ICEqube

Ethernet LCD
Thermal Management Systems

OPERATION MANUAL
Version 3.86

*** IMPORTANT ***

PLEASE READ this manual and follow the instructions for safe and satisfactory
installation and operation of this system. Keep this manual for future reference.
Some information may not apply to all systems.

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Operations of the IQ Ethernet LCD System
Ver. 3.86

Ice Qube's Ethernet Thermal Management Center (ETMC) is an innovative approach to monitoring and controlling the thermal management equipment on electrical, electronic and telecommunications equipment. With the ETMC, it is easy to connect the thermal management equipment to a network anywhere there is access to a node. Ice Qube ETMC has all the features of the standard digital controller, plus a user-friendly LCD message center, expanded temperature and alarm ranges, improved functionality and the capability to communicate on an Ethernet network.

Basic Operations are broken down into two areas - Local Control and Ethernet. Local Control refers to operations via the LCD display and keyboard whereas Ethernet Control refers to operations over Ethernet connections utilizing a standard desktop Internet browser. The Ethernet Control assumes connectivity between the IQ system and the desktop via Ethernet utilizing LAN (Local Area Network) as well as WAN (Wide Area Network).

To utilize the LAN and WAN requires some knowledge of these systems. If you have an IP administrator, they will be able to guide you through the setup to comply with the needs of the system. The IQ system does allow quick LAN installation on simple LAN systems that utilize DHCP as outlined below in sections P4.40 to P4.60. Providing connectivity via WAN (internet) is possible but requires a much better understanding of networking which is outside of the scope of this guide. Consult your IP administrator or specialist for assistance.

Local Control:
The system normally monitors, displays, and controls the IQ system. The LCD display consists of 2 lines. The top line typically shows the system status while the bottom line shows additional information. In addition to the display, there are 4 LED lamps that continuously display the system status that can be seen at a much greater distance away from the unit.

Some Typical Operating Mode Displays:
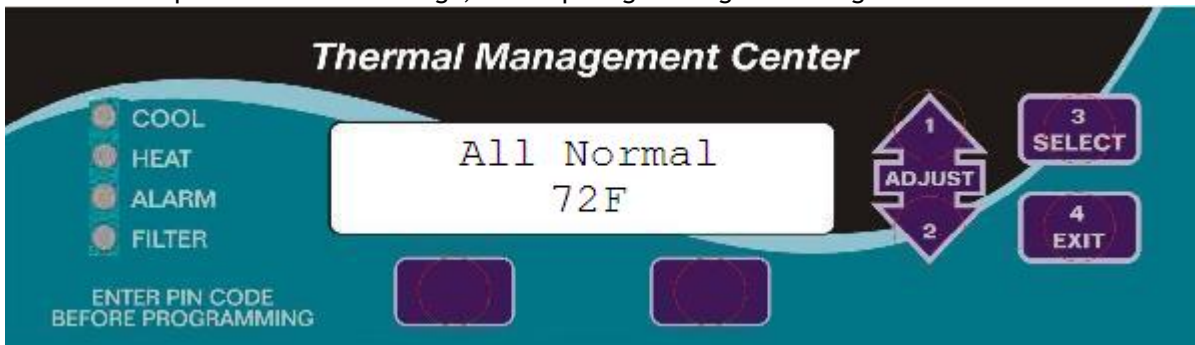Enclosure temperature is within range, not requiring Cooling or Heating - no Alarms:

Fig. 1

Enclosure temperature is higher than the Cooling ON set point but the system is waiting for the cooling to be turned on (time delay), keeping the compressor from Short Cycling:

Fig. 2

Enclosure temperature is higher than the Cooling ON set point, time delay expired:
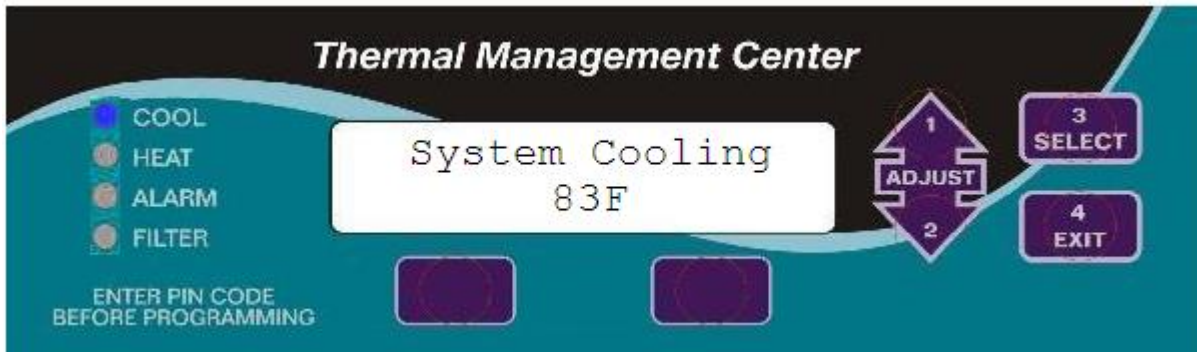

Thermal Management Center

COOL
HEAT
ALARM
FILTER

ENTER PIN CODE
BEFORE PROGRAMMING

System Cooling
83F

1 ADJUST 2
3 SELECT
4 EXIT

Fig. 3

Enclosure temperature is higher than the TOO HOT Alarm set point:

Thermal Management Center

COOL
HEAT
ALARM
FILTER

ENTER PIN CODE
BEFORE PROGRAMMING

System ALARM
Too HOT 101F

1 ADJUST 2
3 SELECT
4 EXIT

Fig.4

The ALARM LED is blinking, and if Audible Alarms are enabled, they are sounding.

Enclosure temperature is lower than the Heating ON set point but the system is waiting for the heating to be turned on (time delay):

Thermal Management Center

COOL
HEAT
ALARM
FILTER

ENTER PIN CODE
BEFORE PROGRAMMING

Wait for Heating
48F

1 ADJUST 2
3 SELECT
4 EXIT

Fig. 5

Enclosure temperature is lower than the Heating ON set point:

Thermal Management Center

COOL
HEAT
ALARM
FILTER

ENTER PIN CODE
BEFORE PROGRAMMING

System Heating
46F

1 ADJUST 2
3 SELECT
4 EXIT

Fig. 6

Enclosure temperature is lower than the TOO COLD Alarm set point:

Fig. 7

Additional alarms and conditions are displayed as needed and are outlined in the program modes listed below. Should there be multiple alarms or messages they will be displayed one at a time for a short period before displaying the next message. The system is very intuitive and messages are very obvious as to what they mean.

Programming Mode:
To gain access to the system, a valid PIN number must be entered into the keyboard of the system. The default system PIN is 1234. Press buttons labeled as 1, 2, 3, and 4. As you press each button (individually) you should hear a short chirp. Once you have entered all four numbers, after waiting a couple of seconds, you should hear a couple of quick beeps, the display should blink, then the top line of the LCD will read 'Programming Mode'. This message informs you that you are now in the system program mode. If the LCD blinks but the top line of the LCD does not read 'Programming Mode', then you have not entered the PIN code properly - try again. The 'Programming Mode' consists of a series of menu items that allow you to set up the operation of the system. The specific item is normally displayed on the second line of the LCD. This setup is divided into 4 sections -- Cooling, Heating, Alarm and Misc. (which includes Ethernet).

If no selection is made after a time delay, the system will return to its normal operating mode of display and control.

To navigate the menus, the SELECT (3) key is used to advance to the next menu item. EXIT (4) is used to exit the program mode at any time. The Adjust Up (1) and Down (2) are used to change the setting that is displayed. Ethernet items also utilize the Left (5) and Right (6) keys below the display. Unless otherwise informed, for clarity, the top line will not be listed below - but will show 'Programming Mode' on the LCD. All settings are saved once you exit the program mode.

P1.00 - Program Cooling:
> **P1.10** - Select if System has cooling components installed.
> > 'Cool Instld YES'
> UP or DOWN toggles YES / NO. If cooling is installed, press SELECT once the message reads 'Cool Instld YES'. If 'NO' is selected skip to P2.00
>
> **P1.20** - Select if System is in Manual Cooling mode, that is, the cooling is ALWAYS ON without utilizing the temperature set point for control.
> > 'Manual Cool OFF'
> UP or DOWN toggles OFF / ON. If ON is selected the system, once out of programming mode, will be in 'Manual Cooling' mode which will be displayed on the top line of the Operating Mode instead of the 'All Normal' message. Also the programming will go to P3.00 - skipping the P2.00 heating settings
>
> **P1.30** - Select if System has Cooling Enabled. This mode is typically used for servicing when you want the cooling to be shut off. Normally set to YES.
> > 'Cooling Enabled YES'
> UP or DOWN toggles YES / NO. If NO is selected the system, once out of programming mode, the system will be in 'Cooling Disabled' mode which will be displayed on the top line of the Operating Mode instead of the 'All Normal' message. The cooling will not come on while in this mode.
>
> **P1.40** - Select the temperature that the cooling turns on at.
> > 'COOL ON at 80F'
> Pressing / holding UP or DOWN will move the number on the display either up or down. Above this temperature, the system will start the cooling cycle.

