock. The clock will then try to connect to the building Wi-Fi network.

[Previous] [Help] [Save]

Save Settings Progress

As the settings are being sent to the clock, the page will display the progress. Once the settings are pushed to the clock, the clock will attempt to join the building's network. If it succeeds, it will then try to fetch the current network time. During this process, your phone's connection to the clock may drop. If this happens, the page will wait for a bit to try and reconnect. If it fails to reconnect, you may be prompted to re-join the clock's Wi-Fi network.

If the connection was successful, you will be presented with a success screen.

National Time & Signal - Clock Setup
Connected to S/N 5001

Save Settings

Press *Save* below to save the new settings to the clock. The clock will then try to connect to the building Wi-Fi network.

1. Sending settings...

2. Settings saved successfully. Reinitializing...

3. Clock connecting to building Wi-Fi...

4. Fetching time information...

[Previous] [Help] [Save]

Success

At this point, the clock is configured and has received time from the network. **Digital clocks** will immediately show the correct time.

Analog clocks will immediately display the correct time on the OLED display, but the hands will need about 10 minutes to get on-time. The hands will advance to 12:00 and pause 4 minutes before advancing to the correct time. They will further refine their time, if necessary, within 24 hours as the hands are calibrated.

> **National Time & Signal - Clock Setup**
> **Connected to S/N 5001**
>
> ## Success!
>
> The clock should correct to the right time immediately. The time will be synced every two hours starting now. Press *Next* to continue to the next clock.
>
> [Previous] [Next]

Monitoring

After the success screen, the monitoring screen describes the monitoring setup. Please see the section *Monitoring and Reporting* for detailed instructions.

In general, the best procedure is to configure the clocks all at once and write down the **serial number** and **room/location** of each clock as you are placing them on the wall. Then you can enter this information into the monitoring site all at once.

If you have more clocks to configure, select *New Clock* to continue. Otherwise, close the browser and switch your phone back to the building Wi-Fi. The clock will go back to sleep in about 10 minutes.

> **National Time & Signal - Clock Setup**
> **Connected to S/N 5001**
>
> ## Monitoring
>
> Current Clock time: 4/9/2018, 11:01:36 AM
>
> Voltage: 3.42V (Good)
>
> If you have set your time server to time.natsco.net, you can monitor the clock status on the TIMEWiSE cloud service. If you want to check it out now, first rejoin your phone/laptop to your building's Wi-Fi, then navigate to http://cloud.natsco.net.
>
> If you'd rather set up another clock, just press the "new clock" button below and follow the instructions.
>
> [Previous] [New Clock]

New Clock

Setting up additional clocks is simple – you can either enter new settings, or you can push the same settings to the next clock.

In either case, you should connect to the next clock:

1) Power up the next clock
2) Use your phone's Wi-Fi menu to connect to network *TimewiseYYYY*, where *YYYY* is the serial number of the next clock.
3) Return to the web browser and verify that the New Clock page says "Currently connected to *YYYY*"
4) Press *New Settings* or *Same Settings* to enter new settings or push the same settings out to the new clock.

National Time & Signal - Clock Setup
Connected to S/N 5001

New Clock

Follow these instructions to configure the next clock. The new settings you just entered will be remembered for the next clock.

1. In your phone/laptop Wi-Fi settings, join the TimeWise<Serial No.> Wi-Fi network, where *Serial No* is the serial number of the next clock.

2. Wait for the "Connected" bar above to show the serial number of the next clock. Currently connected to 5001

3. Press *New Settings* below to enter new settings, or press *Same Settings* to reuse the same settings as the previous clock.

Previous   New Settings   Same Settings

Wi-Fi Advanced Setup

Advanced setup gives more options than quick-start and may be needed for some installations. Quick-start is much faster, so it should be used if possible. Unlike quick-start, the settings on the advanced setup pages are saved directly to the clock when the save button on the bottom of each page is pressed.

