

# e-Stat<sup>®</sup> System Product Brief

## Two-Way Communicating Remotely Programmable Thermostat

### Applications

The e-Stat<sup>®</sup> is intended for commercial low-voltage remotely controlled thermostat applications primarily used in National Accounts where multiple location climate control and monitoring are required, and remote policy-based management with diagnostic troubleshooting from a centralized web-enabled system is desired.

### Description

The e-Stat<sup>®</sup> is a low voltage, solid state, automatic changeover, heating/cooling thermostat with digital display showing setpoints and room temperature. Retrofit installations can utilize existing HVAC wiring, typically.

Fully programmable from a centralized web server, the e-Stat<sup>®</sup> offers the flexibility to program daily temperature programs, fan control, override control, and button permissions. Key diagnostic features include real-time remote status of thermostat plus 72 hour space temperature and HVAC operational history.

### Features

#### Standard Features:

- Commercial programmable thermostat controls up to two stages of heating and two stages of cooling.
- Proportional Plus Integral (P+I) control for accurate, even temperature control.
- Automatic changeover from heating to cooling with deadband between heating and cooling setpoints to prevent short cycling of equipment.
- Intelligent pre-conditioning of the controlled space prior to business open.
- Time delays for equipment protection.
- Backlit display for easy viewing in low-light conditions.
- Supports heat pump reversing valve operation.
- 45 second fan ON/OFF time delay when fan set to AUTO.
- Automatic randomized delay timers to prevent power surges at power up (4 to 12 minutes).
- Adjustable 3 to 6°F deadband between heating and cooling.
- Adjustable heating and cooling interstage differentials (1.5°F default).
- Supports optional humidity sensing.

- Colored visual status indicators.
- 2 year warranty with toll-free technical support (included).

#### Local Control / Diagnostic Features:

- System ON/OFF switch to shut down HVAC equipment and thermostat.
- FAN control button to set fan for AUTO or ON operation, if permitted.
- Temperature adjustment buttons for temporary setpoint program overrides, if permitted.
- Cancellable time delays for field verification.
- Selectable heating interstage differential for optimal heat pump operation.
- Selectable compressor time delays.
- Selectable fan control by equipment during heat cycle.
- Ability to force either heating or cooling stages ON when troubleshooting.
- Ability to toggle state of Auxiliary relay to verify field wiring.

#### Remote Control / Diagnostic Features:

- Daily temperature / occupancy programming with up to four steps / day.
- Corporate controlled setpoints and temperature override permissibility to prevent overheating or cooling of space.
- Limit, completely disallow, or change button functionality for certain buttons.
- System retains up to 5 years of performance data on your HVAC equipment and controlled space for diagnostic review.
- Configurable to provide immediate notification of HVAC problems via email or email capable portable devices.
- Remotely issue/cancel temporary temperature setpoint overrides.
- Remotely issue/cancel temporary FAN mode overrides.
- Remotely utilize/cancel timed System ON/OFF to temporarily shut down HVAC equipment or to simply cycle power to e-Stat<sup>®</sup>.
- Optional humidity sensing can be configured to additionally manipulate cooling setpoint during excessive humidity conditions.
- Remotely issue an HVAC Load Curtailment for a fixed interval. Possible algorithms:
  - Outputs Off
  - Fixed Setpoints
  - Offset Program Setpoints
  - Duty Cycle Outputs (15 min ON/OFF)
- Variable history logging interval.



**UL Listed Two-Way Communicating Thermostat**

#### Electrical Specifications:

The e-Stat<sup>®</sup> uses existing thermostat wiring for thermostatic control (requires common wire). Requires industry standard RJ-45 Ethernet connection to enable two-way communications over a full-time secure Internet connection.

