Chiller Guard Users Manual
Version 1.0

ChillerGuard Initial Installation Procedure

Before the new ChillerGuard system can be set into operation, some simple initial installation procedures must first be followed

Network Configuration

The ChillerGuard unit should already come with the latest version of the ChillerGuard web application software pre-installed on the unit. However, in order to make use of its features, the ChillerGuard unit must first be configured for your network. There are two approaches that can be taken to see this through:

  (1) Configuring the ChillerGuard unit on the LAN
   a. Connect the unit to the local area network via a CAT5 network cable to an open and available network jack
   b. Launch the executable application named "IPSetup.exe" (included in the packaged software received in your kit)
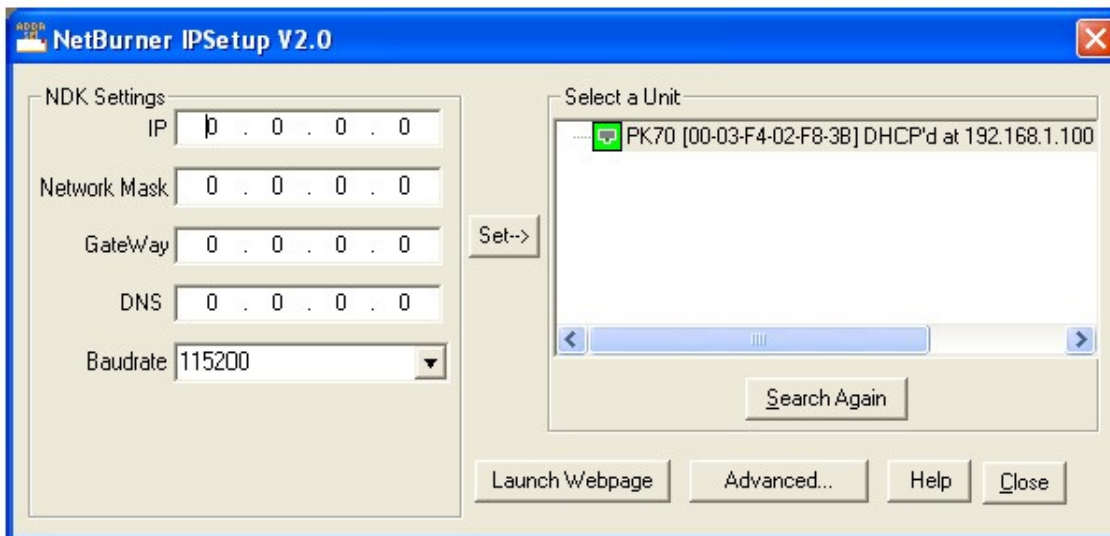   c. A screen similar to the following appear:

Figure 1.0; IP Setup Interface

   d. If multiple ChillerGuard units have been attached to the network, all should appear in the list beneath the "Select a Unit" header. Select the specific ChillerGuard unit you are configuring
   e. The default configuration of the unit (with IP address of 0.0.0.0) defaults to a DHCP configuration. For the unit to operate properly, it must receive it's own static IP address. Enter the appropriate information in the "IP", "Network Mask", "GateWay" and "DNS" fields then click "Set " to apply those settings to the chosen ChillerGuard unit.

(2) Configuring the ChillerGuard unit locally using a cross over cable
      a. Connect the unit directly to a PC via a CAT5 cross-over cable
      b. Follow the instructions as laid out in steps (1)b to (1)e above
      c. Connect the unit to the local area network via a CAT5 network cable to an open and available network jack

Provided the network identification information has been assigned properly, the ChillerGuard web application should now be accessible from anywhere within the network.

Launching and Configuring the ChillerGuard Web Application

Once the unit has been properly configured for the network, launch a web-browser (only latest versions of Internet Explorer and Firefox are supported) and key in the following address:

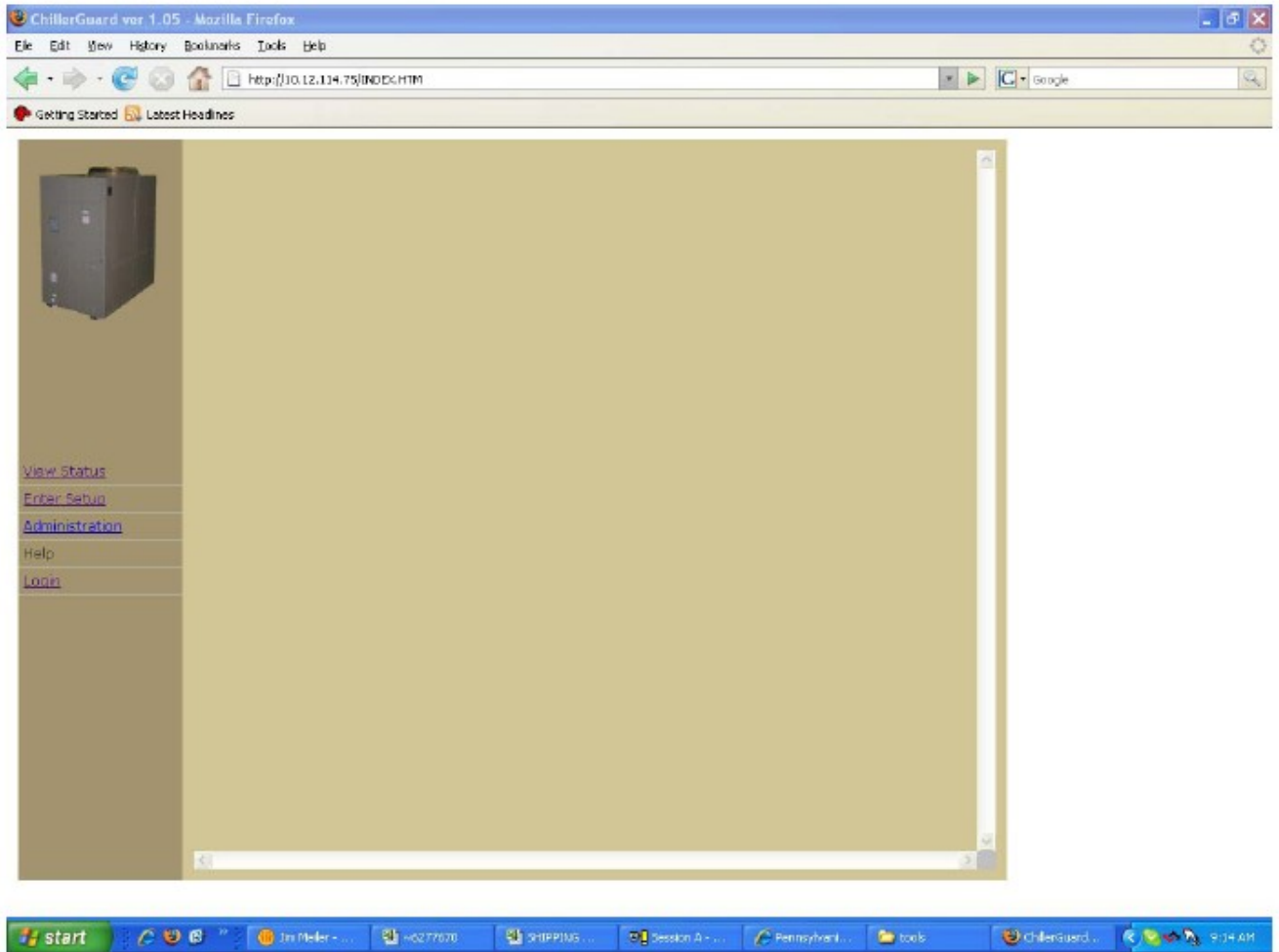<div align="center">http://<ip_address>/index.htm</div>