To enter advanced setup, power up the clock, connect to it with your phone, and navigate to the clock's web page. For more details on connecting to the clock, see the Quick Start instructions.

Main Advanced Setup Page

The first page of the advanced setup has details of the clock and connections to the rest of the clock setup.

Serial Number: The serial number is unique to each clock and is used on the Natsco Device Cloud web site to check the status of the clock.

Version: Firmware version of the Wi-Fi radio component.

Clock Version: Firmware version of the clock movement or display.

Module Type: Type of clock. This can be useful when identifying an unknown clock on your network.

MAC Address: This hardware address is unique to each clock and may be needed for your IT administrator to aid in troubleshooting or connecting the clock to your network.

Wi-Fi Signal Strength: Ranges from 1-100, this indicates the quality of the connection to the building Wi-Fi network. Anything above 20 should be fine.

Voltage: Shows the voltage of the clock. Hardwired units should always be at or above 4.5V. Battery units will vary depending on the battery level. Once batteries reach 3.2V, they should be replaced. Use the Natsco Device Cloud service to track battery voltage.

Clock Location/Description: This can be used to record the clock's location. This setting is only saved on the clock. In most cases, this can be left blank and the clock's location can be entered on your TIMEWiSE master clock or the Natsco Device Cloud web page instead.

Current Time: The time loaded from the network. If the date shows years 1999 or 2000, then the time has not been successfully loaded. Note that this display shows the time according to the phone/laptop time zone. The clock can be configured to different time zones that may not match the phone.

National Time & Signal - Clock Setup

This is the advanced setup system. For quick start, go back to the start page.

Back

System Information
Serial Number: *5001*
Version: *1.1.8*
Clock Version: *0.1.3*
MAC Address: *5CCF7F187CA9*
Module Type: DW Series Digital Clock
WiFi Signal Strength: *51*
Voltage: *3.42V (Good)*
Clock Location / Description:
New TIMEWiSE Clock   Save

Current Time: 4/21/2018, 8:40:28 AM
Get Network Time Update   Manually Set Time...

Clock Controls
Clock Type: Digital Clock
Timer Control
Digital Display Settings

Network Settings
Configure Network Settings

Time Settings
Configure Time Settings

Bell Settings
Configure Bell Settings

Password Settings
Change Password

Firmware Update
Update Firmware

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Get Network Time Update: Immediately tries to get time from the network. If the Wi-Fi connection to the building is working, then this will attempt to get the time from the configured time server. If the clock can't fetch the time, it will remain unchanged.

Manually Set Time: Open this page to set an arbitrary time into the clock.

Clock Controls: Depending on the model of clock, this allows direct control of the movement or display.

Network Settings: Used to join the clock to a building network.

Time Settings: Configuration of time zones and time server information.

Bell Settings: On Digital clocks, configures which bell circuit this clock is on. When the master clock or TIMEWiSE supervision scheduler rings a Wi-Fi circuit, the digital clocks with the specified circuit number will activate their beepers or count-down timers.

Password Settings: For protecting the login interface of the clock.

Firmware Update: For updating the clock's radio firmware.

Page Details — Manually Set Time

Enter the time you wish to see on the clock. It will be converted according to your phone's local time zone and then sent to the clock. On digital clocks, the time will reset immediately. On analog clocks, use the clock control page to make the clock immediately go to the new time.

Note that the clock may fetch new time from the network that will overwrite the time entered on this page. If you wish to force a specific time that doesn't match the network time, you should first clear the network time server setting on the *Time Settings* page.

National Time & Signal - Clock Setup

Set Current Time

Current Time: 4/21/2018, 9:05:18 AM

Year: 2018 (Use year 2000 or later)
Month: 4 (1-12)
Day: 21 (1-31)
Hour: 9 ● AM ○ PM (1-12)
Minute: 5 (0-59)
Second: 18 (0-59)

Save Settings

<< Back to Main

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Page Details — Digital Clock Controls — Timer Control

On Digital clocks, the clock can also be used as a timer. This can be accomplished via plug-in wall controls or through the clock's web interface.

