

X-300

User's Manual

Revision 1.2 July 30, 2009



Web Enabled
Thermostat
Thermometer
Alarm/Logger



7 Day Programming: On Off

	Su	Mo	Tu	We	Th	Fr	Sa
Morning	Time: 06:00 Cool: 78.0 °F Heat: 72.0 °F	Time: 06:00 Cool: 78.0 °F	Time: 06:00 Cool: 78.0 °F	Time: 06:00 Cool: 78.0 °F	Time: 06:00 Cool: 78.0 °F	Time: 06:00 Cool: 78.0 °F	Time: 06:00 Cool: 78.0 °F
Afternoon	Time: 12:00 Cool: 78.0 °F Heat: 72.0 °F	Time: 12:00 Cool: 78.0 °F	Time: 12:00 Cool: 78.0 °F	Time: 12:00 Cool: 78.0 °F	Time: 12:00 Cool: 78.0 °F	Time: 12:00 Cool: 78.0 °F	Time: 12:00 Cool: 78.0 °F
Evening	Time: 18:00 Cool: 78.0 °F Heat: 72.0 °F	Time: 18:00 Cool: 78.0 °F	Time: 18:00 Cool: 78.0 °F	Time: 18:00 Cool: 78.0 °F	Time: 18:00 Cool: 78.0 °F	Time: 18:00 Cool: 78.0 °F	Time: 18:00 Cool: 78.0 °F
Night	Time: 22:00 Cool: 78.0 °F Heat: 72.0 °F	Time: 22:00 Cool: 78.0 °F	Time: 22:00 Cool: 78.0 °F	Time: 22:00 Cool: 78.0 °F	Time: 22:00 Cool: 78.0 °F	Time: 22:00 Cool: 78.0 °F	Time: 22:00 Cool: 78.0 °F

Cool Set Temp: 78.0 °F
Heat Set Temp: 72.0 °F

*Select the far left column to change all days at the same time.
*The cool set temperature must be 3°F (1.5°C) above the heat set temperature.



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www.ControlByWeb.com

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Legend: This manual uses a text format to help the user understand the functions of the X-300 more easily. The following defines this text format:

Setup Page Tabs

Setup Page Fields

Setup Page Options

Defined User Input

Possible Option Entry

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FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

Warning: This equipment has been tested and found to comply with the limits for a Class B (Class A for POE models) digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause interference to radio communications. There is no guarantee, however, that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice: Changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Installation Guidelines (Read Before Installing)

- Do not open the X-300™ enclosure. This could damage the unit or cause personal harm and will void the warranty.
- This unit must be installed by qualified personnel. When using as a thermostat, this unit must be installed by a qualified HVAC technician.
- This unit must not be installed directly outdoors.
- This unit must not be used for medical, life saving purposes, or for any purpose where its failure could cause serious injury or the loss of life.
- This unit must not be used in any way where it's function or failure could cause significant loss or property damage.

Notes about security:

By design, X-300™ is very secure. It does not support terminal or file transfer programs such as telnet, FTP, ssh, etc. This means that it is not possible for someone to 'break in' to X-300™ and access other devices on your local network. The simplicity of X-300™ makes it a very secure device. As with any device to be installed on a network, there are some security precautions that should be observed. If X-300™ is installed on the Internet, it is recommended that passwords be enabled for the **Control Page**. Make sure secure passwords are used. Passwords should be at least 8 characters in length and should be a combination of upper case letters, lower case letters, and numbers. Don't use passwords that would be easy to guess. For additional security, a firewall may be used to limit access only to selected IP addresses. Another option may be to set up a Virtual Private Network (VPN) between the network where X-300™ resides and the client machine (web browser, another ControlByWeb™ product, etc.).

Final installation note. This ControlByWeb™ product supports connection to 10Mbps and 100Mbps networks. Although 100Mbps networks are faster, the amount of data transferred to and from this device is very minimal and little if any performance increase will be gained by setting it to 100Mbps. There are advantages however, to operate this device at 10Mbps. At 10Mbps, less power is required, the unit runs cooler, and the lifetime of the product will be extended.

Section 1: Introduction

1.1 Overview

The X-300™ is a powerful web-based instrument for remote temperature measurement, logging, and alarming. In addition, the X-300™ can function as a full-featured single stage thermostat.