where "<ip_address>" is the static ip address of the unit.

NOTE: Cookies **MUST** be enabled for this web application to function properly!

The ChillerGuard web application should appear. Note to your left is a menu of items. Clicking on "Help" brings you to a Users Manual that helps explain in more detail the steps that are about to be mentioned here.

(3) Please thoroughly read section 3 "Administration" in the online Users Manual for instructions on properly setting up user login passwords
(4) Please thoroughly read section 4 "Enter Setup" on properly configuring the unit for
      a. General Information
      b. Email server configuration for email notifications
      c. Warning Limit entry
      d. Setting system time

Once all items are in place and the attached chiller unit is online, the web application and datalogging system should be online and fully functional. Please refer to the additional sections in the online Users Manual for instructions on how to make use of all other features available in the ChillerGuard web application.

1.   Index Page

When the ChillerGuard web application is first launched, the index.htm page is invoked:

http://<ip_addr>/index.htm

This page acts as a consistent template while navigating to other utilities the ChillerGuard web application has to offer. In the left hand column of the index.htm template are a series of selectable options that, once chosen, appear in the main section of the index page.

View Status links the user directly the status page where the majority of the attached chiller's activities can be monitored (and, in some instances, controlled)

Enter Setup links the user to the setup page where all application/location specific information is maintained

Administration takes the user to an administrative interface, allowing each of the two basic level users to change their password or permit the super administrator (discussed in more detail in the Administration section below) to reset user passwords altogether.

Help takes the user to the Chiller Guard Users Manual

Login allows the user to log in to the application before viewing any of the above
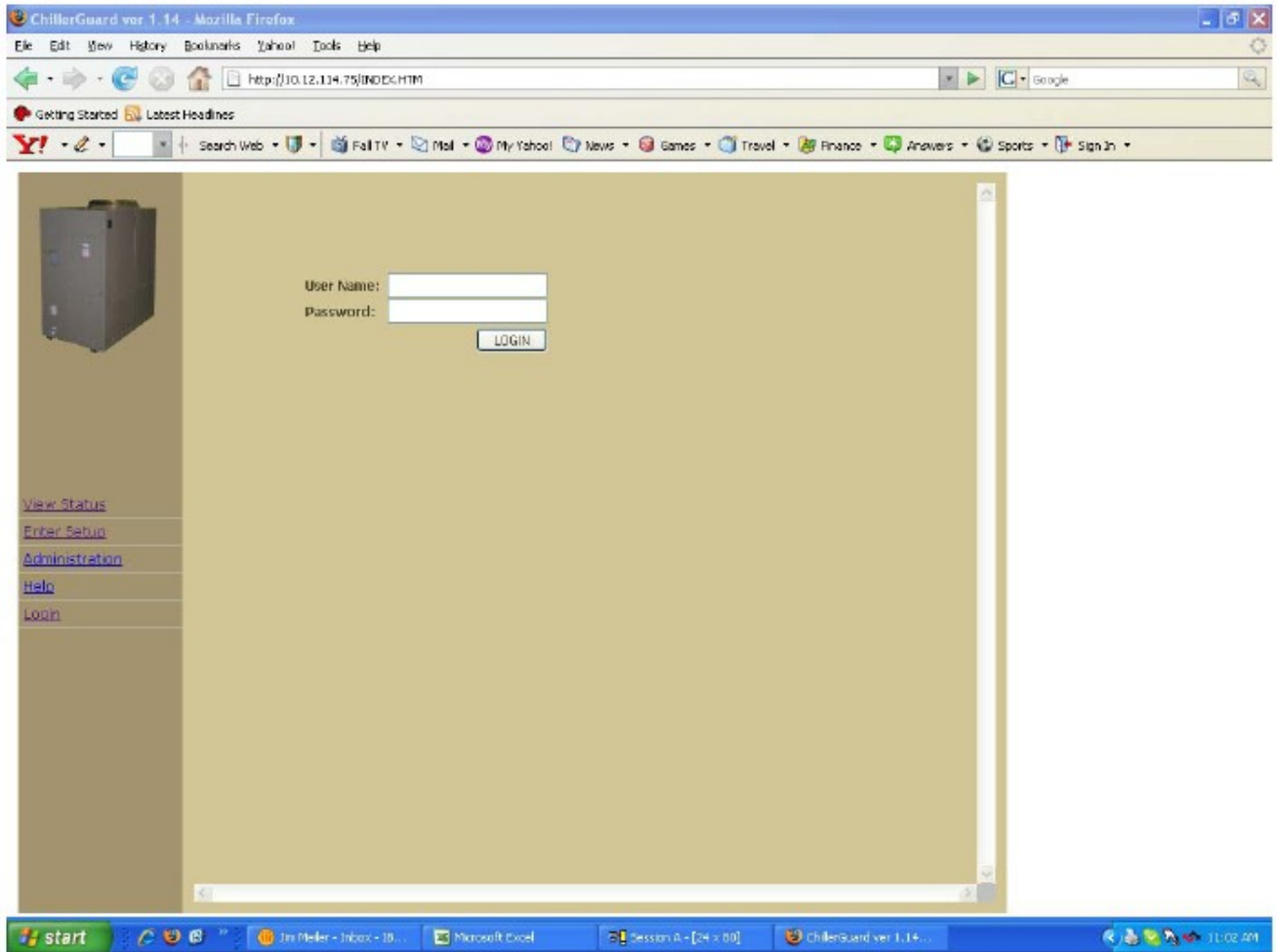
2. Login