Start/Stop – Starts or stops the counting.

Timer/Clock – Press *timer* to switch the display into timer mode. Press *clock* to switch back into normal clock mode. Note that the timer can be running even while the clock is displayed.

Reset – Sets the timer back to its start time. The start time is set via *Set Timer Value*, described below.

Up/Down – Sets the timer into count-up or count-down mode.

Set Timer Value – Sets the current time on the timer to the specified value. On six-digit clocks, all three values will be shown. On four-digit clocks, seconds values will only be shown once hours reach zero.

Beep – Sounds the clock's internal beeper for the specified number of quarter-second intervals. Set to 4 to ring for one second.

Use Physical Switches – If the web interface is used to control a timer that also has physical switches, the physical switches will be ignored until this button is pressed. Once this button is pressed, the timer will switch to whatever mode is set on the physical button switches attached to the clock.

National Time & Signal - Clo

<< Back to Main

Timer Control - Port 1 Only

| Start Stop | Reset |
| Timer Clock | Up Down |

___ Hours
___ Minutes
___ Seconds
Set Timer Value

Outputs
Duration: 4   Beep
(1-98 quarter seconds)

Press this button to enable phyical switches on clocks with the optional timer control switches attached.
Use Physical Switches

Page Details — Digital Clock Controls — Digital Display Settings

This page allows configuration of digital-clock-specific display options.

12/24 Hour Format – Set to *0* for default 12-hour time (AM/PM) display or set to *1* for 24-hour (military time) format.

Low-Light Brightness – The brightness of the display when in a low-light environment (ie: the room lights are turned off or there is little sunlight). This value should be set to something lower than the high-light brightness. The clock will automatically use this lower brightness to prevent the display from being overwhelming.

High-Light Brightness – The brightness of the display when in a bright environment (ie: the room lights are on or there is bright sunlight). This value should be set to something higher than the low-light brightness. The clock will automatically use this higher brightness to ensure that the clock is visible.

Auto-Dim Threshold – Determines the ambient light level where the clock switches from low-light brightness to high-light brightness. The light sensor is located on the front face of the clock in a hole in metal case in the bottom right corner. It can be tested in a lighted room by placing a finger over the sensor to simulate darkness.

Beeper Settings – When countdown events from the built-in timer or from scheduled bell events complete, the internal beeper can be set to sound. Set to zero to disable the beeper.

Save Settings – Press this button to commit the new settings to the clock.

Page Details — Network Settings

The network settings allow for configuration of all the clock's Wi-Fi connection options.

**Current Network:** The currently connected Wi-Fi SSID.

Current IP Address: IP Address on the building Wi-Fi network.

Local Access Point: If the clock's built-in access point is active, this will show how much longer it will be active. The built-in Wi-Fi can be activated or extended in duration by pressing the clock's *Setup* button (see Quick Start section for details).

Network Name (SSID): The Wi-Fi network to which the clock will connect. Note that capitalization and spacing *must* be correct for the clock to join the network.

Network Mode: *Normal* is used for any network that has a shared password for all users (called a pre-shared key). *Enterprise* (EAP/802.1x) networks require a user name and a per-user name to join the network. Consult with your IT administrator to determine which settings to use.

Network Password: The Wi-Fi network password. If using Enterprise mode, this will be the user password.
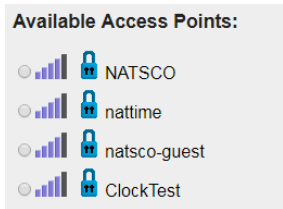
Available Access Points: Shows access points that are broadcasting locally. Initially this will show as "Scanning…" and after a few seconds it will change to a list of the local networks. Pick one of the networks to automatically set the network name to the selected SSID. This can help prevent typos in the network name field.

Wi-Fi Active Time: (Hardwired clocks only) Hardwired clocks can be configured to either stay on the Wi-Fi network permanently or to disconnect as soon as they fetch the current time.