#### General:

Voltage Rating ..... 20.4 to 30VAC  
Current Draw.....285 mA @ 24VAC (Typ)

*Intended for NEC Class 2 Circuit for Low Voltage (24VAC) systems only*

#### HVAC:

Cabling ... up to 10-Conductor, #18AWG  
Wiring Distance (Max) ..... 500 ft

#### All Relays, Rated (per UL):

24 VAC, 60 Hz, Class 2, 1A,  
Resistive / Pilot Duty

#### Each Sensor:

Cabling ..... 2-Conductor, #18AWG  
Wiring Distance (Max) ..... 500 ft

#### Network:

Cabling ..... Cat-5, or Better  
Ethernet ..... 10/100BT Auto-sensing  
Wiring Distance (Max) ..... 328 ft

### What's Included

#### Base System:

- e-Stat<sup>®</sup> Thermostat
- Remote Temperature Sensor
- Remote Supply Air Temperature Sensor
- Cat-5 Ethernet Cable
- Installation and Operation Manual
- Decorative Wall Plate
- Mounting Hardware



### Device Configuration:

Each e-Stat® ships pre-configured to customer specifications at the factory to simplify the installation process.

- IP Address, Netmask, Gateway and TCP/IP Port pre-configured at factory for out-of-box plug and play operation.
- Send programming and review diagnostics by individual or group.
- Receive real-time visual notification of server / thermostat communications.

### Communication and Security

#### Key Features:

- Thermostatic control and network communications are purposely separated to prohibit interrupted operation of HVAC equipment.
- 256-bit AES Rijndael encryption (e-commerce uses just 128-bit) between server and e-Stat®.
- Field proven deployments utilizing VPN enabled firewalls.

### Network Features:

- Static or Dynamic (DHCP) IP address assignment.
- Uses standards based ARP, TCP, IP, and ICMP to ensure robust, reliable network communications.
- Password protected TCP/IP port for secure protected communication transactions.
- Supports standard ICMP diagnostic ping.
- On-demand (except configured performance alerts and periodic time updates) communications result in very low network bandwidth and data exchange.
- e-Stat® connects and operates like any typical Internet enabled device.

#### Requirements:

- Full-time Internet connection between the Server and e-Stat®.
- Secure access requires proper installation behind network firewalls consistent with established corporate network information technology security policies.

### Wiring Requirements

#### Installation Features:

- Configurable to accommodate local building codes.
- 1-Amp relays switch up to 6 HVAC loads.
- Dedicated O and B relays.
- Auxiliary N.O. or N.C. dry contacts for controlling one auxiliary load.
- Wire-to-wire installation replacement (common wire required).
- Remote room and supply temperature sensors included.
- Industry standard RJ-45 Ethernet jack for easy connection to local area network (LAN).
- One-piece design eases installation at each location (excluding sensors).
- One model fits single or dual stage: gas, electric heat, or heat pumps.
- Retrofit friendly for easy change outs.

## System Overview

### System Characteristics

The e-Stat® system is compatible with TCP/IP and Ethernet enabled networks. It is capable of communicating across T1, Fractional T, Frame Relay, Broadband, and DSL mediums using either a VPN or non-secured connection.

A full time Internet connection between the server and devices is a prerequisite for proper and successful system deployment.

#### Communications:

Communications between each individual e-Stat® and the server occur over TCP/IP using Lightstat's secure and proprietary protocol. To conserve network bandwidth, the protocol data exchanges were designed with satellite communications in mind. Therefore, the majority of the communications are transactional, generating network traffic only on demand and to specific devices when the user queries the control center website.

There are a few exceptions since no well-intentioned Internet device is completely quiet on the network.

These exceptions are:

- ARP requests at 5 minute intervals for duplicate IP address checking.
- Custom configured performance alerting (if enabled). All enabled alerts are limited to just three short transmissions over a 24 hour period. Once activated, alerts must be acknowledged at the control center in order to be re-enabled.
- Periodic time synchronization updates from the server every 1 to 14 days.

The worst case TCP/IP packet data transfer size for a given communication session is approximately 15k bytes per e-Stat® and it is only when the history log is requested from the e-Stat®.

Some optional features may result in additional traffic. Please refer to Network Traffic Behavior Profile (TPUB00004 Rev.3) for complete details.

#### Secure Centralized Management:

Centralized management features allow corporate facilities personnel to control multiple e-Stat® thermostats deployed across a large geographic region from a central location using a secure connection over the Internet. Access the web interface from your corporate preferred

web browser.