When the user first launches the ChillerGuard web application, the Login page is an inevitable visit if he/she wishes to view any of the other utilities the application has to offer. If the user clicks on any of the other links (the Help link aside) the app will redirect to the Login screen.

There are currently 3 possible users that can log in to the application, each with their own privileges:

The level 1 user (the lowest level) can log in to the application, navigate from page to page, but is not permitted enough privileges to make changes or control the attached chiller in any way whatsoever. It's purely a read-only privilege.

The level 2 user essentially has full reign of the application. He/she may make changes to parameters in the setup page, power cycle the chiller or modify the chiller unit's setpoints.

The level 3 user has all the same privileges as level 1 and level 2, but may also reset passwords for both level 1 and level 2 users

Once the user logs in with his/her username and password, the application is open for navigation.

NOTE: Cookies MUST be enabled on your browser for this to function properly
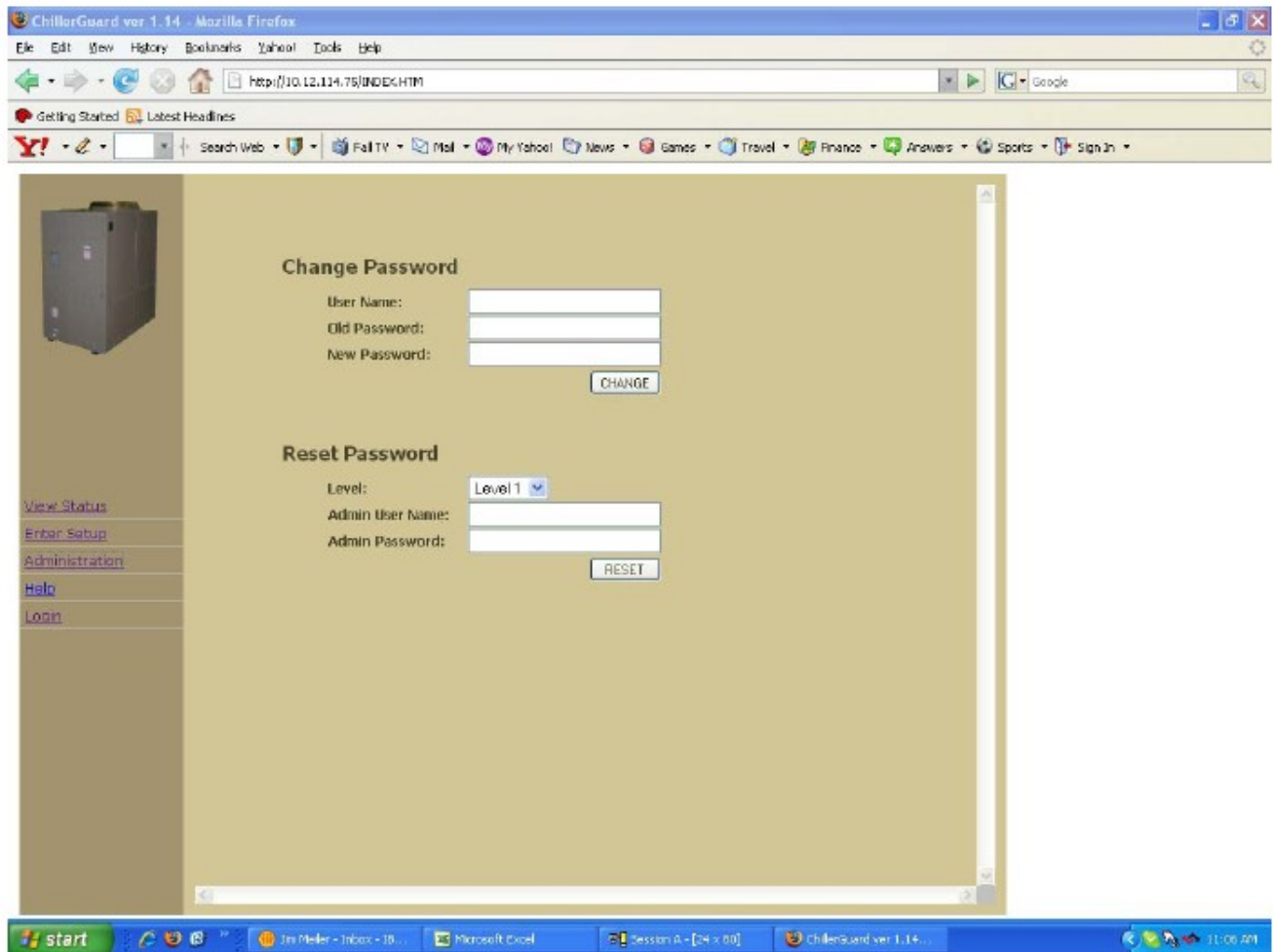
3. Administration

The administration interface allows some degree of control over user passwords. It consists of two sections: "Change Password" and "Reset Password". Within the Change Password section, either level 1 user or level 2 user has the ability to change his or her own password.