Static IP Settings: If a dedicated IP address must be used, enter it here. Dynamic address is recommended in most cases.

Save Settings: Press this button to commit the new settings to the clock. Unlike the *Quick Start* settings, the settings on this page will immediately get pushed to the clock and the clock will attempt to connect. The connection to the clock may drop temporarily during this process. If necessary, re-join the clock's internal Wi-Fi and/or reload the web page.

Page Details — Time Settings

This page allows for configuring the time zone and time server information.

Time Server: This is an SNTP time server. The default server, *time.natsco.net* is a free service provided by National Time. If you use this server, you will also be able to use our free cloud monitoring service at http://cloud.natsco.net to check the status of your clocks. Other options include a local TIMEWiSE-enabled master clock, which also allows for supervision and monitor of the clock. Finally, you can use any SNTP server (such as pool.ntp.org or a local Windows Server) to provide basic time information[4].

Time Settings

Timeserver Address:
time.natsco.net   Use *time.natsco.net* for cloud monitoring.

Timezone offset:
-5   Example: *-5* for US Eastern Time.

Daylight Saving Time Rule:
3.1.0.2;11.0.0.1;1

SNTP Format: Natsco Cloud ▼

Save Settings

Timezone Offset: Offset in hours from UTC / GMT time. US Eastern Time is - 5. For half-hour offsets, decimals may be used. For example, Newfoundland would have a value of "*-3.5*".

Daylight Saving Time Rule: This text defines a custom daylight saving time rule. The common values below can be used, or consult with National Time's tech support for additional regions. To disable DST, set the field to blank.

Region	Rule	Description
United States	3.1.0.2;11.0.0.1;1	Start: Second Sunday in March End: First Sunday in November
Europe	3.5.0.2;10.5.0.1;1	Start: Last Sunday in March End: Last Sunday in October
Australia	10.0.0.1;4.0.0.2;1	Start: First Sunday in October End: First Sunday in April

Update Days

The module will power up and get the time from the network on the selected days.

☑ Sunday
☑ Monday
☑ Tuesday
☑ Wednesday
☑ Thursday
☑ Friday
☑ Saturday

Update Hours

On update days, the module will power up and get the time at the selected hours.

☐ 1:00 AM
☐ 3:00 AM
☑ 5:00 AM

SNTP Format: Set to *Natsco Cloud* if getting time from *time.natsco.net* or a TIMEWiSE-enabled master clock. This format allows cloud monitoring. In general, the cloud format works with all time servers. However, you can set this option to *Basic* to have the clock use a completely standards-compliant time request format. Set to *Disabled* to prevent all time updates.

Update Days/Hours: (TimeCast Analog Only) Select the days and hours when the clock will fetch time. The default is every day at 5:30 AM, when network traffic is low.

Save Settings: Press this button to apply the settings and immediately try to fetch the time. Note that analog clocks that have already fetched their time will not re-correct the clock until the next wake-up cycle.

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[4] **IT Note:** the network firewall must allow UDP port 123 traffic to the selected server.

Password Settings

New Password:

Re-type New Password:

Save Password

Page Details — Password Settings

This page allows you to set a new password for the clock's web interface. Be sure to keep the new password safe, as it will be required to make any future changes on the web page. If you ever forget the password, you can use the *Setup* button on the clock to reset to defaults.

Page Details — Update Firmware

Occasionally, National Time will release new versions of the Wi-Fi radio firmware to add new features or to address issues found in the field. On these occasions, our support team may send you a file ending in ".bin" for uploading onto the Wi-Fi radio. To update the firmware, follow these steps:

1) Download the new .bin file onto your laptop.
2) Wake up the clock and connect to it via the building Wi-Fi or the clock's internal Wi-Fi.
3) Navigate to the *Update Firmware* page.
4) Click *Choose File* and select the .bin file from step 1.
5) Press *Upload*. You will see a progress indicator, and then the clock will restart. You may need to reconnect to the clock or reload the webpage. When the process is complete, the new firmware version will show under *System Information*.