P2.00 - Program Heating:

    P2.10 - Selecting if System has heating components installed.

        'Heat Instld YES'

UP or DOWN toggles YES / NO. If heating is installed, press SELECT once the message reads 'Heat Instld YES'. If 'NO' is selected skip to P3.00. Not all systems have heating installed, check with your supplier to determine if heating is installed in your system.

    P2.20 - Select if System is in Manual Heating mode, that is the heating is ALWAYS ON without utilizing the temperature set point for control.

        'Manual HEAT OFF'

UP or DOWN toggles OFF / ON. If ON is selected the system, once out of programming mode, will be in 'Manual Heating' mode which will be displayed on the top line of the Operating Mode instead of the 'All Normal' message. Also the programming will go to P3.00 - skipping the P1.00 cooling settings.

    P2.30 - Select if System has Heating Enabled. This mode is typically used for servicing when you want the heating to be shut off. Normally set to YES

        'Heating Enabled YES'

UP or DOWN toggles YES / NO. If NO is selected the system, once out of programming mode, the system will be in 'Heating Disabled' mode which will be displayed on the top line of the Operating Mode instead of the 'All Normal' message. The heating will not come on while in this mode.

    P2.40 - Select the temperature that the heating turns on at.

        'HEAT ON at 50F'

Pressing / holding UP or DOWN will move the number on the display either up or down. Below this temperature, the system will start the heating cycle.

P3.00 - Alarm Settings:

    P3.10 - Select if the HOT Alarm is ON

        'HOT ALARM ON'

UP or DOWN toggles OFF / ON. If OFF then the system does not check for system TOO HOT and skips to P3.30.

    P3.20 - Select the temperature that if above triggers the TOO HOT alarm.

        'TOO HOT at 99F'

Pressing / holding UP or DOWN will move the number on the display either up or down - setting the desired temperature

    P3.30 - Select if the COLD Alarm is ON

        'COLD ALARM ON'

UP or DOWN toggles OFF / ON. If OFF then the system does not check for system TOO COLD and skips to P3.50.

    P3.40 - Select the temperature that if below triggers the TOO COLD alarm.

        'TOO COLD at 38F'

Pressing / holding UP or DOWN will move the number on the display either up or down - setting the desired temperature

    P3.50 - Select if the Condenser Alarm is ON

        'COND ALARM ON'

UP or DOWN toggles OFF / ON. If OFF then the system does not check for Condenser being too hot. Normally this alarm should be on.

    P3.60 - Select if the Filter Alarm is ON

        'FILT ALARM ON'

UP or DOWN toggles OFF / ON. If OFF then the system does not activate the filter alarm and skips to P3.80

    P3.70 - Select the number of days for the filter alarm*

        'FILTER DAYS 30'

Pressing / holding UP or DOWN will move the number on the display either up or down - setting the desired number of days between filter alarms.

This is not based on a clock timer, but compressor run time.

Once in alarm, the message on the bottom line of the display will show 'Service FILTER', the beeper will sound (if enabled), the alarm relay will activate (if enabled), and [AlarM] and [FilteR] LEDs will blink. To acknowledge this alarm, simply pressing any key will silence the beeper, deactivate the relay, and make [alarm] and [FILTER] LEDs activate. The 'System ALARM' and 'Service FILTER' messages will remain on the display until this alarm is canceled by entering in the PIN code. Once the PIN is entered, the alarm is cleared and the day counter is reset to begin its count down until the next filter alarm.

P3.80 - Select if the Alarm Beeper is ON
        'ALARM BEEP ON'
UP or DOWN toggles OFF / ON. If ON then the internal beeper sounds on all alarms

P3.90 - Select if the Alarm Relay Output is ON
        'ALARM OUTPUT ON'
UP or DOWN toggles OFF / ON. If ON then the Alarm Relay Output activates on all alarms

P4.00 Misc. and Ethernet Settings:

P4.10 - Setting Temperature Units F or C
        'TEMP UNITS F'
UP or DOWN toggles F / C. If F then Fahrenheit, if C the system is in Celsius. Be advised, due to rounding, going back and forth between F & C may result in a 1 degree error between the local control and Ethernet side.

P4.20 - Setting if a Security PIN is needed to enter Program Mode
        'SECURITY ON'
UP or DOWN toggles OFF / ON. If OFF then any key press twice will access the program mode and skip to P4.40. If ON then the valid PIN must be entered to go into the program mode.

P4.30 - Setting the PIN Code
        'PIN 1234'
The Left and Right keys under the display will move to which digit that will be changed. That digit will be blinking. Pressing UP or DOWN will change the digit within the allowable range. By utilizing these 4 keys, select the desired PIN code that will be need to access the system. The Left Key = 5, and the Right Key =6. These keys may also be utilized as part of the PIN Code

P4.40 - Automatically getting the Dynamic Host Configuration Protocol (DHCP) Address. If your network utilizes DHCP address utilization and your IP Network system administrator advises you to use a DHCP address, you may use this feature to have your network automatically assign the IQ system a unique IP Address and Mask. This feature should work on most IP Networks that have DHCP addressing. If you have a problem utilizing this automatic feature, consult your administrator and use the Static IP feature. Basically what this feature does is use the network's DHCP mechanism to get a valid address and mask. Then the feature automatically sets the IQ System's Static address and mask. By transferring this address and mask automatically making it static, the IQ System's address will not change.

        'AUTO ADDRESS OFF'
UP or DOWN toggles OFF / ON. If ON then once you exit the programming mode, the system initiates a DHCP request for an IP Address and Mask. Once your network system assigns an address to the IQ device, the display will show that address on the bottom line of the display. You will need this address to access the unit via your web browser. Pressing any key will return the display to normal and will automatically turn the Auto Address OFF.

P4.50 - Setting / Viewing the IP Address - this allows you to set or view the Static IP address.
        'IP ADDRESS'   <--TopLine
        '192.168.000.135'

The values that are displayed are what the system is set to. If you utilized the Auto Address feature, this address will be what the network assigned.

Should you want to enter a Static Address manually, the Left key under the display will move to which digit group that will be changed. The Right key will move to select which digit of the group that will be changed. That digit will be blinking. Pressing UP or Down will change the within the allowable range. By utilizing these 4 keys, select the desired address can be set.

P4.60 - Setting / Viewing the IP Network Mask - this allows you to set or view the Static IP Mask.
       'Net MASK'   <--TopLine
    '255.255.255.000'

As with the IP Address, the currently set mask is displayed while the Left and Right keys under the display allow navigation and the UP / DOWN change the value of the digit. By utilizing these 4 keys, select the desired mask can be set.

Please be advised, setting up the Ethernet connection is a simple task; however, there are many issues that dictate connectivity between your desktop browser and the remote IQ device(s). Most of these issues deal with how your network is setup, firewalls, and differences between public and private networks and are outside of the scope of this guide. Consulting your IP administrator, specialist, or consultant will reveal potential problems and solutions to these issues.

Ethernet Control:

To control the IQ system via your desktop browser, assuming that both the desktop computer and IQ system have joint connectivity; all that is required to do is to enter the address of the IQ system that is desired to monitor or control. You may obtain the IP address of the board by pressing the left button under the LCD display. If the message above the IP states "Detecting Type," you do not yet have a connection. It must read your type of connection i.e. "100 Base T Full Duplex."