NOTE: Passwords are **restricted to 16 long**

NOTE: Usernames cannot be changed. The usernames for level 1, 2 and 3 users are 'level1user', 'level2user' and 'level3user' respectively. Further note that 'level3user's password is fixed and cannot be changed.

The Reset Password section is a utility for the level 3 (level3user) user only. In the event a password for level1user or level2user is forgotten, the level3user (also referred to as the SuperAdmin user) has the ability to reset their passwords to the default.

NOTE: Upon initial startup of the ChillerGuard web application, both level1 and level2 passwords are the same as their respective usernames. It's the responsibility of the users to change these passwords.
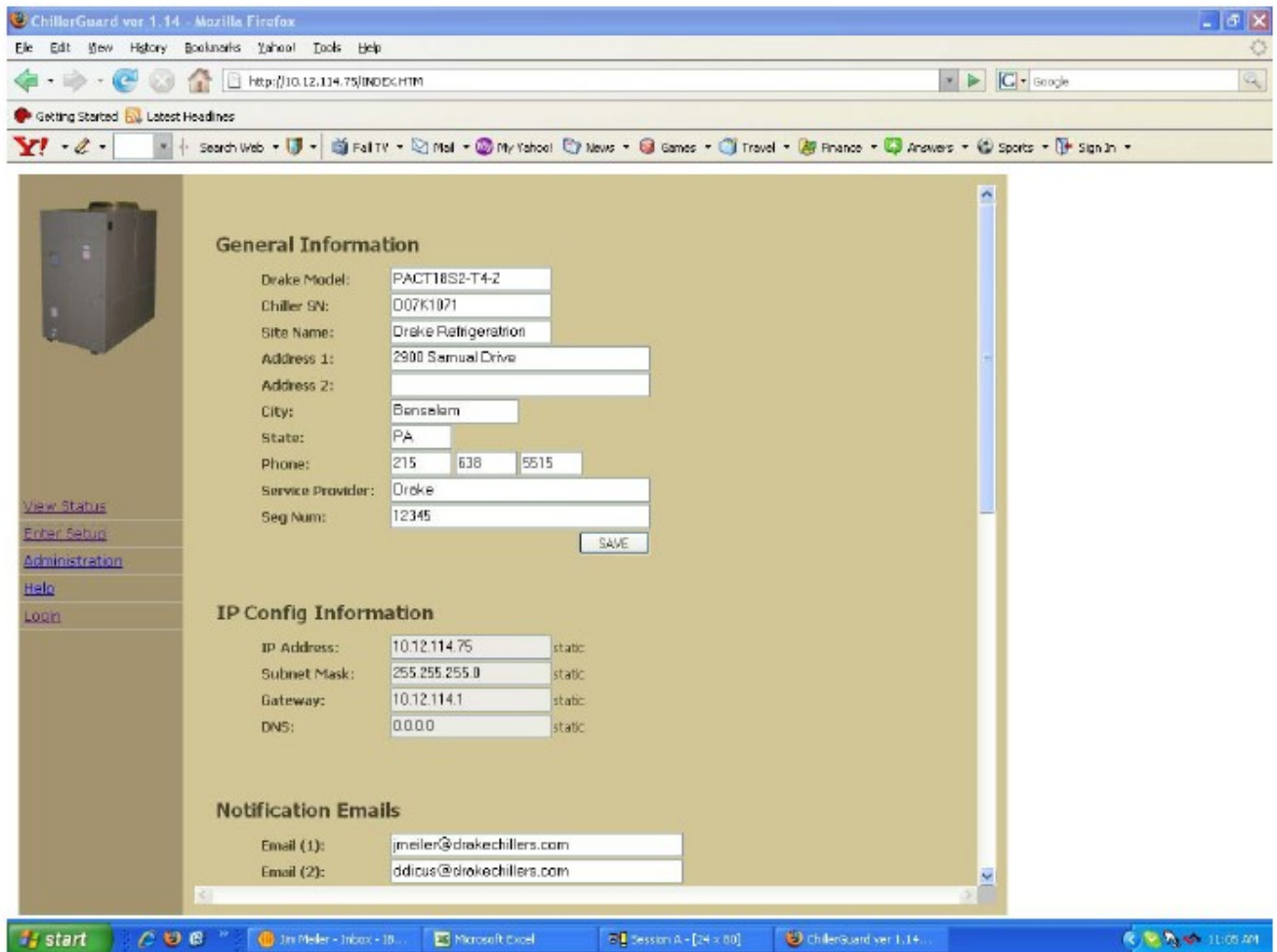
4. Enter Setup

The setup interface consists of a multitude of parameters and settings that prove instrumental to proper functionality of the ChillerGuard web application. Stepping through the sections:

General Information:

The General Information section is intended to act as a repository for basic site-related information: Model Number of the Legacy chiller unit being controlled, serial number of the chiller unit being controlled, site name, address information, contact information, etc. Making any permanent changes to these fields requires the user to click "SAVE" before moving to another page. Otherwise, all entered information will be lost.

IP Config Information:

This section is purely read only. Upon initial configuration (even before this web page is accessible) the ChillerGuard must undergo a simple installation and setup procedure for proper networking of the device. During this setup procedure, the unit is configured to either maintain a static IP address or accept a dynamically assigned IP address (dhcp). The four fields (IP, Subnet, Gateway and DNS) are informational only and display the current configurations. The mode ('dhcp' or 'static') will appear next to each field to reflect its current configuration state.