Features:

- Web-Based Temperature Monitoring with Email Alerts and Alarms
- Can be used as a stand-alone web-based programmable thermostat with advanced features such as seven day scheduling.
- Simple drop-down list configuration
- Web-browser based; no software required.
- Can be used with up to 8 sensors in monitor mode (2 in thermostat mode).
- Three, 3-Amp relays (automatic or manual control)
- Field Re programmable, users can install firmware updates when available.
- Built-In Real Time Clock for logging and scheduled temperature changes
- Capacitor power backup keeps time for days during power failure.
- Data Logging
- Configure manually or with DHCP.
- Supports Simple Network Management Protocol (SNMP)
- Supports Modbus/TCP
- Remote Services options allows X-300™ to initiate connection to external servers
- Internal temperature and voltage monitoring for diagnostics.
- Supports BASIC scripts for advanced configuration
- Wide operating temperature range.
- Removable terminal connector for convenient wiring.
- Compact, DIN-Rail mountable enclosure

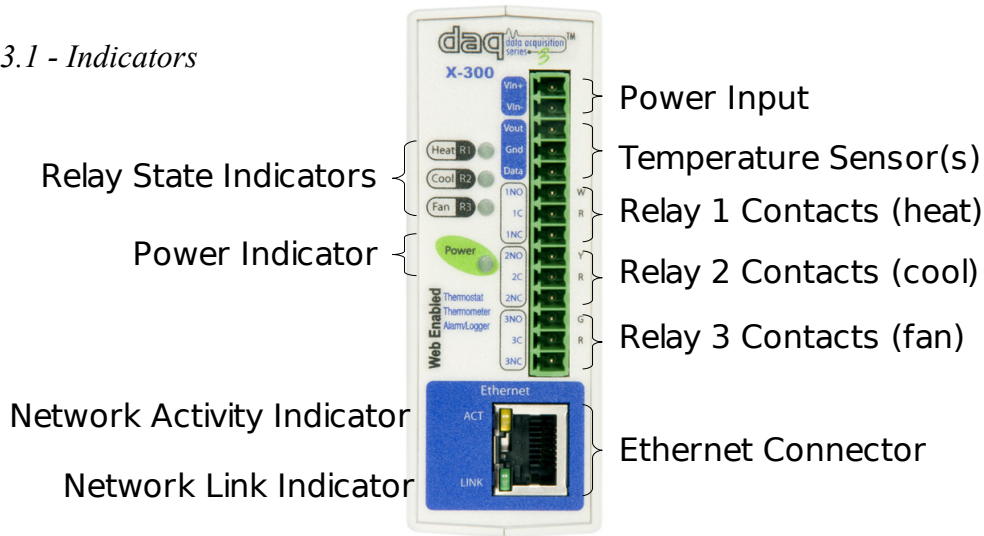
1.2 X-300™ Models Available

Three models are available. The only difference between these three models is the power supply requirement. Note that some models may be available only by special order.

Model Number	Power Supply Requirement
X-300-5	5VDC (regulated power supply required)
X-300-I	9-28VDC
X-300-E	Power Over Ethernet (802.3af) or 5VDC

1.3 Connectors & Indicators

Figure 1.3.1 - Indicators



1.3.1 Connectors

Power, temperature sensors, and relay contact connections are made through a removable 14-pin terminal connector.

Power is required for the X-300™ to operate. Power can be applied to the terminal connector, or for POE models it may be applied through the Ethernet connector (using the 802.3af POE standard).

The temperature sensors all connect to the terminal connector through the same three terminals. The sensors are identified using a unique address so separate terminals for each sensor are not necessary. When multiple sensors are connected, they can be physically connected to the terminals or daisy-chained. See the Application Configuration section for more details.

The terminal connector provides access to the “form C” relay contacts (Common, Normally Open, and Normally Closed). The relay contacts are “dry” contacts and are directly connected (internally) to the terminal connector. The contacts are completely isolated from all other circuits and from each other. For the greatest flexibility, there is no internal voltage, fuse, or protection circuitry connected to the relay contacts.

The Ethernet connector is used for the network connection. This must be connected to a 10Mbps or 100Mbps Ethernet network.

1.3.2 Indicators

Five LED indicators show status information as described below.

The power LED (green) illuminates whenever power is correctly applied to the unit.