The customized website allows key facilities personnel to:

- Remotely control thermostat.
- Diagnose HVAC problems and temperature controlled space.
- Custom group thermostats logically.
- Create daily temperature program presets with up to four steps per day.
- Create daily auxiliary load program presets with up to four steps per day.
- Create / recall custom temperature profiles and schedules as needed.
- Grant or deny policy-based user set point overrides, and local button permissions.
- Configure and View Alerts.
- Capture, review, and save historical performance data.
- Generate reports for:
  - Temperature setpoints
  - Auxiliary loads
  - Connected equipment
  - HVAC alerts
  - HVAC and Aux load curtailments
  - Override activity
  - Device activation and site activity
- Schedule Load Curtailments.
- Temporarily adjust setpoint programs for holidays.
- And much more.

**Server Requirements**

For customers electing to host their own server, the following software must be installed on your server:

- Microsoft® Windows® Server 2008 or better
- Microsoft® Windows® IIS
- Microsoft® SQL Server 2008 R2 Standard Edition (Installed in Mixed Authentication mode), or better
- Microsoft® .NET Framework v3.5, 4.5

Please refer to the e-Stat® EMS Server Requirements (TPUB00016 Rev.4) document for complete details.

**System Flexibility:**

The e-Stat® system architecture is flexible and extensible in both its implementation and configuration. It can be configured numerous ways in order to accommodate your network.

The number of e-Stat® thermostats that you intend to deploy generally dictates the recommended optimal configuration.

Lightstat will work with your MIS/IT department to develop a solution that best meets your needs and security requirements.