<u>Notification Emails:</u>

The ChillerGuard web application has the ability to send two types of emails to all of the valid addresses listed in the three email fields: Warning and Alarm emails. Alarm emails are triggered the moment an alarm/alert notification has been received from the Legacy Master controller. Warning emails are triggered in the event any of the measured parameters (outlined in the upcoming section Warning Alarm Limits) exceed a configured threshold.

Note the SMTP related fields. This email utility is configured under the assumption there will be a SMTP server available for processing email messages. The following is a description of each SMTP field:

SMTP:	holds the SMTP server IP address
SMTP User:	holds the SMTP server username (for servers which require authentication only)
SMTP Password:	holds the SMTP sever password (for servers which require authentication only)

If the SMTP User field contains data, the email utility will assume your server requires authentication and will attempt to establish authenticated communication.

The SMTP Password field will never explicitly display the entered password. If the user chooses the route of authenticated emailing (by entering the necessary parameters and clicking "SAVE") the SMTP User will be displayed, but the Password will not. However, it is stored and will be used only if the SMTP User field contains data.

Again, to reiterate, if your SMTP server does not require authentication, then the SMTP IP address is all that's required.

The 'From Address' is the email address that appears in the "from" field of the recipients' emails.

NOTE: It is highly recommended to populate this field with an email address. Some email servers reject emails with empty "from" email fields.

Note there are two buttons for this section. The 'SAVE' button behaves as expected. Once all parameters are entered, you must click the SAVE button to commit these items to flash memory. Clicking the TEST button will send a test email to the recipients in the email list. Note email configuration parameters must all be SAVEd first prior to TESTing.

<u>Warning Alarm Limits:</u>

As mentioned in the previous section, there are two types of email notifications sent. The first is the alarm/alert notifications that are a result of alarm messages coming directly from the Legacy Master controller. The second is the concept of warning emails dictated by the threshold values set here. Emails will be triggered based on any of the following conditions:

Hi Press 1:	If the High Pressure value for compressor no. 1 exceeds this value
Hi Press 2:	If the High Pressure value for compressor no. 2 exceeds this value
Hi Temp:	If the Outlet Temperature value exceeds this value
Lo Press 1:	If the Low Pressure value for compressor no. 1 drops below this value
Lo Press 2:	If the Low Pressure value for compressor no. 2 drops below this value
Lo Temp:	If the Outlet Temperature value drops below this value

The checkbox labeled "Turn ON/OFF Warnings and Errors" will enable/disable email notifications for all Warnings and Alarms. Checking the box activates the emails, un-checking it deactivates them.

The ChillerGuard email notification routine is configured to check every 5 seconds for new alarms or warning conditions. If an alarm or warning is triggered, it (and any other currently active alarms or warnings) will be compiled into an email and sent to the recipients' email addresses specified in the previous section. Once an email is sent, the routine halts checking for further warnings or alarms until a total of 10 minutes has passed. After the first 10 minute interval, the routine will check again. If alarms/warnings still exist, another email will be sent. This process will repeat indefinitely until the warnings and/or alarms are cleared.

Firmware Uploads:

The ChillerGuard application is capable of updating its own software as well as the Master and Remote Legacy controllers. The "Update EID" piece applies to the ChillerGuard unit. Simply click the "Browse…" button and navigate to the *_APP.s19 file, select it and click "UPDATE". The application will take you to a status page providing some feedback about the update process. Once complete, the following message will ultimately appear:

NOTE: Please completely close your browser (including all other active tabs) and wait a minimum of 90 seconds for adequate initialization time before accessing the application

Please heed this message. Failure to follow this instruction could result in an improperly initialized application.

For the software updating of a Master and Remote (if a remote is attached and *both* units must be updated) it is suggested to **update the Remote unit first.** This is to ensure that if an upgrade specifically targets the communication scheme between the Remote and Master, communication with the Remote will not be lost after the upgrade to the Master has been completed.

Further note that it is imperative that the Master or Remote unit must NOT be power cycled during this process. Individual updates can take up to a full minute before the process is complete; if power is lost in midstream, the unit(s) will not be easily recoverable. Note a successful update can be verified by checking for a change in the "ver: x.xx" number that appears next to the respective upload section on the setup page. This version number will not update automatically – only during page refreshes.

Rule of thumb when updating software for the Master and/or Remote units: Upload the respective file, wait a period of 60 seconds, refresh the page. If the version number has changed, an upload was successful.

System Time Management:

It is important to know that the ChillerGuard does not have an internal clock that maintains time during a power cycle. Therefore, upon startup, the unit passes through a NTP (Network Time Protocol) polling routine that attempts to query the current time (in UTC) from a series of NTP servers. If the polling routine fails to retrieve the proper time from any of the available servers, the system time of the unit will not be properly initialized and will begin at Jan 1st, 2008; 12:00:01pm.

For the ChillerGuard to properly gain access to (any) NTP server, your IT department must be sure to open UDP port 123 on all firewalls between the unit and the remote time servers. Otherwise, communication will fail. The following is a list of IP addresses for each of the NTP servers the ChillerGuard attempts to poll:

"192.5.41.209",
"164.67.62.194",
"192.43.244.18",
"128.138.140.44"

The polling routine starts at the top of the list and times out after approximately 15 to 20 seconds on each one until either (1) a server responds or (2) the entire list times out.

If you're ChillerGuard was able to successfully poll one of these servers, you'll notice your "current UTC time:" should be today's date (and likely offset by some number of hours depending on your location with respect to UTC time). Additionally, you will see the IP address of the NTP Serv: that was found. The following is an example of a successful NTP server poll:

current UTC time: Jun 26, 2008; 03:18:25 (NTP Serv: 192.5.41.209)

The following is an example of an Unsuccessful NTP server poll:

current UTC time: Jan 1, 2008; 12:00:01 (NTP Serv: failed)

In the event of a failed NTP server poll, there are two options for bring the ChillerGuard up to speed with a current Date and Time stamp.