Simply enter into the address bar of your browser the address such as: http://192.168.1.40 normally you do not need to enter the http:// into most browsers. Once logged in you can simply save each unit as a "FAVORITE" adding descriptions as you require. Then you can use your browser's 'FAVORITES' feature to access the page at a later date.
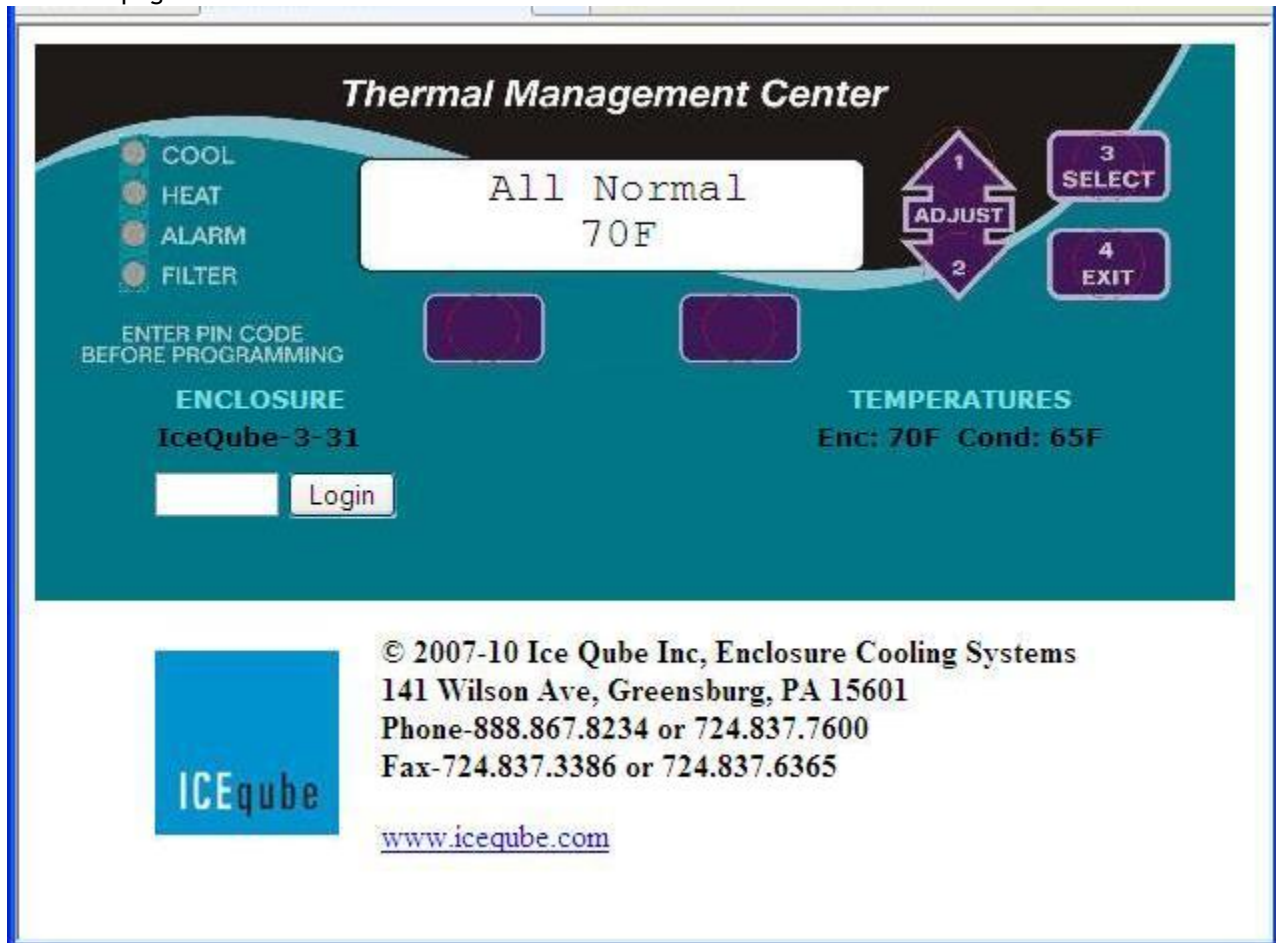
Fig. 8

The sample above shows the system displaying the current temperatures as well as the system's status. Basically this is the same view as with the Local Control. If you leave this up on your browser, the system will update approx. every 4 seconds. You will also notice that the LEDs will 'light up' on the web page similarly as they do locally with the exception that the web page LEDs do not blink.

Clicking on the www.iceqube.com link will take you to the IceQube website.

Java Script must be enabled on your browser for proper operation. If it is not enabled, you will get a warning message and the Web Page will not load nor operate properly.

The system will not allow both the Local Control and Ethernet Control to be in the 'Programming Mode' at the same time. This is not permitted since changing system parameters on one side may not immediately change on the other control side causing confusion. Basically the system utilizes the concept that either control can alter settings. The side that stored the setting last will be the final setting.

Entering Edit Mode from the Internet:

By entering in your PIN number [default = 1234] into the box to the left of the 'Login' button then clicking on 'Login' (assuming that the PIN is valid) the following Programming Mode page will be displayed:

Fig. 9

By using your computer, you can now adjust and select the various options that you require. By reviewing the Local Control section and using it for your guide, you can quickly configure your IQ system. Basic web rules and navigation apply, including the scroll bar at the right. By scrolling down, you will see the remainder of the page. In this case showing the SUBMIT and LOGOUT buttons. Depending upon the display of your desk top computer system, more or less of page may show at one time.

Shown above is the CONTROLLER tab. The first half of the CONTROLLER editing screen includes the Enclosure Name, Cooling Installed, Manual Cooling, Cooling Enabled, and the set point temperature for the Cooling.

The system checks for valid data when entering. Some characters are not allowable in the 'Enclosure Name' – including SPACE. If the entered data is not valid, a warning page will 'pop up' once you press the SUBMIT button near the bottom of the page. The LOGOUT button will log you out of the Program Mode and shrink the display. The system will automatically leave this programming mode after 5 minutes of entering into it.

Controller Tab Cont'd:
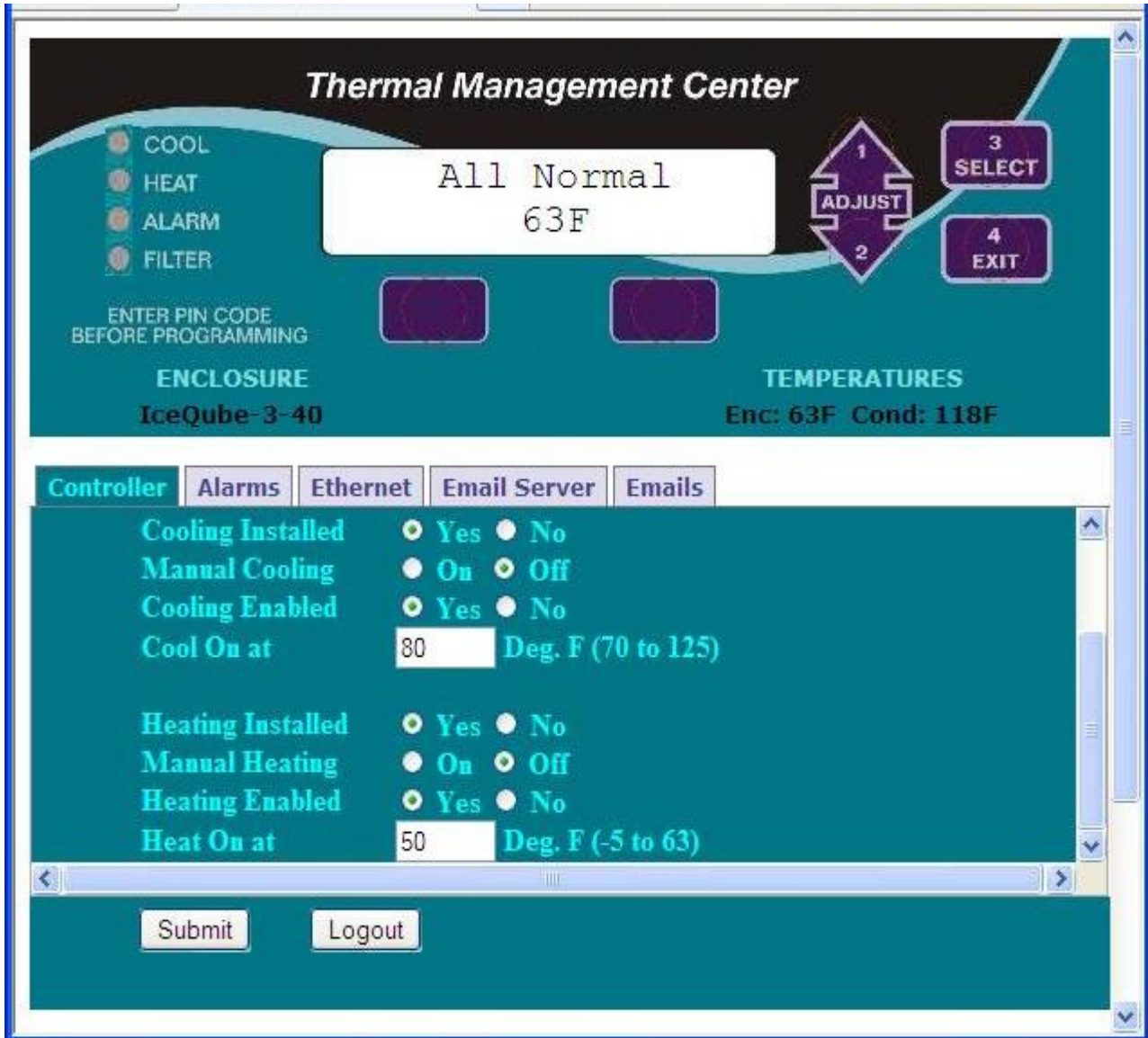
Fig. 10

Shown above is the second half of the CONTROLLER tab with the selections for Heating Installed, Manual Heating, Heating Enabled, and the set point temperature where the heating will come on.