System Information

Serial Number: *5001*
Radio Version: *1.1.8*

Upload your firmware

Select a file to upload. The file must be a firmware binary ending in ".bin".

Choose File | No file chosen

Upload

NATSCO Device Cloud

The National Time & Signal device cloud is a free service that logs the status and check-in information of your clocks. Whether the clocks are using RF or Wi-Fi time base, the clocks appear on the same cloud service and customer clock lists. Cloud monitoring is enabled by choosing the ***time.natsco.net*** as the SNTP timeserver. For RF mode clocks, choose the timeserver in the base station. The base station will forward clock statuses to the NATSCO device cloud. For Wi-Fi mode, choose the timeserver during the clock Wi-Fi setup.

Clock Monitoring and Supervision

The status of a clock can be monitored using the **Natsco Device Cloud** at http://cloud.natsco.net

Using the Natsco Device Cloud, you can:

1) Directly check the status of a particular clock
2) View clock check-in history
3) Create lists of devices
4) Configure daily or weekly email reports

The Device Cloud can be used from any phone or PC from any location (at home, on the road, etc).

To begin, open a web browser and navigate to http://cloud.natsco.net

The device cloud has two major sections.

1) Lookup Clock: This option lets you check the status of a particular clock. It is best used for troubleshooting a specific clock.
2) Clock Lists: This option allows you to build lists of clocks for quick status checks of an entire building. You can also use these lists to generate email reports at regular intervals.

Read more about these options below.
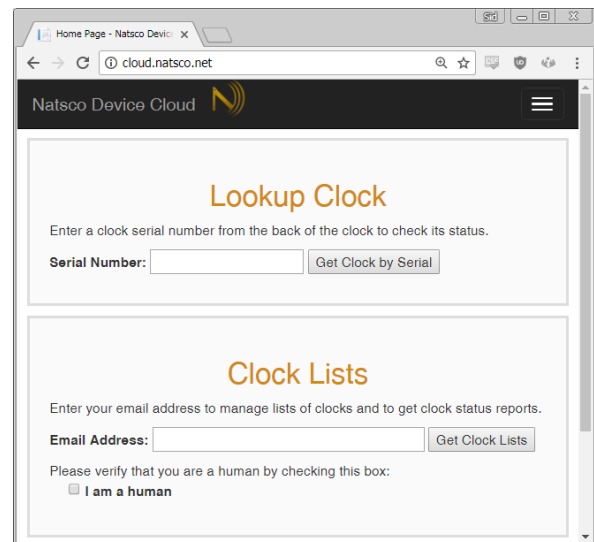
Clock Lookup

Using the *Lookup Clock* section on the Device Cloud site, enter the serial number from the back of the clock. In this example, let's look up device 5018. After the serial is entered, press *Get Clock by Serial*.

The status page will appear with a summary of the clock status from the last time it checked in. The fields are as follows.