(1) Try the AUTO SET routine. This is essentially the same routine that gets invoked during startup (the one described above). However, this proves useful when working with your IT department/professional during troubleshooting. If a poll is successful, the update will be instantaneous and the "current UTC time:" will update as expected.
(2) Set the time manually. There are 7 fields that require entries before attempting to set the time manually:

Month:	1=Jan, 12=Dec
Day:	1-31
DayOWk	1=Sun, 7=Sat
Yr:	20XX
Hr:	11=11am, 23=11pm
Min:	0-60
Sec:	0-60

Once the values have been entered, click "MAN SET" and that current time will be taken as the base system time for the ChillerGuard.

NOTE: The time entered MUST BE "UTC" time.
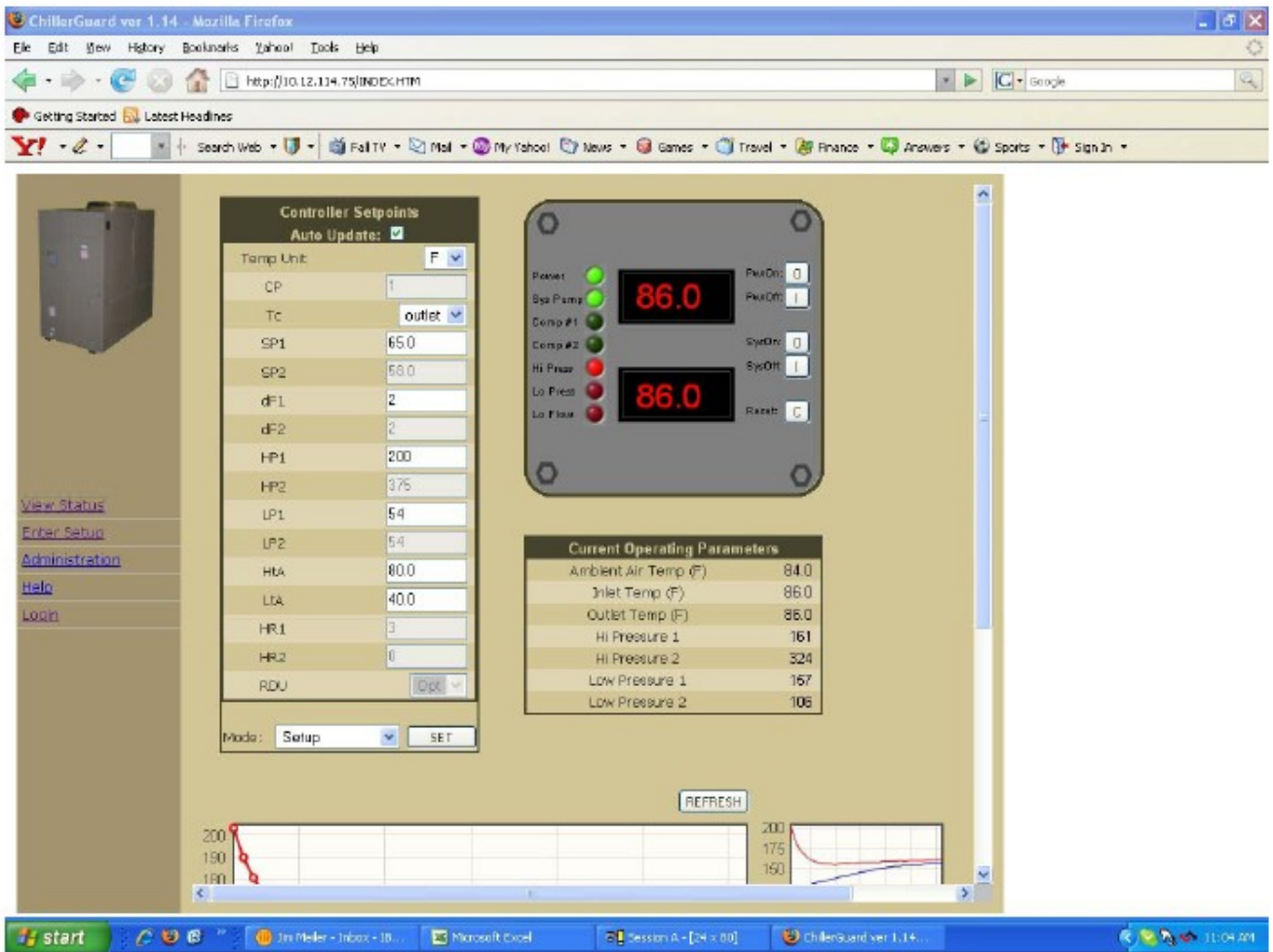
5. View Status

The status page serves as the main control panel between you and the Master Controller/chiller unit. Please note the following pieces:

(1)   Controller Setpoints Section in the upper left hand portion of the screen
(2)   Controller (graphical representation) Section in the upper right hand portion of the screen
(3)   Current Operating Parameters table below the Controller image
(4)   The scrolling charts at the base of the page

Controller Setpoints:

This section consists of a series of setpoints that are configurable on the chiller Master controller itself. Note these are all a repeat of what is presented on the Master controller (physical) interface.

Depending on how the setpoints are configured (1 vs 2 compressors dictated by the "CP" field), some fields may be disabled.

NOTE: for the 'level1user', ALL fields will be disabled, regardless of CP value

If 'CP' (number of compressors) is set to "1", all fields related to compressor number '2' are disabled: SP2,dF2,HP2,LP2,HR2.

Note also (for levels 2 and 3 users) additional fields will be disabled/enabled based on the "mode" selected in the Mode section (section number (4) above). If the mode is chosen to be "Setup", then the following fields will be disabled: CP,HR1,HR2 and RDU. If the mode is "Factory Setup", all fields will become enabled (except for HR2 if this is configured to be a 1 compressor unit).