The ALARM tab:
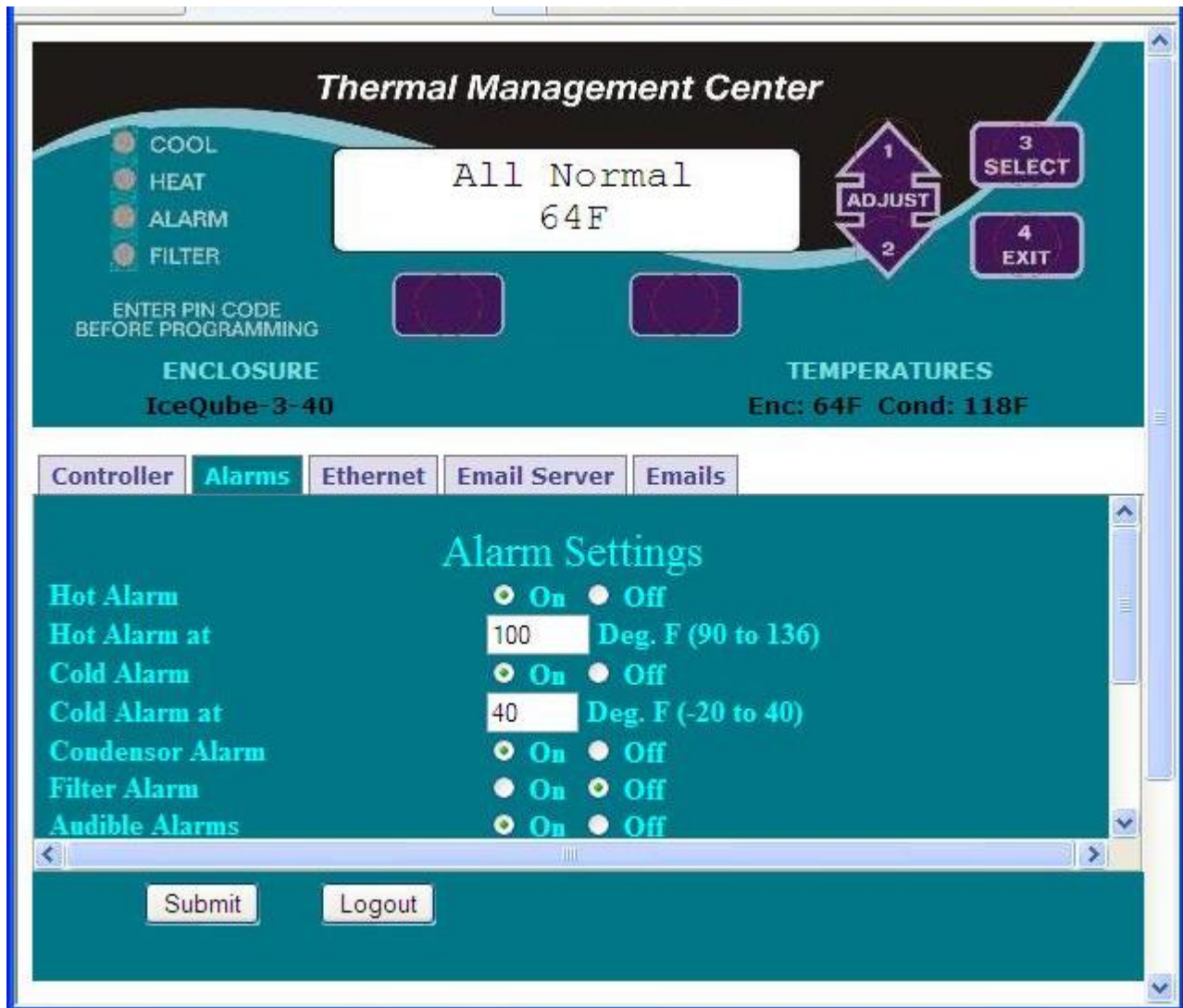
Fig. 11

Some items are 'grayed out' when selecting certain options not allowing you to set them. For instance, in the following example, since the 'Filter ALARM' is Off, the 'Filter Timer Days' selection is grayed out since it is not used.

ALARM Tab Cont'd:
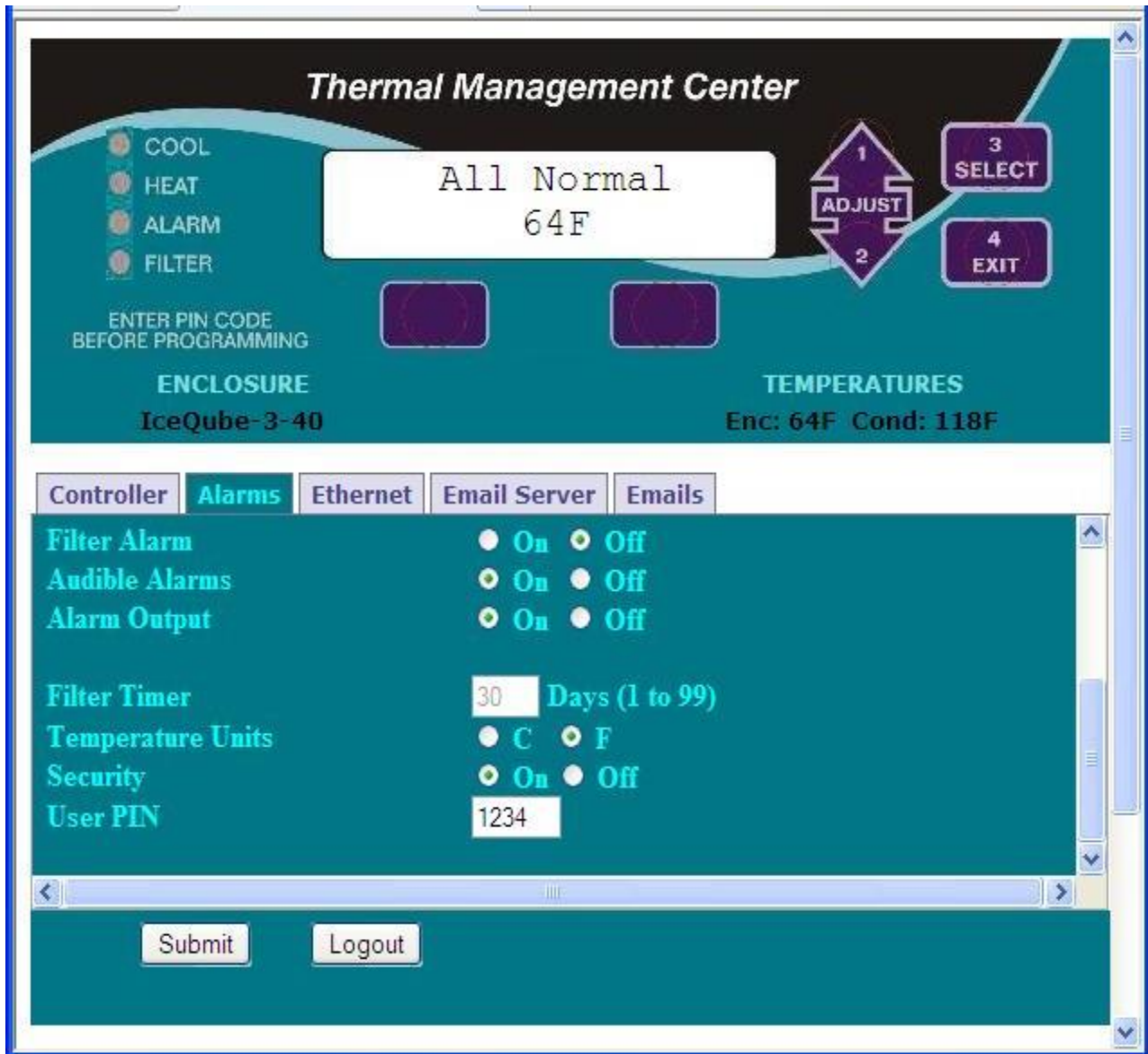
The User PIN code can be set on this page, but be aware of an additional feature, if you enter a PIN that utilizes other than 1,2,3,4,5,6 – there will not be local access to the 'Programming Mode' as the local keypad only has these 6 keys. So if, say you enter a PIN as 'B99j', then although that PIN will work for the web login, there is NOT any way to access the unit locally. Also be advised that the system is case sensitive, meaning that 'j' is different than 'J'. If the 'Security' option is selected OFF, the 'User PIN' block will be grayed out. Then on the Login Block, any PIN code will allow access into the system, but a PIN must still be entered in.