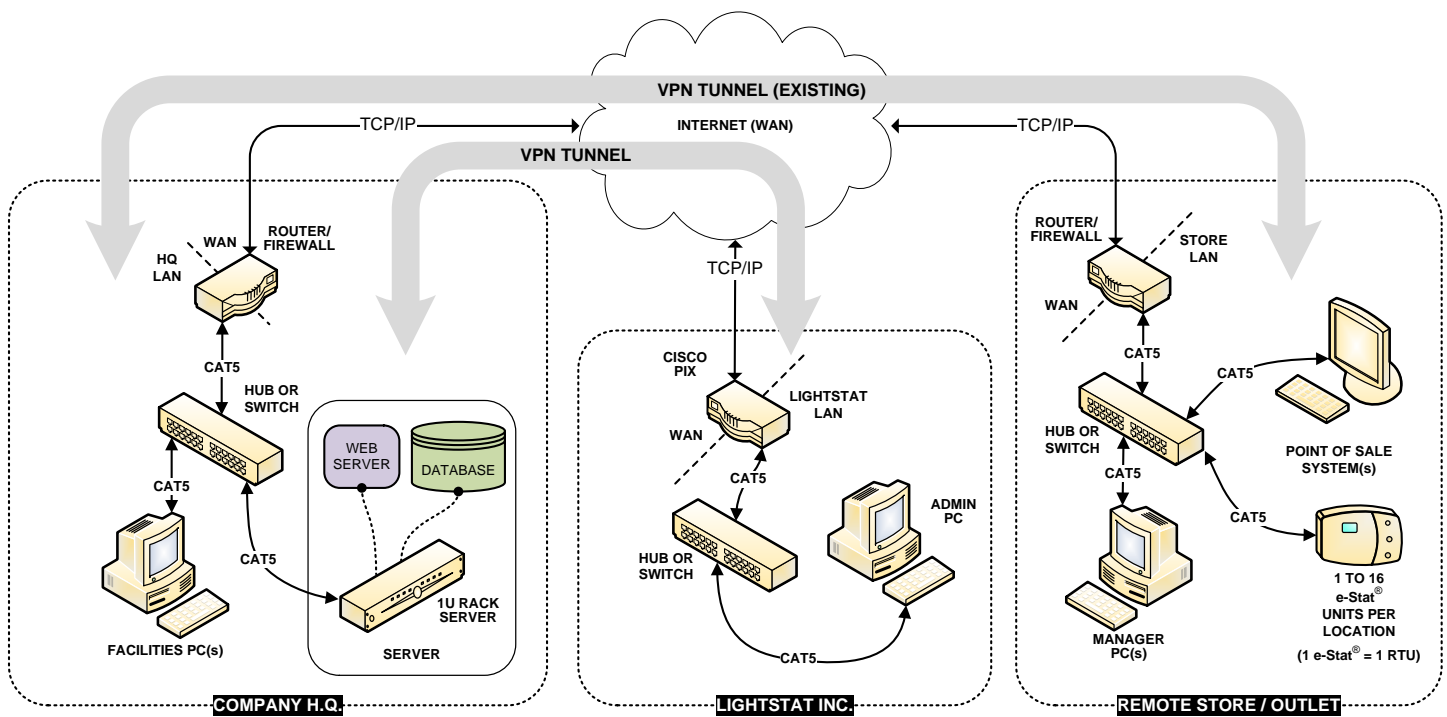
**Architectural Solutions:**

Lightstat provides phone support for the installation, configuration, operation, and first response assistance for your system. As such, Lightstat requires access to the Server in order to provide this level of service and support. This is generally accomplished using a secure VPN connection. Remote access allows Lightstat to add new e-Stat® thermostats to the system, assist HVAC personnel with installation and checkout, and provide first response technical support to stores when they experience any HVAC problems during normal use.

**Examples**

In the examples that follow, several common e-Stat® system configurations commonly deployed are presented for use depending upon the number of deployed devices.

Some contrived examples shown herein are recommended for system wide deployment, while others are intended for product evaluation.



**Figure 1.** A preferred e-Stat® system solution configured to use a corporate hosted server.

**System with many e-Stat® Thermostats:**

For a system with many e-Stats deployed, the configuration in **Figure 1** represents a typical configuration.