Note the "Auto Update" checkbox at the top of the table. The default value for this field is "true" or "checked". When checked, all fields in this table are constantly being updated with the latest setpoint values as reported back from the Master controller. To make changes to these setpoints (and further commit those changes to the controller by clicking the "SET" button) this checkbox must be UNchecked first. Otherwise, the values you key in will likely be automatically overwritten before clicking the SET button.

Note when making a change to one (or more) of the setpoints, these changes will appear to have briefly fallen back to their original values once the SET button has been clicked. However, if those new changes took effect on the Master controller unit, they will update within 5 seconds (provided the Auto Update checkbox is checked) on the interface.

Controller (graphical representation)

This section is intended to represent (as closely as possible) the interface of the physical Master controller itself. The two numeric indicators represent inlet temperature (upper value) and outlet temperature (lower value).

The LED's to the left of the graphic represent miscellaneous current states of the controller:

Power:Bright Green = Power ON; Dark Green = Power OFF
Sys Pump:Bright Green = System Pump ON; Dark Green = System Pump OFF
Comp #1:Bright Green = Compressor No. 1 ON; Dark Green = Compressor No. 1 OFF
Comp #2:Bright Green = Compressor No. 2 ON; Dark Green = Compressor No. 2 OFF
(always off in single compressor units)
Hi Press:Bright Red = Hi Pressure Alarm has triggered; Dark Red = no Hi Pressure alarm
Lo Press:Bright Red = Lo Pressure Alarm has triggered; Dark Red = no Lo Pressure alarm
Lo Flow:Bright Red = Lo Flow Alarm has triggered; Dark Red = no Lo Flow alarm

NOTE: These values update automatically! at a rate of approximately once very 5 seconds. This portion of the application utilizes AJAX technology, eliminating the need to refresh the whole page for new data.

NOTE: If an alarm (of any kind) is triggered on the Master, a string of bright flashing red text will appear above the inlet temperature value. Additionally, this type of alarm will have triggered an email to be sent (outlined in Notification Emails section of the Enter Setup section above).

The buttons to the right of the graphic represent miscellaneous controller functions such as:

Turning the Power ON and OFF from the interface (the Power LED corresponds to this state)
Turning the System Pump ON and OFF from the interface (the Sys Pump LED corresponds to this state)
Resetting alarms that get triggered from the unit

<u>Current Operating Parameters</u>

The *Current Operating Parameters* table just below the graphic also displays numerical values in realtime (at an approximate once per 5 second rate). This too incorporates AJAX technology and does not require a page refresh to see changes in the data.


<u>Scrolling Charts</u>

The charts at the base of the page are a javascript based, interactive plot that allows the user to see up to the past 3 hours of pressure and temperature data. The upper plot displays both Hi and Lo pressures (the equivalent to the realtime values displayed in the Current Operating Parameters table for Hi Pressure 1 and Lo Pressure 1). The lower plot displays both Inlet Temp and Outlet Temp.

Each plot consists of two windows to view the data. The first (larger) window allows the user a detailed glimpse into the data over the past 3 hours. Each record is stored at 30 second intervals, allowing for accurate resolution over the duration. Note the user can 'click and drag' a highlighted window around a certain subset of data for a tighter view of a portion of the plot. The smaller child plot gives the user perspective on which portion of the larger plot has been 'windowed'.

These plots do not update in realtime, therefore a page refresh must be invoked before they update to the most recent data. A 'REFRESH' button has been placed at the top of the plots for your convenience.

It's worth noting that the date/time axis automatically adjusts to your browsers current time zone. So, although all data stored to the SD card (detailed in the following section) is in UTC time, it's automatically adjusted on the plots.
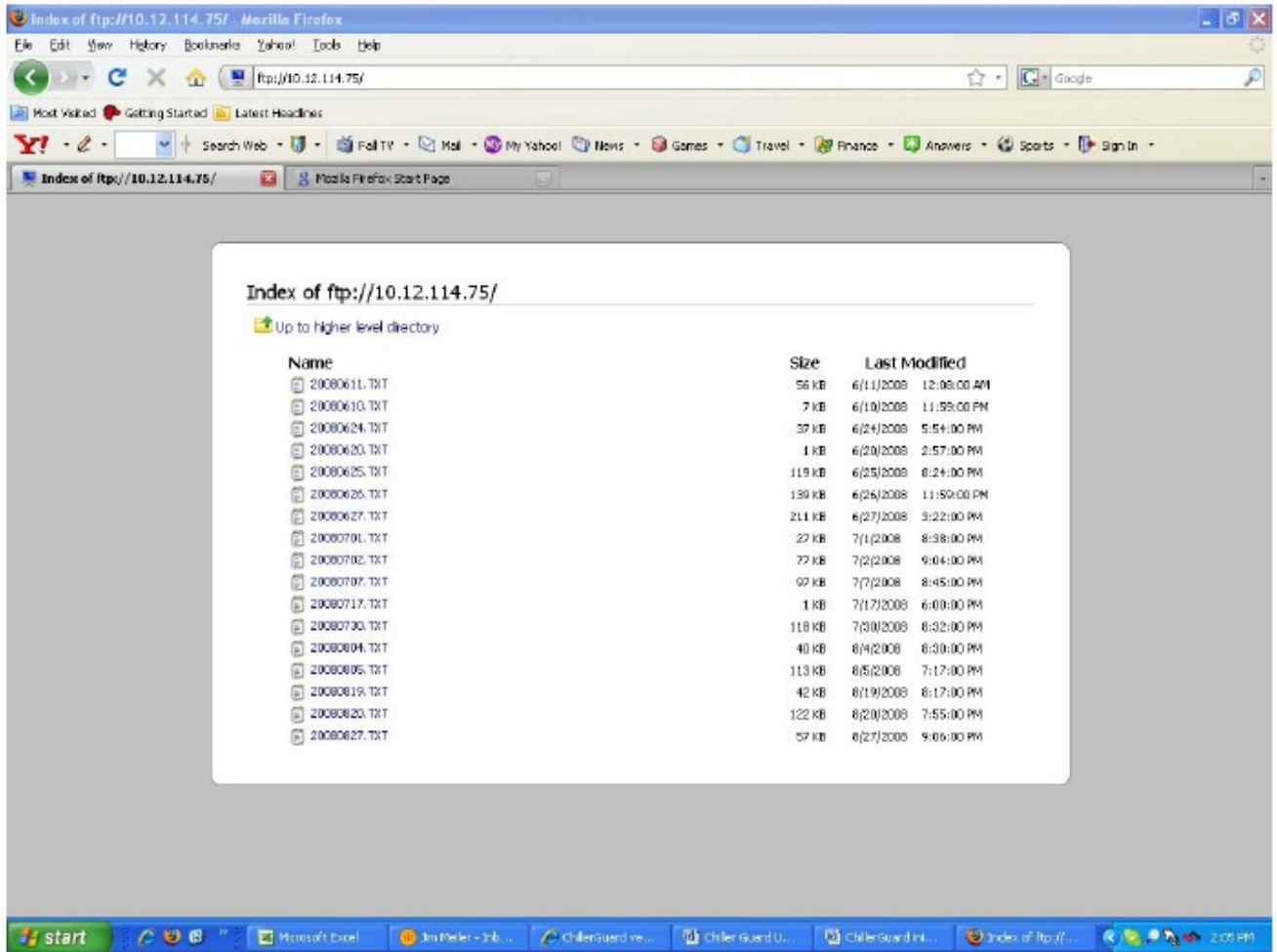
6.   Data Logging and File Management