The ETHERNET tab:

Be careful in changing IP Network settings, as you may not be able to access the system once you do. Although very powerful, the Automatic IP Address feature must be used with caution! If you select it from the web page, you may not be able to retrieve the address setting without looking at the Local Control or having your network administrator look up the new address that the system was assigned by your DHCP server. If you do not understand these settings, DO NOT change them – consult with your network administrator first.
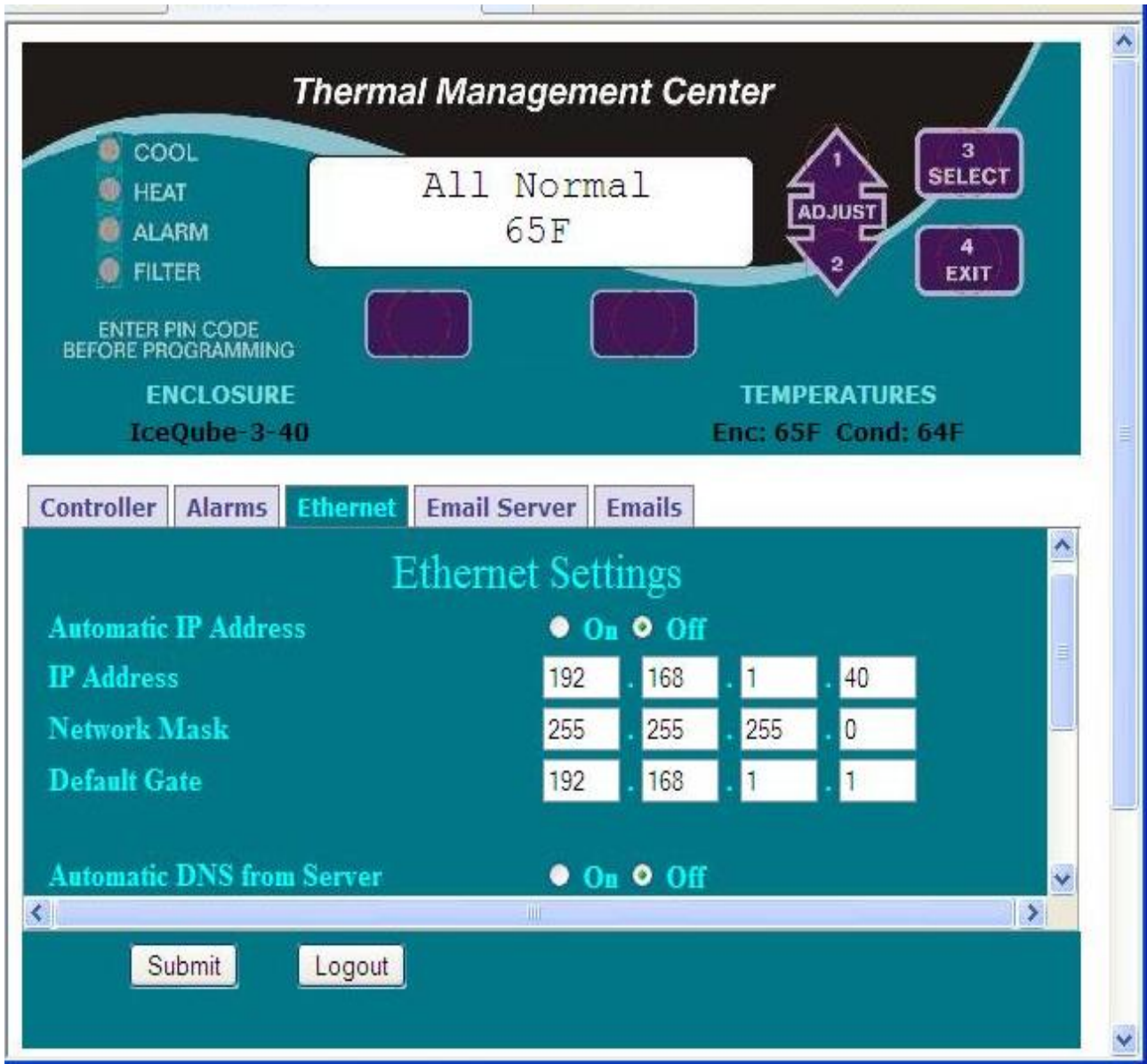
Fig. 13

Automatic or Manual DNS Selection:

If Automatic is selected, the system must be restarted with Automatic IP (DHCP) to pull the DNS information from the Server.
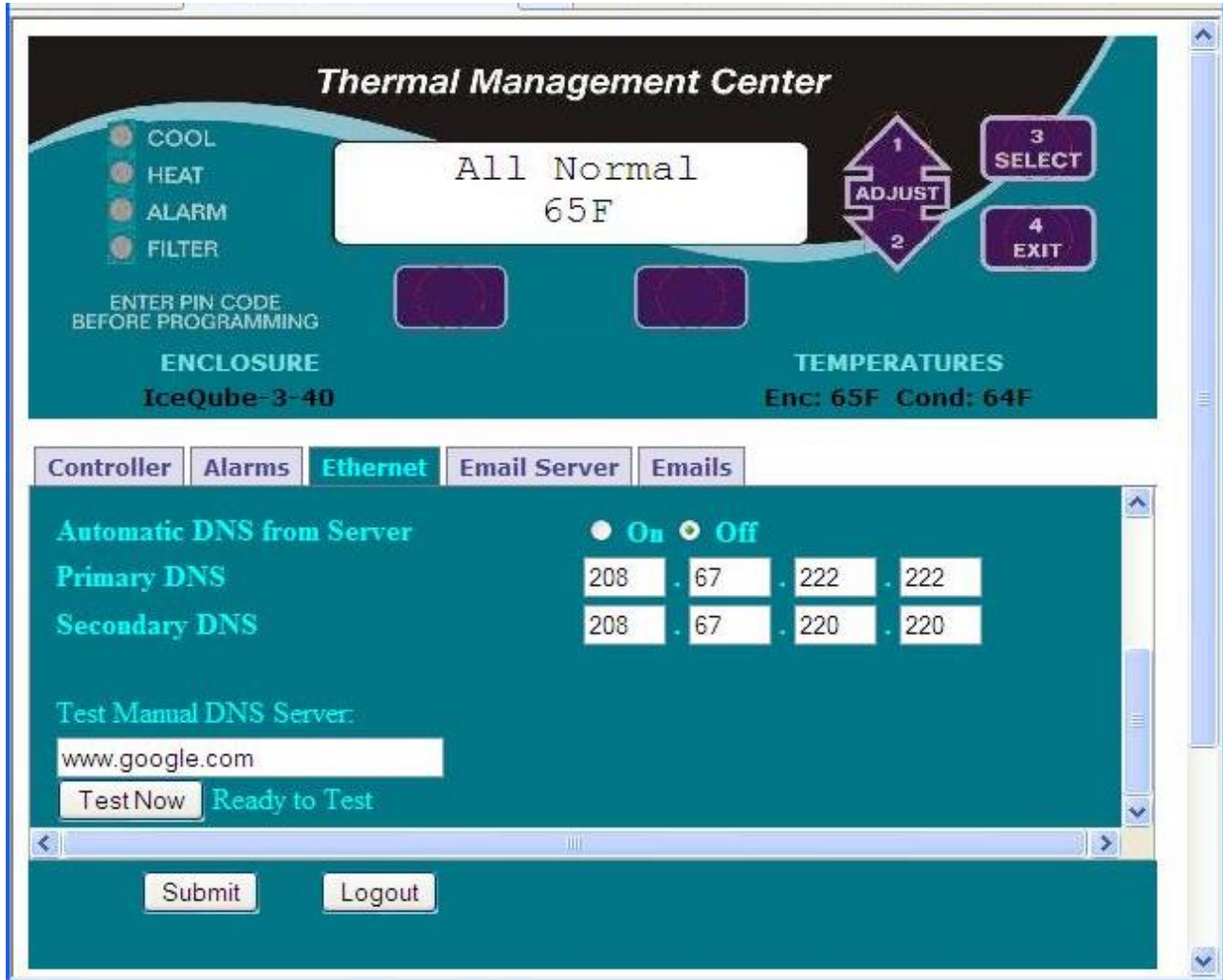
Fig. 14

Testing the DNS server uses the entries in Primary and Secondary DNS Servers to resolve the web address from the text field above it, in this example "www.google.com".