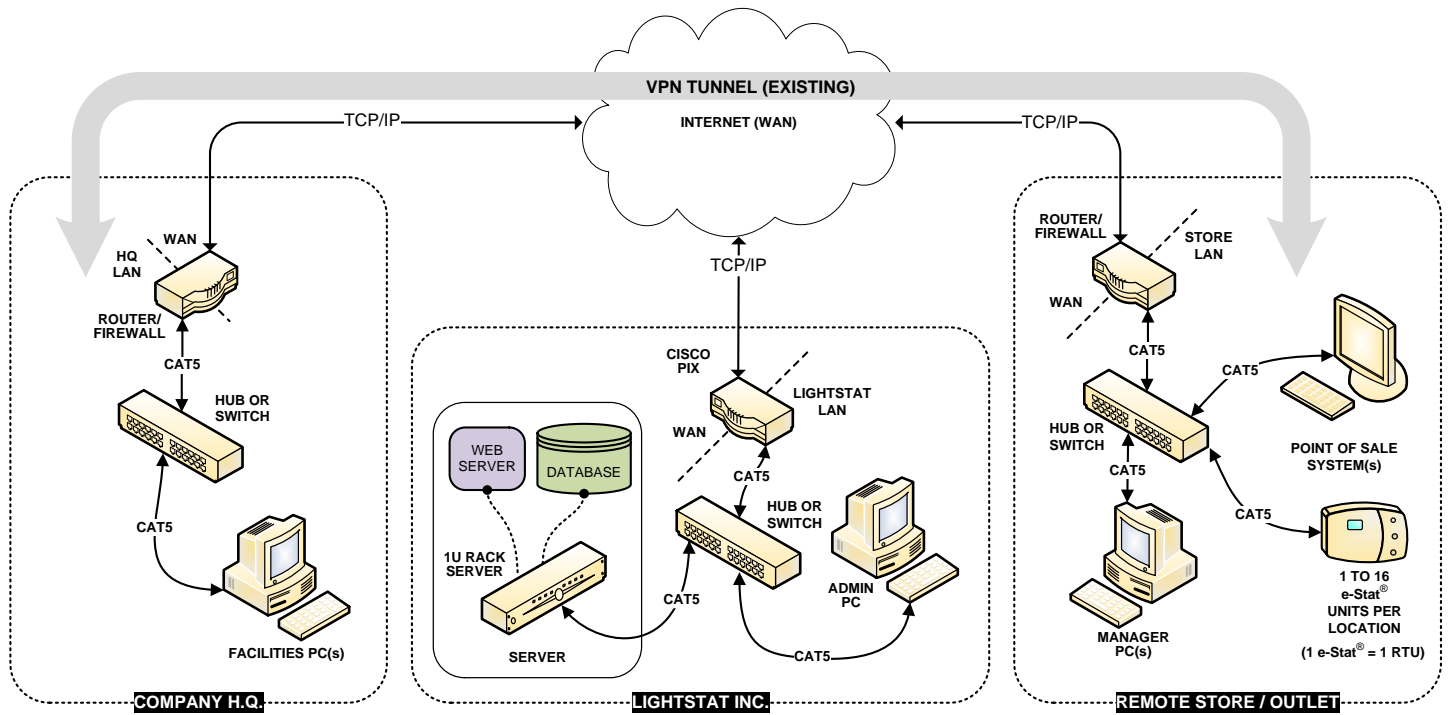
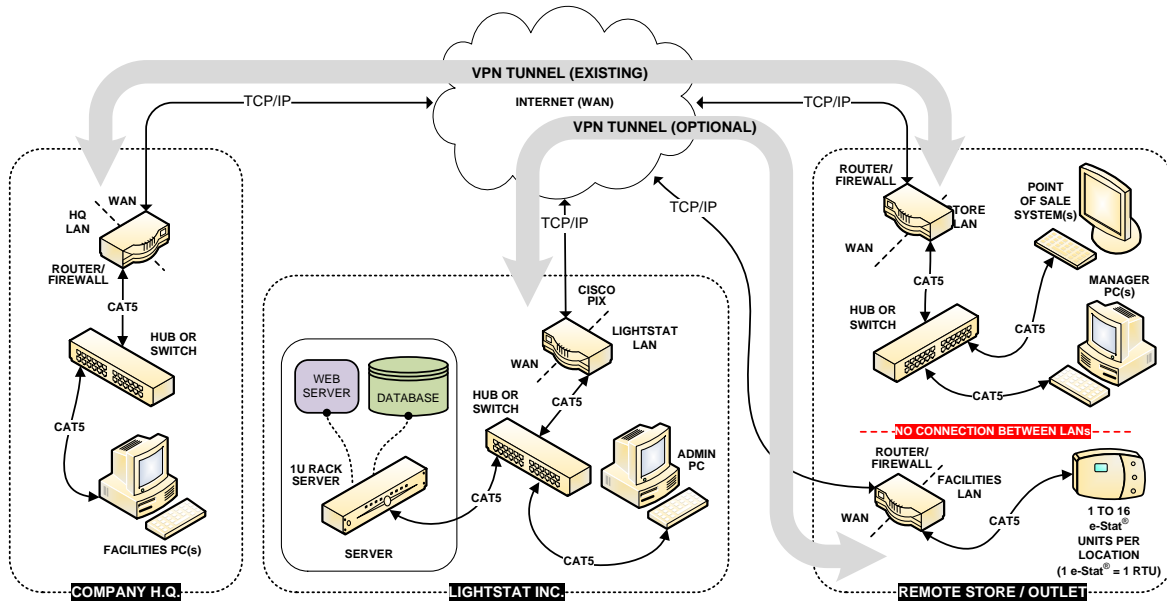


Figure 2. An e-Stat® System solution configured to use a Lightstat hosted server.

**System with few e-Stat® Thermostats:**

The configuration shown left in Figure 2 allows the e-Stat® system to be evaluated using a limited number of devices without significant changes to your existing network. As seen in the example, Lightstat would host the centralized server. The secure web interface, which is restricted to authorized users, displays real-time status information and is accessible from any Internet enabled computer.



**System with Second LAN:**

Some security conscious retailers have chosen to create a second “service” LAN at each location for the purposes of keeping the point-of-sale network isolated and secure.

Figure 3 is one such example. This approach can be achieved either by using physical hardware as illustrated, or by using virtual LANs (VLANs) if supported by your network hardware.

Figure 3. An e-Stat® System solution (Second LAN) configured to use a Lightstat hosted server.

A server maintained either at Lightstat’s data center or at your premises provides the Facilities Manager with a password protected custom configured secure website allowing real-time access e-Stats® over a secure VPN connection.

If these configurations do not meet your needs and/or security requirements, please consult your Lightstat representative.

Other configurations are certainly possible.