The ChillerGuard, in order to properly function, requires a standard SD card (minimum 1Gb) inserted prior to startup. Once in operation and communicating properly with the Master controller, ALL data from the Master is captured and stored as a new record to the SD card every 30 seconds.

File Structure:

Each file entry (record) stored to the SD card is a string of comma delimited ASCII characters for ease of portability into a 3rd party spreadsheet/data analysis program. A typical entry might be:

```
1214870429,07/01/2008,00:00:29,84.0,73.0,72.0,353,334,144,151,73.0,72.0,1,0,
55.0,58.0,2,2,375,375,54,54,84.0,40.0,41,0,0,1,0,1,0,0,0,0,,0
```

Where the individual fields are:

```
//   --   [0]    =  Timestamp – seconds since Jan 1, 1970 (UTC time)
//   --   [1]    =  human readable date of record (UTC time)
//   --   [2]    =  human readable time of record (UTC time)
//   --   [3]    =  Ambient Air Temperature
//   --   [4]    =  Inlet Temperature
//   --   [5]    =  Outlet Temperature
//   --   [6]    =  Hi Pressure 1
//   --   [7]    =  Hi Pressure 2
//   --   [8]    =  Low Pressure 1
```

```
//     --    [9]  = Low Pressure 2
//     --    [10] = Upper indicator value on the controller
//     --    [11] = Lower indicator value on the controller
//     --    [12] = CP; number of compressors (integer)
//     --    [13] = Tc; inlet or outlet control (integer)
//     --    [14] = SP1; temperature setpoint #1
//     --    [15] = SP2; temperature setpoint #2
//     --    [16] = dF1; Differential #1
//     --    [17] = dF2; Differential #2
//     --    [18] = HP1; High Pressure setpoint #1
//     --    [19] = HP2; High Pressure setpoint #2
//     --    [20] = LP1; Low Pressure setpoint #1
//     --    [21] = LP2; Low Pressure setpoint #2
//     --    [22] = HtA; High temp outlet water alarm
//     --    [23] = LtA; Low temp outlet water alarm
//     --    [24] = HR1; compressor #1 run hours in 100 hr increments
//     --    [25] = HR2; compressor #2 run hours in 100 hr increments
//     --    [26] = rdu; 0=Std; 1=Opt; (integer)
//     --    [27] = power LED; 0=off; 1=on;
//     --    [28] = sys pump LED; 0=off; 1=on;
//     --    [29] = comp #1 LED; 0=off; 1=on;
//     --    [30] = comp #2 LED; 0=off; 1=on;
//     --    [31] = hi press LED; 0=off; 1=on;
//     --    [32] = lo press LED; 0=off; 1=on;
//     --    [33] = lo flow LED; 0=off; 1=on;
//     --    [34] = flashing alarm message (the alarm message retrieved from the
Master)
//

            -- [35] = temperature display units; 0=F; 1=C;
```

Rather than storing all records to a single file, new files are generated on a daily basis beginning at midnight.

The file-naming convention is as such:

YYYYMMDD.txt

YYYY = four digit year
MM = two digit month
DD = two digit day

File Management:

The ChillerGuard will continue to store records until the card has reached 90% storage capacity. At which point, the unit will begin searching and removing the oldest file prior to beginning a new. Given the current average size of each daily file (~400kb), the time to reach 90% capacity on 1Gb card is approximately 2250 days (just over 6 years).

File Access:

All data files are made visible via use of a custom onboard ftp server. Depending on the browser of choice, downloading data can be performed as such:

To access this data in Firefox:

- Type ftp://<pk_ip_address>/ in the URL and hit enter
- To save the file to your PC:
    o "right" mouse click on the file of interest

o Select "Save Link As…"
o Choose the location to save the file
o Click "Save"

To access this data in IE (tested in IE7):

- Type ftp://<pk_ip_address>/ in the URL and hit enter
- To save the file to your PC:
  o "right" mouse click on the file of interest
  o Select "Save Target As…"
  o Choose the location to save the file
  o Click "Save"
- In IE, you also have the option of launching a Windows Explorer window, granting you rights over read-only based file management of the SD card:
  o In the upper right hand portion of the toolbar, you'll see a "Page" icon (more like a drop down list)
  o Click on that and scroll down to select "Open FTP Site in Windows Explorer"