The two IP addresses used, 208.67.220.220 and 208.67.222.222, are the free domain name servers from OpenDNS, see www.OpenDNS.com for more information.

After testing we see that 208.67.222.222 combined with 208.67.220.220 has resolved www.google.com to be 208.69.32.231 taking 39 milliseconds, about 1/25th of a second.

Fig. 15

In this next example, 28.67.222.222 and 28.67.220.220 are used instead of the 208.
After testing we see that 28.67.222.222 and 28.67.220.220 are not DNS servers because they returned 0.0.0.0 and the system waited 6001 milliseconds before it gave up waiting for a response.
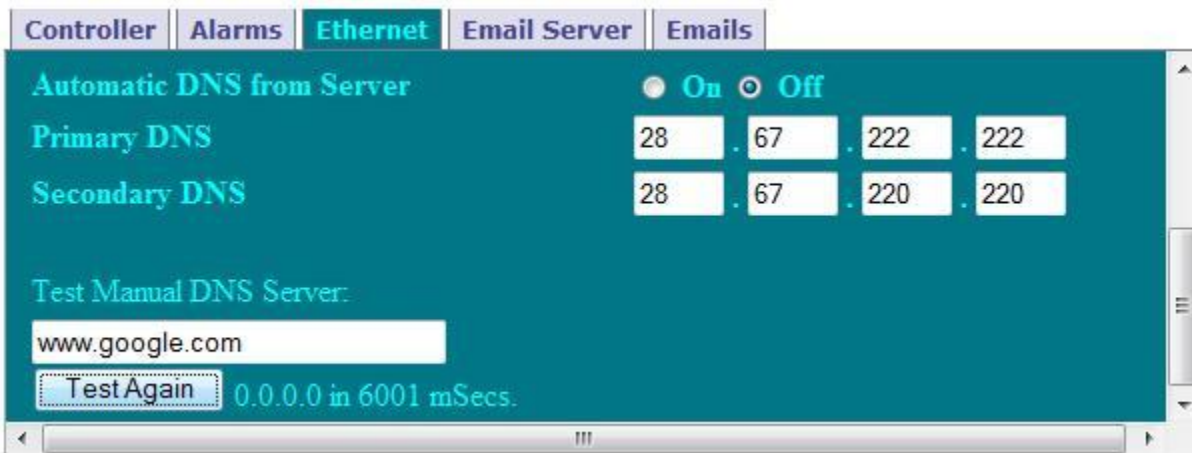
Fig. 16

In this example, the DNS servers returned something for www.gxxgle.com, it took 164 milliseconds, a relatively long time, but the servers are good.
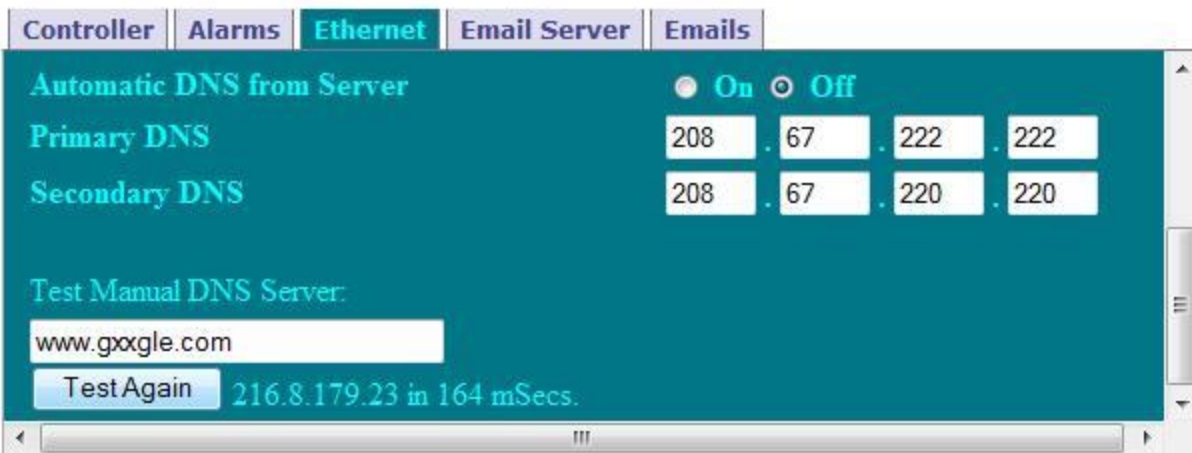
Fig. 17

Defining the EMAIL server:
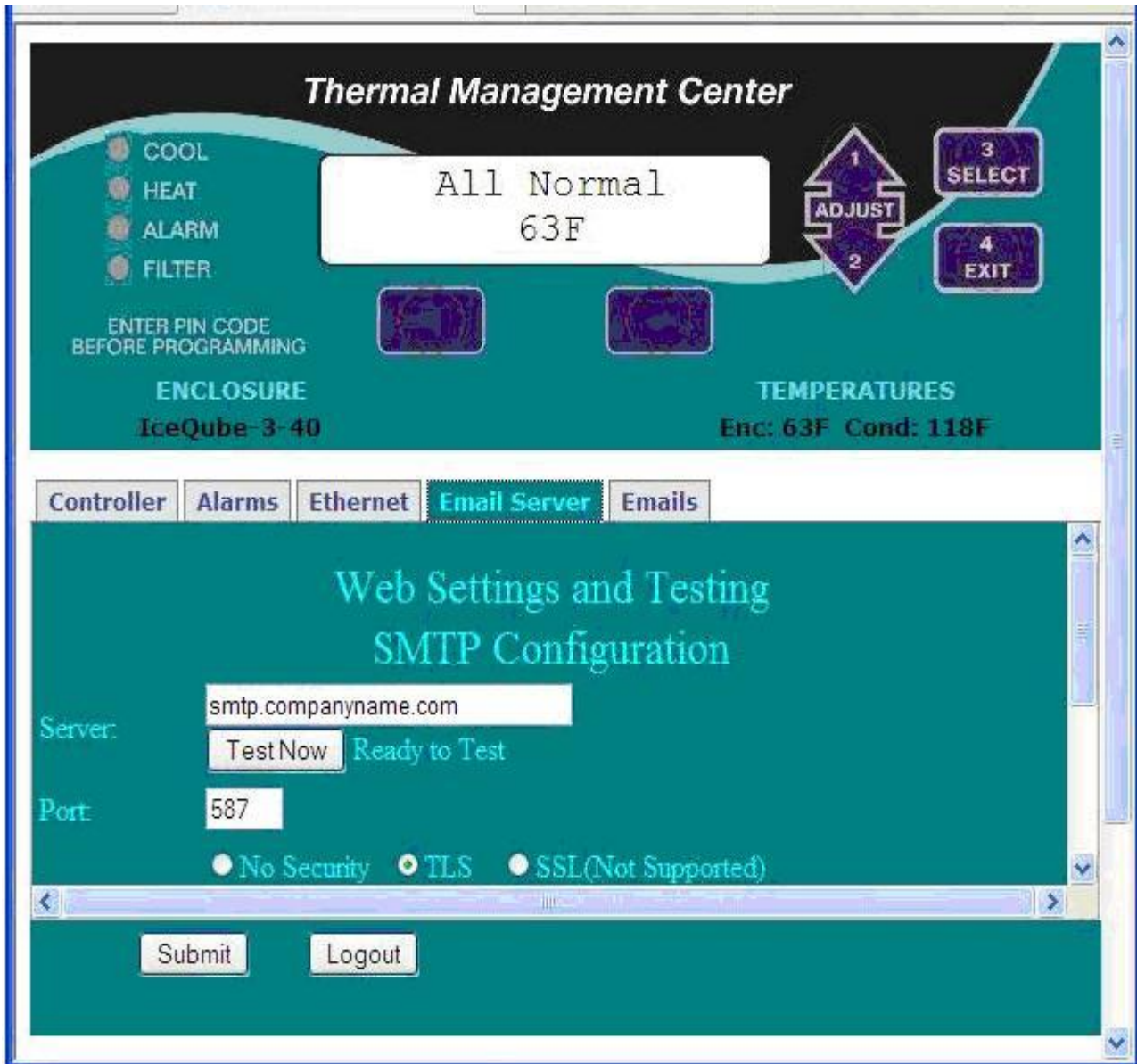
Fig. 18

The "TEST NOW" button is used to test the SMTP server and the Port number. If everything checks out a response similar to: 220 mail16c40.carrie Server Good will replace the "Ready to Test" message.