Three relay status indicators (yellow) illuminate whenever the corresponding relay is energized. When a relay is energized (LED is on), electrical continuity exists between the common (C) and normally open (NO) terminals, and there is no electrical continuity between the common (C) and normally closed (NC) terminals. When a relay is NOT energized (LED is off), electrical continuity exists between the common (C) and normally closed (NC) terminals, and there is no electrical continuity between the common (C) and normally open (NO) terminals.

The Link indicator (green) is located on the Ethernet connector. When this is illuminated, it indicates that the X-300™ is correctly (physically) connected with the network. This indicator is normally always on and must be on before any communications with the X-300™ can occur.

The Activity (ACT) indicator (yellow) flashes when the X-300™ detects activity on the network.

Note that the LINK and ACT indicators are also used to indicate that the X-300™ is in a special mode called the boot-loader mode. This mode is used only for upgrading firmware or resetting the unit to factory defaults. When the X-300™ is in this mode, both the LINK and ACT indicators will simultaneously flash. See Appendix B for details.

1.4 Options for Accessing the X-300™

The X-300™ is a flexible, self-contained instrument and requires NO COMPUTER to operate. It can be used as a single stand-alone device or as part of a large system. It can be accessed directly from a computer or indirectly through a large server. It can be accessed using a web browser, or using custom software.

1.4.1 Basic Access Using A Web Browser

The X-300™ has a built-in web server and provides simple web pages that can be accessed using a standard web browser. This allows users to access the unit with NO SPECIAL SOFTWARE installed on their computer. This is ideal for basic applications that require a quick, simple solution that does not need to be accessible to more than a few people. This configuration is simple to setup, simple to use, and can be accessed from any computer without the installation of software. Note that computers that are not on the local network may only access the X-300™ if the local network router is setup to allow this.

1.4.2 Accessing X-300™ with Custom Software or Third Party Applications

The X-300™ provides a programming interface that allows applications running on a computer to have full access to it. Custom applications can send commands to the X-300™ for monitoring and control. Custom applications can be used to provide a custom user interface, provide access to multiple units in a single screen, automation, logging, etc. The benefit of using custom software to access the X-300™ is that flexibility is almost unlimited.

1.4.3 Using an external Web Server

Rather than accessing X-300™ directly from a computer, an external web server can be used. The term “external” web server is used here to mean a separate web server (such as Apache or IIS) that is not the web server built into the X-300™. In this scenario, users access custom web pages that reside on the external web server and the external web server communicates with the X-300™. Users would not communicate directly with the X-300™.

Using an external web server to provide a custom user interface is beneficial because multiple X-300™ devices (or other ControlByWeb™ products) can be integrated into a single control page or set of pages so they appear as part of a larger system rather than individual devices. In other words, the user may not be aware that he/she is using multiple X-300™ devices, but rather the user sees a custom control page that shows the temperature in every room in a building. In addition, the use of an external web server allows programmers to create custom user interfaces that take advantage of the additional resources typically available on larger web servers including more memory and various web programming languages.

There are two approaches that an external server can use to communicate with X-300™ and other ControlByWeb™ devices. The first approach is for the external server to create a TCP connection whenever it needs to access the X-300™. In this case, the external server opens the connection, sends commands and/or reads the device, and closes the connection. The second approach is for the X-300™ to initiate a connection. Using the “Remote Services” settings under the **Advanced Network** tab in the setup pages, the X-300™ can be configured to open a TCP

connection with an external server. Once the connection is open, the external server can send commands and/or read the device. The external server can leave the connection open (so that it never closes) or close the connection.

Each of the two approaches is appropriate for different applications. The first approach is ideal when the the web server and all of the X-300™ devices are on the same network (without routers between them). In this case, the server can communicate with the X-300™ devices directly and security concerns are minimal because data never has to leave the local network. When the server and the X-300™ devices are on different networks, the first approach can still be used, but routers that are installed between them must be configured to allow appropriate access. For companies that own or control the networks where all of these devices are installed this is not a problem. Anytime a public network is used (the Internet), however, security precautions should be implemented.

The second approach described above uses “Remote Services” features and is ideal for installations where the server and the X-300™ devices are installed on different networks. This is especially useful when each X-300™ is installed on a separate private network. An example is used to illustrate the use of this approach...