Device Type: The model of clock.
Last Seen: The time when the clock was last seen.
Battery Voltage: On battery units, a voltage of <3.2V indicates the batteries should be changed.
Signal Strength: Signal strength should generally be above 5% for reliable communication.
Remote IP Address: The IP address that the Natsco Device Cloud sees when the clock checks in. This is usually shared within your building.
Peers Visible: (RF mode) How many nearby clocks this clock can see. Seeing at least a few clocks helps ensure a reliable path back to a base station.
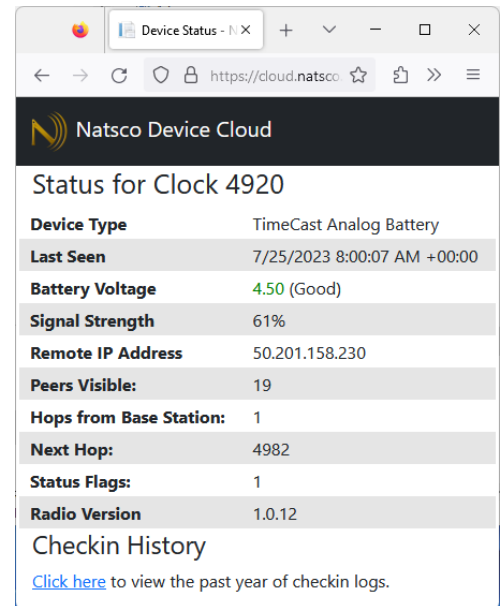
Hops from Base Station: (RF mode) How many transmission/retransmission "hops" are needed to reach the clock from a base station. Smaller is better, and this will always be at least one.
Next Hop: (RF mode) The serial number of the next clock in the path back to the base station. This can be used to trace out the path the clocks use to connect to their peers and share information.
Status Flags: Used by Natsco support to provide technical assistance.
Radio Version: The firmware version of the clock.

A **Check-in History** option is also available to see the recent check-ins of the clock. This can be used to diagnose connection issues or to inspect network reliability. How often the clocks connect will also depend on their check-in schedule.

Clock Lists

Clock lists provide an easy way to manage a list of your clocks. To begin, enter your email address into the main screen under *Clock Lists* and be sure to choose the *I Am a Human* checkbox.
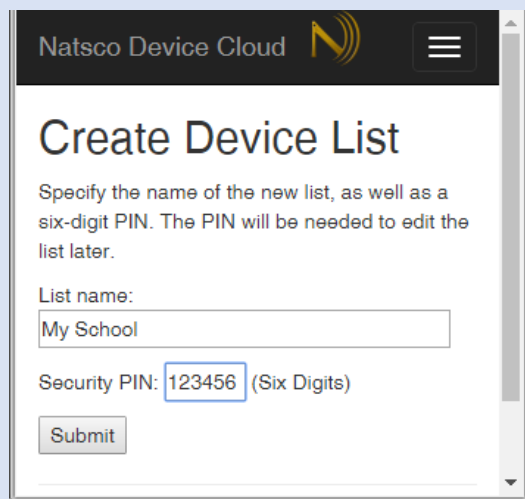
Once you enter the Clock List screen, you will be presented with all the lists associated with your email address. If there aren't any yet, you can click *Create a new device list* to make your first list.
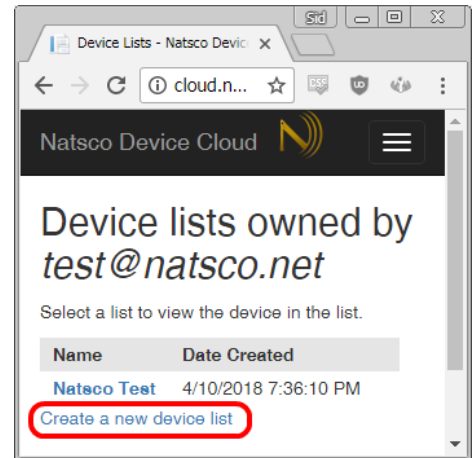
Creating a Clock List
Name the list (usually with the building name) and assign a six-digit PIN to prevent others from editing your list.
Clocks can be in more than one list, so you can also create extra lists to sub-divide your clocks even further. For example, you could create one list for the entire building and another list for another area. In addition, other users can add the same clocks to their own lists.