EMAIL SERVER Tab Cont'd:
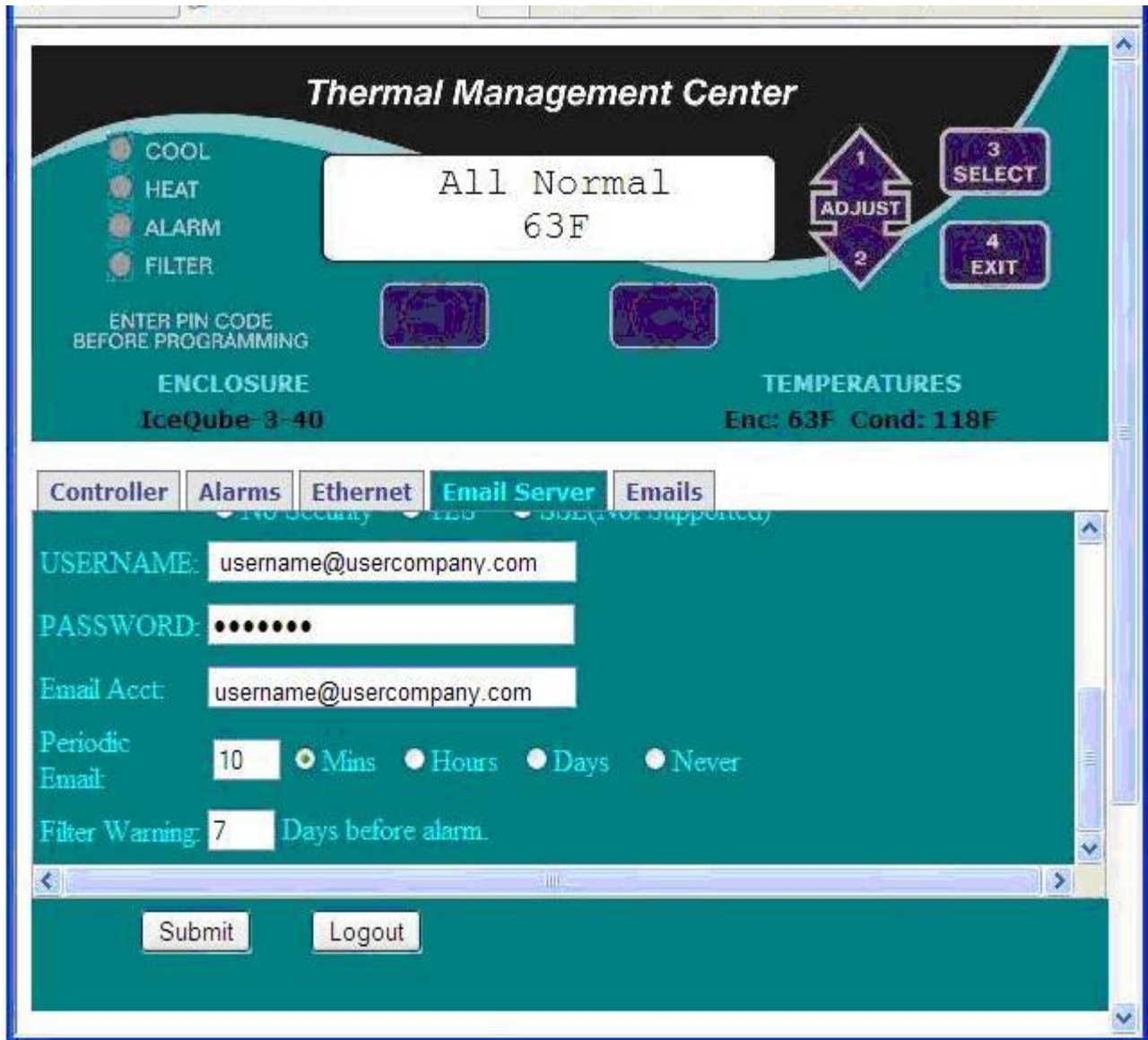
Fig. 19

This portion shows the username, password, and Email Account that will be used to send Email messages.

Periodic Email time is used to calculate when a "System Status Update" email should be sent to the subscribers, as indicated in the Emails tab. Filter Warning indicates how many days in advance that the "Filter will need to be changed" email will be sent.

Final portion of the EMAIL SERVER tab:
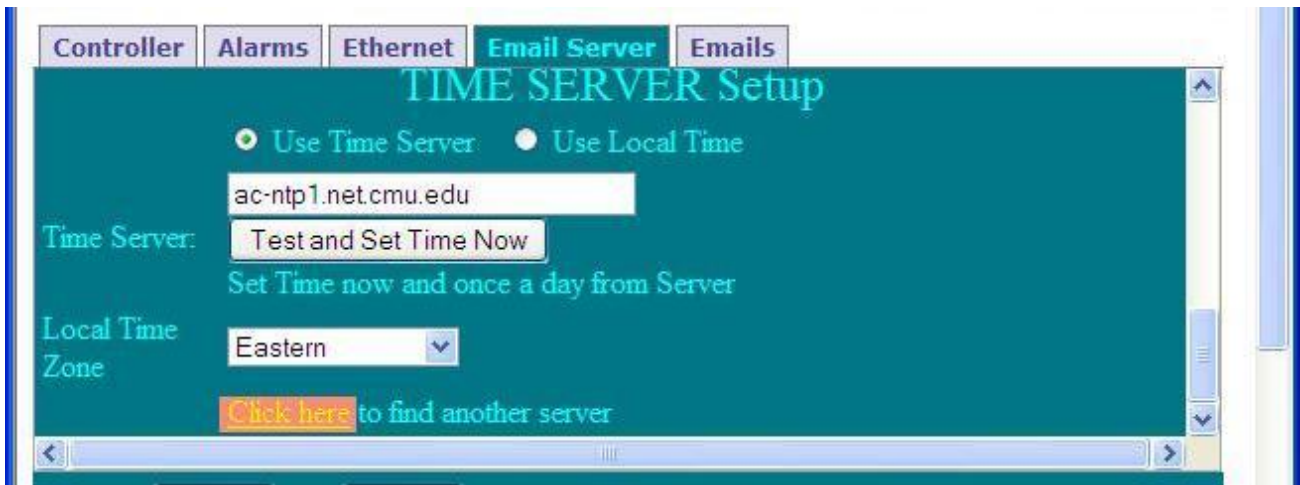
Fig. 20

TIME SERVER Setup allows you to configure how the Time will be set. The time is only used for stamping email send times. If the date is not set, a date will not be sent in the emails and the receiver will see the Receive Time, and not the Sent Time. Some email servers will reject emails without a time stamp as SPAM.

If you select "Use Time Server", the system will synchronize itself when you click the "Test Button" automatically when coming back from a power outage and once every 24 hours.

If "Use Local Time" is selected, you must set the time manually using the test button every time the system comes back from a power failure. This may be subject to a drift of a minute or two per month.

Fig. 21

Local Time Zone helps to correctly represent the Date/Time in emails.

However, using a Time Server is not as easy as it sounds. Occasionally they go down, are replaced or just disappear. That's why the link at the bottom was included.

Fig. 22

Clicking on the link will open a window similar to the one on the next page. This will explain everything. If there is a problem, select a time server with Open Access that does not require notification.

Stratum Two Time Servers:

On this page, it looks like the Australian server NTP.TOURISM.WA.GOV.AU would be a good choice. It permits OpenAccess and does not need to be notified. Even though they are in Australia, setting the Time Zone permits us to adjust for their time.