"XYZ resort is a 4-star condominium resort with 310 privately owned condominiums. When the condominium owners are not using their condominium, ABC company offers the service of renting out the condominium. Since each condominium is privately owned, each condominium has independent utilities and each has its own Internet connection. To keep costs down, ABC company installed an X-300™ in each condominium unit with one relay in series with the in-room thermostat and another relay in parallel. This allows them to monitor temperatures, and to override the air-conditioner when condominiums are vacant. To simplify things even further, ABC company wrote a custom computer application that communicates with all of the X-300™ devices, and to automatically turn off the cooling systems when the condominiums are not being used. Since ABC company doesn't own or control any of the network connections inside each condominium, they use the “Remote Services” settings in the X-300™ to connect to their computer that has the cooling system control software. By using the “Remote Services” configuration, the X-300™ initiates a TCP connection over the Internet with their control computer. Since the X-300™ initiates the connection, the control computer doesn't have to know the IP address of the X-300™. This means that the X-300™ can be installed in each condominium using DHCP to obtain a dynamic IP address. In addition, no special router configuration is required in each condominium unit. This makes the network installation of the X-300™ very simple for ABC company, and since no incoming ports need to be opened up in each condominium owners router, security is not compromised."

See the description of the **Advanced Network** tab in chapter 2.5 for more information.

1.5 Application Examples

This section briefly describes some of the applications for the X-300™, illustrates connections for those applications, and provides key configuration settings. Before installing the X-300™, please read Section 2: Installation and Setup . Note that some of the examples below require that temperature sensors be mounted in harsh locations such as outdoors or in water. For those applications, appropriate sensors that are encapsulated in thermal wells or properly protected should be used.

1.5.1 Temperature Monitoring, Logging, and Alarming

The X-300™ can be used as a simple web-enabled thermometer for conveniently viewing temperatures on a computer or web-enabled mobile telephone. This is useful for viewing the temperatures of living spaces, outdoors, refrigeration systems, tanks, pipes, etc. In addition to simple viewing, temperatures can be logged to internal memory and the unit can be configured to send email alerts (or indirectly, text messages) when preset temperature thresholds are crossed. In this and any configuration, the X-300™ can communicate directly with a custom computer application which can read the temperature data from the X-300™ for process control or other functionality.

1.5.1.1 Single Sensor

Applications:

- Thermometer,
- Temperature monitoring of living spaces, outdoors, refrigeration systems, etc
- Email alert alarms
- Ethernet based data acquisition systems

Connection (Figure 1.2):

Provide power, network and temperature sensor.

Software Configuration:

Mode: *Temperature Monitor*

Settings: Under **Sensors** setup tab:

Set **Sensor** to *Sensor 1*

Set **Sensor Address** to address of connected temperature sensor

Power Supply
(5 VDC or 9-28 VDC)

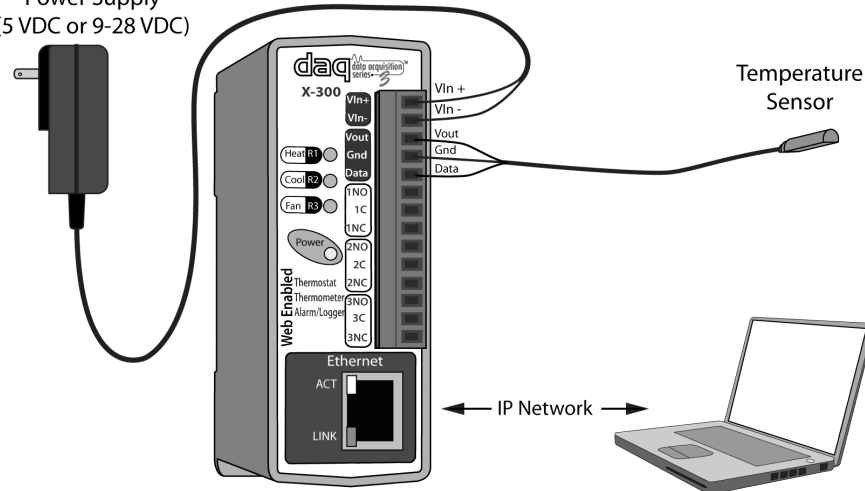


Figure 1.2 – Temperature Monitoring with Single Sensor