Adding Clocks to the List
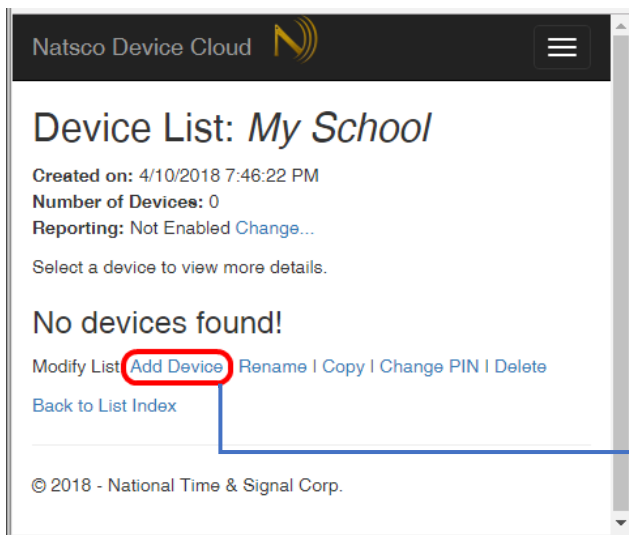
Initially the list will be empty. Add clocks by clicking *Add Device* at the bottom of the list. It is easiest to add all of the clocks at once after they have been positioned in their various rooms, but you must be sure to record the serial number and location as they are being hung.

List Maintenance

Once the list is created and some clocks are added, you have several options for maintaining it:

Edit allows you to rename a clock.

Remove deletes a clock from the list.

Rename renames the list.

Copy allows you to copy a list to a new list or a different email address.

Change PIN lets you change the PIN for the list.

Delete deletes the list. All clocks will still be able to check in like normal, and any other lists containing the clocks are unaffected.

Reporting →Change lets you configure daily or weekly status reports on your clocks.
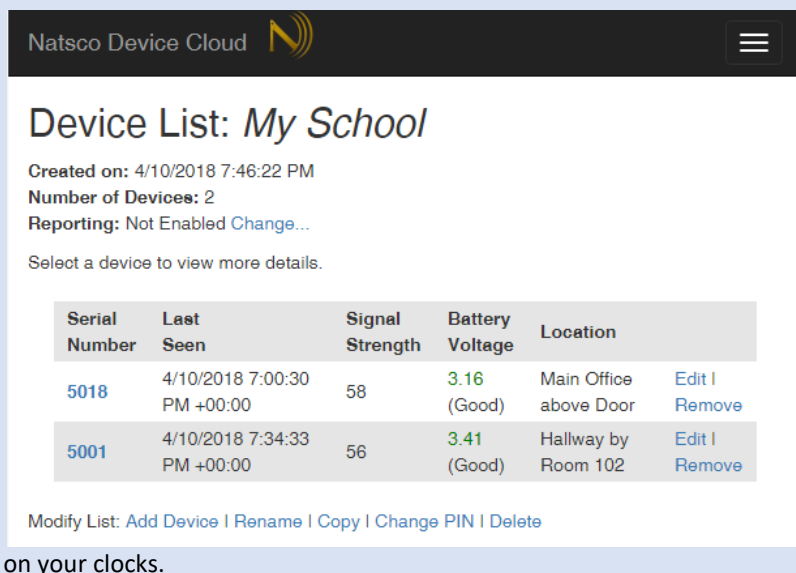
Reporting

Device list reports send daily or weekly reports to the email address with which the list was created.

Day of the Week allows you to pick which day(s) to send the report.

When to Send allows you to always send the report or to only send it if there are clocks that have low battery/signal or which are not checking in for several days.

Sunday is a recommended report day, since it will help identify any daylight saving time issues at the start of the week.

Natsco Device Cloud

Change List Reporting Days

Each day, you may receive a report detailing clock status and highlighting any clocks with issues.

Enter a reporting days for the device list "My School".

Sunday ▾

Always Send ▾

Change Reporting Cancel

Clock Status Email

If the clock status report has been enabled on a list, you will periodically receive email detailing the clock status. To see more details about the clock list, you can simply click *view the clock list here* at the bottom of the email. Note: a clock might have multiple trouble conditions. For example, a unit might show as off-line *and* low battery if the battery has expired.

🕐 Clock Status Report for **Dexter Cornerstone Elementary**

Total	Healthy	Offline	Low Battery	Low Signal
19	18	0	0	1

For a complete report of every clock, view the clock list here. If you've received this message in error, please notify support@natsco.net for r

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