Fig. 23

Fig. 24

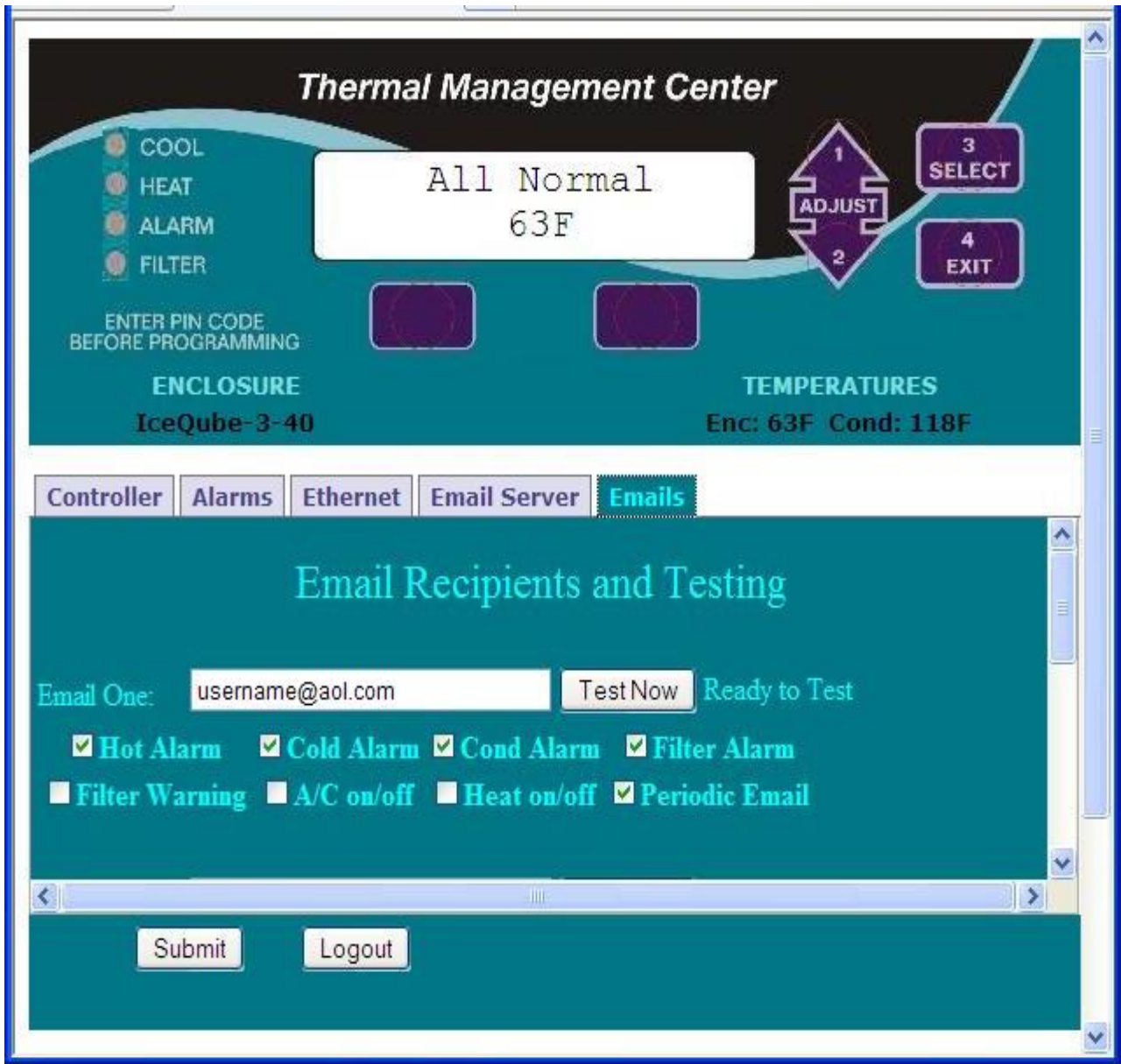Addresses and participation of the Email Subscribers:

Fig. 25

There are four possible subscribers; each one has the same options. The first four, when checked, send out an Email when an alarm occurs. Filter Warning, sends an Email a number of days in advance of the Filter Alarm, if defined on the Email Server tab. If it is suspected that a system is "cycling", that is, constantly turning on and off, it will become obvious when selecting "A/C on/off" or "Heat on/off". The final check-box is for Periodic Email. The frequency of Periodic Status Update Emails is set on the Email Server tab.

Here, the "Test Now" button will send an Email to specified Email address, allowing testing for spam filters, validity of address, etc. Note that testing one Email address will reset the timer for all Email Recipients, and everyone that has "Periodic Emails" checked will receive an Email.

See the next few pages for some sample Emails.

Example Emails:

The Test Email:
Date: Thu, 13 May 2010 14:14:05 -0500 DST
From: IceQube-3-40<YourName@YourServer.com>
To: <EmailRecipient1@TheirEmailServer.com>
Subject: IceQube-3-40 (67F)->   All Normal   <-Test Email
If you are reading this; Your Email address is properly configured
IceQube-3-40 (67F)->   All Normal   <-Test Email

   All Normal
     67F

Condenser Temp
    65F

As of: Thu, 13 May 2010 14:14:05 -0500 DST

The Automatic Periodic Email:
Date: Thu, 13 May 2010 14:18:13 -0500 DST
From: IceQube-3-40<YourName@YourServer.com>
To: <EmailRecipient1@TheirEmailServer.com>
Subject: IceQube-3-40 (67F)->   All Normal   <-Automated Periodic Email

This automated message is being sent to you on power-up and every 12 Hour(s)
for modifications contact YourName@YourServer.com Ref:Email(1)

IceQube-3-40 (67F)->   All Normal   <-Automated Periodic Email

   All Normal
     67F

Condenser Temp
    65F

As of: Thu, 13 May 2010 14:18:13 -0500 DST

The Debugging Periodic Email is sent if the period is set in minutes, this allows you to observe the minutes of compressor time:

Date: Thu, 13 May 2010 14:18:13 -0500 DST
From: IceQube-3-40<YourName@YourServer.com>
To: <EmailRecipient1@TheirEmailServer.com>
Subject: IceQube-3-40 (67F)->   All Normal   <-Automated Periodic Email

Debug info: Heap:27032 On for 110 mins. Compressor on 0 Mins
 Every 10 Min(s) Ref:Email(1)

IceQube-3-40 (67F)->   All Normal   <-Automated Periodic Email

   All Normal
     67F

Condenser Temp
    65F

As of: Thu, 13 May 2010 14:18:13 -0500 DST

Change of State:

Date: Thu, 13 May 2010 14:47:20 -0500 DST
From: IceQube-3-40<YourName@YourServer.com>
To: <EmailRecipient1@TheirEmailServer.com>
Subject: IceQube-3-40 (94F)-> System Cooling <-Change of Cooling Email

This automated message is being sent to you because Change in Cooling has occurred.

IceQube-3-40 (94F)-> System Cooling <-Change of Cooling Email

 System Cooling
     94F

Condenser Temp
     73F

As of: Thu, 13 May 2010 14:47:20 -0500 DST

An Alarm Email:

Date: Thu, 13 May 2010 14:58:43 -0500 DST
From: IceQube-3-40<YourName@YourServer.com>
To: <EmailRecipient1@TheirEmailServer.com>
Subject: IceQube-3-40 (106F)-> System ALARM <-Alarm Notification!

This automated message is being sent to you because an alarm has occurred.

IceQube-3-40 (106F)-> System ALARM <-Alarm Notification!

  System ALARM
Too HOT 106F

Condenser Temp
     91F

As of: Thu, 13 May 2010 14:58:43 -0500 DST

A Sample Email if the case where Time Server is set to Local Time, and power has been lost and restored. Note that there is no date field in the first line. The date has been assigned by the Email Server.

From: IceQube-3-40<YourName@YourServer.com>
To: <EmailRecipient1@TheirEmailServer.com>
Subject: IceQube-3-40 (72F)->   All Normal   <-Automated Periodic Email

This automated message is being sent to you on power-up and every 12 Hour(s)
for modifications contact YourName@YourServer.com Ref:Email(1)

IceQube-3-40 (72F)->   All Normal   <-Automated Periodic Email

  All Normal
     72F

Condenser Temp
     70F

As of: Wed, 31 Dec 1969 19:00:10 -0500   (Local Date/Time not set since Power Outage)

A View from the Email Recipient:

Fig. 26

We see from this example that the Periodic Emails are set to arrive every 12 hours, but one appears at 4:04 with a bad internal date. Therefore, there was a power outage sometime after 4:01, and power was restored at 4:04. We see on the bottom line of the Email that the date was set to January 1, 1970 Greenwich Mean Time and, since we are in the Eastern Time Zone, five hours ahead, the internal Date is set to five hours earlier at 7PM December 31, 1969. Because the "Send Date" was not included in the Email, the Email Server tagged it with its own time of receipt, allowing us to know it passed through there at 4:04 PM.